BIOSTATISTICS

- **Statistics**: as a science comprises data collection methods, processing of data into useful information, and utilizing this information in taking decisions that entail least error.
- **Biostatistics:** Biostatistics is defined as the collection, compilation, analysis and interpretation of data.

Basic concepts in statistics:

- **Population:** It is the universe from which conclusions are drawn. In statistics it includes all persons, objects or events about which we want to obtain information. There are five dimensions of population – size, could be infinite or finite; geographic area; structure that could be either homogenous or heterogeneous; nature that could be static or dynamic and lastly the time frame.
- **Sample**: is a proportion of population selected by a pre-decided and scientific method (different types of sampling methods)
- **Parameter and statistic**: Characteristic of population is termed as parameter and that of sample as statistic. All population parameters are denoted by capital letter e.g. X, Y, Z etc and sample statistic by small letters e.g. x, y, z etc.
- **Characteristic**: Every person has certain qualities and measurements that differentiate him/her from others. These may be age, height, weight, income, Haemoglobin count etc. then there are others like sex, ethnicity, and blood group etc. these qualities or measurements are referred to as characteristics. For a given person the number of characteristics could be infinite.

Two main types' attributes and variate

- Attributes: An attribute is a characteristic or quality in an individual / object or event that is either present or absent. Denotes '***qualitative***' data.
- Variates: Characteristics that is expressed in terms of scale of measurement or counts of persons, objects or events with a particular measurement. Denotes '***quantitative***' data. Variates can be of two types

  Continuous i.e. theoretically can assume any values from 0 to or
  Discrete – has only real numbers as values and no fractions e.g. family size, population

Data: Data can be classified into different ways. Most commonly they are classified depending on

- Source – primary and secondary data;
- Characteristic – qualitative or quantitative;
- Contents – referred to as measurement scales.

Qualitative date	Quantitative data
1. Finite, discrete variable	1. Infinite, continuous variable
2. No magnitude	2. Magnitude - scale
3. Rate, ratio, proportion	3. Mean, SD, correlation coefficient
4. Answer to question is in yes / no	4. Answer to question is an quantitative value with unit

Measurement scales(Mnemonic:NOIR)

1. Nominal: Data are divided into qualitative categories or groups e.g. male / female; urban / suburban / rural; colours; religion. There is no implication of order or ratio. Nominal data that fall into two groups (yes/no, present / absent) are called *dichotomous data*.

2. Ordinal: data can be placed in a meaningful order e.g. rank; mild/ moderate / severe or grading of Ca lungs – Grade I/II/III/IV. There is no information about the size of the interval.

3. Interval: Numerical unit of measurement has meaningful order, has meaningful equal intervals. Difference between any two measurements is shown in terms of an interval between two points on the scale.
e.g. IQ level , Body temperature in Celsius / Fahrenheit scale.

4. Ratio: Have the same properties as interval scale, but because it has an absolute zero, meaningful ratios do exits. Most biomedical variables form ratio scales.
E.g. Kelvin temp, Height; weight.

Likert scale is a special scale on responses to degree of agreement viz. strongly agree equivocal disagree strongly disagree; A typical test item in a Likert scale is a statement. The respondent is asked to indicate his or her degree of agreement with the statement or any kind of subjective or objective evaluation of the statement e.g. ice cream is good for breakfast –

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

Identification of type of data is helpful

- In further analysis of data, e.g. summary measures like mean are suited for quantitative data, while proportions are for qualitative data.
- In selecting the data presentation method e.g. pie chart for qualitative data.
- In selecting the test of significance e.g. 't' test for quantitative data.

Methods of data presentation

- Tabular method – for scientific audience e.g. in journals etc. Frequency table, association table, correlation table etc.
- Graphical method – for administrators and lay public. Bar diagram, histogram, frequency polygon etc.

Data presentation (Graphical Presentation)

Qualitative data	Quantitative data
• Bar diagram • Pie/ Sector diagram • Pictogram/ Picture diagram • Map diagram/	• Histogram • Frequency polygon • Frequency curve

Spot map	• Line chart/ graph • Cumulative frequency diagram (Ogive) • Scatter/ Dot diagram

Measures of central tendency

A measure of central tendency is a single value that attempts to describe a set of data by identifying the central position within that set of data. As such, measures of central tendency are sometimes called measures of central location. They are also called as summary statistics. The mean (often called the average) is most likely the measure of central tendency that you are most familiar with, but there are others, such as, the median and the mode.

The mean, median and mode are all valid measures of central tendency but, under different conditions, some measures of central tendency become more appropriate to use than others. In the following sections we will look at the mean, mode and median and learn how to calculate them and under what conditions they are most appropriate to be used.

Mean (Arithmetic mean)

The mean (or average) is the most popular and well known measure of central tendency. It can be used with both discrete and continuous data, although its use is most often with continuous data. The mean is equal to the sum of all the values in the data set divided by the number of values in the data set. So, if we have n values in a data set and they have values x_1, x_2, ..., x_n, then the sample mean, usually denoted by $\bar{x}$ (pronounced x bar), is:

$$\bar{x} = \frac{(x_1 + x_2 + \cdots + x_n)}{n}$$

This formula is usually written in a slightly different manner using the Greek capitol letter, $\sum$, pronounced "sigma", which means "sum of...":

$$\bar{x} = \frac{\sum x}{n}$$

An important property of the mean is that it includes every value in your data set as part of the calculation. In addition, the mean is the only measure of central tendency where the sum of the deviations of each value from the mean is always zero.

When not to use the mean

The mean has one main disadvantage: it is particularly susceptible to the influence of outliers. These are values that are unusual compared to the rest of the data set by being especially small or large in numerical value. For example, consider the wages of staff at a factory below:

Staff	1	2	3	4	5	6	7	8	9	10
Salary	15k	18k	16k	14k	15k	15k	12k	17k	90k	95k

The mean salary for these ten staff is \$30.7k. However, inspecting the raw data suggests that this mean value might not be the best way to accurately reflect the typical salary of a worker, as most workers have salaries in the \$12k to 18k range. The mean is being skewed by the two large salaries. Therefore, in this situation we would like to have a better measure of central tendency. As we will find out later, taking the median would be a better measure of central tendency in this situation.

Another time when we usually prefer the median over the mean (or mode) is when our data is skewed (i.e. the frequency distribution for our data is skewed). If we consider the normal distribution -

as this is the most frequently assessed in statistics - when the data is perfectly normal then the mean, median and mode are identical. Moreover, they all represent the most typical value in the data set. However, as the data becomes skewed the mean loses its ability to provide the best central location for the data as the skewed data is dragging it away from the typical value. However, the median best retains this position and is not as strongly influenced by the skewed values.

Median

The median is the middle score for a set of data that has been arranged in order of magnitude. The median is less affected by outliers and skewed data. In order to calculate the median, suppose we have the data below:

65	55	89	56	35	14	56	55	87	45	92

We first need to rearrange that data into order of magnitude (smallest first):

14	35	45	55	55	56	56	65	87	89	92

Our median mark is the middle mark - in this case 56 (highlighted in bold). It is the middle mark because there are 5 scores before it and 5 scores after it. This works fine when you have an odd number of scores but what happens when you have an even number of scores? What if you had only 10 scores? Well, you simply have to take the middle two scores and average the result. So, if we look at the example below:

65	55	89	56	35	14	56	55	87	45

We again rearrange that data into order of magnitude (smallest first):

14	35	45	55	55	56	56	65	87	89	92

Only now we have to take the 5^{th} and 6^{th} score in our data set and average them to get a median of 55.5.

Mode

The mode is the most frequent score in our data set. On a histogram it represents the highest bar in a bar chart or histogram. You can, therefore, sometimes consider the mode as being the most popular option. An example of a mode is presented below:

Normally, the mode is used for categorical data where we wish to know which is the most common category as illustrated below:

Example: 3, 7, 5, 13, 20, 23, 39, 23, 40, 23, 14, 12, 56, 23, 29
In order these numbers are: 3, 5, 7, 12, 13, 14, 20, **23, 23, 23, 23**, 29, 39, 40, 56
In this case the mode is **23**.

However, one of the problems with the mode is that it is not unique, so it leaves us with problems when we have two or more values that share the highest frequency, such as below:

Example: {1, 3, 3, 3, 4, 4, 6, 6, 6, 9}
3 appear three times, as does 6. So there are two modes: at **3** and **6**
Having two modes is called **"bimodal"**.
Having more than two modes is called **"multimodal"**.

Mode = 3median – 2mean (Used where data is bimodal)

We are now stuck as to which mode best describes the central tendency of the data. This is particularly problematic when we have continuous data, as we are more likely not to have any one value that is more frequent than the other. For example, consider measuring 30 peoples' weight (to the nearest 0.1 kg). How likely is it that we will find two or more people with exactly the same weight, e.g. 67.4 kg? The answer, is probably very unlikely - many people might be close but with such a small sample (30 people) and a large range of possible weights you are unlikely to find two people with exactly the same weight, that is, to the nearest 0.1 kg. This is why the mode is very rarely used with continuous data.
Another problem with the mode is that it will not provide us with a very good measure of central tendency when the most common mark is far away from the rest of the data in the data set.

When you have a normally distributed sample you can legitimately use both the mean and the median as your measure of central tendency. In fact, in any symmetrical distribution the mean, median and mode are equal. However, in this situation, the mean is widely preferred as the best measure of central tendency as it is the measure that includes all the values in the data set for its calculation, and any change in any of the scores will affect the value of the mean. This is not the case with the median or mode.

Summary of when to use the mean, median and mode

Type of Variable	**Best measure of central tendency**
Nominal	Mode
Ordinal	Median
Interval/Ratio (not skewed)	Mean
Interval/Ratio (skewed)	Median

Measures of Dispersion/ Variation

Measures of dispersion are the quantities that characterize the 'spread' of the data, such as range, inter–quartile range, or standard deviation.

Range: The range R is the difference between the maximum and minimum value. This measure is unstable since it depends upon the two extreme values of the data and not the entire set. The extreme values can result from exceptional observations, but the range is useful to show the extent (or limits) of the data.

In order to reduce the influence of the extreme values, inter–quartile range (IQR) or inter–decile range is often used as indicators of the dispersion of the data.

Inter–quartile range = $q_3 - q_1$

Inter–decile range = $d_9 - d_1$

Mean deviation: Fist attempt at standardizing variation with respect to central tendency. Defined as observed difference from mean in terms of the total number of observation. as a defined drawback of negative sing as central point could be negative as well.

$$MD = \frac{\sum|x-\bar{x}|}{n}$$

Standard deviation

Standard deviation (denoted by *s* or *s.d.*) is the root mean square of the deviations from the arithmetic mean. The standard deviation indicates the average distance of the observations from the mean of the data set. It is best measure of dispersion of data.

$$s = \sqrt{\frac{\sum(X_i - \bar{X})^2}{n}}$$

To get a better estimate of the standard deviation of the population (denoted by □), standard deviation is often computed with *n*–1 instead of *n* in the denominator. However, for large values of *n* (*n* □ 30) there is practically no difference between the two definitions.

Uses ofSD in biostatistics:

- Summarizes the deviation of a large distribution from mean
- Indicates whether the variation of difference of an individual from the mean is by chance
- Helps in finding the standard error
- Helps in finding the suitable size of sample for valid conclusions

Variance: is the square of the standard deviation. $(SD)^2$

The standard deviation is an absolute measure of deviation that expresses variation in **the same units** as the original data.

Coefficient of Variation (COV):

• Is a measure used to compare relative variability
• Is a unit-free measure **to compare dispersion of one variable with another**[Q]
• Is SD expressed as percentage of mean

Coefficient of variation/ dispersion = $\frac{SD \times 100}{Mean}$

Example – how to calculate ?

Observations	12 13 14 15	10 11 15 18
Mean(μ)	13.5	13.5
Range	15-12 =3	18-10 = 8
Sum of squared deviations from mean	5.0	41.0
Variance(σ^2)	5.0/3 = 1.66	41.0/3 = 13.66
Standard deviation (σ)	√1.66 = 1.29	√13.66 = 3.69

Probability: is the chance of an event occurring. It ranges between 0 and 1, expressed as fraction and not percentages. It can never be negative.

Mathematically,
P= n/N, where, p= probability of event occurring, n= no. with desired characteristic and N= total number of events.

The probability of an event not occurring = 1- probability that it will occur.

Rules of probability:

- **Mutually Exclusive Events & the Addition Rule**

Two events are said to be mutually exclusive when the occurrence of one precludes the occurrence of the other (i.e. both cannot occur simultaneously).

e.g. toss of a coin, it could be either head or tails, but not both at a given time.

p (A or B) = p (A) + p (B) (Mutually exclusive)

Example – Calculated the probability of getting either '1' or '5' in a single throw of dice. Let us consider, if these events are mutually exclusive. Can '1' and '5' surface at the same time ? answer is no. thus these events are mutually exclusive. Using the addition law, Prob of getting '1' on the dice = 1/6; prob of getting '5' on the dice =1/6, prob getting either '1' or '5' = 1/6 +1/6 =2/6 i.e. 1/3

- **Independent events & the multiplicative rule**

Two different events are independent if the outcome or occurrence of one event has no effect on the outcome or occurrence of the second event. The occurrences of one or more events are independent, but may occur simultaneously e.g. in acute appendicitis, one could pain abdomen only or pain abdomen with fever and vomiting, all are independent events but could occur together.

p (A & B) = p (A) . p (B) (Independent event)

Example – What is probability of getting 'tails' in two successive throws of a coin?
Let us see if the events are independent. Is it possible to get 'tails' in two successive throws? Answer is yes; also it is possible to get one tail and one head or two heads too. Thus the events are mutually non exclusive or independent. So using the multiplication law, probability of getting 'tails' in one throw = 0.5 and same in the next throw as well.

Now probability of getting two successive 'tails' =0.5 x 0.5 = 0.25.

Sampling is that part of statistical practice concerned with the selection of individual observations intended to yield some knowledge about a population of concern, especially for the purpose of statistical inference. Each observation measures one or more properties (weight, location, etc.) of an observable entity enumerated to distinguish objects or individuals. Results from probability theory and statistical theory are employed to guide practice.
The sampling process consists of seven simple stages:

- Defining the population of concern
- Specifying a sampling frame, a set of items or events possible to measure
- Specifying a sampling method for selecting items or events from the frame

- Determining the sample size
- Implementing the sampling plan
- Sampling and data collecting
- Reviewing the sampling process

Sample: Sampling is the process of selecting units (e.g., people, organizations) from a population of interest so that by studying the sample we may fairly generalize our results back to the population from which they were chosen. It is a proportion of population selected by a pre-decided and scientific method (different types of sampling methods)
The sample should be -
(a) Adequate
(b) Representative
(c) Independent of selection i.e. selection of one item does not effect the probability of selection of another.
(d) Homogeneous i.e. all the units of the universe are of a similar nature.

Sampling Frame: is the list of ultimate sampling entities, which may be people, households, organizations, or other units of analysis. The list of registered students may be the sampling frame for a survey of the student body at a university. Problems can arise in sampling frames, for instance, but tend to under- represent the poor (who have fewer or no phones) and the wealthy (who have unlisted numbers). Random digit dialing (RDD) reaches unlisted numbers but not those with no phones, while over representing households owning multiple phones.

Sampling method: in statistics, the sampling methods used are of two types – Random,/ probability and non random/ non probability sampling.

I. Probability sampling: A **probability sampling** method is any method of sampling that utilizes some from of random selection. In order to have a random selection method, you must set up some process or procedure that assures that the different units in your population have equal probabilities of being chosen. Humans have long practiced various forms of random selection, such as picking a name out of a hat, or choosing the short. Straw these days, we tend to use computers as the mechanism for generating random numbers as the random selection.

a. Simple Random, sampling: the simplest form of random sampling is called simple random sampling. In a simple random sample random sample of a given size, all such subsets of the frame are given an equal probability. Each element of the frame thus has an equal probability of selection: the frame is not subdivided or partitioned

b. Stratified sampling: Where the population embraces a number of distinct categories, the frame can be organized by these categories into separate "strata". A sample is then selected from each "stratum" separately, producing a stratified sample.
The two main reasons for using a stratified sampling design are
- To ensure that particular groups within a population are adequately represent in the sample and
- To improve efficiency by gaining greater control on the composition of the sample. In the second case, major gains in efficiency (either lower sample sizes or higher precision) can be achieved by varying the sampling fraction from stratum to stratum. The sample size is usually proportional to the relative size of the strata.

c. Systematic sampling: Selecting (say) every 10^{th} name the telephone directory is called an every 10^{th} sample, which is an example of systematic sampling. It is easy to implement and the stratification induce can make it efficient, but it is especially vulnerable to periodicities in the list. If periodicity is present and the period is a multiple of 10, then bias will result. It is important that the first name chosen is not simply the first list, but is chosen to be (say) the 7^{th}, where 7 is a random integer in the range 1…,10-1. every 10^{th} sampling is especially useful, for efficient sampling from databases

d. Multi- stage sampling: It is where the researcher divides the population into strata, samples the strata, then stratifies the samples, and then re-samples, repeating the process until the ultimate sampling units are selected at the last of the hierarchical levels. When the strata are geographic units, this method is sometimes called area sampling. For instance, at the top level, states may be sampled (with sampling proportionate to state population size); then cities may be sampled; then schools; then classes; and finally students.

e. Cluster sampling: The best way to find the immunization coverage will be by simple random sampling (30X7 cluster sampling) of the beneficiaries i.e. children.
30 cluster sampling method for coverage evaluation survey (CES) of immunization coverage; method: A district is divided into 30 clusters (a cluster is a natural unit with some geographical delineation); 7 samples are taken from each cluster randomly. Each sample – a child in the age group 12 months to 23 months. Confidence levels are 95%. No with district comparison can be made. Thus, total sample size =7x30 =210. Coverage = Number completely immunized/ total sample size expressed as a percentage.

II. Non – Probability sampling: The difference between non- probability and probability sampling is that non- probability sampling does not involve random selection and sampling does. Does that mean that non- probability samples aren't representative of the population ? not necessarily. But it does mean that non- probability samples cannot depend upon the rationale of probability theory. At least with a probabilistic sample, we know the odds or probability that we have represented the population most sampling methods are purposive in nature because we usually approach the sampling problem with a specific plan in mind. The most important distinctions among these types of sampling methods are the ones between the different types of purposive sampling approaches.

a. Convenience Sampling: One of the most common methods of sampling goes under the various titles listed here. I would include in this category the traditional "man on the street" (of course, now it's probably the "person on the street") interviews conducted frequently by television news programs to get a quick (although non representative) reading of public opinion. I would also argue that the typical use of college students in much psychological research is primarily a matter of convenience.

b. Quota Sampling: In quota sampling, you select people nonrandomly according to some fixed quota. There are two types of quota sampling; proportional and non proportional. In **proportional quota sampling** you want to represent the major characteristics of the population by sampling a proportional amount of each. For instance, if you know the population has 40% women and 60% men, and that you want a total sample size of 100, you will continue sampling until you get those percentages and then you will stop. So if you've already got the 40 women for your sample, but not

the sixty men, you will continue to sample men but even if legitimate women respondents come along, you will not sample them because you have already "met your quota"

c. Snowball Sampling: In snowball sampling, you begin by identifying someone who meets the criteria for inclusion in your study. You then ask them to recommend others who they may know who also meet the criteria. Although this method would hardly lead to representative samples, there are times when it may be the best method available. Snowball sampling is especially useful; when you are trying to reach populations that are inaccessible or hard to find. For instance, if you are studying the homeless, you are not likely to be able to find good list of homeless people within a specific geographical area. However, if you go to that area and identify one or two, you may find that they know very well who the other homeless people in their vicinity are and how you can find them

d. Judgment Sampling: The basis of selection of sample is based on the judgment or discretion of the investigator.

Sampling error or variation

Standard error (S.E. of mean) – it if the standard deviation of a sampling distribution
S.E. of mean = standard deviation / $\sqrt{N}$

Standard error of proportion (S.E.P) is a measure that describes the sampling variation of an attribute
SEP = $\sqrt{PQ/N}$

Sample Size

"What is the adequate size of the sample for a study?"
A large sample will take more time to complete study and also other resources like manpower and logistics whereas a small sample may not give proper approximation of result as it may not be representative and so results are not generalizable.

- Depends on
  - Effect size
  - Prevalence
  - Population SD
  - Significance level (alpha)
  - Power of study (1-Beta)
- For qualitative study – $4\ pq / L^2$
- For quantitative study – $4\ SD^2 / L^2$

p = Prevalence
q = 1-p
L = Allowable error % of prevalence

Normal Distribution

A probability distribution that plots all of its values in a symmetrical fashion and most of the results are situated around the probability's mean. Values are equally likely to plot either above or below the mean. Grouping takes place at values that are close to the mean and then tails off symmetrically away from the mean.

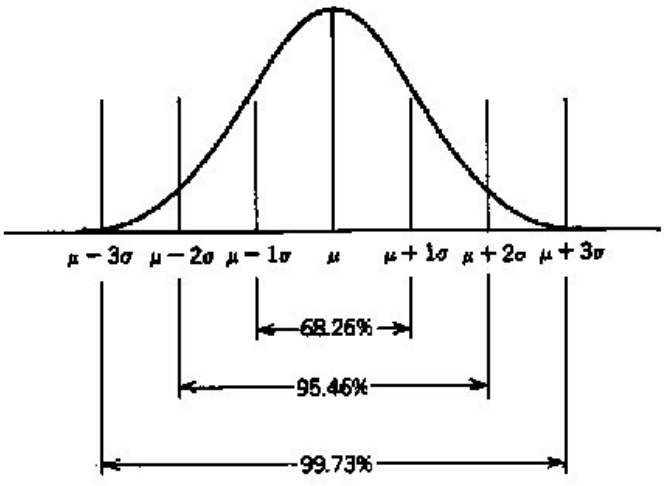
Also known as a "Gaussian distribution" or "bell curve".

The normal distributions are a very important *class* of statistical distributions. All normal distributions are symmetric and have bell-shaped density curves with a single peak.

Characteristics of normal curve:

- Based on Large number of observation (Continuous Random Variable)
- Bell-shaped curve.
- The normal curve extends indefinitely in directions, approaching, but never touching, the horizontal axis as it does so.
- Unimodal
- Mean = Median = Mode
- Symmetrical with respect to the mean. That is, 50% of the area (data) under the curve lies to the left of the mean and 50% of the area (data) under the curve lies to the right of the mean.
- 68% of the area (data) under the curve is within one standard deviation of the mean
  95% of the area (data) under the curve is within two standard deviations of the mean
  99.7% of the area (data) under the curve is within three standard deviations of the mean
- The total area under the normal curve is equal to 1.

Normal Distribution



The 68-95-99.7% Rule

All normal density curves satisfy the following property which is often referred to as the *Empirical Rule*.

68% of the observations fall within 1 standard deviation of the mean, that is, between $\mu - \sigma$ and $\mu + \sigma$.

95% of the observations fall within 2 standard deviations of the mean, that is, between $\mu - 2\sigma$ and $\mu + 2\sigma$.

99.7% of the observations fall within 3 standard deviations of the mean, that is, between $\mu - 3\sigma$ and $\mu + 3\sigma$.

Standard Normal curve

The standard normal distribution is a normal distribution with a mean of 0 and a standard deviation of 1.
Normal distributions can be transformed to standard normal distributions by the formula:

$$z = \frac{X - \mu}{\sigma}$$

where X is a score from the original normal distribution, μ is the mean of the original normal distribution, and σ is the standard deviation of original normal distribution. The standard normal distribution is sometimes called the z distribution. A z score always reflects the number of standard deviations above or below the mean a particular score is. For instance, if a person scored a 70 on a test with a mean of 50 and a standard deviation of 10, then they scored 2 standard deviations above the mean. Converting the test scores to z scores, an X of 70 would be:

$$z = \frac{70 - 50}{10} = 2$$

So, a z score of 2 means the original score was 2 standard deviations above the mean. Note that the z distribution will only be a normal distribution if the original distribution (X) is normal.

Characteristics of standard normal curve:

- Based on Large number of observation (Continuous Random Variable)
- Bell-shaped curve

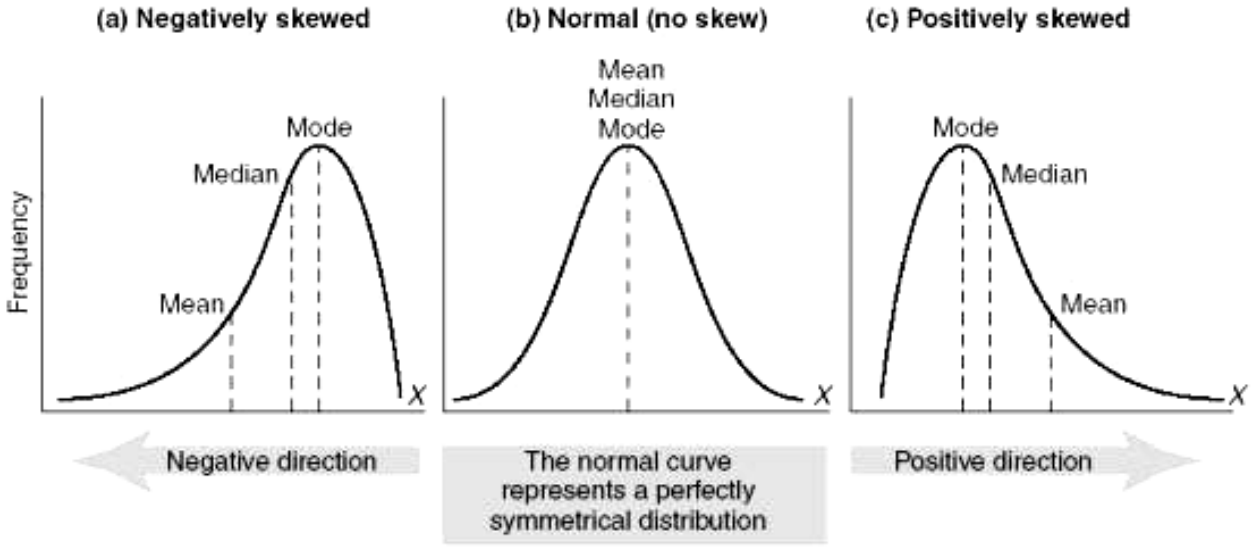
- The normal curve extends indefinitely in directions, approaching, but never touching, the horizontal axis as it does so.
- Unimodal
- Mean = Median = Mode = 0 & SD=1
- Symmetrical with respect to the mean. That is, 50% of the area (data) under the curve lies to the left of the mean and 50% of the area (data) under the curve lies to the right of the mean.
- 68% of the area (data) under the curve is within one standard deviation of the mean
  95% of the area (data) under the curve is within two standard deviations of the mean
  99.7% of the area (data) under the curve is within three standard deviations of the mean
- The total area under the normal curve is equal to 1.

Skewness

Describe asymmetry from the normal distribution in a set of statistical data. Skewness can come in the form of "negative skewness" or "positive skewness", depending on whether data points are skewed to the left (negative skew) or to the right (positive skew) of the data average.

Skewed deviations

Positively Skewed: Mean> Median> Mode; Tailing to right
Negatively skewed: Mean < Median < Mode; Tailing to left



Correlation

Correlation addresses the relationship between two different factors (variables). The statistic is called a correlation coefficient. A correlation coefficient can be calculated when there are two (or more) sets of scores for the *same* individuals or matched groups.

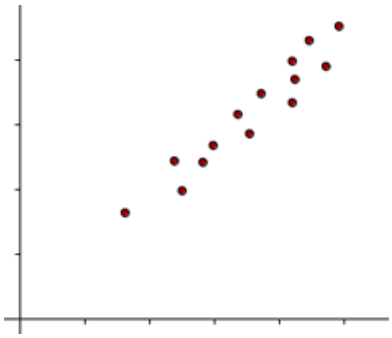
A correlation coefficient describes direction (positive or negative) and degree (strength) of relationship between two variables. The higher the correlation coefficient, the stronger the relationship. The coefficient also is used to obtain a *p* value indicated whether the degree of relationship is greater than expected by chance. For correlation, the null hypothesis is that the correlation coefficient = 0.

Examples: Is there a relationship between family income and infant mortality rate? Does amount of time spent studying predict exam grade? How does alcohol intake affect reaction time?

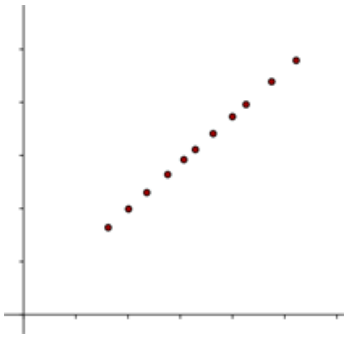
Correlation can be positive or negative, depending upon the direction of the relationship. If both factors increase and decrease together, the relationship is positive. If one factor increases as the other decreases, then the relationship is negative. It is still a predictable relationship, but inverse, changing in opposite rather than same direction. Plotting a relationship on a graph (called a scatter plot) provides a picture of the relationship between two factors (variables).

Types of Correlation

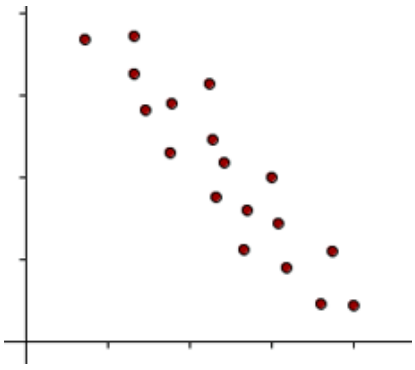
Positive Correlation: when an increase in one variable increases the value in another.
The line corresponding to the scatter plot is an increasing line.



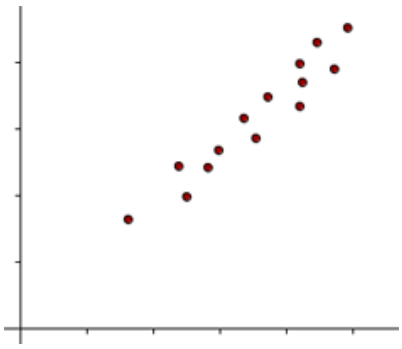
Perfect Correlation
Perfect correlation occurs when there is a funcional dependency between the variables.
In this case all the points are in a straight line.



Negative Correlation: when an increase in one variable decreases the value of another.
The line corresponding to the scatter plot is a decreasing line.

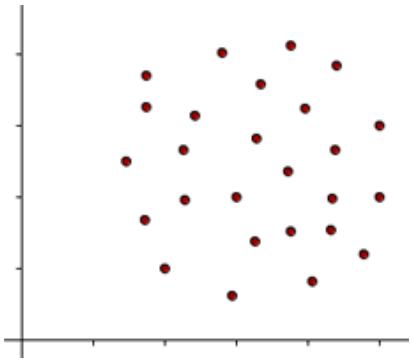


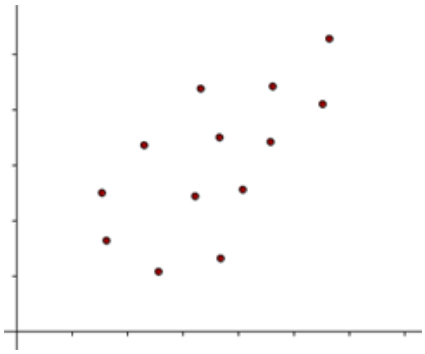
Strong Correlation
A correlation is stronger the closer the points are located to one another on the line.



No Correlation
No correlation occurs when there is no linear dependency between the variables.

Weak Correlation
A correlation is weaker the farther apart the points are located to one another on the line.





Correlation Coefficient (*r*) :

The quantity *r*, called the *linear correlation coefficient*, measures the strength and the direction of a linear relationship between two variables. The linear correlation coefficient is sometimes referred to as the *Pearson product moment correlation coefficient* in honor of its developer Karl Pearson.

The mathematical formula for computing ***r*** is:

$$r = \frac{n\sum xy - \left(\sum x\right)\left(\sum y\right)}{\sqrt{n\left(\sum x^2\right) - \left(\sum x\right)^2}\sqrt{n\left(\sum y^2\right) - \left(\sum y\right)^2}}$$

where *n* is the number of pairs of data.

The value of *r* is such that $-1 \leq r \leq +1$. The + and – signs are used for positive linear correlations and negative linear correlations, respectively. *Positive correlation:* If *x* and *y* have a strong positive linear correlation, *r* is close to +1. An *r* value of exactly +1 indicates a perfect positive fit. Positive values indicate a relationship between *x* and *y* variables such that as values for *x* increases, values for *y* also increase.

Negative correlation: If *x* and *y* have a strong negative linear correlation, *r* is close to -1. An *r* value of exactly -1 indicates a perfect negative fit. Negative values indicate a relationship between *x* and *y* such that as values for *x* increase, values for *y* decrease.

No correlation: If there is no linear correlation or a weak linear correlation, *r* is close to 0. A value near zero means that there is a random, nonlinear relationship between the two variables Note that *r* is a dimensionless quantity; that is, it does not depend on the units employed. A *perfect* correlation of ± 1 occurs only when the data points all lie exactly on a straight line. If $r = +1$, the slope of this line is positive. If $r = -1$, the slope of this line is negative.

A correlation greater than 0.8 is generally described as *strong*, whereas a correlation less than 0.5 is generally described as *weak*. These values can vary based upon the "type" of data being examined. A study utilizing scientific data may require a stronger correlation than a study using social science data.

Coefficient of Determination, r^2 or R^2 :

The *coefficient of determination*, r^2, is useful because it gives the proportion of the variance (fluctuation) of one variable that is predictable from the other variable. It is a measure that allows us to determine how certain one can be in making predictions from a certain model/graph. The *coefficient of determination* is the ratio of the explained variation to the total variation. The *coefficient of determination* is such that $0 \leq r^2 \leq 1$, and denotes the strength of the linear association between *x* and

y. The *coefficient of determination* represents the percent of the data that is the closest to the line of best fit. For example, if $r = 0.922$, then $r^2 = 0.850$, which means that 85% of the total variation in *y* can be explained by the linear relationship between *x* and *y* (as described by the regression equation). The other 15% of the total variation in *y* remains unexplained. The *coefficient of determination* is a measure of how well the regression line

represents the data. If the regression line passes exactly through every point on the scatter plot, it would be able to explain all of the variation. The further the line is away from the points, the less it is able to explain.

Spearman correlation coefficient: Sometimes the variables are not normally distributed but are ranked in order then the appropriate correlation measure is Spearman rank correlation coefficient. The Spearman correlation coefficient also ranges from -1 to +1 and is interpreted in the same way as the Pearson correlation coefficient.

Regression

If value one variable (Independent) is known - to know the value of other variable (Dependent / Outcome) – Regression analysis

The term "regression" was coined by ***Francis Galton*** in the nineteenth century to describe a biological phenomenon

Regression is the estimation or prediction of the unknown value of one variable from the known value of the other variable. The variable which is used to predict the variable of interest is called the independent variable and the variable to be predicted is called the dependent variable. The analysis used is called the simple linear regression analysis. This analysis has become synonymous with prediction or estimation which is used extensively in all social and physical sciences. Pharmaceutical companies use regression for studying the effect of new drugs on patients by way of experimentation.

A statistical measure that attempts to determine the strength of the relationship between one dependent variable (usually denoted by Y) and a series of other changing variables (known as independent variables). The two basic types of regression are linear regression and multiple regression.

Linear regression uses one independent variable to explain and/or predict the outcome of Y, while multiple regression uses two or more independent variables to predict the outcome. The general form of each type of regression is:

Linear Regression: $Y = a + bX$

Multiple Regression: $Y = a + b_1X_1 + b_2X_2 + b_3X_3 + ... + b_tX_t$

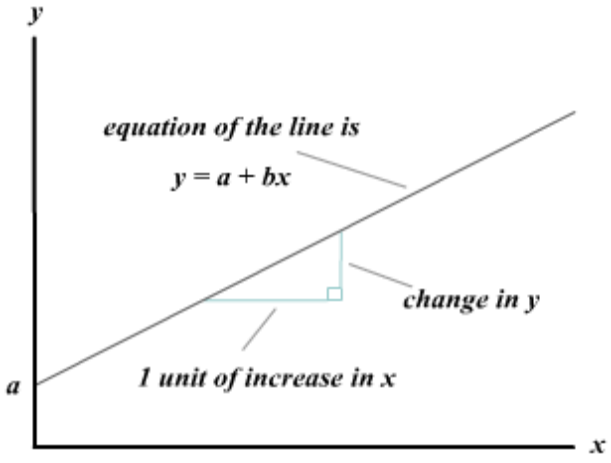
Where:

Y= the variable that we are trying to predict

X= the variable that we are using to predict Y

a= the intercept

b= the slope



In multiple regression the separate variables are differentiated by using subscripted numbers. Regression takes a group of random variables, thought to be predicting Y, and tries to find a mathematical relationship between them. This relationship is typically in the form of a straight line

(linear regression) that best approximates all the individual data points. Regression is often used to determine how much specific factors such as the price of a commodity, interest rates, particular industries or sectors influence the price movement of an asset.

APPROACHES: STATISTICAL INFERENCE (Tests of significance)

- Estimation (Confidence Interval Approach – 95 % CI)
- Hypothesis Testing(Test of Significance Approach – P value)

Confidence interval (CI) is an interval estimate of a population parameter. Instead of estimating the parameter by a single value, an interval likely to include the parameter is given. How likely the interval is to contain the parameter is determined by the confidence level or confidence coefficient. Increasing the desired confidence level will widen the confidence interval.

Confidence limits – on either side of mean

- Mean ± 1 S.D. – 68.27%
- Mean ± 2 S.D. – 95.45% [+1.96 S.D. – 95%]
- Mean ± 31 S.D. – 99.73% [+ 2.58 S.D. – 99%]
- Level of significance = 1- level of confidence

Estimation (CI Approach)

- To determine the true treatment effect, we calculate the CI for our point estimate
- CI is a range of values within the "true" treatment effect is believed to be found, with a given level of confidence
- 95% CI is a range of values within which the "true" treatment effect will lie 95% of the time
- The objectives of interval estimation are to obtain narrow intervals with high reliability.
- The narrower the intervals, the larger the sample size.
- Confidence interval (95 %) – Precision / uncertainty
- 3 parts – Confidence level / Statistic / Margin of error
- CI = Statistic $\pm$ Margin of error
- CL = Probability (P value) describes how strongly we believe that particular sampling method will produce a CI that include true population parameter.
- Confidence level (0.05) – α
  If CL is 0.05 → 95 % CI / If CL is 0.01 → 99 % CI

Hypothesis Testing

- We want to compare the outcomes in two treatment arms (A and B)
- Testing two hypothesis
  - H0: A = B (Null hypothesis – no difference)
  - H1: A = B
- Calculate test statistic based on the assumption that H0 is true (i.e. there is no real difference)
- Test will give us a p value
- Smaller the p value, we reject H0
- If $p < 0.05$ – the trial gives statistically significant evidence that there is a difference
- If $p \geq 0.05$ – Not significant – No difference

Errors in Hypothesis Testing

Type I and Type II errors can be defined in terms of hypothesis testing.

- A Type I error (α) is the probability of rejecting a true null hypothesis.
- A Type II error (β) is the probability of failing to reject a false null hypothesis.

Or simply:

- A Type I error (α) is the probability of telling you things are wrong, given that things are correct.
- A Type II error (β) is the probability of telling you things are correct, given that things are wrong.

The above statements are summarized in Table 1.

Table 1: Summary of Type I and Type II Errors

	when H0 is true	when H1 is true
Do not Reject H0	correct decision $p = 1 - \alpha$	Type II error $p = \beta$
Reject H0	Type I error $p = \alpha$	correct decision $p = 1 - \beta$

One concept related to Type II errors is "power." Power is the probability of rejecting H0 when H1 is true. The value of power is equal to 1- β. It is the power to detect the change.

Bayes' theorem

The probability that an observed positive result is a false *positive* (as contrasted with an observed positive result being a true *positive*) may be calculated using Bayes' theorem.
The key concept of Bayes' theorem is that the true rates of false positives and false negatives are not a function of the accuracy of the test alone, but also the actual rate or frequency of occurrence within the test population; and, often, the more powerful issue is the actual rates of the condition within the sample being tested.

Test of significance

Selecting a statistical test

	Type of Data			
Goal	**Measurement (from Gaussian Population)**	**Rank, Score, or Measurement (from Non-Gaussian Population)**	**Binomial (Two Possible Outcomes)**	**Survival Time**
Describe one group	Mean, SD	Median, interquartile range	Proportion	Kaplan Meier survival curve
Compare one group to a hypothetical	One-sample *t* test	Wilcoxon test	Chi-square or	

value			Binomial test	
Compare two unpaired groups	Unpaired *t* test	Mann-Whitney test	Fisher's test (chi-square for large samples)	Log-rank test or Mantel-Haenszel
Compare two paired groups	Paired *t* test	Wilcoxon test	McNemar's test	Conditional proportional hazards regression
Compare three or more unmatched groups	One-way ANOVA	Kruskal-Wallis test	Chi-square test	Cox proportional hazard regression
Compare three or more matched groups	Repeated-measures ANOVA	Friedman test	Cochrane Q	Conditional proportional hazards regression
Quantify association between two variables	Pearson correlation	Spearman correlation	Contingency coefficients	
Predict value from another measured variable	Simple linear regression or Nonlinear regression	Nonparametric regression	Simple logistic regression	Cox proportional hazard regression
Predict value from several measured or binomial variables	Multiple linear regression or Multiple nonlinear regression		Multiple logistic regression	Cox proportional hazard regression

SCREENING FOR DISEASE

Screening – Active search for unrecognized disease among apparently healthy population

Characteristics of screening test

- Applied to a group
- Done on healthy individuals. [apparently]
- Test results are for screening only and are not final.
- Based on one criterion or cut off point
- Should not be a basis of treatment
- Less accurate, less expensive

Strictly speaking, screening is testing for infection or disease in population or in individuals who are not seeking health care e.g. serological testing for AIDS virus in blood donors, neonatal screening, pre-marital screening for syphilis.
Case finding: use of clinical and / or laboratory tests to detect disease in individuals seeking health care for other reasons.
E.g. The use of VDRL, test syphilis in pregnant women.
Other disease includes PTB in chest symptomatic, HT, cervical cancer, Breast cancer, DM.
Lead Time $\rightarrow$ the time interval between diagnosis by early detection & diagnosis by other means.

Type of screening

1. Mass screening
2. High risk or selective screening
3. Multiphasic screening

Criteria for instituting a screening program:

Disease	Serious & constitutes a public health problem Recognizable latent period or high prevalence of pre-clinical stage

	Natural history is well understood Effective treatment is available Evidence that early detection and treatment reduce morbidity and mortality
Diagnostic test	Sensitive and specific Simple and cheap Safe and acceptable Reliable
Diagnosis and treatment	Facilities are adequate Effective, acceptable and safe treatment available

Screening test

a. Acceptable

b. Repeatability → Reliability

Observe variation → Take average of several measurement

Subject variation → Repeat observation over time

c. Validity → Sensitivity

Sensitivity

Validity is an expression of a degree to which a test capable of measuring what it is intended to Specificity measure. A study is valid if its results correspond to the truth and there should be no systematic error. Internal or external. Sensitivity and specificity and represents criterion validity.

		Disease		**Total**
		Present	**Absent**	
Screening test	**Positive**	a (TP)	b (FP)	a+b
	Negative	c (FN)	d (TN)	c+d
Total		a+c	b+d	a+b+c+d

- Sensitivity = $\frac{a}{a+c} \times 100$ $\left[\frac{TP}{TP+FN}\right]$
- Specificity = $\frac{d}{b+d} \times 100$ $\left[\frac{TN}{TN+FP}\right]$
- Predictive value of a +ve test (PPV)
  [Diagnostic power of +ve test]
  = a/ a+b X 100 $\left[\frac{TP}{TP+FP}\right]$

- Diagnostic power of a –ve test (NPV) = d/c+d X 100 $\quad \frac{TN}{TN + FN}$

- FN% = $\frac{c}{a + c}$ X 100 $\quad \left[\quad\right] \frac{FN}{TP + FN}$
  FN% = 1 – Sensitivity

- % of false +ve = $\frac{b}{b + d}$ X 100 → $\quad \left[\quad\right] \frac{FP}{TN + FP}$
  FP% = 1 – Specificity

Ideal screening test- 100% sensitive & 100% specific

Predictive of test Positive α Prevalence (Sensitivity and specificity being constant)

Baye's theorem: As the prevalence of a disease increases, the positive predictive value (PPV) of the test increases and its negative value decrease.
Based on Bayes Theorem

$$PPV = \frac{\text{Prevalence} \times \text{sensitivity}}{(\text{Prevalence} \times \text{Sensitivity}) + (1\text{-prevalence})(1 - \text{specificity})}$$

$$NPV = \frac{(1\text{- Prevalence})(\text{Specificity})}{(1\text{- Prevalence})(\text{Specificity}) + (1\text{- sensitivity})(\text{Prevalence})}$$

Combination of two or more test

- In series : Test 1 → positive result → Test 2 → positive result → final result Positive [one negative result is negative]
  ↑ Specificity and positive predictive value of the combined tests.
- In parallel: Test 1 + Test2 independently → result positive if any one positive [one positive result is positive]
  ↑ Sensitivity of the combined tests.

Screening tests: important points

- Test in series – increases specificity
- Test in parallel- increases sensitivity
- Prevalence of the disease has definitely has a bearing on PPV
- The most important measure in a screening test is its sensitivity
- Sensitivity and specificity and represents criterion validity.
- Sensitivity and specificity are inversely proportion.

****

DEMOGRAPHY & FAMILY PLANNING

Demography – is the scientific study of human population

Demographic process

Fertility / Mortality / Marriage / Migration / Social mobility

Age group	**% of Population**
Infants (0-1 yr)	3%
0-4 yrs	10%
5-14 yrs	23%
15-49 yrs	53%
50-59 yrs	7%
>60 yrs	7%

Demographic cycle

i.	High stationary	–	High BR	High DR	
ii.	Early expanding	–	High BR	Decline DR	
iii.	Late expanding	–	Fall BR	Decline DR	India (BR > DR)
iv.	Low stationary	–	Low BR	Low DR	
v.	Declining	–	Low BR	Low DR	

Demographic terms:

- **Demographic transition** - High BR/DR → Low BR/DR
- **Demographic window** - High Repro. age group populn
- **Demographic dividend/Populn dividend** - High Repro age group → Economy grows
- **Demographic gift** - Low BR → Beneficial effect
- **Demographic trap** - High BR / Low DR

DEMOGRAPHIC TRENDS IN INDIA

- Total population – 1210 million (16.87% of world population and 2.4% of world's area). 1181 million (2008)
- India - Crude birth rate (CBR) = 22.1/1000 LB / Crude death rate (CDR) = 7.2/1000 LB [2010]
- World - Crude birth rate (CBR) = 23.7/1000 LB / Crude death rate (CDR) = 8.4/1000 LB [2010]
- UN projects that India's population will reach 1.53 billion by 2050.
- Growth rate – 1.64% - very rapid growth {World – 1.23% (2010)}
- Population doubling time for India at present growth rate – 30 years

Rating	**Annual GR**	**Populn doubling time**
Stationary	No growth	-
Slow growth	<0.5	>139 yrs
Moderate growth	0.5-1	139-70 yrs
Rapid growth	1-1.5	70-47 yrs
Very rapid	**1.5-2**	**47-35 yrs**
Explosive	2-2.5	35-28 yrs
	2.5-3	28-23 yrs
	3-3.5	23-20 yrs
	3.5-4	20-18 yrs

- Sex ratio: F:M = 940:1000 (2011)

- State with max population – Uttar Pradesh (199 million – 6.17%) f/b Maharashtra, Bihar and West Bengal.
- Decadal growth rate – 17.64%
- Urban population – 31.2%; rural population – 68.8%
- Mega cities – Cities with population more than 10 million – Mumbai (16.3 million), Kolkata (14.3m), Delhi (15.3m)

Population pyramid / Age pyramid – represents age and sex composition of a population; is a double histogram sharing a common vertically placed base.

- Height represents max. age span of population
- Shape reflects fertility behavior
- Asymmetry indicates presence of gender bias

Sex ratio- 940 females per thousand males (2011)

Kerala – 1084 [highest], Pondicherry – 1038, Haryana – 877, Delhi – 866, Chandigarh – 818, Daman & Diu - 618 [lowest]

Sex ratio at birth - 878 (Rural - 871 / Urban - 891)

Child sex ratio (0-6 yrs) – 914 (2011) (Rural - 902 / Urban - 919)

Highest – Mizoram (971), Lowest – Haryana (830)

Dependency ratio – population above 65 years and children below 15 years are considered to be dependent on the economically productive age (15-64 years)

Young age dependency ratio – less than 15 years (0-14 yrs)

Old age dependency ratio – more than 65 years

$$\text{Formula} = \frac{\text{Children 0-14 yrs} + \text{Population} \geq 65 \text{ yrs}}{\text{Population 15-64 yrs}} \times 100$$

Dependency ratio India: 55.6 [2010]

Demographic bonus – connotes period when dependency ratio in a population declines because of decline in fertility, until it starts to rise again because of increase in longevity.
Demographic burden – refers to increase in total dependency ratio, by increased old age dependency.

Population density – 382 per square km (2011)

Literacy rate – person above 7 years of age and can read and write with understanding in any language (2001)

$\text{Crude literacy rate} = \frac{\text{No. of literate persons}}{\text{Total population}} \times 100$	$\text{Effective literacy rate} = \frac{\text{No. of literate persons} > 7 \text{ yrs of age}}{\text{Total population} > 7 \text{ yrs of age}} \times 100$

India 74.04% - Males 82% - Females – 65%

Kerala – 93% (highest) – Male 96% - Females – 92%

Bihar – 64% / Arunachal Pradesh – 67% / Jharkhand – 68% (lowest)
State with lowest female literacy – Bihar – 53% / Jharkhand – 56%

Age at marriage

Mean age	Females 22.4 years / Males 24 years
Legal minimum age	Females 18 years / Males 21 years (Child marriage restraint act, 1978)

Life expectancy at birth – average no. of years a new born baby may expect to live, according to the mortality patterns prevalent in the country.
One of the best indicator of country's level of development & overall health status of population.
India – 63.9 years for males and 66.9 years for females.
Maximum in Japan – Males – 80 years / Females – 86 years

FERTILITY INDICATORS

Fertility (Natality) means actual bearing of children. Fecundity means the ability the capacity to bear children (become pregnant). A woman's reproductive period lasts for 30 years (15-45 years) & she may give birth to maximum 15 children. Some demographic factors having a bearing on fertility;

Factors determining fertility –

Factor	Effect on fertility
1. Age at marriage	Increase
2. Duration of married life	Increase
3. Spacing of children	Decrease
4. Education	Decrease
5. Economic status	Decrease
6. Caste and religion	Linked to religion
7. Nutrition	Decrease
8. Family planning	Decrease
9. Others – like widow re-marriage, breast feeding customs etc.	Decrease

Crude Birth rate (CBR) = $\frac{\text{No. of live births}}{\text{Estimated Midyear population}} \times 1000$

General Fertility Rate (GFR)

GFR = $\frac{\text{No. of LB in an area}}{\text{Midyear female population (15-44 or 49yrs)}} \times 1000$

General Marital Fertility Rate (GMFR)

GMFR = $\frac{\text{No. of LB in an area}}{\text{Midyear married female population (15- 49yrs)}} \times 1000$

Age Specific Fertility Rate (ASFR)

ASFR = $\frac{\text{No. of LB in particular age group}}{\text{Midyear female population in same age group}} \times 1000$

Age Specific Marital Fertility Rate (ASMFR)

ASMFR = No. of LB in particular age group X 1000
Midyear married female population

Total Fertility Rate (TFR) & Total Marital Fertility Rate (TMFR) – Synthetic rate/not actually counted

$$TFR = \frac{5\sum_{15-19}^{45-49} ASFR}{1000} \qquad TMFR = \frac{5\sum_{15-19}^{45-49} ASMFR}{1000}$$

TFR≈ Family size completed
India – 2.5 [2010] targets by 2010 is 2.1 (NPP 2000)
UP / Bihar – 3.8 / Kerala – 1.7

Gross reproduction rate- no. of girls that would be born to a women if she experiences the current fertility throughout her reproductive span, assuming no mortality.

$$GRR = \frac{5\sum_{15-19}^{45-49} \text{ASFR for female LB}}{1000}$$

Current figures – 1.2 (2010)

Net reproduction rate - number of daughters a new born girl will bear during her life time assuming fixed age specific fertility and mortality rates

NRR – demographic indicator
NRR = 1 – 2 child norm / NRR < 1 – below replacement level
For NRR = 1, CPR = 60% (Couple protection rate)
Current level 1.48 Goal by 2010 is 1.0

Child women ratio

No. of children (0-4yrs of age) per 1000 Women of child bearing age (15-44 or 49yrs)

Pregnancy rate

Ratio of no. of pregnancies in a year to married women in ages 15-44 or 49yrs
Includes all pregnancies (LB/SB/abortion)

Abortion rate – no. of abortions in a year per 1000 women in child bearing age group
Abortion ratio – no. of abortions to no. of live births

Crude Marriage rate = No. of marriages in yr X 1000
Midyear population

General marriage rate = No. of marriage in year X 1000
No. of unmarried persons in 15-49yrs age group

Demographers formula 1 – GFR = Birth rate X 5
Demographers formula 2: Birth rate = (TFR X 8) +1
Demographers formula 3: GRR = ½ TFR (if male: female:: 1:1)

Sources of demographic information in India

Some surveys that are used in demography;

- **Census:** The total process of collecting, compiling and publishing demographic, economic and social data pertaining at a specified time or times, to all person in a country or a delimited territory. Legality offered by census act, 1948. First census in India took place in 1881. Last in March, 2011. The census is usually conducted at the end of first quarter of first year of the decade. Supreme officer for census – Census commissioner of govt. of India.

- **Registration of Vital Events:** Primarily done by civil registration system (CRS). The act governing this event is referred as, the central births and deaths registration act, 1969. The time limit for registration of deaths and births is 21 days (amendment, 2004).

- **Sample Registration System:** dual record system consisting of continuous enumeration of births and deaths by an enumerator and an independent survey every 6 months by an investigator or supervisor. This is the most important source of health information.

- **Adhoc Surveys:** this includes surveys like national family health surveys, surveys done for health for all by 2000 AD etc.

- **National family health survey**: Three have been completed till date, though the data for the third is still awaited.
  NFHS I-1992-93;
  NFHS II-1998-99;
  NFHS III-2005-06.

FAMILY PLANNING

Scope of family planning

- Spacing and limitation of births
- Advice on sterility
- Education on parenthood
- Sex education
- Screening for pathological conditions related to reproductive system
- Genetic counseling
- Pre-marital counseling and examination
- Marriage counseling
- Preparation for parenthood
- Services for unmarried mothers
- Pregnancy testing
- Education in home economics and nutrition
- Adoption services

Approach to family planning in India

- Welfare approach – emphasizes the link between family planning and welfare services
- Educational approach – no compulsions in family planning
- Cafeteria approach – information given to the beneficiaries so that they could take an informed decision

Some basic information

Eligible couple (EC):

- Couple with wife in reproductive age group 15-45 yr;
- 150-180 EC / 1000 population
- % eligible couple using contraception – 40 % (2011).
- EC register – important document for Family Planning service – maintained at Subcentre (SC) by Multi-Purpose Worker (MPW) or Male Health worker

Target couple: couple having 2-3 living children (originally). Now expanded to include even newly married couples. Note this term is not very widely used today.

Couple protection rate: the percentage of eligible couples effectively protected against child birth by any contraceptive methods.

$$CPR = \frac{\text{Total no. of EC protected by FP (4) methods}}{\text{Total no. of EC in community}} \times 100$$

- Indicator of prevalence of contraceptive use in community
- For NRR=1, CPR-60%
- Currently India CPR = 40% (2011) / Unmet need for family planning – 12.8% (NFHS 3)

Effective values of different contraceptive methods for CPR
Sterilization and oral pills – 100%
IUD – 95%
Conventional contraceptive (condom) – 50%
Contraceptive methods providing maximum couple protection in the community – Tubectomy
Most cost effective contraceptive method – Vasectomy

Pearl index

- Most common technique used for measuring effectiveness of a contraceptive method
- No. of failures per 100 woman-years (HWY) of exposure.
- $PI = \frac{\text{Total accidental pregnancy}}{\text{Total months of exposure}} \times 1200$

Interpretation – A failure rate (PI) of 10 per HWY would mean that in the lifetime of the average woman about $1/4^{th}$ or 2.5 accidental pregnancies would result, since average fertile period of a woman is about 25 yrs.

In designing and interpreting a use-effectiveness trial, a minimum of 600 months of exposure is usually considered necessary before ant firm conclusion can be reached.
Also Life table analysis can be used. It calculates a failure rate for each month of use.

	PI (per HWY)
No method used	80
Rhythm (Calendar) method	24
Coitus interruptus	18
Vaginal sponge	20-40/9-20 (Nulli)
Male condom	2-14
Female condom	5-21
Diaphragm	12 (6-20)
IUD	0.5-2
Oral pills	0.1-0.5
Centchroman (Saheli)	1.83-2.84

Vasectomy		0.15 per 100 person yr
Tubectomy –Lap	2.1%	
Minilap		0.1-0.5%
Abstinence	0	

Contraceptive methods:

Preventive methods of help women avoid unwanted pregnancies. There is no ideal contraceptive available at present.

Spacing methods	**Terminal methods**
• Barrier methods • Intrauterine devices • Hormonal methods • Post conceptional methods • Miscellaneous	• Tubectomy • Vasectomy

Barrier methods

- Physical – condom / diaphragm / vaginal sponge
- Chemical – spermicidal jellies, foams
- Combined – TODAY (Nonoxynol-9)

Intrauterine devices (IUD)

- First generation – Lippe's loop / Grafinberg's ring
- Second generation – CuT / Nova T
- Third generation – Progetasert / LNG-IUD

Hormonal contraceptives

Oral pills	**Depot formulations**
Combined pills	Injectable
Progesterone only pills	Subcut implants
Post coital pills	Vaginal rings
Once a month pill	
Male pill	

Post conceptional methods

- **Menstrual regulation** - Aspiration of uterine contents without confirming pregnancy within 6-14 days of missed period
- **Menstrual induction** - disturbing normal progesterone / Prostaglandin balance

Miscellaneous

- Abstinence
- Coitus interruptus
- Safe period / Rhythm method / Calendar method
- Natural FP methods – BBT / Cervical mucus / Symptothermic
- BF
- Birth control vaccine

Conventional contraceptives: those methods that require action at the time of sexual intercourse, e.g. condom, diaphragm, spermicidal jelly

Intra uterine devices:

- First person to successfully use IUD in women – Dr Ota
- Concept in early Mesopotamian civilization where rounded stones were put in the uterus of female camels.
- Gained popularity during Lippe's loop and later Cu T

1st generation – inter devices exemplified with Lippe's loop
Double 'S' shaped made of polyethylene, Non medicated with barium sulphate in 4 sizes
Duration - as along as desired. / Failure rate – 13/100 women years

2nd generation – developed with a view to bring down the expulsion rate. Smaller in size and medicated (means copper containing); some have ionic silver in the core (helps in controlling infection)

Device	Failure rate		Device	Failure rate
Cu T	1.9 /HWY		Nova T -Ag	0.7 /HWY
Cu T – 200	3.0 /HWY		ML Cu – 250	0.5 /HWY
Cu T – 220C	0.9 /HWY		ML Cu - 375	0.1 /HWY
Cu T – 380 Ag	0.3 /HWY			

Best post coital contraceptive method if applicable to user.
Cu T – 380 Ag – can be kept till 10 years.

3rd generation – Developed with a view to decrease menstrual blood loss
Progetasert – 65 mcg Progesterone / day (total 38 mg equivalent progesterone)
Max. Incidence of ectopic pregnancies
Levonorgestrel – 20 mcg / day; **LNg – 20**

- Failure rate = 0.3 / 100 women yrs
- Duration 5-7 years / Minimum bleeding
- Lowest ectopic rates as well – 0.2 / 1000 women years
- Brand name – Mirena, Levonova

Contraindication –

Absolute	Relative
• Suspected pregnancy • PID • Vaginal bleeding undiagnosed • Ca cervix, uterus • Previous entopic	• Anaemia • Menorrhagia • H/o PID • Purulent cervical discharge • Distortion of uterus • Unmotivated person

Most appropriate time – within 10 days of menstruation
Commonest side effect – increased vaginal bleeding
Most common reason for removal of IUDs – Pain

Expulsion and removal rates of some IUDs

Device	Pregnancy rate	Expulsion rate	Removal rate
Lippe's loop	3	12-20	12-15
Cu – 7	2-3	6	11
Cu T - 200	3	8	11
Cu T - 380	0.5-0.8	5	14
Progetasert	1.3-1.6	2.7	9.3
Levonorgestrel IUD	0.2	6	17

Ideal IUD candidate: Planned parenthood Federation of America (PPFA)

- Who has borne at least one child
- Has no h/o pelvic disease
- Has normal menstrual periods
- Is willing to check the IUD tail
- Has access to follow up and treatment of potential problems and
- Has a monogamous relationship

Warning signs: IUD (PPFA)

- **P**-period late (pregnancy), abnormal spotting or bleeding
- Abdominal pain, pain during intercourse.
- **I**-Infection (any STI), abnormal discharge
- **N**- Not feeling well, fever, chills
- **S**- Strings missing, shorter or longer

	Loop devices (1^{st} Gen)	**Copper devices (2^{nd} Gen)**	**Hormone device (3^{rd} Gen)**
Shape	Available in many shapes simulating open serpentine, open spiral, configuration of 8 etc.	T or modified T shapes like 7 etc. some also have surrogate fins e.g. multiload devices	Mostly T shaped devices that releases a fixed quantity of progestongen hormones
Material used to manufacture	Polythene and impregnated with barium sulphate for radio opacity	Polyethylene and reinforced with copper metal	Made from ethylene vinyl co-polymer which contains the requisite quantity of progestongen and also contains barium sulphate for radio-opacity
Mode of action	Generates a foreign body reaction in the endometrial cavity, thus making the uterine milieu hostile to fertilized ova	Acts primarily by releasing Cu ions which – • Reduce motility and survival of sperms • Produce an inflammatory reaction in the endometrium • Prevent the	Release progestogen hormone, which suppresses the estrogen sercretion and hinders the maturation of endometrium as well as preventing the implanatation of fertilized ova.

		migration of fertilized ova as well	
Major side effects	• Increased menstrual bleeding • Expulsion rates are very high	Increased menstrual bleeding, but less that 1st generation devices	No menorrhagia, but increased incidence of ectopics in all except LNG releasing devices.

Hormonal contraceptives - Oral Pills: There are various types of OC pills –

- **Combined Pills** – the most popular, others like sequential pills / triphasic pills are no longer used in India.
  MALA D–for social marketing and MALA–N available free through PHCs, Urban family centres etc.
  Contents: **Levonorgestrel – 0.15 mg & Ethinyl estradiol – 0.03mg**
  Mechanism of action – prevents the release of ovum from the ovary. Estrogens block the pituitary secretion of gonadotropins and progestrogens inhibit the tubal motility as well as make the cervical mucus viscid or thick.
- **Progesterone only Pill – Mini Pill**
  - Good for lactating mother
  - When estrogen contraindicated → Ectopic Pregnancy
  - It makes cervical mucus viscid
- Once a month pill – Quinestrol
- Male pill – Gossypol
- Newer pills – Yasmin – containing ethinyl estradiol 0.03 mg and drospirenone 3 mgs – dose is similar to OC pills

Adverse effects – mostly due to estrogen component

- MI, hypertension
- Cerebral thrombosis
- Venous thrombosis
- Pulmonary embolism
- Ca Cervix, Hepatocellular adenoma
- Decrease in breast milk secretion
- Breast tenderness

Complications – weight gain, Cholestatic jaundice and hypertension

Failure rate: <1 / 100 women years.

Contraindications

Absolute	**Relative**
• Previous thromboembolic event or strok [Q] • History of an estrogen-dependent tumor [Q] • Active liver disease[Q] • Pregnancy • Undiagnosed abnormal	• Hypertension[Q] • *Women receiving anticonvulsant drug therapy*[Q]

uterine bleeding[Q] • Hypertriglyceridemia[Q] • Women over age 35 who smoke heavily (>15 cigarettes per day)[Q]	

OCP: Disease Risk:

Increased	Decreased
• *Coronary heart disease*[Q]—increased only in smokers > 35; no relation to progestin type • *Hypertension*[Q]*—relative risk* 1.8 (current users) and 1.2 (previous users) • *Venous thrombosis*[Q]—relative risk ~4; markedly increased with factor V Leiden or prothrombin-gene mutations • *Stroke*—increased only in combination with hypertension; unclear relation to migraine headache • *Cerebral vein thrombosis—relative risk* ~13–15; synergistic with prothrombin-gene mutation • *Cervical cancer*—relative risk 2–4	• *Ovarian cancer*[Q]—50% reduction in risk • *Endometrial cancer*[Q]—40% reduction in risk

Beneficial effect

- Benign breast disorders (Fibroadenoma /Fibrocystic disease)
- Benign ovarian disease (Ovarian cyst, PCOD)
- Malignant ovarian disease (Ovarian cancer)
- PID
- Ectopic pregnancy
- Iron deficiency anemia
- Endometrial cancer
- Almost 100% effective in preventing conception – thereby alleviating the anxiety of pregnancy in users

Depot Formulations

Progesterone – only Injectable

i. Depot medroxy progesterone acetate → 150 mg I/M – 3 monthly
   Lactation, > 35 yr age
ii. Norethisterone enantate (Net-EN) 200mgs every 60 days.

Combined → Estrogen + Progesterone,
Once a month

Cyclofem / cycloprovera Failure rate – 0.2 – 0.4 / HWY
Mesigyna

Norplant R-1 & 2 – Levonorgestrel – 5 yrs – now better [Failure rate 0.7/HWY over a 3 years period]

Non hormonal anti implant pill – Centchroman (Saheli & Centron)

- Centchroman is a novel non steroidal agent unrelated to any conventionally used contraceptive.
- This is the only anti-implantation agent approved for clinical use in the world.
- Weak estrogenic and potent anti-estrogenic properties.
- Dosage – 30 mgs tabs – initially given as twice a week dose till 12 weeks and then once a week.
- Recommended to be used for a maximum period of 9 months, then give a break for 3 months for full return of fertility.
- Failure rate – 1.63 ± 0.74 /100 women years.

MTP act, 1971

Allows termination of pregnancy up to 20 wks

- 12 wks – 1 registered medical practitioner is empowered
- 12^{th} to 20 weeks – 2 registered medical practitioner is required

Indications – Medical / Eugenic / Humanitarian / Socioeconomic / Failure of contraceptive device
Qualifications to do abortions

- 25 MTP in approved institutions
- 6 months horsemanship in obstetrics and gynecology
- Post graduate qualifications in Obs. & Gynaec.

Natural methods of contraception

- Abstinence – 100% effective, but has many social and psychological implications.
- Coitus interruptus – oldest method of voluntary fertility control – high failure rate 25% or more.
- Safe period – calendar method 8^{th} – 22^{nd} day
  Shortest cycle – 18 days → 1^{st} day
  Longest cycle 10 days → last day
  - Ectopic pregnancy rates are very high
  - Embryonic abnormalities are also very high
- A newer method, primarily used in western world – is a computerized machine – "Persona" – gives idea about the safe period for a lady.

PERSNA

o Natural family planning enters the age of technology. This is basically a microcomputer attached to a micro
laboratory.
o **It is based on measurement of levels of leutenizing hormone and oestrogen -** 3 **- glucuronide in early**
moring urine.
o The woman is required to insert test sticks dipped in her urine
o The device then calculates the likely date of ovulation well in advance and allows for sperm survival,
o She is thus shown green light days when *conception is unlikely* and 'red light' days when *conception may well*
occur.
o With perfect use **failure rates** are in the region of **6/100** woman years,

o However more typical user failure rates are much higher.
o Persna has advantage for couples who wish to use natural family planning in that it takes away much of the
subjectvity of the symptothermal method and its greater predictive accuracy results in fewer abstinence days (8 on
average, compared to 12) however the best use failure rate is still high compared to other methods and it should
therefore, be viewed as most suitable for couples spacing rather then preventing a pregnancy

- Uses urine strips to understand the levels of estrogen and progesterone in the woman and give a green day for safe period, a red day for unsafe period and yellow day when it requires more information.
- Natural method → basal body temperature method – progesterone is responsible for the rise / Cervical mucus method (billing method) / Symptothermic

Emergency contraception:

Also referred as post coital contraception

- Copper releasing IUDs are the method of choice in eligible candidates and up to 5 day after exposure
- Oral pills – combined variety – 4 stat + 4 after 12 hours in all cases (3 days) (Yuzpe & Lance method)
- Progesterone (Levonorgestrel) 0.75 mgs – one stat + one after 12 hours
- Mifepristone (RU-486) dose – 50 mgs single dose within 5 days

Regimen	Timing of dose after intercourse	Reported efficacy	Remarks
Combined pills	0 - 75 hrs	75%	4 stat and 4 after 12 hrs
Cu IUDs	0 - 120 hrs	Failure rate < 1%	
Mifepristone 10-600 mgs	0 - 120 hrs	85-100%	Single dose
Levonorgestrel 0.75 mgs	0 - 72 hrs	75-85%	Two doses 12 hrs apart

Sterilization

Female sterilization – 85%
Male sterilization- 10-15%
Vasectomy most cost effective method
Guidelines:

- Husband age 15-50 yrs / Wife age 20-45 yrs
- 2 living children
- Spouse consent required
- Spouse not sterilized

Vasectomy -

- Sterile after 30 ejaculations; most common reason for failure – mis- identification of vas
- No scalpel vasectomy

Laparoscopic sterilization

- 6 wk PP Hb>8
- With MTP 48 hr stay in hospital

National population policy 2000

Objectives:
Short term - To address unmet needs for contraception
Mid-term - To bring TFR to replacement levels (2.1) by 2010
Long term - To achieve a stable population by 2045

National Socio-demographic goals for 2010

- IMR< 30 per thousand live births
- MMR< 100 per lakh live births
- Universal immunization
- Institutional deliveries – 80% / Delivery by trained person - 100%
- Vital Data registration – 100% - birth – death – marriage – pregnancy
- To reduce school drop out <20% at primary and secondary schools both for boys and girls free compulsory education up 14 yr
- Marriage age-preferably > 20 yr Girls
- Fertility regulation, contraception replacement level of TFR
- Prevent & control communicable diseases
- Contains the spread of AIDS, promote greater integration between the management of RTI, STI
- Integrate ISM in the provision of RCH services

GOALS FOR HEALTH & FW PROGRAMME

INDICATORS	CURRENT LEVEL	GOAL BY 2010 A.D
1. IMR	56 (2007)	<30
a) Neonatal mortality rate	34	
b) Post neonatal mortality rate	22	
2. Crude death rate	7.5 (2007)	
3. Perinatal mortality rate	33 (2003)	10.0
4. Maternal mortality ratio	301 (2003)	<1
5. Life expectancy at birth – male	63.9 (2005)	64
Female	66.9 (2005)	64
6. LBW (wt < 2.5 kg)	30% (2004)	10%
7. Crude birth rate	23.5 (2007)	21.0
8. Growth rate (Annual)	1.93% (2001)	1.2%
9. Preg. Mother, Recg. ANC	50.7% (2005-6)	100
10. Deliveries by TBA	48-3% (2005-6)	100

Targets of major policies / projects relevant to MCH

Indictor	Tenth plan goals (2002-2007)	RCH II goals (2005-2010)	National population policy 2000 (by 2010)	Millennium development goals (by 2015)
Population growth	16.2% (2001-2011)	16.2% (2001-2011)	-	-
Infant mortality rate	45/1000	35/1000	30/1000	-

Under 5 mortality rate	-	-	-	Reduce by 2/3 rds from 1990 levels
Maternal mortality ratio	2001/100,000	150/100,000	100/100,000	Reduce by 3/4th from 1990 levels
Total fertility rate	2.3	2.2	2.1	-
Couple protection rate	65%	65%	Meet 100% needs	-

Census 2011 (Provisional report)

The major highlights of the Census 2011 (Provisional figures) are as under:

- The population of India has increased by more than **181 million** during the decade 2001-2011.
- Percentage growth in 2001-2011 is **17.64**; males 17.19 and females 18.12.
- 2001-2011 is the first decade (with the exception of 1911-1921) which has actually added lesser population compared to the previous decade.
- **Uttar Pradesh (199.5 million)** is the **most populous State in the** country followed by Maharashtra with 112 million.
- The percentage decadal growth rates of the six most populous States have declined during 2001-2011 compared to 1991-2001:
    - Uttar Pradesh (25.85% to 20.09%)
    - Maharashtra (22.73% to 15.99%)
    - Bihar (28.62% to 25.07%)
    - West Bengal (17.77 % to 13.93%)
    - Andhra Pradesh (14.59% to 11.10%)
    - Madhya Pradesh (24.26% to 20.30%)
- During 2001-2011, as many as 25 States/UTs with a share of about 85% of the country's population registered an annual growth rate of less than 2% as compared to, 15 States/UTs with a share of about 42% during the period 1991-2001.
- 15 States/UTs have grown by less than 1.5 per cent per annum during 2001-2011, while the number of such States/UTs was only 4 during the previous decade.
- The total number of children in the age-group 0-6 is 158.8 million (-5 million since 2001)
- Twenty States and Union Territories now have over one million children in the age group 0-6 years. On the other extreme, there are five States and Union Territories in the country that are yet to reach the one hundred thousand mark.
- Uttar Pradesh (29.7 million), Bihar (18.6 million), Maharashtra (12.8 million), Madhya Pradesh (10.5 million) and Rajasthan (10.5 million) constitute 52% children in the age group of 0-6 years.
- Population (0-6 years) 2001-2011 registered minus (-)3.08 percent growth with minus (-)2.42 for males and -3.80 for females.
- The proportion of Child Population in the age group of 0-6 years to total population is 13.1 percent while the corresponding figure in 2001 was 15.9 percent. The decline has been to the extent of 2.8 points.
- Overall sex ratio at the national level has increased by 7 points to reach 940 at Census 2011 as against 933 in Census 2001. This is the highest sex ratio recorded since Census 1971 and a shade lower than 1961. Increase in sex ratio is observed in 29 States/UTs.

- Three major States (J&K, Bihar & Gujarat) have shown decline in sex ratio as compared to Census 2001.
- Kerala with 1084 has the highest sex ratio followed by Puducherry with 1038, Daman & Diu has the lowest sex ratio of 618.
- **Child sex ratio (0-6 years) is 914**. Increasing trend in the child sex ratio (0-6) seen in Punjab, Haryana, Himachal Pradesh, Gujarat, Tamil Nadu, Mizoram and A&N Islands. In all remaining 27 States/UTs, the child sex ratio show decline over Census 2001.
- Mizoram has the highest child sex ratio (0-6 years) of 971 followed by Meghalaya with 970. Haryana is at the bottom with ratio of 830 followed by Punjab with 846.
- Literacy rate has gone up from 64.83 per cent in 2001 to 74.04 per cent in 2011 showing an increase of 9.21 percentage points.
- Percentage growth in literacy during 2001-2011 is 38.82; males: 31.98% & females : 49.10%.
- Literates constitute 74 per cent of the total population aged seven and above and illiterates form 26 per cent.

Ref:
http://articles.timesofindia.indiatimes.com/2011-03-31/india/29365558_1_uts-percentage-decadal-growth-rates-census
The provisional figures of Census 2011 were released in New Delhi on Thursday by Union home secretary Shri G.K.Pillai and RGI Shri C Chandramouli.

****

NUTRITION

Nutrition - Science of food & its relationship with health
Nutrient or "food factor": Means specific dietary constituents such a proteins, vitamins and minerals.
Dietetics: Practical applications of principles of nutrition.

Proximate Principles: refers to Proteins, fats and carbohydrates as they form main bulk of food.

Classification of foods

- Body building foods – Proteins
- Energy giving foods – carbohydrates/fats
- Protective foods – Vitamins & minerals

Macronutrient	Energy/ gram	% total energy intake
Proteins	4 kcal/ gm	7-15
Carbohydrate	4 kcal/ gm	65-80
Fats	9 kcal/ gm	10-30

Man weights 68 kg, consumers 325 gm carbohydrate, 65 gm protein and fat : applicable statement:

- His total calorie intake is 3000
- He has a equal proportion of fat – carbon / protein as with balanced diet
- He has a negative nitrogen balance
- He is consuming 30% of diet as fat
- The caloric intake of the man is 2145 kcal
- He is getting 260 kcal from proteins (65*4)= 12.12%
- He is getting 1300 kcal from carbohydrates (325*4)=68%

PROTEINS

- Essential Amino Acids – 9 (Methionine, Threonine, Tryptophan, Valine, Isoleucine, Leucine, Phenylalanine, Lysine & Histidine) / Cystine and Tyrosine (Arginine & Taurine)- essential for premature babies
- **Biologically Complete Protein** which contains all Essential Amino Acids in amounts corresponding to human needs. E.g. Milk, Egg & Fish
- **Reference Protein – Egg** (High biological value and digestibility coefficient)
- Main source in Indian diet – Cereals & pulses
- Limiting A.A.
  Cereals – deficient in Lysine & threonine
  Pulses – deficient in Methionine & Cysteine
  Maize – deficient in Tryptophan & lysine (Limiting amino acids)
- Supplementary action of proteins- Cereals and pulses

Protein content of some foods (gm/100 gm)

Soyabean – 43.2	Meat – 18-26
Pulses – 21-28	Fish – 15-23
Cereals – 6-13	Egg – 13
Nuts – 4.5-29	Milk – 3.2-4.3

Protein Quality

Evaluation of proteins

- PDCAAS

- Protein Efficiency ratio
- Biological value
- Digestibility coefficient
- Net Protein Utilization

Protein Quality

PDCAAS –

- Protein Digestibility Corrected Amino Acid Score
- AAS with added digestibility component (chemical score)

- AAS = $\frac{\text{No. of mg of one AA per gm of protein}}{\text{No. of mg of same AA per gm of egg protein}} * 100$

- Reference protein – Egg
- Animal foods – 70-80
- AAS = 1 (Egg, casein, whey, milk & soy)

Protein Quantity

Protein Energy ratio

- PE = $\frac{\text{Energy from protein}}{\text{Total energy in diet}} * 100$

- Recommended – 10-12%

Biological value

- Measures amount of N_2 retained in comparison to amount of N_2 absorbed.
- BV = $\frac{N_2 \text{ retained}}{N_2 \text{ absorbed}} \times 100$

Digestibility Coefficient

- DC = $\frac{N_2 \text{ absorbed}}{N_2 \text{ intake}} \times 100$

Net protein utilization

- NPU – most complete expression of Quality
- ***Best indicator of quality***
- NPU = DC * BV/100
- NPU = $\frac{N_2 \text{ retained}}{N_2 \text{ intake}} \times 100$
- Soyabean – 55 / Egg – 96

Assessment of protein status

- Arm muscle circumference
- Creatinine – height index
- Serum albumin & transferrin
- Total body nitrogen

Best measure-

Serum albumin – More than 3.5 gm% - Normal
3.5 gm% - mild malnutrition
3.0 gm% - severe malnutrition

Requirement

- 1 gm/kg for India adult (mix veg. protein) - Assuming **NPU-65** (ICMR)
- 0.7gm/kg (in terms of egg protein) **NPU-96**

FATS / LIPIDS

- Compounds of Fatty acids (FA) + Glycerol
- Concentrated source of energy
- Classification – Simple lipids – TG
  Compound lipids – Phospholipids
  Derived lipids – Cholesterol
- Most of body fats (99%) – TG

RDA - 10-30% dietary energy **(**ICMR < 20% energy → Fats)
Ref. man – 25-40 gm/day
Ref. woman - 20-30 gm/day
Pregnant - 30 gm/day
Lactation - 30 gm/day
Children - 25 gm/day
Adolescents – 35-45 gm/day

Fatty acids

- Saturated FA (SFA) - Lauric, Palmitic, Stearic acids (Animal fat)
- Unsaturated FA (UFA) -
  Monounsaturated (MUFA) – Oleic acid
  Poly unsaturated (PUFA) - Linoleic acid, Arachidonic, Linolenic, Eicosapentaenoic
  (Vegetable oils are rich source of unsaturated fatty acids)
  Safflower oil – 73 % unsaturated acid

Main source of Saturated FA is Animal oils (except Coconut & palm oil though veg - more sat. fats)
Main source of Unsaturated FA is Vegetable oils (except fish oil – though animal more Unsat. fats)

Essential fatty acids (Vitamin F)

- Cannot be synthesized by human body
- Derived only from food
- Most imp.- Linoleic acid (Veg oils- Richest source – Safflower oil)
- Others - linolenic & arachidonic acid
- Phrenoderma deficiency of EFA – toad skin (Common - Kerala/Karnataka & Gujrat /
  Treatment – EFA – Linseed or Safflower oil with B-complex)

Hydrogenation

- Veg. oils when hydrogenated (under temperature & pressure) Liquid oils → Semisolid/ Solid fats E.g. Vanaspati ghee (dalda)
- Advantage – stored in hot/humid condition
- Disadvantage – During process- Unsat. FA → Sat. FA & EFA decreased

- Vanaspati – fortified with Vit A (2500 IU) & vit D (175 IU) per 100gm

Trans-fatty acids

- Geometric isomers of Cis-UFA that adapt SFA like configuration on partial hydrogenation to increase the shelf life of PUFA
- Render plasma lipid profile – **more atherogenic** than SFA by increasing LDL – cholesterol & decreasing HDL
- Also it takes years to clear from body
- WHO ceiling for their use - <5 gm/day

Invisible fats

- Fats in cereals, pulses, nuts & vegetables
- Bajra (6.5%) / Jowar (4%) / Rice & wheat (3%)

Refined oils

- Oil treated with steam to remove Free FA & rancid materials
- No change in UFA content
- Improves quality & taste
- But costly

Fatty acid content of different fats (percent)

Fats	Saturated FA	Mono-unsaturated FA (MUFA)	Polyunsaturated FA (PUFA)
Coconut oil	**92**	6	2
Palm oil	83	15	2
Cotton seed oil	24	25	50
Groundnut oil	19	41	32
Safflower oil	9	13	**75**
Sunflower seed oil	12	22	62
Corn oil	12	35	50
Soyabean oil	14	24	53
Butter	68	29	2
Vanaspati	46	49	4
Rice bran oil	17	43	38
Sesame oil	16	41	42
Mustard oil	4	**65**	15
Flax seed oil	10	21	16
Canola oil	6	60	22

Richest Source	
• Linoleic acid – Safflower oil	• Eicosapentaenoic acid – Fish oil

• Linolenic acid – Flaxseed oil • Arachidonic acid – Meat/eggs/Milk	• MUFA – Mustard oil • PUFA – Safflower oil

Choice of cooking oils

- Ratio of PUFA/saturated fatty acid 0.8 - 1.0
- Linoleic acid/ alpha Linoleic acid – (n-6/n-3) = 5 - 10 in the total diet
- Increase the quantity of alpha linoleic acid decrease the quantity of linoleic acid
- Choose a variety of vegetable oils instead of a single source
- Mix 2 or more oils with different compositions
- An equal mixture of PUFA rich sunflower, safflower, cornoil with MUFA rich groundnut oil supplemented with occasional use of mustard oil to ensure adequate omega 3 PUFA intake.
- A blend of rice bran oil with sunflower oil, canola oil, & sesame oil are also good choices.
- Mustard oil is not a good choice as sole cooking medium.
- It contains erucic acid – detrimental for health
- Rapeseed (Canola) and Mustard oil have similar composition, except that erucic acid content of genetically engineered rapeseed oil is low.

CARBOHYDRATES

- 1 gm → 4 kcal
- Carbohydrates reserve (Glycogen) in human – 500 gm

Dietary Fibre

- Non starch polysaccharide – 2 types
- Insoluble fibres – cellulose, hemicellulose, lignin / Soluble fibers – pectins, gums, mucilage
- It absorbs water, increase the bulk of stools, reduce constipation – encourages bowel movements
- Cancer of stomach and colon – linked with low fibre diet
- Reduces CHD – binds to bile salts and prevents its reabsorption, reduces CHL
- 40% gum present in fenugreek – reduces blood glucose.
- A daily intake of 40 gm of fibre per 2000 kcal of energy is desirable
- Indian diet provides 50 – 100 gm of fibre/day

Total fibre content of common foods (g/100g)

High >10	**Medium 1-10**	**Low <1**	**Nil**
Wheat	Rice	Refined &	Sugar
Jowar	Most vegetables	processed	Fats
Bajra	Most fruits	Foods	Oils
Ragi	Coconut		All types of
Maize	Sesame		meat
Legumes	Almonds		
Dhals	Dates		
Fenugreek			

VITAMINS

Vitamin A

- Retinol - Preformed Vitamin A
- β carotene – Provitamin A
- Fish liver oil – Richest source (Halibut liver oil/Cod liver oil) / Veg. source - Carrot
- Deficiency – Xerophthalmia
- Extra-ocular manifestations – follicular hyperkeratosis, Anorexia, growth retardation/ respiratory & intestinal infections
- Treatment – 200000 IU Vit. A orally on two successive days

Xerophthalmia

WHO Classification

X1A Conjunctival xerosis	XS Corneal scarring
X1B Bitot's spots	XN Night blindness
X2 Corneal xerosis	XF Xerophthalmic fundus
X3A Corneal ulceration / Keratomalacia < 1/3rd cornea	
X3B Corneal ulceration / Keratomalacia > 1/3rd cornea	

Prevalence criteria for Xerophthalmia

At risk - Preschool children (6 mths - 6 years)

Night blindness	> 1%
Bitot's spots	> 0.5%
Corneal xerosis/ulceration /Keratomalacia	> 0.01%
Corneal ulcer	> 0.05%
Serum retinol (<10 mcg/dl) (Normal value - 20 mcg/dl)	> 5%

Sources of vitamin A

- Animal sources – live, eggs, butter, cheese, whole milk, fish, meat
- Fish Liver oils are richest source
- Plant Sources – green leafy vegetables (spinach), darker the green leaves - higher the Vit.A content, Yellow fruits (papaya, mango, pumpkin), Some roots (carrot)
- Most important carotenoid – beta carotene – highest Vit.A activity

Requirement (1 IU = 0.3µg of retinol or 0.55 µg of retinol palmitate) / 1 RE = 3.33 IU of Vit.A)

- Adult – 600 µg /day Retinol = 4800 β carotene = 2000 IU
- Pregnancy – 800 µg = 6400 β carotene = 2670 IU
- Lactation – 900 µg /day Retinol = 7600 β carotene = 3170 IU
- Infant – 350 µg /day Retinol = 2800 β carotene = 1170 IU
- Antenatal mothers to be given Vitamin A not exceeding 10,000 IU per day till symptoms disappear or levels come to normal
- Toxicity – nausea, vomiting, anorexia, sleep followed by skin desquamation, and then an enlarged liver and papillary edema. High intake of carotene may color plasma and skin, but not dangerous

- Teratogenic effect.

Treatment

- 200,000 IU OR 110 mg Retinol Palmitate X 3 days
- Prophylaxis – RCH 1 - 9 months to 3 year

National program for prophylaxis against Blindness in children due to Vit A deficiency (VAD) (Prevalence 5.7%)

- Provides 5 doses of vitamin A orally (Syrup). Total dose = 9 lac IU
- 1 lac IU at 9 mths along with measles vaccine f/b 200000 IU every 6 months till 3 yrs age
- Administered by Anganwadi worker (AWW)
- Implemented through RCH programme
- Strength of syrup - 1 lac IU/ml / 2 ml spoon available
- Under new guidelines (Nov-06)-Vit A-9 doses orally (17 lac TU) till age of 5 yrs.

WHO strategy for Prevention of Xerophthalmia

Short term – Vitamin A prophylaxis to vulnerable groups

Child < 12mths age	1 lac IU	with measles vaccine
> 12 mths	2 lac IU	every 4-6 mths
Newborn	50000 IU	At birth
Women 15-49 yrs age	3 lac IU	within 1mth of delivery
Pregnancy/lactation	5000 IU	every day
	20000 IU	once a week

Medium term - Food fortification with vitamin A

Long term- Promotion of consumption of green leafy vegetables / Promotion of BF (Breast feeding) / Improvement in environment / Immunization against measles / Prompt treatment of diarrhoeal disease / Social & health education

Vitamin D

- D2 – Calciferol / D3 - Cholecalciferol
- Deficiency – Rickets / Osteomalacia
- Requirement 1 mcg – 40 IU

Adults	100 IU (2.5µg)
Infant/children	200 IU (5µg)
Pregnancy/lactation	400IU (10µg)

- Treatment: Rickets: 600000 IU stat f/b X ray after 4 wks; if no line of calcification rpt. Vit D 600000 IU.
- Rich source – Fish liver oils (Halibut / Shark /cod liver oil)

Vitamin E:

- Toropherol / α-toropherol – most potent
- Richest sources – Veg. oils, Cotton seeds, sunflower, egg yolk, butter
  (Selenium - trace element with Vitamin E like action)
- Foods rich in PUFA are also rich in Vit.E
- Estimated requirement – 0.8 mg/gm of EFA

Vitamin K:

- K1 – Dark green leafy vegetables / fruits

- K2 - Synthesized by intestinal bacteria
- Stored in liver
- Function – Stimulate production of certain clotting factors
- Daily Requirement – 0.03 mg / kg wt – 0.5 mg
- K1 Injected at Birth
- Deficiency – clotting time prolonged

Vitamin B-complex:

Thiamine (B_1)

- Thiamine pyrophosphate → Activate Transketolase necessary for glucose oxidation
- Source : Wheat, Rice, Milk
- Richest source of Thiamine – Groundnut/Gingelly seed
- Requirement ⇒ 1.2 mg / day; 0.5 mg/1000 kcal/day.
- Deficiency : **Beriberi** – Dry – peripheral neuritis / Wet – Cardiac / Infantile - 2-4 months age **Wernicke's encephalopathy** - characterized by bilateral Ophthalmoplegia, Mental Retardation, Ataxia & Neuritis). Originally triad of acute mental confusion, ataxia and Ophthalmoplegia.
- Minor deficiency – loss in appetite; absence ankle / knee jerk; calf tenderness

Riboflavin (B_2)

- Indicator of state of nutrition of children
- Deficiency – Ariboflavinosis (angular stomatitis, cheilosis, glossitis, nasolabial dyssebacia)
- Requirement – 0.6 mg/1000kcal or 1.2-1.8 mg/day
- Richest source – Sheep liver (Rich in animal sources)

Niacin (B_3)

- Precursor – Tryptophan (60 mg Tryptophan → 1 mg niacin)
- Source : Liver, Meat, Groundnut
- Milk – poor source but rich in tryptophan
- Requirement – 6.0 mg/1000kcal or 12-18 mg/day
- Deficiency → **Pellagra** –Diarrhoea / Dementia / Dermatitis (3D), Glossitis/stomatitis
- Maize / Jowar as staple diet - Excess leucine interfere conversion of tryptophan to niacin

Pantothenic acid (B_5)

- Adreno-cortical function - Biosynthesis of corticosteroids
- Present in cells as coenzyme A
- RDA – 10mg
- 3 mg excreted in urine daily

Pyridoxine (B_6)

- Deficiency → Peripheral Neuritis
- INH therapy (TB) → decreases B6 therefore supplementation given. (10 mg/day)
- Requirement – Adults – 2 mg/day , Pregnancy - 2.5 mg/day

Folic acid (B_9) – Pharmaceutical preparation / Recommended name – Folate / Folacin

- Source: leafy vegetables
- Functions - Synthesis of nucleic acid / Development of blood cell in marrow

- Destroyed by overcooking/ sterilization of milk.
- Deficiency: Megaloblastic Anaemia, Glossitis, Infertility, diarrhea, distension, flatulence.
- Folic acid antagonists - Cotrimoxazole, Alcohol, Pyrimethmine
- Lab diagnosis of F.A→ Serum & Red cell Folate Cone [6.0 mcg/ml]

Cyano-cobalamine (B_{12})

- Function: Synthesis of fatty acid in myelin & Synthesis of DNA
- Deficiency → Megaloblastic Anaemia, Demyelinating neurological lesion in spinal cord, infertility
- There is no vegetarian source of vitamin B12. (No plant source for vitamin D & vitamin B12)

	Folate	
B12		
Adult	200 mcg	1 mcg
Pregnancy	500 mcg	1.2 mcg
Lactation	300 mcg	1.5 mcg
Infant & children	80-120 mcg	0.2 mcg

Vitamin C

- Required only by man, monkey, guinea pigs
- Most heat labile Water soluble vitamin
- Potent antioxidant
- Function – Formation of collagen (Supporting matrix for bones/blood vessels) & Facilitate iron absorption
- Deficiency – Scurvy
- Requirements – Adult: 40 mg/day,
  Pregnancy - 60 mg/day & Lactation - 80 mg/day
- Source – Amla (Indian Gooseberry), Green veg.

Richest source	Amla/Indian gooseberry	600 mg/100 gm
	Guava	212 mg/100 gm
	Cabbage	124 mg/100 gm
	Amaranth	99 mg/100 gm
	Lime	63 mg/100 gm

MINERALS

Classification: They are divided into 3 groups

- Major Minerals: Calcium, Phosphorus, Sodium, Potassium & Magnesium
- Trace elements: Iron, Iodine, Fluoride, Zinc, Copper, Cobalt, Chromium, Selenium etc.
- Trace elements with no known functions (Contaminants): Lead, mercury, barium, boron, aluminium

Calcium

- Blood level – 10 mg /dl (maintained by vitamin D / PTH / Calcitonin)

- Function – Formation of Bone / Teeth , Coagulation, Muscular contraction , Cardiac Action
- Source: Milk &Milk Products, Ragi (richest source), Sitaphal, Green leafy vegetables, Egg, Fish etc.
- 1 Litre of Cow's milk – 1200 mg & of Human milk – 300 mg
- Absorption - ↑ By vitamin 'D' / ↓ phytates (cereals) , Oxalates – green vegetables & Fatty acids
- Requirements: Adult - 600 mg / day
  Pregnancy/ Lactation - 1200 mg/day
  Infants 0-12 mths 500 mg/day
  Children 1-9 yrs 600 mg/day
  10-18 yrs 800 mg/day

Magnesium

- Mainly stored in bones & essential for normal metabolism of Ca & K
- Deficient in chronic alcoholics, cirrhosis of liver, Toxemia of pregnancy, PEM & Malabsoption syndrome
- Deficiency – Irritability / Tetany / Hyperflexia or hyporeflexia
- Requirement – Adult Man – 340 mg/day
  Adult Woman – 310 mg/day
  Infant – 30-45 mg/day

Iron

- 3-4 gm in human body
- 60-70% in blood (Hb)
- Source - Haem Iron (1 gm = 3.34mg iron) – Animal origin (Liver, Meat, Poultry & Fish)
  Non Haem – Vegetable origin (cereals, green vegetables, jaggery, dried fruits)
- Absorption in → Duodenum (Only 5 % absorption in Indian diet)
  Inhibitors - Phytates (wheat), Phosphate (egg), Tannin (tea), Oxalate (vegetables), Carbonates & dietary fibres / ***Promotors*** - Vitamin C
- Total daily iron loss – Male 1mg & Female – 12.5 mg per 28 days cycle in menstruating woman
- **Iron deficiency Anaemia**
  I stage – decreased storage without any abnormality detected
  II stage – latent iron deficiency / S. ferritin decrease
  % saturation of transferrin reduces from 30 → 15%
  III stage – overt deficiency / Hb decreases
- **Diagnosis –** (Hb 10-11 gm/dl Early anaemia & <10 gm/dl – Marked anaemia)

	g/ dl (Venous blood)	MCHC (%)
Adult males	13	34
Adult Females, non pregnant	12	34
Adult Females, pregnant	11	34
Children-6 mths to 6 yrs	11	34
Children, 6-14 yrs	12	34

- **Indicators -** Hb – insensitive indicator
  S. iron concentration - More useful (0.80-1.80mg/L – Normal, < 0.50mg/L – deficiency)
  S. ferritin – Single most sensitive tool (< 10 mcg/L – absence of iron)
  S.transfemin saturation – Normal - 30% (≤ 15% deficiency)

- **Requirements of Iron**

Age group		RDA mg /d
Adult males		17
Adult females (Non pregnant)		21
Pregnancy		35
Lactation		21
Infants	0-6 mths	46 mcg / kg / d
	6-12 mths	5
Children	1-3 yrs	9
	4-6 yrs	13
	7-9 yrs	16
Adolescents	10-12 yrs	Males 21 / Female 27
	13-15 yrs	Males 32 / Female 27
	16-17 yrs	Males 28 / Female 26

- **When Anaemia is a problem?**

Prevalence	
≤ 5%	Not a problem
5-14.9%	Low magnitude
15 – 39.9%	Moderate magnitude
40% & above	High magnitude

- **Treatment & Prophylaxis**:
  Adult IFA tab – 100 mg elemental iron + 500 mcg FA
  Paediatric IFA tab- 20 mg elemental iron + 100 mcg FA (Upto 5 yrs.)
  30 mg elemental iron + 250 mcg FA (6-10 yrs.)

Iodine

- Body store – 50 mg; Blood - 8-12 µg/dl
- Best sources – Sea foods ;Fresh water 1- 50 µg/dl
- Iodine content of soil is important as it enters food/water through soil
- Goitrogens: Cabbage, Cauliflower, Cyanoglucoside, and Thiocyanate
- Requirement – 150 mcg/day Pregnancy/lactation – 250 mcg
  Children - Preschool -90 mcg, School – 120 mcg
- **Deficiency (IDD)**
  Goiter / Hypothyroidism
  Sub intelligence, Delayed milestone, mental defects, hearing defect, speech defect, Strabismus, squint, Nystagmus,
  Neuromuscular weakness
  Intra-uterine deaths (spontaneous abortion / miscarriage)

- **Epidemiological assessment**
  Prevalence of goiter
  Prevalence of cretinism
  Urinary iodine excretion (used for surveillance)
  T3, T4, TSH

Prevalence of neonatal hypothyroidism (Most sensitive indicator for environmental iodine deficiency)

- **Iodization of salt**
  PFA act- Iodine content of salt > 30ppm at production point & > 15ppm at consumer level
  Iodized oil – poppy seed oil/safflower – sunflower oil
  Dose of 1ml (IM) – 4 yrs protection
  Oral oil – 2ml – 2 yrs protection
  Twin fortified salt - Iodine + Iron/Double fortified salt (NIN Hyderabad)
  40 mcg iodine + 1 mg iron per gm of salt

Fluorine

- Drinking water – 0.5 mg/l
- Requirement – 0.5-0.8 mg/l
- Teeth & bones stores - 96%
- Food sources – sea fish, cheese, tea, water
- Increased level – Dental / Skeletal / endemic Fluorosis
- Decreased level – Dental Caries
- ***DMFT index*** in caries – Decayed. Missing, filled teeth index
  The average DMFT index at age 16 yrs – rural area – 4, urban area – 6

Goal in **National Oral health programme**
• To bring down the DMFT in school children between 6-12 yrs < 2.

- **Endemic Fluorosis-**
  Excess amount of fluorine in water
  Important Health problem in Andhra, Punjab, Haryana, Karnataka, Kerala, TN

  a) Dental Fluorosis
  Excess fluorides during early age of tooth calcification
  Mottling of dental enamel
  > 1.5 mg/L – intake
  Chalk white patches → yellow → brown
  Shiny appearances → corroded appearances
  Best seen in incisors of upper jaw
  Confined to permanent teeth

  b) Skeletal Fluorosis
  3.0-6.0mg/L – fluorides consumption
  Heavy fluoride deposition in skeleton
  > 10 mg/L – crippling Fluorosis

  c) Genu valgum
  Genu valgum & osteoporosis of lower limbs – recently reported
  Sorghum (jowar) based diet – promote retention of ingested fluorides
- Interventions
  Changing the water source Ground → surface water

Chemical – treatment – Nalgonda technique - addition of lime & alum – flocculation, sedimentation & filtration (NEERI, Nagpur)
Other measures – avoid fluoride in toothpaste

Copper

- Amt. Of Copper in adult body – 100-150 mg
- In deficiency → Neutropenia
- Hypocupremia – asso. with Nephrosis, Wilson disease, PEM
- Hypercupremia - Associated with Leukemia, Hodgkin's disease, Haemochromatosis, MI, Hyperthyroidism
- Requirement – 2 mg/d

Zinc

- Insulin synthesis / Immune function
- Deficiency – growth failure / sexual infantilism / loss of taste / delayed wound healing / Spont. Abortions /congenital malformation, anorexia, alopecia, acral dermatitis, acrodermatitis enteropathica, behavioral changes, susceptibility to infections, secondary to defective cell medial immunity
- Antioxidant
- RDA - Adult male-12 mg/d, Female-10 mg, Children-10 mg, Infant-5 mg / Pregnancy & lactation-12 mg/d
- **Zinc treatment of Diarrhea**

  Zinc – 200 mg/day for 14 days – adjunct to ORS in the management of diarrhea in children older than 3 months
  Potential to decrease hospital admission rate by 15 – 20%
  Decrease child mortality by 3-5%
  Decrease the incidence of subsequent episodes of diarrhea & possibly pneumonia.

Dietary Antioxidants

- Substance in food which significantly decreases the adverse effects of reactive oxygen, nitrogen species (free radicals)
- Maintain membrane stability
- Nutrients - Vitamin A, C, E, β carotene, Se, Zn
- Non nutrient – Plant phenols, flavonoids, coumarins, benzyl isothiocynate, caffeic, ferrulic, gallic & ellagic acids, enzymes – superoxide dismutase, catalase superoxide mutase

<u>Nutritive values of some important food items</u> (for MCQs)

- Ragi - Richest source of calcium - 344mg/100gm
- Soyabean – Best vegetable protein - 100 gm / NPU-55
  Energy – 432 kcal Protein – 43.2gm Calcium – 240mg
  Iron – 10.4mg Fats – 19.5gm Minerals – 4%
  Rich – Ca, Iron, Vitamin B Limiting AA – Methionine
- Green leafy vegetables are rich in Carotenes, Vitamin C, Iron and Calcium
- RDA for green leafy veg – 40 gm/day
- Roots & tubers - 50-60 gm/day (good source of carbohydrates)
- Other veg- 70gm/day
- Nuts & oilseeds- Good amount of fats % proteins

Fats – Walnut - 64.5% Almonds – 58.7% Cashew nut – 46.9%

- Groundnut Fats – 40% & Proteins – 16.7%
- Pistachio – richest in iron -14 mg/100 gm
- Meat – poor in calcium / Fish – poor in carbohydrates
- Rice – poor in Thiamine/Ca/Iron/Vitamin A, D, C
- Egg – Poor in Carbohydrates & vitamin C
- Fish – Protein/PUFA/Vitamin A & D/ Ca, fluorides, iodine
- Iodine – Sea food, lobsters, oysters
- Margarine – veg oil fortified with vitamin A & D
- Tea – 150ml – 79kcal / Coffee – 150ml – 98kcal
- Alcohol – 5-6% in beer to 40-45% in whisky, rum, gen, brandy (1 gm → 7kcal)
- Rice – Deficient - vitamin A, D, C, Fe, Ca
- Germinating Seed – high Vitamin B,C

Milk

- Carbohydrate, protein, fats, mineral (poor – iron)
- Vitamins all except vitamin C
- Poor in iron & vitamin C
- Goat's milk – folate deficiency
- Nutritive value of milk compared (value per 100 grams)

	Buffalo	**Cow**	**Goat**	**human**
Fat (g)	6.5	4.1	4.5	3.4
Protein (g)	4.3	3.2	3.3	1.1
Lactose (g)	5.1	4.4	4.6	7.4
Calcium (mg)	210	120	170	28
Iron (mg)	0.2	0.2	0.3	
Vitamin C (mg)	1	1	1	3
Minerals (g)	0.8	0.8	0.8	0.1
Water (g)	81	87	86.8	88
Energy (kcal)	117	67	72	65

- Skimmed milk – fat removed
- Toned milk- Blend of natural milk & made up milk
  1 part water + 1 part natural milk & 1/8 part of skim milk powder
  Stirred, pasteurized & supplied in bottles
  Cheap & wholesome
- Vegetable milk- Groundnut & Soyabean

Egg

- 1 gm protein → 6.25gm N2
- All nutrients except carbohydrates & vitamin C
- 12% shell, 58% egg white, 30% yolk
- 1 egg – 60gm wt
  Protein 6 gm
  Fat 6 gm
  Calcium 30 mg
  Iron 1.5 mg

Energy 70 kcal
Cholesterol 250 mg

- All EAA present – reference protein
- NPU – 100 (Meat – 80/milk – 75) (NPU -96 which is taken as 100 for comparison)
- If NPU low – requirement in diet is high
- Boiling destroys avidin, a substance which prevents the body from obtaining biotin, one of B complex vitamin, boiled egg is better than raw egg.

Dietary Goals – Prudent diet

- Fat – 15-30%
- Saturated fat – 10 %
- Salt – 5 gm
- Protein – 10-15%
- Junk foods – reduced
- Dietary fibre – increase

Indian reference man- Definition

- 18-29 yrs age
- Weight – 60 kg
- Height – 1.73 m
- BMI – 20.3 kg/m^2
- Free from disease & physically fit for active work
- Employed for 8 hrs – moderate activity
- 8 hrs in bed/4-6 hrs – setting/moving/2 hrs – walking – in active recreation & household duties

Indian reference woman- Definition

- 18-29 yrs age
- Weight – 55 kg
- Height – 1.61 m
- BMI – 21.2 kg/m^2
- 8 hrs – Household work/industry/mod. Active work
- 8 hrs in bed/4-6hrs – sitting & moving
- 2 hrs walking

Energy

- Consumption unit's coefficient
- Coefficient of dietary intake
- varies with age, sex, physical activity

RDA – Energy & protein intake (2010)

	Activity / Age	Energy (cal/day)	Protein (gm/day)
Adult Male	Sedentary (S)	2320	
	Moderate (M)	2730	60
	Heavy (H)	3490	
Adult Female	Sedentary	1900	
	Moderate	2230	55
	Heavy	2850	
Pregnancy (I Trimester +150)	Pregnancy	+350	78
	Lactation (0-6mths)	+600	74
	Lactation (6-12mths)	+520	68
Infants	0-6 mths	92/kg	1.16/kg

	6-12 mths	80/kg	1.69/kg
Children	1-3yrs	1060	16.7
	4-6	1350	20.1
	7-9	1690	29.5
Adolescents	10-12 (M/F)	2190 / 2010	39.9 / 40.4
	13-15	2750 / 2330	54.3 / 51.9
	16-18	3020 / 2440	61.5 / 55.5

- Energy requirement-
  Recommended Dietary Allowance (RDA) for all **nutrients** – Mean + 2SD **(**97.5% population) except energy- as excess energy is undesirable
  Therefore RDA for energy - Mean (& not Mean + 2SD**)** is used

  Reference man – 45 kcal/kg body weight / 24hrs
  Reference woman – 40 kcal/kg body weight / 24hrs
  1 year – 112 kcal/kg, 1-3yrs – 100 kcal/kg, 4-6yrs – 90 kcal/kg, 7-9yrs – 80 kcal/kg
- WHO recommends reduction in energy intake after age 40yrs-
  5% till 60yrs of age
  10% each decade thereafter
  2% decline per decade in adults
- Energy required by Basal metabolism -1 kcal/hr for every kg of body weight apart from energy required for daily activities & occupational work.

Nutritional Problems

Low Birth Weight (Further details in MCH chapter)

- Birth wt <2500 g
- Prevalence in India – 28%
- Cause - Maternal Malnutrition / Anemia
- Goal - < 10 % by 2000 AD (Health for all by 2000 AD – Target)

Protein Energy Malnutrition

- Incidence – 1-2% in pre school children
- **Causes -** Food Gap: In quantity and quality infections – diarrhea, Acute respiratory infections, worm infestation
- FIRST INDICATOR OF PEM - Wt for age
- **Wt for Age (Gomez Classification)**

Normal	90-110%
1st degree malnutrition	75-89%
2nd degree malnutrition	60-74%
3rd degree malnutrition	< 60%

- Waterlow's classification

W/H / H/A	**>m-2SD**	**<m-2SD**
>m-2SD	Normal	Wasted
<m-2SD	Stunted	Wasted and

		stunted

- Indicator of acute malnutrition - Wt for Age
- Indicator of chronic malnutrition - Ht for Age (stunting)
- Indicator of both acute and chronic malnutrition – Wt for Ht (wasting)

	Stunting	**Wasting**
Normal	>95 %	>90
Mild	86.5-95%	80-90
Moderate	80-87.5	70-80
Severe	< 80	<70

- **Mid Arm Circumference (Shakir's tape)**

  Yields a relatively reliable estimation of the body's muscle mass
  Can not be used before 1 yr of age
  Age 1-5 yrs
  Interpretation

> 13.5 cm	satisfactory normal status
12.5-13.5cm	mild to moderate malnutrition
<12.5cm	severe malnutrition

- **Prevention measures for PEM**

Health Promotion	**Early diagnosis and treatment**
Measures directed to pregnant and lactating women (education) Promotion of breast feeding Development of low cost weaning foods Measures to improve family diet Nutrition education Home economics Family planning and spacing of births Family environment	Periodic surveillance Early diagnosis of any lag in growth Early diagnosis and treatment of infections and diarrhea Development of programmes for early rehydration of children with diarrhea Development of supplementary feeding programmes during epidemics Deworming of heavily infested children
Specific Protection The child's diet – protein energy rich Immunization Food fortification	**Rehabilitation** Nutrition rehabilitation Hospital treatment Follow up care

Comparison between growth monitoring and nutritional assessment

Factor	Growth monitoring	Nutritional assessment
Strategy	Preservation of normal growth	Detection of under nutrition
Approach	Educational – motivational	Diagnostic – interventional
Enrolment	All infants	Representative sample
Age	Start before 6 months and continue monthly	Representative ages at longer intervals
Number	Small groups, preferably between 10 and 20	Any size group, 50-100 most efficient

Wt. recorder	Mothers guided by worker	Trained worker
Weight card	Simple, emphasis growth	Precise, nutritional status
Nutritional emphasis	Maintaining good nutrition	Detect malnutrition
Response	Early home intervention based on local knowledge	Nutritional rehabilitation often with supplements
Response time	Brief, resumption of normal growth	Long, regain of good nutrition in community
Interventions	Primary health care, ORS, vaccines, vitamin A, deworming, contraceptives, chloroquine, other treatment	Food supplements of community wide response, such as food subsidy
Referral	Health system for check up and possible brief food supplements	Malnutrition rehabilitation, often in special center

Food Surveillance

Milk hygiene

- **Milk borne infections**

TB	Typhoid	Brucellosis	Shigellosis
Streptococcus	Cholera	Staph enterotoxin	Enteropathogenic E coli
Salmonellosis	Diphtheria	Fever	Hepatitis

- **Methylene blue reduction test (MBRT)** – done for detection of bacteria before milk is accepted
- **Pasteurization**- Heating milk f/b rapid cooling to destroy bacteria
  3 methods
  Holder (Vat) method – Milk heated at 63-66^{0}C for 30 min then cooled to 5^{0}C (Small & rural communities)
  HTST method – Heated at 72^{0}C for > 15sec. f/b rapid cooling to 4^{0}C
  UHT method – 2 stages (2nd stage under pressure to 125^{0}C for few sec. f/b rapid cooling)
- 90% bacteria – killed at pasteurization temperature
- Rapid cooling – to check growth of bacteria

- **Tests of pasteurized milk**
  Phosphorus test - Phosphatase is present in raw milk - Destroyed at 60^{0}C for 30 min
  Standard plate count- < 30000/ml of pasteurized milk
  Coliform count - Absent in 1 ml milk

Food Toxicants

Epidemic Dropsy

- Contamination of Mustard seed with argemone (argemone oil)
- Toxin - Alkaloid - Sanguinarine from Argemone oil - interferes with oxidation of pyruvic acid
- Seeds of argemone mexicana resemble mustard seeds.
- Clinical manifestations - B/L - Swelling of legs – sudden non inflammatory, Diarrhoea, Dyspnea, Cardiac failure, Death may occur. Some patients may develop glaucoma
- The disease may occur at all ages except breast feed infants
- Mortality may vary from 5-50%
- Inflammation of blood vessels accumulation of pyruvic acid in blood

- **Tests -** Nitric acid test – detect upto 0.25% argemone oil- development of brown to red color.
  Paper chromatography 0.0001 % oil – most sensitive

Lathyrism

- Paralyzing disease of humans and animals
  In human – Neurolathyrism
  In animals -Osteolathyrism (odoratism) -pathological changes - skeletal deformities
- **Neuro –Lathyrism** - Crippling disease of the nervous system characterized by gradually developing Spastic Paralysis of lower limbs
- Prevalent in MP, UP, Bihar, Orissa
- Lathyrus Sativus - Khesari Dhal mixed with red gram or Bengal gram
- Diets containing > 30% Dhal for 2-6 months
- Toxin - Beta Oxalyl amino alanine (BOAA)
- Disease: In young men 15-45 yrs
- **5 Stages**

  Latent Stage — Ungainly gait on physical stress
  No-Stick Stage — Short jerky steps
  One Stick Stage — Crossed gait. Tendency to walk on toes
  Two Stick Stage — Excessive bending of knees and crossed legs.
  Crawler Stage
- **<u>Management</u>**

  Vitamin C prophylaxis (500-1000 mg daily for a week)
  Removal of toxin - Steeping method - Toxin is water soluble. 2 hr soaked in hot water
  Parboiling (soaking in lime water overnight)
  Genetic Approach – cultivating strains with low levels of toxin.

Aflatoxins

- Mycotoxin produced by Aspergillus flavus and Aspergillus parasiticus
- In food grains - Under conditions of improper storage (Storage fungus)
- Produce aflatoxins – B1 & G1 are hepatotoxic and carcinogenic
- Aflatoxin B1 – sample of breast milk & urine – infantile cirrhosis
- Control - Proper storage – moisture below 10%

Ergot

- Field Fungus Claviceps fusiformis
- Infested during flowering stage & grow as blackish mass
- Disease by consumption - Ergotism
- Common in area where Bajra is staple food
- Symptoms acute. Rarely fatal – nausea, vomiting, giddiness, drowsiness extending up to 24-48 hrs after ingestion of ergoty grain
- Chronic cases - painful cramps in limbs peripheral gangrene
- Control - Floating in 20 % salt water/ Hand picking / air floatation
- Upper safe limit - 0.05 mg alkaloid/100 g of food material

Fusarium Toxin

- Contaminate food crops
- Pose health hazards to livestock and man

- Contamination of sorghum
- Rice is a good substrate of Fusarium
- Fusarium incamatum

Endemic ascites

- Prevalent in MP
- Mortality – 40%
- Manifestations - Ascites & Jaundice
- Nutrient - Millet: Panicum miliare (Gondhli) contaminated with weed – seeds of crotalaria which contain Pyrrrolizidine alkaloids which are hepatotoxin
- Prevention – simple weeding of Jhunjhunia & Sieving of millet at the household level to remove the seed

Lathyrism	BOAA	Khesari Dal (Lathyrus sativus)
Epidemic dropsy	Sanguinarine	Argemone Mexicana
Endemic ascitis	Pyrrolizidine alkaloid	Crotalaria seeds (Jhunjhunia)
Aflatoxicosis	Aflatoxin	Asp. Flavor/parasiticus
Ergotism	Clavine alkaloid	Claviceps fusiformis (Jowar, bajra, wheat, rye oil)

Glycemic index of food items

100%	Glucose
80-90%	Corn Flakes, Carrots, Parsnips, Potatoes (mashed), maltose, honey, idli
70-79%	Bread (whole meal). Millets, rice (white), broad beans, potato, uppama
60-69%	Bread (white) paratha (wheat), rice (brown,unhusked) shredded wheat, beetroot, banana, raisins, sprouted green gram, sucrose
50-59%	Noodles (white), peas (frozen), pongal, sweet corn, potato chips
40-49%	Noodles (whole meal), pooridge oats (dalia), beans, sweet potato, oranges, peas (dried), Bengal gram, black gram
30-39%	Black eyed peas, chick peas, apple, skimmed milk, curd/yogurt, tomatosoup, ice cream
20-29%	Kidney beans, lentils (all daals), rajma, fructose
10-19%	Soyabeans, groundnut

Assessment of nutritional status

1. Clinical examination
2. Anthropometry
3. Biochemical evaluation
4. Functional assessment
5. Assessment if dietary intake
6. Vital & health statistics
7. Ecological studies

1) Clinical examination

2) Anthropometry: Height / Weight / Skin fold thickness / arm circumference / BMI

3) Lab & Biochemical assessment

a) Lab tests - Hb estimation – anaemia / Stools – parasitic infestation / Urine – albumin & sugar

b) Biochemical tests

Nutrient	Method	Normal value
Vitamin A	Serum retinol	20 mcg/dl
Thiamine	Thiamine pyrophosphate (TPP) – Stimulation of RBC Transketolase activity	1.00-1.23
Riboflavin	RBC glutathione Reductase activity Stimulated by FAD	1.0-1.2
Niacin	Urine N-methyl nicotinamide	not reliable
Folate	Serum folate	6mcg/ml
	RBC folate	160mcg/ml
Vitamin B12	Serum conc.	160mg/L
Vitamin C	Leucocyte Ascorbic acid	15mcg/10^8 cells
Vitamin K	Prothrombin time	11-16sec
Protein	Serum albumin	35gm/L
	Transferrin	20gm/L
	Thyroid binding Prealbumin	250mg/L
Vitamin D	Serum Vitamin D3 level	>30mg/ml

4) Fundamental indicators

System	Nutrient	System	Nutrient
a) Structural integrity		**b) Host defence**	
Erythrocyte fragility	Vitamin E, Selenium	Leucocytes chemotaxis	P/E, Zn
Capillary fragility	Vitamin C	Leucocytes phagocytic capacity	P/E, Fe
Tensile strength	Cu	Leucocytes bactericidal capacity	P/E, Fe, Se
		Increase cell blastogenesis	P/E, Zn
		Delayed Cut. Hypersensitivity	P/E, Zn
c) Homeostasis		**d) Reproduction**	
Prothrombin time	Vitamin K	Sperm court	Energy, Zn
e) Nerve function		**f) Work capacity**	
Nerve conduction	P/E, Vitamin B1/B12	Heart rate	P/E
Dark adaptation	Vitamin A/Zn	Vasopressor response	Vitamin C
EEG	P/E		

5) Assessment of dietary intake (Dietary survey)

Weightment of raw food (1-21 days – 7 day cycle)

Weightment of cooked food

Oral Questionnaire method

6) Vital statistics

Mortality – 1-4yrs age group related to malnutrition

IMR/second year mortality rate/LBW – rate/Life expectancy

Morbidity – PEM, Anaemia, Xerophthalmia & other vitamin deficiencies, Endemic goiter, Diarrhea, Measles & Parasitic infestations

7) Assessment of ecological factors

Food balance sheet — Socioeconomic factors
Health & educational services — Conditioning influences

Indicators of nutritional status

Phenomenon	Indicator
Maternal nutrition	Birth weight
Infant and preschool child nutrition	% being breast fed % on weaning foods, by age in months, mortality rates in children aged 1,2,3,4 yrs with emphasis on 2 yrs old If age known - H/A, W/A If age unknown - W/H, MAC, C/F
School child nutrition	H/A; W/H at 7 yrs or school admission clinical signs

Food additives

- Non-nutritious substances which are added intentionally to food in small quantity, to improve appearance, flavor, texture or storage properties.
- 2 categories

Category I — Safe for human consumption
Coloring agents (Saffron, turmeric)
Flavoring agents (Vanilla essence)
Sweeteners (Saccharin)
Preservatives (Na-benzoate, sorbic acid)
Acidity imparting agents (citric acid, acetic acid)

Category II — Contaminants

Food Fortification

- The process where by nutrients are added to foods (in relatively small quantities) to maintain or improve the quality of the diet of a group, a community or a population
- E.g.

Water + Flouride	Dental Caries
Salt + Iodine	Endemic goiter
Salt + Iron	Anaemia
Vanaspati ghee	Vit A & Vit D

Prevention of food adulteration (PFA) Act, 1954

Objective

- To ensure pure & wholesome food to consumer
- To protect from fraudulent practices

Amendments 1964, 1976, & 1986

- Minimum imprisonment – 6 months & minimum fine Rs. 1000/-
- If food – injurious then life imprisonment & Fine Rs. 5000/-
- 1986 amendment – consumer & NGOS can take food samples

Administration

- Central committee for food standards
- State govt. & local bodies
- Four regional food labs (central) – Kolkata / Mysore / Ghaziabad / Pune

Institutes:

- CFTRI, Mysore – Central food Technological & Research institute
- NIN – Hyderabad – National Institute for Nutrition
- ITRC – Indian Toxicology Research center, Lucknow
- DFRL – Defence food research lab, Mysore
- NDRI – National dairy research institute, Kernal (AP)
- NDDB – National dairy development board, Anand (Gujarat) – Amul

Food standards

a) Codex alimentarius
Food standard in India
Principal organ of joint FAO/WHO food

b) PFA standards
Purpose is to obtain a min level of quantity of food stuffs attainable under Indian conditioning

c) AGMARK standards-
Standardization of food by directorate of marketing & inspection of govt. of India

d) ISI mark – Bureau of Indian standards

National Nutritional goals 2000

- Reduction in moderate and severe malnutrition among preschool children by half
- Reduction in chronic malnutrition and stunted growth in children
- Reduction in incidence of LBW < 10 %
- Elimination of blindness due to Vit .A deficiency
- Reduction in iron deficiency anemia in pregnant women to 25 %
- Universal Iodisation of salt and to reduce IDD to 10%
- Production of 250 million tones of food grains
- Promoting appropriate diets and healthy lifestyles

National Nutrition Policy – 1993

A) Direct interventions-	**B) Indirect policy instruments**
1) Nutrition interventions for vulnerable groups a) Expanding safety net – UTP/ORT/ICDS b) Improving growth monitoring – 0-3yrs age with close involvement of mother c) Reaching adolescent girls through ICDS d) Ensure coverage of ANC mother 2) Fortification of essential foods 3) Popularization of low cost nutrition foods 4) Control of micro-nutrient deficiencies among vulnerable groups	1) Food security – 215kg/person/year food grain 2) Improvement in dietary pattern 3) Improvement in purchasing power & improving PDS 4) Land reforms 5) Health & FW 6) Basic health & nutrition knowledge 7) PFA 8) Nutritional surveillance 9) Monitoring of nutrition programmes 10) Research 11) Equal remuneration for woman 12) Communication

	13) Minimum wage administration 14) Community participation 15) Education & literacy – asp. Women 16) Improvement of status of women

Community Nutrition Programme

Programme	Ministry
Vitamin A prophylaxis programme	Ministry of Health & Family Welfare (MOHFW)
Prophylaxis against nutritional anemia	Ministry of Health & Family Welfare
Iodine deficiency disorder control programme	Ministry of Health & Family Welfare
ICDS programme	Ministry of social welfare
Midday meal programme	Ministry of education

1) Vitamin A prophylaxis programme (1970)

- MOHFW
- Single massive dose of vitamin A 2 lac IU orally to all pre-school children every 6 months.

2) Prophylaxis against Nutritional Anaemia

- MOHFW
- Distribution of iron & folic acid tablet to pregnant women & children

3) National Iodine deficiency disorder control programme (NIDDCP) - 1986

- MOHFW
- National goiter control programme (1962)
- Components - Iodized salt /Monitoring & surveillance / Manpower training / Mass communication

4) Special nutrition programme (1970)

- Ministry of social welfare
- Nutritional benefit of children < 6yrs age, Pregnant & nursing mothers
- Supplementary food - 300 kcal & 10-12 gm protein per child per day / 500 kcal & 25 gm protein – mothers
- Supplements for 300 days in a year
- Now merged with ICDS

5) Balwadi nutrition programme (1970)

- Ministry of social welfare
- Beneficiaries - Children – 3-6yrs of age children in rural area
- Supplementary nutrition - 300 kcal & 10 gm proteins
- Merged with ICDS

6) Applied Nutrition programme

- To promote production of protective food - fruits & vegetables & to ensure their consumption
- Beneficiaries – 2-6yrs age children/pregnant & nursing mothers

7) Integrated Child Development Services (ICDS) programme (1975)

Ministry of social & Women's welfare
6799 ICDS projects with 12.41 lac AWC – functioning (2011)

Scheme is universal (not restricted to BPL families only)

Population Norm

1 Anganwadi centre (AWC) – 400-800 population
2 Anganwadi centre (AWC) – 800-1600 population
3 Anganwadi centre (AWC) – 1600-2400 population
Then 1 AWC for every 800 population

Tribal area
1 Anganwadi centre (AWC) – 300-800 population
Mini AWC 150-300 population (Hamlet / Tribal village)

In general - 1000 population (rural/urban) & 700 populations (tribal)

Service package

- Supplementary nutrition
- Immunization
- Health checkup
- Medical referral services
- Nutrition & Health education for women
- Non-formal education upto 6yrs of age

Beneficiaries

- Pregnant/Nursing mothers
- Other women in 15-45yrs age group
- Children 0-6yrs
- Adolescent girls – 11-18 yrs

Supplementary nutrition

	Energy	**Protein**	**Financial norm**
Children upto yrs	500 kcal	12-15 gm	Rs.4 per child per day
Malnourished child	800	20-25	Rs.6 per child per day
Adolescent girls	500	20-25	
Pregnant/nursing mother	600	18-20	Rs.5 per beneficiary per day

- for 300 days in a year
- Children < 3 yrs, Pregnant & lactating mothers – "Take home ration" is provided
- Children 3-6 yrs – freshly prepared/cooked food provided in AWC.

Nutritional Norms:- Revised dated 24.2.2009

Sl. No.	**Category**	[Pr-revised]		[Revised] **(per beneficiary per day)**	
		Calories (K Cal)	**Protein (g)**	**Calories (K Cal)**	**Protein (g)**
1.	Children (6-72 months)	300	8-10	500	12-15
2.	Severely malnourished children (6-72 months)	600	20	800	20-25
3.	Pregnant women and Nursing mothers	500	15-20	600	18-20

Ref:www. http://wcd.nic.in/icds/

Health checkup-

ANC – expectant mothers / PNC – for nursing mothers
Newborn care
Care of children < 6yrs - Record of Ht/Wt, Watch over milestones, Immunization, Health checkup at internal 3-6 months, Treatment if disease – diarrhea/RTI, Deworming, Vit. A /Anaemia prophylaxis & Referral

Administration

Community Development Block - rural area
Tribal Community Development – tribal
Group of slums – urban area

Rural/urban project - 100000 populations (100 villages)
Tribal - 35000 populations (50 villages)

Anganwadi centre (AWC) – Heart of ICDS / Manned by 1 AWW & 1 helper
Anganwadi worker (AWW) – focal point of service delivery
Child Development Project Officer (CDPO) - In-charge of 4 supervisors (Mukhya Sevika) & 100 AWW
Each supervisor (Mukhya Sevika) – 20-25 AWW/AWC

Indicator for impact of programme

1. ↑ Birth wt.
2. ↓ Incidence of malnutrition
3. ↑ Immunization coverage
4. ↓ IMR and child M.R.

Schemes for Adolescent girls under ICDS

Kishori shakti Yojana (KSY) –
To address their needs of self development, nutrition & health status, literacy & numerical skills, vocational skills etc.

Nutrition programme for adolescent girls – (2009-10)
Pilot project
Undernourished adolescent girls (11-19 yrs.)
Body wt. < 30 kg (11-15 yrs.) & < 35 kg (15-19 yrs.) – given 6 kg free food grains per month

Rajiv Gandhi Scheme for empowerment of adolescent girls (SABLA) –
For age group 11-18 yrs to improve their nutritional & health status

Indira Gandhi Matrutva Sahyog Yojana (IGMSY)
Conditional cash transfer will be made to pregnant & lactating mothers to improve their nutritional & health status.

8) Mid day Meal programme- (MDMP)

Ministry of education
School lunch programme (1961) – to attract more children to school & retain them
Nutritional supplements - 1/3rd energy & 1/2 protein requirement

Model Menu	gm/day/child
Cereals & millets	75
Pulses	30
Oils/fats	8
Leafy veg.	30
Non leafy veg.	30

Supplementary food for 250 days in a year
Part of minimum needs programme

9) Mid-day meal scheme-

National Programme of Nutritional support to Primary Education
15th Aug 1995 / revised in 2004
For universalization of primary education
Centrally sponsored scheme
Ministry of HRD
I to V std. children – Govt/local bodies /govt. aided schools
Food grain – 100 gm/student/day
300 kcal & 8-12 gm proteins/day

WHO-FAO Expert group on diet, nutrition & Prevention of chronic diseases - ***Population nutrient intake goals***

Dietary factor	**Goal (% of total energy)**
Total fats	15-30%
Saturated FA (SFA)	<10%
PUFA	6-10%
n-6 PUFA	5-8%
n-3 PUFA	1-2%
Trans FA (TFA)	<1%
MUFA	By difference [Total fat – (SFA+PUFA+TFA)]
Total Carbohydrates	55-75%
Free sugars	<10%
Proteins	10-15%
Cholesterol	<300 mg/day
Sodium	<5 gm/day (<2 gm/day)
Fruits & vegetables	≥400 gm/day

****

SOCIOLOGY

- **Social Sciences** – disciplines which are committed to scientific examination of human behavior
  Economic/ Political science/ Sociology/ Social psychology/ Social anthropology
  Last 3 – Behavioral sciences as they deal directly human behavior
- **Economics** – deals with human relationship in the specific context of production, distribution, consumption & ownership of scarce resources, goods & services.
- **Political Sciences** – Study of system of laws & institution which constitute govt. of whole society
- **Sociology** – study of human relationships & of human behavior for a better understanding of the pattern of human life.

- **Social Psychology** – understanding basis of perception, thought, opinion, attitudes, general motivation, &learning in individuals & how these vary in human societies & groups.
- **Anthropology** – Study of physical, social & cultural history of man.
  Physical anthropology/Social anthropology/Cultural anthropology
  Medical anthropology – deal with cultural components in ecology of health & disease
- **Society** – is a group of individuals who have organized themselves & follow a way of life. Organization of member agents/ a system of social relationship between individuals
- **Social structures** – pattern of inter – relations between persons in a society
- **Social institution**- eg. Family, school, club, hospital etc
- **Socialism** – a system of production & distribution based on social ownership
  -use of property & resources of the country for social welfare
  "all for all" & "each for all"
- **Socialization** – Process by which an individual gradually acquires cultures & becomes member of a social group.
  Eg. Children going school, Internship training for doctors

  Primary socialization – Learning in primary groups(emotional oriented)
  eg. Family, peers, neighborhood etc
  Secondary socialization – Learning in a secondary groups like school, organization, clubs, association, books, mass media etc (task oriented)
  Anticipatory socialization – Learning in anticipation of future positions
  eg. Internship for doctors
- **Social control mechanism-**
  Formal or informal rules for the maintenance of relationships
  Eg. Public health laws, punishments

- **Customs** – established pattern of behavior that can be objectively verified within particular social setting.
- **Folkways** – right ways of doing things / **Mores** – more stringent customs
- **Culture** – learned behavior which has been socially acquired. Transmitted from one generation to another through learning
- **Acculturation** – Culture contact
- **Sociometry** – Tendency of some member of a group to identify & interact with selected members only leads to formation of a subgroup
- **Social change**

Traditional ----------> Transitional ----------> Modern
Society not adapted to change — society better adapted to change — society best adapted for change

- **Social stress** – conflicts generated by new opportunities &frustration arising from social change
- **Social problem**- affecting a large no. of people
  Eg. Poverty, crime, alcoholism, population growth, divorce, mental illness, adduction
- **Social deviance**- Drug abuse/Juvenile delinquency/suicide
- **Social pathology** – study of social problem
  -describe relationship between disease & social conditions
- **Social survey** - Social pathology is uncovered by social survey

- **Social defence**- Preventive, therapeutic, & rehabilitative service for the protection of society from antisocial, criminal & deviant conduct
- **Social injustice** - glaring contrast in the state of health between rural & urban area, between rich & poor, between developed & developing countries.
- **Medical sociology –** First proposed by Charles McIntire (1894)

PSYCHOLOGY: Study of human behavior

- **Attitude** - a relatively enduring organization of benefits around an object, subject or concept which predisposes one to respond in some preferential manner.
  -acquired characteristics
  -permanent ways of behaving
  -objective
  -caught but never taught

- **Value** – the ideals, customs, institutions of a society toward which people of the group have an affective regard.
- **Opinions** – Views held by people on point of dispute/ Temporary & provisional
  -inner subjective thought of a person towards an individual on a situation
- **Belief** – Views derived from parents, grandparents & other people we respect – are permanent, unstable & almost unchanging
- **Cultural belief** – Learned behavior which is permanent & consistent but liable to change

- **Learning** - any relative permanent change in behavior that occurs as a result of practice or experience
  3 types – Cognitive learning (knowledge)
  Affective learning (Attitude)
  Psychomotor learning (skills)
  Condition affecting learning-
  -Intelligence
  -Age
  -Learning situation
  -Motivation
  -Physical health
  -Mental health
- **Habits** – accustomed ways of doing things
  -acquired through repetition
  -automatic
  -performed only under similar circumstances

- **Defence Mechanism-**

1. Rationalization – making excuse & justifies behavior
2. Projection – blaming others for mistakes/failures
3. Compensation – for failure in one situation distinguish in other situation
4. Escape mechanism – to overcome failure (taking alcohol/drug)
5. Displacement – trying to escape from one situation & fixing blame on another situation (office ---> home)
6. Regression – weeping as a mode of adjustment (childhood practices)

- ***Unit of study in psychology is individual & sociology is group***

- **Personality** – Physical & mental traits which are characteristics of a given individual
  4 components – Physical/Emotional/Intelligence/Behavior
- **Intelligence** – ability to see meaningful relationship between things
  Binet & Simon – first test of intelligence
  Termen – revised test
  -Defined intelligence as capacity to use abstract ideas for solving problems
  Gessel – 4 sectors of intellectual development
  -Motor ability
  -Adaptive behavior
  -Language development
  -Personal – social behavior

$$IQ = \frac{\text{Mental age}}{\text{Chronological age}} * 100$$

IQ	Level of intelligence
0 -24	Idiot
25-49	Imbecile
50-69	Moron
70-79	Borderline
80-89	low normal
90-109	Normal
110-119	Superior
120-139	Very superior
>=140	Near genius

- **Mental retardation**

50-70	Mild
35-49	Moderate
20-34	Severe
<20	Profound

Wings Handicaps, Behavior & skills (HBS) Schedule to measure abilities & disabilities

- **Family** – Most powerful example social cohesion
- **Household** – all members – not blood related
- **Family of origin (Family of procreation)**
- **Family cycle**-
  -Formation
  -Extension
  -Complete extension
  -Contraction
  -Complete Contraction
  -Dissolution
- **Types of family**-
  -Nuclear (Conjugal/Elementary) family
  -Joint/Extended family
  -Three generation family (stem family)
- **New families** – under 10 yrs duration

- Patrilocal -wife ----> husband's house
  Matrilocal -Husband ----> wife's house
  Patriarchal -male dominated
  Matriarchal -female dominated
  Monogamous -single spouse
  Polygamous - (Polyandrous/Polygynous)
  Matrilinear -Maternal lineage
  Patrilinear -Paternal lineage

- **Communal family** – where all members are playing a parts in its management
- **Broken family** – parents separated/dead
- **Problem family** – which lag behind the rest of the community

- **Socioeconomic scales-**

Urban – Modified Kuppuswamy's scale -Kulshreshtha scale -Srivastava scale -Jalota scale	Rural - Uday Parikh's classification -modified B.G. Prasad's classification

Kuppuswamy's classification
Education - 1-7
Occupation - 1-10
Family income - 1-12
26-29 -upper (I)
16-25 -upper middle (II)
11-25 -lower middle (III)
5-10 -upper lower (IV)
<5 -lower (V)

B. G. Prasad's classification – per capita monthly income
I – Upper high >10000
II – High 5000-10000
III- Upper middle 3000-5000
IV – Lower middle 500-1500
V – Very poor (BPL) <500

- **Social security**
  Consumes Protection Act – 1986
  Immoral traffic (Prevention) Act -1986
  The children act -1960
  Dowry prohibition act – 1986
  Narcotic drugs & Psychotropic substance act -1985
  Prevention of food adulation act -1954
  MTP act – 1971
  ESI act – 1948
  Factories act – 1948
  Juvenile Justice Act – 1986
  Central Births & deaths Registration act – 1969
  PCPNDT act –1994

- **Poverty line** – expenditure required for a daily calorie intake of 2400 per person - rural & 2100 per person – urban.

Some important terminologies in Economics

- Per capita GNP – General measure for human welfare & health
- Gross national income / product (GNI/GNP) – Gross income generated from within the country + net income received from abroad
- Gross domestic income / product (GDI/GDP) – Gross income generated within the country.
- Net national product (NNP) = [GNP – capital consumed in production process]
- Net domestic product (NDP) = [GDP – value of depreciation on fixed assets]
- Purchasing power parity (PPP) – defined as no. of units of a country's currency required to buy the same amount of goods & services in domestic market as one dollar would buy in the USA.
- India's per capita GNP (2010) - $3560 (PPP) – 4th largest (USA / China / Japan)
- Per capita income (2011-12) – Rs.60603.

****

HISTORY OF MEDICINE

- **Henry Siegerist** - medical historian
- **Aristotle (Father of Biology)** - Theory of spontaneous generation -
- **Louis Pasteur** - Disproved theory of spontaneous generation
  - Germ theory of disease ('Single cause idea / one to one causation")
    - Pasteurization / Sterilization / Disinfection
  - Father of Bacteriology
  - Vaccines – ARV / Cholera / Diphtheria / Typhoid
- **Pettenkofer of Munich** - Multifactorial causation of disease (Web of causation)

- **Ayurveda** –
  Knowledge of life or the knowledge by which life is prolonged
  Atharveda - Veda from which Ayurveda is derived
  Dhavantari - Hindu god of medicine
  Atreya - First great Indian physician & teacher
  Charaka - Charak Sumhita (Medicine)
  Susruta - Father of Indian surgary / Susruta Samhita (translated by Hessler)
- **Siddha** - practiced in Tamil speaking areas in TN
- **Unani-Tibb** - system of medicine introduced by Muslim ruler in 10th century
- **Homeopathy** - Samuel Hahnemann (Germany)
  - Treatment of diseases by the use of small amount of a drug which produces symptoms similar to those of diseases being treated. (Simila similibus curenter)
  -single medicine at the time of treatment
  -minimum dose to be used

ISM & H - Indigenous system of medical & Homeopathy
AYUSH - Ayurveda, Yoga & Naturopathy, Unani, Siddha, Homeopathy (Key components of NRHM)

- **Paracelsus** – Father of toxicology / Publicly burnt the work of Galen & Avicenna
- **Fracastorsus** - Theory of contagion
  -explained the cause of epidemic
  -Syphilis transmission through sexual route
  -Founder of epidemiology
- **Claude Bernard** – father of physiology
- **Sigmund Freud** - Father of psychoanalysis
- **Andreas Vasalius** – anatomist / first man of modern science (Book: Fabrica)
- **Ambroise Pare** – Father of surgery
- **Thomas Sydenham** – first distinguished epidemiologist (Scarlet fever, malaria, dysentery, & cholera)
- **Edward Jenner** – smallpox vaccine
- **Morgagni** – Pathologic anatomy
- **Edwin Chadwick** – Lawyer in UK
  "Great Sanitary Awakening" in UK (Mid 19th century)
  -enactment of public health act, 1948
- **Cholera** – Father of public health
- **John Snow** – Father of epidemiology – English epidemiologist
  - Polluted water → cholera (spot map)
- **William Budd** – Outbreak of typhoid fever in UK
- **Sir John Simon** – first medical officer of health (UK)
- **Robert Koch** – Koch's postulate/Anthrax bacilli/ V. cholera
- **James Lind** - Citrus fruits in prevention of scurvy – first human experiment
- **Ignaz Seimelweiss** - hand washing & puerperal sepsis
- **Joseph Lister**: Antiseptic Principle of Practice of Surgery
- **Bruce** – African sleeping sickness & tse-tse fly
- **Ross** – Malaria & anopheles mosquito

- **Walter Reed** – yellow fever & Aedes mosquito
- **Allopathic Medicine** – Treatment of disease by the use of drug which produces a reaction that itself neutralizes the diseases
- **Neumann/Virchow** – Medicine is a social science & politics in medicine on large scale
- **Alfred Grotjahn** – social pathology
- **C.E.A Winslow** – defined public health – Science & art of preventing diseases, prolonging life & promoting health & efficiency through organized community efforts
- **Bhore committee** – development of health centers in India.
- **Barometer of social welfare** – TB
- **Social Medicine**: Study of man as a social being in his total environment
- **State medicine**: Provision of free medical service to the people at government expenses.
- **Socialized Medicine** – provision of medical service & professional education by the state but the progamme in operated & regulated by professional groups.
  Socialization of medicine benefits-
  1. It estimates the competition among physicians in search of clients.
  2. It ensures social equity i.e. universal coverage by health services.
  3. Medical care becomes free for the patient- supported by the state.

  Imp- Socialization is not sufficient to ensure utilization of health services.
- Family medicine – Dr. Francis Peabody
- First country to launch compulsory sickness insurance – Germany (1883)
- First country to nationalize health services – England (1946)
- First country to socialize medicine completely & to give its citizens a constitutional right to all health services – Russia.
- **Smallpox eradication**
  Last indigenous case in India – 17th May 1975
  Last known case in India – 24th May 1975 (Imported from Bangladesh)
  Last case of smallpox in world – 26th Oct 1977 (Somalia)
  India declared smallpox free – April 1977
  WHO declared global eradication of smallpox – 8th May1980
- Last polio case in India (wild virus) - 13th January 2011 (WB)
- Term Vaccination – Edward Jenner / Vaccine – Louis Pasteur
- **Paul Ehrlich** – Terms: Chemotherapy / Autoimmunity

Changing concepts in public health

In history of public health – 4 distinct phases may be demarcated

a) Disease control phase (1880-1920)
b) Health promotional phase (1920-1960)
c) Social engineering phase (1960-1980) – Social & behavioural aspects of health & disease.
d) Health for all phase (1980-2000)

****

EPIDEMOLOGY

Definition: The study of the distribution and determinants of health related states or events in specified population and the application of this study in the council of health problem.

- Disease frequency
- Disease distribution
- Disease determinants

Tools of measurement:

Rates: Measures the occurrence of some particular event in a population during a given time. Numerator is part of denominator.

Ratio: Relation in size between two random quantities. Numerator is not a part of denominator.

Proportion: percentage mid yr population as 1st of July

International death certificate

Part I – a) immediate cause

b) & c) Underlying cause - most important

Part II $\rightarrow$ Any significant associated disease

Mortality Rates & Ratios

1. Crude death rate

2. Specific death rates

3. Case fatality rate (Ratio) – [%]

- $\frac{\text{Death Due to disease}}{\text{Total Cases}} \times 100$
- Time interval not specified
- Used in acute infectious disease
- Related to virulence

4. Proportional mortality rate (ratio)

$$\frac{\text{No of death from sp. dis. in a yr}}{\text{Total deaths from all causes}} \times 100$$

Used when population data not available

It is of limited value in making comparison between population groups.

Does not indicate the risk of dying from the disease.

Useful indicator of importance of the specific disease, as a cause of death

5. Survival rate - Describe prognosis

6. Adjusted or standardized mortality rate:

Direct standardization – ASDR of given population applied to std. population

Indirect standardization – ASDR of standard population are applied to given population
Standardized Mortality Ratio (SMR) = Observed Death X 100
Expected death
Standard population: One for which the number in each age sex GP are known
*Can be calculated when age specific data is not available

Measurement of morbidity:
Incidence

- Primarily a rate
- No. of **new cases** occurring during a specifies period in a given population [a risk]
- Incidence rate: per 1000
- Not affected by duration of disease
- Generally restricted to acute conditions
- Types: Attack rate & SAR

Attack rate: (%)

- Reflects extent of epidemic
- Used when population is exposed to risk for a limited period of time

Secondary attack Rate (SAR):

- No. of exposed persons developing the disease within the range of the incubation period following exposure to a primary case.
- Primary case exclude from both Numerator & Denominator
- Denominator - only susceptible close contacts

Prevalence

- Primarily a ratio
- All cases **(New + old)** existing at a particular time or over a period of time in a given population
- Types: Point prevalence & Period prevalence

Relationship between Incidence & Prevalence: Prevalence = Incidence X Duration

Epidemiological studies

(A) Observational studies	**(B) Experimental studies**
I. Descriptive II. Analytical • Ecological - population as unit of study. • Cross sectional (Prevalence) • Case control • Cohort (Incidence) Individuals as unit of study	• Randomized control trial on patients [clinical trial] • Field Trial – community intervention studies • Community trials - Communities as unit of study.

DESCRIPTIVE STUDIES

Procedure:

- Define population
- Define disease: Operational definition
- Describe disease: Time, Place & Person distribution
- Measurement of Disease in terms of Mortality & Morbidity
- (Cross sectional studies → prevalence & Longitudinal studies → incidence)
- Comparing with known indices
- Formulation of a hypothesis – Hypothesis is a supposition, arrived at from observation or reflection, population, cause, outcome, dose/time.

A) Time distribution

Short term fluctuations (Epidemic)

- Sudden outbreak of disease
- Epidemic curve → Graph of the time distribution of epidemic cases
- Median I.P → Time required for 50% of cases to occur

Point source epidemic – an epidemic curve that shown a tight clustering of cases in time with a sharp upslope and a trailing down slope. There are no secondary waves. The first cases usually happen in one incubation period.

Continuing common source-

Outbreaks breaks may arise from common sources that continue over time. The epidemic curve will rise sharply as with a point source. Rather than rise to a peak, this type of epidemic curve will find a plateau. The down slope may be precipitous if the common source is removed or gradual if it exhausts itself.

Propagated - this kind of epidemic is caused by a transmission from one person to another person which requires direct contact such as touching, biting kissing, or sexual activities.The epidemic curve show a slow increase in the no, of cases with progressive peaks approximately one incubation period.

Periodic fluctuations

- Seasonal trend: Assessed by comparing incidence
  e.g.- Measles- early spring Varicella, malaria, ARI – winter
- Cyclic trend: → Ag variation & Variation in herd immunity
  e.g.- Rubella → 6-9yr, influenza – 1-10 yr, measles – 2-3 yr

Long term fluctuations: - Secular trend e.g. CHD, Ca lung, Diabetes mellitus.

B) Place Distribution

International – Japan → Ca stomach Ca oral cavity & cervix → India

C) Person Distribution

Age: Bimodal → Hodgkin's leukemia, breast Ca
Sex: Occupation, marital status etc.

ANALYTICAL STUDIES

- Second major type of epidemiological studies

- Objective is to **test the hypothesis**
- Subject of interest is individual from the population (Unit of study – Individual) but results are applicable to population from which they are selected.

Ecological studies

In Ecological studies, the unit of observation is an aggregate, a geo graphical administrative locality, a cluster of houses, a town or a whole country etc.

Aggregate analysis of national figures

- These studies consist of an aggregate analysis of the correlation between a study factor and a disease (or mortality from a specific cause) in the geographical locale.
- They do not offer information in the exposure status of the individuals afflicted with or dead from the specific cause, instead, the level of experience in the geographical unit or country is taken as a measure for all individuals in that unit or country.
- E.g. Ecological correlation of per capita consumption of cigarettes and level of mortality from lung cancer.
  Ecological correlation of water hardness and mortality from cardiovascular disease.

Time series ecological studies

- A variety of ecological studies may add a time series dimension by examining, still on an aggregate basis.
- Whether the introduction of a factor into a geographical area was associated with an increase in morbidity or mortality, or whether intervention in a geographical area reduced the morbidity or mortality.
- Eg. The study of death certificate for US women of reproductive years between 1961 and 1966 to find out there had been an increase in mortality from Thromboembolism in women after the introduction of oral contraceptives in 1960-61.

Disadvantages and biases (Ecological fallacies) in ecological studies

- While such studies are of interest as sources of hypothesis and as initial or quick methods of examining associations, they cannot be used as the basis for making casual interferences.
- The most serious flaw is the risk of ecological fallacy – when the characteristics of the geographical unit are incorrectly attributed to the individuals.
- Many risk factors clusters in certain geographical areas – air pollution, heavy industry, ageing, crowding correlate to cities. The death of a person from heart disease may have little or no relationship to the presence of heavy industry.

Cross Sectional studies

- In an analytical cross- sectional study, the investigator measures exposure and disease simultaneously in a representative sample of the population.
- Cross- sectional studies measure the association between exposure variable and existing disease (prevalence).
- Rare diseases, condition of short duration, or diseases with high case fatality are often not detected by the one time snapshot of the cross sectional study. Therefore, cross sectional studies are more appropriate for measuring the relationship between fairly permanent characteristics in the individuals and chronic diseases or stable conditions.

Advantages	Disadvantages
• They can be short term, less costly than prospective studies • They are the starting point in prospective studies out already existing conditions • Useful in health system research • Allow a risk statement to be made, although not precise	• They provide no direct estimate of risk • Since exposure and disease are measures at the same time, it is not possible to establish temporality (i.e. whether the exposure or presence of a characteristic preceded the development of the disease or condition.

Case series study

- This kind of study is based on reports of a series of a specific, conditions or a series of treated cases with no specifically allocated control group.
- They represent the numerator of disease occurrence, and should not be used to estimate risks.
- Examples
  1. One initial observation on AIDS was from a case series in San Francisco, the distribution of cases was almost entirely among homosexual men. This led to the suspicion about sexual practices as the cause.
  2. When a series of cholera cases is reported from a particular area in the country, initial tabulation of the case series might lead to the potential source of the epidemic, and subsequent analytical studies would confirm or dispel the initial suspicion.
- Both exposure & outcome (disease) have occurred before the start of study.
- The study proceeds backwards from effect to cause [Retrospective]
- It used a control or comparison group to support or refute an inference
- To support or refute an inference.

Case Control Study

- Comparison of cases & control with respect to known confounding factor
- Effect → Cause or Disease → Risk factor – Retrospective study
- Major use in chronic disease
- Basic Steps
  1. Selection of cases
  2. Selection of control free from disease
  3. Matching
  4. Measurement of exposure & analysis

	Cases	Control	Total
Exposed	**a**	**b**	a + b
Unexposed	**c**	**d**	c + d
Total	a + c	b + d	a + b + c + d

[

- **Odds Ratio** = ad / bc (Strength of Association between risk factor & disease)

Advantages	Disadvantage
• Few subjects • no risk to subjects • Easy & rapid • Multiple disease etiology is studied	• Recall Bias • Selection of cases & control difficult • Incidence – not measurable.

• No attrition may be identified	

Cohort Study

- Cohort identified prior to appearance of disease
- Cause → Effect or Risk factor → Disease so Prospective study
- When good evidence of an association between exposure & disease
- When exposure is rare but the incidence of disease high among exposed - Retrospective cohort
- Basic steps
    1. Select study subjects
    2. Obtaining data on exposure – factors
    3. Selection of comparison GP
    4. Follow up & analysis

RF	Disease		Total
	Yes	**No**	
Exposed	a	b	a + b
Unexposed	c	d	c + d
Total	a + c	b + d	a + b + c + d

- **Strength of association**:

  Relative risk = $\frac{\text{Incidence among exposed}}{\text{Incidence among unexposed}} = \frac{a/a+b}{c/c+d}$

  Attributable risk

  Attributable risk to what extent disease under study can be attributed to the exposure

  AR = $\frac{\text{Incidence among exposed - Incidence among unexposed}}{\text{Incidence among exposed}}$ X 100

  Population attributable risk

  PAR = $\frac{\text{Incidence in population - Incidence among unexposed}}{\text{Incidence in population}}$ X 100

- **Types of cohort study**
    1. **Prospective / concurrent / longitudinal cohort:** concurrent because the investigator identifies the original population at the beginning of the study and, in effect, accompanies the subjects concurrently through calendar time until the point at which the disease develops or does not develop. In a prospective cohort design, both exposure and non exposure are ascertained as they occur during the course study, and the groups are followed up for several years into the future and incidence is measured.
    2. **Retrospective / non concurrent / historical cohort study:** Suppose we begin our study in 2004, but it was found that the old roster of elementary school from 1984 is available in our community, and that they have been surveyed regarding their smoking habits in 1994. Using these data resources in 2004, we can begin to determine who in this population has developed lung cancer and who has not. What is done is to use historical data from the past so that we can telescope the frame of calendar time for the study and obtain our results sooner. We are comparing exposed and non exposed groups only. The only difference between the exposed and non exposed groups is calendar time. In a retrospective cohort study, exposure is ascertained from the past records and outcome (development of disease or no disease) is ascertained at the time of the study.

3. **Retrospective prospective cohort study:**
   Sometimes a combination of above these two designs is used, with this approach, exposure is ascertained from objective records from the past, (as in a historical cohort study), and follow up and measurement of outcome continue into the future.

Examples of Cohort Study:

- Doll and Hill Smoking and Lung Cancer study (British doctors)
- The Framingham Heart study – Massachusetts – to study the relationship of a number of risk factors eg. Serum cholesterol, blood pressure, weight, smoking to the subsequent development of cardiovascular disease.

Advantages

- Provides incidence / R.R
- Several possible outcomes related to exposure can be studied simultaneously
- Minimum bias
- Dose – response ratio can be calculated

Disadvantages

- Large no / long time
- Unsuitable for disease with low incidence
- Attrition
- Selection of comparison group
- Study itself may alter people's behavior

Advantages	**Disadvantages**
• Provides incidence / R.R • Several possible outcomes related to exposure can be studied simultaneously • Minimum bias • Dose – response ratio can be calculated	• Large no / long time • Unsuitable for disease with low incidence • Attrition • Selection of comparison group • Study itself may alter people's behavior

Nested Case Control Studies:

- Nested case – control studies are case control studies done in the population of an ongoing cohort study. The case control study is thus to be "nested "inside the cohort study.
- In large cohorts, it is often more efficient to construct a case control study within the cohort, once a significant number of cases have emerged to study a specific exposure not measured at baseline.
- If the exposure had not been measured originally, but could be measured at some time after the cohort was assembled. It is efficient to measure the exposure only on cases and a subset of non cases.
- Situations:
  A specimen (e.g. of blood) had been stored but not analysed.
  An interview is conducted to ask about at an exposure not assessed at baseline.
  Records of exposure (medical records, occupational records) are retrieved that were not though about when the cohort was first assembled.
- Analysis is just like any case-control study with computation of an odds-ratio, adjustment for confounding, etc.

Advantages of nested case control study

- Baseline data taken initially, no problems of recalling an event – minimization of bias.
- Samples are taken a prior before occurrence of the disease – temporality of the event can be easily established (in a traditional case control study we do not know that the events

preceded the outcome or not)
- Cost reduced all samples need not be analyzed.

EXPERIMENTAL EPIDEMIOLOGY

- Condition under which study is carried out are under direct control of investigator
- Some action/intervention/manipulation involved.
- 3 main problems – cost/Ethics/Feasibility
- Animal experiment
- Human experiments – Clinical trial
- 2 types – RCT / Nonrandomized controlled trials

Randomized controlled trial

- No. one method of evaluation
- First RCT – James Lind / Edward Jenner
- **Basic steps**

  Drawing up a protocol
  Selecting reference and experimental population
  Randomization
  Intervention
  Follow up
  Assessment of outcome

Purpose of Randomization in a Randomized controlled trial

1. If we randomize properly, we achieve non predictability of the next assignment. We do not have to worry that any subjective biases of the investigators, either overt or covert, may be introduced into the process of selecting patients for one treatment group or the other.
2. Also in long run, randomization will increase the likelihood that the groups will be comparable in regard to characteristics about which may be concerned, such as sex, age, severity of disease, and that may affect prognosis, However randomization is not a guarantee of comparability, because chance may play a role in the process, but over the long process, but over the long term, the groups will tend to be similar.
3. Randomized studies, by definition only can have a concurrent control group. ie. A historical control study can not have a randomized allocation. These yields another advantage participant are enrolled in the same period in the intervention and control group. Therefore trends in care or in the name of the condition being studied are equal in the two groups.

Methods of Randomization

1. Tables of random numbers or computer produced random numbers are more often used
2. Flipping an unbiased coin to determine whether a participant is assigned to group A or B- Lottery method

Methods not acceptable as Randomization

a. Alternative assignment or assignment based on day of the month (odds or even)
b. Matching on the basis of certain characteristics.

Binding - Single: subjects / Patient blinded
Double: investigator + subject/patient blinded
Triple: investigator + subject/patient = Analyst blinded

Sample size of a randomized trial is dependent on

1. The difference in response rates (effect size) to be detected higher the effect size, lower is the sample size required.
2. Level of statistical significance- lower the value of greater the sample size required
3. Power of the study – increase the power, sample size increases
4. Non response rate if higher sample size required is high
5. The hypothesis should be stated whether the should be sided or two sided

Intention to treat analysis:

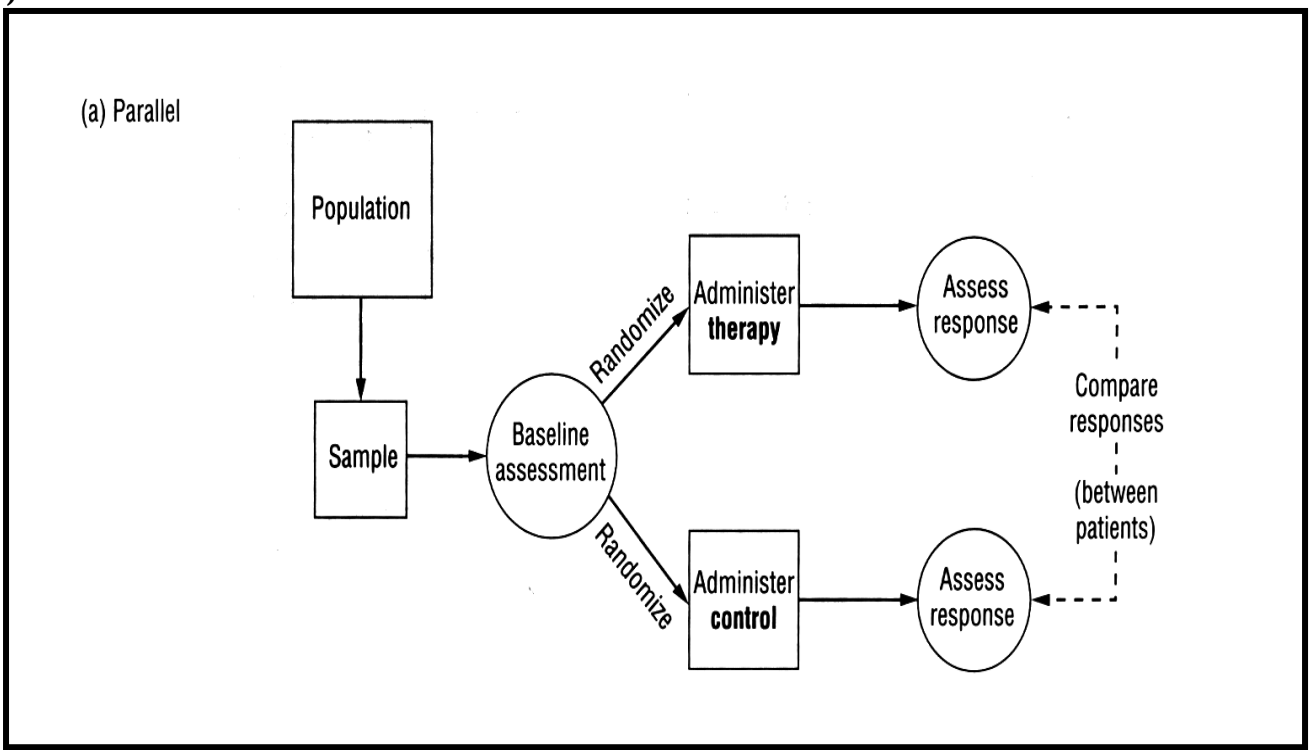
- A procedure in the conduct and analysis of RCTs.
- All patients allocated to each arm of the treatment regimen are analyzed together as representing that treatment arm whether or not they received or completed the prescribed regimen.
- Failure to follow this step defeats the main purpose of ransom allocation and can invalidate the results.

Examples of randomized trials

• Clinical trials • Preventive trials • Risk factor trials	• Cessation experiments • Trial of etiological agents • Evaluation of health services

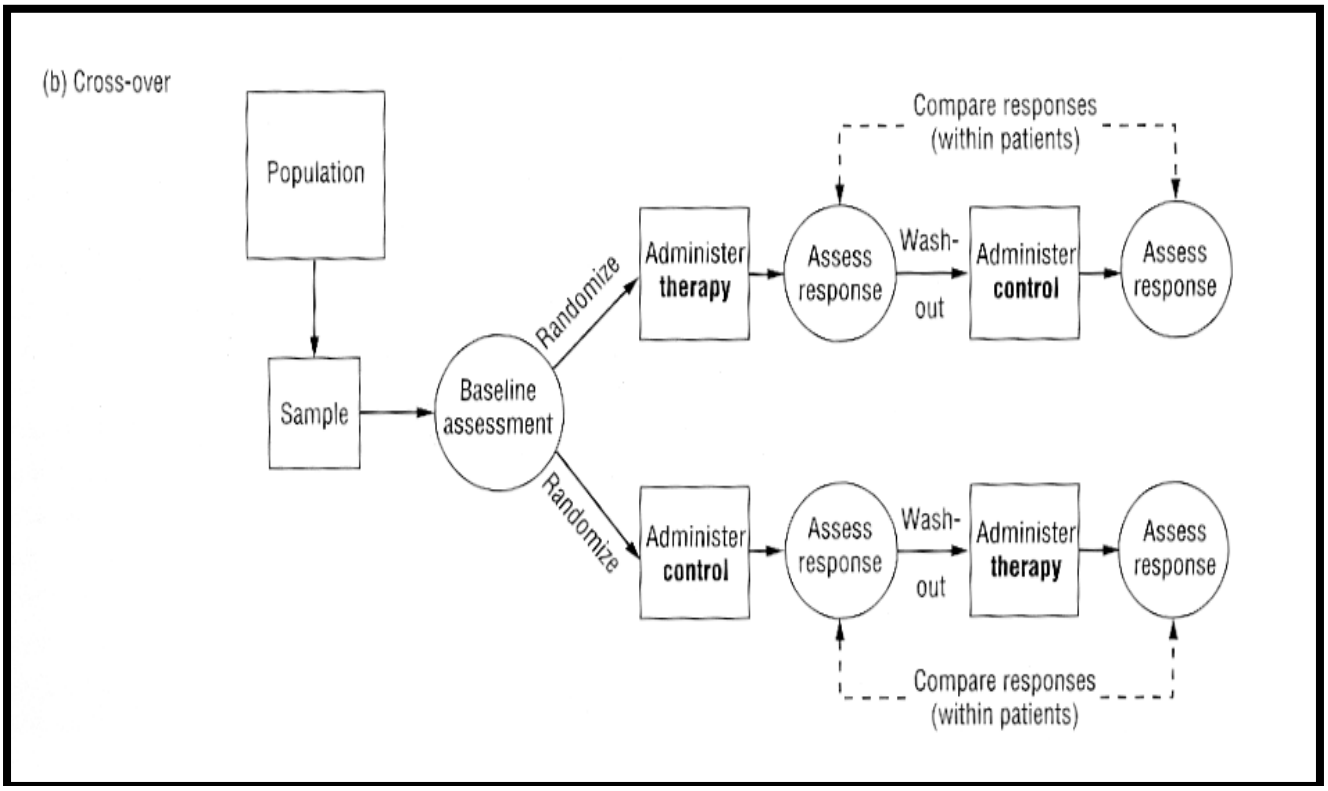
Types of RCT

1) Concurrent or Parallel RCT



2) Cross – over RCT

- Patients are randomly assigned to a study group and control group (can be randomized, may be non random). The study group receives the treatment under consideration & control group receives some alternate form or placebo
- The two groups are observed over time
- Patients in each group are taken off their medication or placebo to allow for the elimination of the medication from the body and for the possibility of any carry over effects- washout period
- After this period, the two groups are switched – those who received the treatment under study are changed to the control group therapy or placebo, and vice versa.



Non randomized (Non-experimental) trials

- Uncontrolled (No control group) trials or Historical (Before treatment was introduced) control
- Natural experiments: Natural circumstances (Smokers / Nonsmokers)
- Before & after comparison study –
    a) without control e.g. Compulsory seat belt legislation – Before & after implementation
    b) with control e.g. Compulsory seat belt legislation – implemented / not implemented countries

Hill's Guidelines for causation

- Temporal Association - cause precedes the effect – essential component
- Strength of Association
- Specificity of association not essential to prove if other factors are proven; difficult to establish
- Consistency
- Biological plausibility
- Coherence of association
- Dose response relationship

Relative ability of different types of study to prove causation

Type of study	Ability to "prove" causation
Randomized controlled trials	Strong
Cohort studies	Moderate
Case control studies	Weak to moderate
Cross sectional	Weak
Ecological weakest	Weakest

Efficacy, Effectiveness, Efficiency

Efficacy – Dose the agent or intervention work under ideal, laboratory conditions?

Efficacy is a measure in a situation in which all conditions are controlled to maximize the effect of the effect of the agent.

Effectiveness-

If we administer the agent in a real life situation, is it effective?

Efficiency

If an agent is shown to be effective, which is the cost-benefit ratio? Is it possible to achieve our goals in a cheaper and better way?

Errors in epidemiological studies:

Bias

Systematic error that occurs during designing, conduct & analysis of study that affects the establishment of association between exposure and disease

Selection bias

- Way in which cases and controls are selected
- **Berkesonian Bias:** different rates of hospital admission; a form of selection bias that occurs in hospital cases and controls in a case control study to be systematically different from one another, this occurs when the combination of exposure and the disease under study increases the risk of admission to the hospital, leading to systematically higher exposure rate among the hospital cases than the hospital controls, this in turn systematically distorts the odds ratio.
- Volunteer bias

Information bias

- Interviewer bias
- **Surveillance bias -** If a population monitored over a period of time disease ascertainment may be better in the monitored population than in the general population and may introduce a surveillance bias which leads to an erroneous estimate of RR or, EG- Physicians monitored patients who had been prescribed OCPs much more closely than they monitored their patients. As a result they were more apt to identify cases of Thrombophlebitis that developed in those patients who were taking OCPs (and who were therefore being more closely monitored) than among other patients who were not well monitored. As a result, just through better ascertainment of Thrombophlebitis in women receiving OCPs, an apparent association of Thrombophlebitis with OCPs may be observed, even if no true association occurs.

- **Recall bias (memory) / rumination bias-** This bias operates to enhance result in cases compared with controls. Thus a certain piece of information, such as a potentially relevant exposure, may be recalled by a case, but forgotten by a control.
- **Reporting bias –** in which a subject may be reluctant to report an exposure he is aware of because of attitudes, beliefs, and perceptions. If such under reporting in more frequent either among the cases or among controls, a bias may result.

Meta-analysis:

- A statistical technique of the data from separate but similar i.e. comparable studies, leading to a quantitative summary of the pooled results.
- A frequent application has been the pooling of re result from a set of randomized controlled trials, none in itself necessary powerful enough to demonstrate statistically significant difference, bit in aggregate capable of so doing
- Meta-analysis also has a qualitative component, i.e. application of predetermined criteria of quality (e.g. completeness of data absence of bias), and a quantitative component, i.e. integration of numerical information.
- The aim is to integrate the findings, pool data & identify the overall trend of results.
- **Publication Bias:** Tendency of editors and authors to publish articles containing positive findings, especially new results, in contrast to report that do not yield significant results i.e. results that accord with previously published findings.

INFECTIOUS DISEASE EPIDEMIOLOGY

Infection - The entry & development or multiplication of an infection agent in the body of man or animals

Contamination – Presence of infectious agent on body surface or inanimate articles

Pollution - Offensive but not necessarily infectious matter.

Infestation - The lodgment, development and reproduction of arthropods on body surface & clothing, lice, itch mite, ascariasis.

Host

- *Obligate:* only host e.g. Man in measles, typhoid
- *Definitive host:* sexual stage of parasite, man in Filariasis
- *Intermediate*: Secondary (no stages). Man in Malaria
- *Transport host*: Organism alive but no development

Contagious: transmitted through contact. E.g. Scabies, leprosy, trachoma, STD

Communicable disease: Specific infectious agent or its toxic product capable of direct or indirect transmission

Epidemic: Sudden outbreak of disease or Excess of expected occurrence
Endemic: Constant presence of disease or infection agent within geographic area.
Hyper-endemic: Disease is constantly present at high incidence and / or prevalence and affects all age groups equality.
Holo-endemic: High level of infection beginning early in life and affecting most of child population, leading to a state of equilibrium such that adult population shows the evidence much less commonly then children. e.g Malaria

Malaria Endemicity (WHO)
Hypo-endemic - Spleen rate in children 2-9 yrs < 10%
Meso-endemic – Spleen rate 11 – 50%
Hyper-endemic – Spleen rate in children over 50%; in adults usually over 25%
Holo-endemic – Spleen rate in children constantly over 75%, adult rate low

Sporadic: Scattered case, time to time, polio, tetanus.
Pandemic: Epidemic affecting a large proportional of population e.g. influenza, cholera, conjunctivitis etc.
Exotic: imported Disease e.g. Yellow fever, Rabies in UK < Epidemic Polyarthritis in UK due to Ross River Virus

Nosocomial Infections – Hospital acquired infections e.g. UTI, hepatitis B,
Opportunistic infections e.g. Herpes, CMV, Toxoplasmosis
Iatrogenic disease: Physician induced
Zoonosis:

- Diseases naturally transmitted between vertebrate animals & man
- **Anthropozoonosis:** from lower vertebrate animals to man.
- **Zooanthroponoses:** from man to lower vertebrate animals.
- **Amphixenosis:** Man ↔lower vertebrate animals.
- **Cyclozeoonosis -** requires more than one vertebrate host in order to complete the developmental cycle of the agent e.g human taeniasis, echinococcosis and pentastomid infections.
- **Metazoonosis -** transmitted biologically by invertebrate vectors to vertebrate host e.g. plague, Schistosomiasis
- **Sapro-zoonosis -** vertebrate host + non animal development site or reservoir e.g. larva migrans

Surveillance

It is defined as the ongoing systemic collection, analysis, and interpretation of data and dissemination of information to those who need to know in order that action is taken. (Continuous scrutiny of factors that determine the occurrence & distribution of disease)

Types of surveillance

- **Passive surveillance** (Routine reporting) – All the NHPs that the case and deaths recorded in the out patient or in patient departments of hospitals, dispensaries, CHC, PHC and other health facilities.

- **Active surveillance:** Active search resource – resource intensive; following conditions warrant active surveillance:
  a) During outbreaks
  b) As the no, of cases of a disease decline to negligible levels e.g. AFP
  c) To confirm absence of even a single case
- **Sentinel Surveillance:**

A sentinel surveillance system is developed to obtain more reliable and extensive disease related information than the one that is available through routine reporting.

Any health centre that caters to a relatively large number of cases of the can be considered as a sentinel centre. The sentinel centre data will not include all cases in the area. However, if one or more sentinel centers have been carefully selected, it will include sufficiently large number of cases for epidemiological analysis.

Data from sentinel centres are useful to determine trends in incidence of the reported disease.
Disease for which sentinel surveillance is done – HIV, Tetanus, Polio, Diarrhea, Blindness, Hepatitis B.C, Dengue, Japanese Encephalitis.

Diseases under International Health Notification – 1969 (3)
- Cholera
- Plague
- Yellow Fever

Revised International Health Regulation – 2005
- Came into force on 15 June 2007
- Goal – to prevent the international spread of emerging infections such as SARS, a pandemic of human influenza, as well as other public emergencies such as a chemical and industrial accidents that may affect populations across border.
- Requires each country to report to WHO any public health emergency of international concern.
- Include provisions that empower WHO to initiate an assessment and response based not only on government reports but also other relevant information and reports by the media and non governmental organizations. (NGOs)

Diseases reportable under IHR 2005
- Unusual diseases such as small pox
- Wild polio virus infection
- SARS
- Human influenza (new subtype)
- Epidemic prone disease – Cholera, pneumonic plague, yellow fever, viral hemorrhagic fevers, West Nile fever.
- Special diseases pertaining to that region – Dengue fever etc.

Disease under surveillance by WHO (5)
- Louse borne typhus fever
- Relapsing fever
- Paralytic polio
- Malaria
- Viral Influenza etc.

Case: A person identified as having the particular disease
a. Clinical case
b. Subclinical case (Inapparent / Abortive). E.g. Rubella, mumps, polio, hepatitis A & B, diphtheria
   * Measles – No subclinical case

c. Latent infection: Host does not shred the infectious agent which lies dormant within the host without
symptoms E.g. Herpes zoster, slow virus disease

Primary case - refers to the first case of a communicable disease introduced to the population unit being studied

Index case – refers to the first case to come to the attention of the investigator; it is always the primary case.

Secondary case - developing from contact with primary case.

Carrier: An infected person that harbors a specific infectious agent in absence of clinical disease

a. *Incubatory carrier* : e.g. measles, mumps, polio, hepatitis B, influenza
b. *Convalescent carrier*: e.g. typhoid, dysentery, cholera, pertusis
c. *Healthy carrier*: e.g. polio, cholera, diphtheria, N. meningitis
d. *Temporary carrier*
e. *Chronic carrier*: indefinite period e.g. Typhoid, hepatitis B, dysentery, malaria
f. *Pseudo carrier*: Avirulent organism carrier.

Reservoir: Any person, animal, arthropod, or plant in which an infectious agent lives & multiplies (Metabolize & Replicates).

- *Animal reservoir*: Influenza pigs & dogs
  Chlamydia: Pigeons
  Ornithosis: birds
  Arboviral disease & Histoplasmosis
- *Soil reservoir*: Tetanus, anthrax, mycetoma & cocidioidomycosis

Modes of Transmission:

Direct transmission

- Direct: STD , AIDS, Leprosy, Leptospirosis
- Droplet: 1-10 microns size, particles in the 1-5 micron range are liable to be easily drawn into alveoli in the lungs and retained there , RTI, eruptive fever, TB, Diphtheria, Q fever, whooping cough, measles, chicken pox.
- Contact with soil: Hookworm, tetanus, mycosis
- Vertical: AIDS, Hepatitis, TORCH, syphilis, cox-sackie B

Indirect transmission – 5F-files, fingers, fomites, food, fluid

- **Vehicle borne:**
  Water, food, blood → Malaria, CMV, IM, hepatitis B, syphilis, Brucellosis, AIDS, Hepatitis C
  The epidemiological features of vehicle transmission:
  - If the dose of the contamination is heavy, the outbreak may be explosive as in the case of cholera and hepatitis A
  - Case are initially confined to those who are exposed to the contaminated vehicle, in some infections
  - When secondary cases occur, the primary case may be obscured
  - The distance traveled by the infectious agent may be great e.g. outbreaks of food poisoning
  - It is not always possible to isolate the infectious agent in the incriminated vehicle, e.g. typhoid bacilli n the contaminated water
  - When the vehicle is controlled or withdrawn, the epidemic subsides, e.g. epidemics of cholera

- The common source of infection is often traceable.

- **Vector borne**

  Malaria: Man → Arthropod → Man

Factors influencing the ability of vectors to transmit disease:

- Host feeding preferences
- Infectivity
- Susceptibility
- Survival rate of vectors in the environment
- Domesticity – degree of association with man
- Suitable environmental factors

Biological Transmission:

1. Propagative : e.g Plague bacilli in rat
2. Cyclo-propagative : e.g. Malarial parasite in mosquito
3. Cyclo-Developmental: e.g. Microfilaria in mosquito, Guinea-worm in Cyclops

Trans Ovarian Transmission: When the infectious agent is transmitted vertically from the infected female to her progeny in the vector
E.g. Scrub TYPHUS (mite): R. tsutsugamushi / Rickettsial pox (mite): R.akari

Trans-stadial transmission: Transmission of disease agent from one of life cycle to another **e.g.** Indian Tick typhus (tick) – R.conorii

Fomite borne: Diphtheria, thyroid, dysentery
Dead end infections – Tetanus, Rabies, Bubonic Plague, Trichinosis, JE

Incubation period: Time interval between invasion by an infectious agent & appearance of the first sign or symptom of the disease.
As a rule., infectious disease are not communicable during the incubation period, **except measles, chicken pox, hepatitis A , whooping cough – communicable during later part of the incubation period.**

Importance of incubation period:

- Tracing the source of infection and contacts.
- Period of surveillance (Quarantine)
- Immunization
- Identification of point source or propagated epidemics
- Prognosis

Median Incubation period- Time required for 50% of the cases to occur following exposure

Latent period- used in non-infectious diseases, equivalent of incubation period in infectious diseases Defined as the period from disease initiation to disease detection.

Pre-patent period – Time interval between inoculation of infective larvae and appearance of detectable microfilariae.
Serial interval- Time between the onset case and secondary case.

Generation Time – Time interval between the receipt of infection by a host and maximal infectivity of that host In general, it is roughly equal to incubation period.

Period of Communicability: Time during which an infectious agent be transferred directly or indirectly from an infect person to another person, from an infected to man, or from an infected person to an animal, including arthropods.

Herd immunity

- It is the level of resistance of a community of group of people to a particular disease
- Immunological barrier
- **Elements:** Clinical & subclinical infections
  Immunity of herd
  Herd structure (remember herd structure is never constant)
- E.g. Diphtheria, polio, measles (No herd immunity for Teatanus)

Isolation – Barrier Approach

- Separation for the period of communicability of infected person or animals from others in such places and other such places and under such conditions, as to prevent or limit the direct or indirect transmission of the infectious agent from those infected to those who are susceptible.
- In some disease where there is a large component of subclinical infection and carrier rate (polio, hepatitis A, typhoid fever), even the most rigid isolation will not prevent the spread of the disease.
- It is also futile to improve isolation if the disease is highly infection before it is diagnosed as in the case of mumps.
- Isolation has failed in control of diseases such as leprosy, TB, STD

Disease	Duration of isolation
Chicken pox	Until all lesions crusted, usually about 6 days after onset of rash
Measles	From the onset of catarrhal stage through 3rd day of rash
German measles	None, except that women in the 1st trimester or sexually active, non-immune women in child bearing years not using contraceptive measures should not be exposed
Cholera, Diphtheria	3 days after tetracycline started, until 48 hrs of antibiotics (or -ve cultures after treatment)
Shigellosis, Salmonellosis	Until 3 consecutive negative stool cultures
Hepatitis A	3 weeks
Influenza	3 days after onset
Polio	2 weeks adult, 6 weeks pediatric
TB (positive)	Until 3 weeks of effective chemotherapy
Herpes Zoster	6 days after onset of rash
Mumps	Until swelling subsides
Pertussis	4 weeks or until paroxysms cease
Meningococcal meningitis, Streptococcal pharyngitis	Until the first 6 hours of effective antibiotic therapy are completed

Quarantine

- Applies to restriction on healthy contacts of an infectious disease.
- Till longest usual incubation period of the disease.

Chemoprophylaxis:

Disease	Chemoprophylaxis
Cholera	Tetracycline or Furazolidine for households contacts
Bacterial Conjunctivitis	Erythromycin eye ointment
Diphtheria	Erythromycin (and first dose of vaccine)
Influenza	Amantadine (effective only for type A) for contacts
Meningitis	Rifampicin, sulfadiazine
Plague	Tetracycline for contacts of pneumonic plague

Investigation of Epidemic

Aim:

- To define magnitude of outbreak
- To define factors responsible
- To identify cause & sources

Steps in Investigation of an epidemic

- Confirm the existence of the outbreak.
- Verify the diagnosis and determine the etiology of the disease.
- Develop a case definition, start case finding, and collect information on cases.
- Describe person, place and time generate hypothesis
- Test hypothesis using an analytic study
- Do necessary environment or other studies to supplement the epidemiological study
- Draw conclusions to explain the causes or the determinants of the outbreak based on clinical, laboratory, epidemiological, environmental evidence.
- Report and recommend appropriate control measures to concerned authorities at the local national, and if appropriate international levels.
- Communicate the findings to educate other public health professional and the general public.
- Follow up of the recommendations to assure implementation of control measures.

Epidemic free criteria - No new case reported for twice the incubation period of disease since the last case.

****

ENVIRONMENT AND HEALTH

- International Drinking Water Supply and Sanitation Decade – 1981-1990
- Aim – Adequate supplies of safe water & sanitation to all people by 1990
- Safe water – 92% / Sanitation – 34% (2010)
- International Decade for Natural Disaster Reduction (IDNDR)1991 -2000
- WHO World Health Day theme 2008 – " **Protecting Health from Climate Change"**
- Poor environmental quality is responsible for up to 25% of all preventable ill health [WHO, 2008]

Climate change (Global warming)

- Not an apocalyptic change in the lives of persons rich or poor
- Direct attribution is difficult under current circumstances
- Poised to steadily increase the vulnerability of poor persons to climatic shocks and overtime will erode the coping capabilities of affected population
- Five key areas have been identified where climate change could stall and then reverse human development --
  - Agriculture and food security –draught ;floods etc are going to play a major role
  - Wate**r** stress and water insecurity –floods in many places and scarcity of potable water
  - Rising sea levels and exposure to climate disasters – hurricanes etc
  - Ecosystem and biodiversity – destruction of coral reefs
  - Human health – extremes of climate will bring in environment problem of heat waves or cold spells

Water

Safe and wholesome water

It is defined water that is

- Free from pathogenic agents
- Free from harmful chemical substances
- Pleasant to taste. i.e. free from colour & odour
- Usable for domestic purposes

Water is said to be polluted or contaminated if it does not fulfill above criteria.

Safe yield of water – Yield that is adequate for **95%** of the year

Requirements

- Drinking water are 2 lit / person / day
- All purposes - 150-200 lit / person / day
- WHO target for domestic use - Rural area - 40 lit /day & Urban areas -125 lit /day
- One hand pump for every 250 persons

Sources:

There are three main sources of water:

1. Rain
2. Surface water- Impounding Reservoirs, Rivers & Streams, Tanks, Pounds, Lakes
3. Ground water – Shallow & Deep wells, Springs

1. Rain

- **Purest water in nature**
- Chemically: very soft (0.0005% solids) so has a corrosive action
- Gaseous sulphur and Nitrogen oxides mixes with water → dil. sulphuric & Nitric acid → Acid rain
- **Sea water:** 3.5 % of salts in solution
  19000 mg/l of chlorides, 10600 mg/l of sodium & 1270 mg/l of Magnesium

2. Surface water-

- Usable for all domestic purposes. Sources are lake, stream and river.

Characteristic	**Source**			
	Rain	**Impounding reservoir**	**River**	**Tanks**
Catchment area	House, road	Surrounding hills	Hills	Sloping terrain
Quality of water	Purest	Second best	Polluted	Polluted
Source of pollution	Air, house, roofs	Human animal activity in catchment areas	Upstream pollution activities, industries	Village activities
Natural purification	By light	Air, sunlight, sedimentation	Air, sunlight, dilution, oxidn, sedimentation	Air, sunlight, storage, sedimetn
Example	Rain water	Artificial lake	Any river	Percolation tanks

Water-related diseases can be classified into 4 major categories, as follows:

Water borne diseases	Infections spread through contaminated drinking water e.g. Cholera, Typhoid etc.
Water washed diseases	Diseases due to the lack of proper sanitation and hygiene e.g. scabies, worm infestation
Water based diseases	Infections transmitted through an aquatic invertebrate organism e.g. Schistosomiasis, guinea worm, Pargonimiasis, clonorchiasis etc.
Water related diseases	Diseases transmitted by insects that depend on water for their propagation e.g. malaria, filaria etc.

3. Ground water

- Wells and springs

Shallow well	**Deep well**
Water from above first impervious layer.	Water from below first impervious layer
Water moderately hard	Much hard
Often grossly contaminated	Pure water
Go dry in summer	A source of constant supply

Sanitary Well:

- A sanitary well is one which is properly located, well constructed and protected against contamination to yield safe water.
- 100 m from house of users & not less than 15m from source of contamination

Water Pollution:

The source of pollution

Natural impurities	**Man-made impurities**
Dissolved gases (N2, CO2, H2S)	Sewage
Dissolved minerals (Salts of Ca, Mg, Na)	Industrial & trade waste
Suspended impurities (sand, silt)	Agricultural pollutants
Microorganisms	Physical pollutants (Heat, Radioactive substances)

The Water (Prevention & control of pollution) Act,1974

Purification of water

It may be considered under two headings

Purification of water on a large scale

1) Storage of water –

a. Physical (Sedimentation)
b. Chemical (Aerobic oxidation)
c. Biological (90% - 5-7 days)

2) Filtration – Slow sand (biological) filter, Rapid sand (Mechanical) filters

3) Disinfection of water

a. Chlorination
b. Ozonation
c. U. V. irradiation

Purification of water on small scale

1) Household level

a. Boiling

b. Chemical disinfection

i. Bleaching powder – 33% available chlorine
ii. Cl. Solution
iii. High Test Hypochlorite (HTH)
iv. Chlorine tab 0.5gm – 20 lit of water
v. Iodine
vi. $KMnO_4$

c. Filtration

i. Ceramic filters (Pasteur chamberland Filter)
ii. Berkefeld filters (Kieselgurh / Infusorial earth),
iii. Katadyn filter (silver catalyst)

d. **Ultraviolet irradiation**

e. **Newer filters (Multistage reverse osmosis)**

Aquaguard domestic filter

a. This purifies the water in three stages.
b. Stage 1: Candle filters the dirt, mud and such other turbid impurities
c. Stage 2: Activated carbon removes organic impurities & thereby colour & odour.
d. Stage 3: Pathogens are destroyed by U.V. treatment in the U.V. chamber.
e. It has built in electronic monitoring system whereby it monitors the quality of purified water and stops the flow if a purification level falls below predetermined levels.

Reverse osmosis technique

In this process, water is purified in 5 stages as follows

a. Stage 1 – 5 μm sediment filter - This removes sand ,silt, dust and rust particles.
b. Stage 2 – Activated carbon block filter - Remove chlorine, organic matters, colors and bleaches.
c. Stage 3 – Gag filter - Removes harmful chemicals and color and taste producing substances.
d. Stage 4 – TF (Thin film) composite membrane with 0.0001mm pore (Reverse osmosis membrane) - It removes dissolved salts, organics, germs, bacteria, virus, compound metals and minerals. Allows only water molecules to pass through.
e. Stage 5 – Bacteriostatic silver impregnated activated carbon -It prevents growth of bacteria at the point of use and removes colour and odour, thereby restores the natural taste of water.

2) Village level

Disinfection of well – chlorination
During epidemic – Double pot Method (NEERI)

Purification of water on a large scale

1. Storage

Storage of water
⇓
Aerobic bacteria oxidizes organic matter
⇓
~~Content of free ammonia decreases & content of nitrates rise~~

Storage of water for 5-7 days
⇓
Bacterial content drops by 90%
(Double this time i.e. 10-14 days)
⇓
~~Drop by 95%~~

2. Filtration

Slow Sand Filter

- It is a biological filter used for purification of water on large scale
- Components of Water Purification System: Storage / Filtration / Disinfection
- Rate of filtration: 0.1-0.4 $m^3/hr/m^2$

- Layers / Elements of filter
  Supernatant (raw) water (1 to 1.5 m)
  A bed of graded sand (1 m) – Effective diameter – 0.2-0.3 mm
  An under drainage system
  A system of filter control valves
- Preliminary Treatment: Plain Sedimentation
- **VITAL LAYER (Schmutzdecke)** is the heart of the filter. It removes organic matter, holds back bacteria and oxidizes ammoniacal nitrogen into nitrates.
- "**Venturi meter**" measures "loss of head / Bed resistance". Loss of Head allowed is 1.5 m.
- Filter is cleaned by SCRAPING OFF THE TOP PORTION to depth of 1-2 cm

Advantages:

a. Simple to construct and operate. Method of choice in urban areas
b. Filtered water has high physical, chemical and bacteriological quality.
c. Removal of bacteria is 99.9 to 99.99%

Disadvantages:

a. Preliminary Treatment: Plain Sedimentation / Storage is required
b. Occupies large space
c. Filtration is slow

Rapid Sand Filter

- Mechanical filter for purification of water on large scale
- Two types: Gravity type (Paterson's filter) & Pressure type (Candy's filter)
- Mode of Action:
  Preliminary treatment - Chemical coagulation / Rapid mixing / Flocculation & sedimentation
  After preliminary treatment water is subjected to RAPID SAND FILTER which holds back the alum floccules,
  suspended impurities and bacteria on the sand bed
- Effective diameter of sand particles – 0.4-0.7 mm
- Rate of filtration is 5 –15 $m^3/hr/m^2$
- Filter is washed by **backwashing** daily or weekly

Advantages	**Disadvantages:**
a. Occupies less space b. Loss of head allowed is 6-8 feet (2 – 2.5 mt) c. Removal of bacteria is 98-99% d. Preliminary Treatment: Plain Sedimentation / Storage is not required e. Filtration is rapid & Removal of turbidity and odour is good	a. Removal of bacteria is 98-99% b. Operations are highly skilled

3. Disinfection

Chlorination:

- Action: $H_2O + Cl_2 \rightarrow HCl + HOCl$ (Hypochlorous acid)
  $HOCl \rightarrow H^+ + OCl^-$ (Hypochlorite ions)
- The disinfecting action of chlorine is mainly due to Hypochlorous acid.
- Chlorine acts best at pH 7
- To ensure proper chlorination,
  - Water should be clear and free from turbidity.

- Chlorine demand of water should be estimated.
- Contact period of at least 1 hour is essential to kill bacteria and viruses.
- Minimum concentration of free chlorine should be 0.5mg/L for one hour
- Dose of chlorine = Chlorine demand + Free residual chlorine

Method of chlorination-

- Chlorine is applied as chlorine gas, chloramine or perchloron.
- Available chlorine in bleaching powder is 33% & starts declining after 48 hrs. Stable bleach quick lime: bleaching powder: 4:1 – available chlorine- 6 weeks
- Chloramine (Chlorine + Ammonia): Less tendency to taste; more persistent type of residual chlorine & slower action
- Break point chlorination – point at which free chlorine appears in water
- Superchlorination - large dose of Cl applied for heavily polluted water. The residual chlorine is about 1 ppm or more.
- Dechlorination – It is done after Superchlorination by using Na. bisulfate/Na. thiosulfate/SO2 to remove excess chlorine after disinfection.
- Recommended Free Residual Chlorine levels (1 mg/lit – 1 ppm)
  a. Drinking water - 0.5 mg/lit
  b. Water bodies (post disaster) > 0.7 mg/lit
  c. Swimming pool - >1 mg/lit

Instruments

Instrument	**Use**
Horrock's apparatus	Cl demand estimation
Chloronome/Chlorinator	Mixing of Cl
Chloroscope	Measuring residual Cl

OT test

- OT test – Ortho-toulidine test
- Measures level of – Free chlorine / Free & combined chlorine
- Reagent – Analytical grade Orthotolidine dissolved in 10% HCl
- Test – 1 ml Water sample + 0.1 ml Reagent → Yellow colour
- Yellow colour is matched with suitable standards.
- Reading after 10 sec – Free chlorine
- Reading after 15-20 min - Free & combined chlorine
- **Principle** - When the reagent is added to water sample containing chlorine, it turns yellow and the intensity of yellow colour varies with concentration of chlorine present in water sample. The yellow colour is produced by both Free & combined chlorine residuals. OT reacts with free chlorine instantaneously (10 sec) but reacts more slowly with combined chlorine (15-20 min.)
- **Drawback** - Yellow colour is affected by interfering substances (nitrites, iron, manganese)
- **OTA test** –
  OTA better because
  - Detects free chlorine & combined chlorine separately
  - Not affected by interfering substances (nitrites, iron, manganese)

Other agents

Ozonization:	**Ultra Violet Irradiation**:

• Advantage - Powerful oxidising agent • Disadvantage - No residual action	• Advantage - Exposure for short period / No taste or odour produced • Disadvantage - No residual effect

Hardness of water

- It is defined as soap destroying power of water.
- **Types of Hardness**
  - **a)** Carbonate hardness/Temporary hardness – due to Ca & Mg – bicarbonates
  - **b)** Non-carbonate hardness/Permanent hardness – due to Ca & Mg – sulphate/chlorides/nitrates
- Unit – mEq/lit (1 mEq/lit – 50mg CaCO3 (50 ppm) in 1 lit water)
- **Classification**

Soft water	<1	(<50 mg/L)
Moderately hard		1-3 (50-150)
Hard	3-6	(150-300)
Very hard	>6	(>300)

- Drinking water should be moderately hard – 50-150 mg/L (1-3 mEq/Lit)
- **Removal of hardness**
  For Temporary Hardness: Boiling / Addition of Na_2CO_3 / Addition of lime / Permutit process
  For Permanent Hardness: Addition of Na_2CO_3 & Base Exchange process (Permutit process)

Water quality criteria and standards

The guidelines for drinking water quality recommended by WHO (2011) Relate to the following variables.

a. Acceptability aspects
b. Microbiological aspects
c. Chemical aspects
d. Radiological aspects

Criteria		Permissible levels
Acceptability aspects Physical parameters	Turbidity	<5 NTU
	Colour	Upto 15 TCU
	Taste & Odour	Acceptable
	Temperature	Acceptable
Inorganic constituents	Chlorides	200 mg/L (Max. 600 mg/L)
	Hardness	1.5 mg/L
	Ammonia	<0.2 mg/L
	pH	6.5-8.5
	Hydrogen sulphide	0.05-0.1 mg/L
	Sodium	200 mg/L
	Sulphate	<250 mg/L
	Total Dissolved solids	<1000 mg/L
	Zinc	0.1 mg/L
	Manganese	0.2 mg/L
Microbiological aspects Bacteriological indicators	Coliforms*	Should not present
	E. coli	
	Faecal streptococci (Recent)	

	Cl. Perfringens (Remote)	
Chemical aspects Inorganic constituents	Arsenic Cadmium Chromium Cyanide Fluoride Lead Mercury Nitrate (Remote) Nitrite (Recent) Selenium	0.01 mg/L 0.003 µg/L 0.05 mg/L 0.07 mg/L 1.5 mg/L 0.01 mg/L 0.001 mg/L 50 mg/L 3 mg/L 0.01 mg/L
Radiological aspects	α activity β activity	0.5 Bq/L 1.0 Bq/L

*Coliforms - 0 = Excellent / 1-2 = Satisfactory / 3-10 = Suspicious / >10 = Unsatisfactory

National water quality criteria

Designated-Best-Use	Class of water	Criteria
Drinking water source without conventional treatment but after disinfection	A	1. Total Coliforms organism MPN/100ml shall be 50 or less 2. pH between 6.5 and 8.5 3. dissolved oxygen 6 mg/l or more 4. biochemical oxygen demand 5 days 20°C 2 mg/I or less
Outdoor bathing (organized)	B	1. Total Coliforms organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 dissolved oxygen 5mg/I or more 2. Biochemical oxygen demand 5 days 20°C 3mg/I or less
Drinking water source after conventional treatment and disinfection	C	1. Total Coliforms organism MPN/ 100ml shall be 5000 or less pH between 6 to 9 dissolved oxygen 4mg/I or more 2. Biochemical oxygen demand 5 days 20°C 3mg/I or less
Propagation of wild life and fisheries	D	1. pH between 6.5 to 8.5 dissolved oxygen 4mg/I or more 2. free ammonia (as N) 1.2 mg/I or less
Irrigation, industrial cooling, controlled waste disposal	E	1. pH between 6.0 to 8.5 2. Electrical conductivity at 25°C micro mhos/cm max. 2250 3. Sodium absorption ratio max. 26 4. Boron max. 2 mg/I
	Below - E	Not meeting A,B,C,D & E criteria

National Water and Sanitation Programme

- 1954
- 1972 – Accelerated rural water supply programme

- 1980 -90 – International Drinking Water and Sanitation Decade
- 2008 – International Year Sanitation
  Targets - 100% Water Supply (Safe)
  Urban Sanitation – 80% / Rural Sanitation – 25%
- **Problem Village**
  No source of safe water is available within **< 1.6 km**
  Water available at a depth **> 15 m**
  Excess salinity, iron, fluorides & other toxic substances
  Water is exposed to risk of **cholera**

Swajaldhara – 2002

Community led participatory programme – safe drinking water in rural areas
Swajaldhara I - First dhara gram panchayat /group of panchayats
Swajaldhara II – Second dhara – district

Air & Air pollution

- The requirement for air is 10 – 20m^3/day
- MC & widely distributed pollutant – CO
- Sensitive marker of air pollution – SO2

Air pollution

Pollutant	Source/Cause	Effect
Carbon monoxide	Automobile exhaust, photochemical reactions in the atmosphere, biological oxidation by marine organisms, etc.	Affects the respiratory activity as hemoglobin has more affinity for Co than for oxygen. Thus, CO combines with HB and thus reduces the oxygen-carrying capacity of blood. This results in blurred vision, headache, unconsciousness and death due to asphyxiation (lack of oxygen).
Carbon dioxide	Carbon Burning of fossil fuels, depletion of forests (that remove excess carbon dioxide and help in maintaining the oxygen-carbon dioxide ratio).	Global warming as it is one of the greenhouse gases.
Sulphur dioxide	Industries, burning of fossil fuels, forest fires, electric generation plants, smelting plants, industrial boilers, petroleum refineries and volcanic eruptions.	Respiratory problems, severe headache, reduced productivity of plants, yellowing and reduced storage time for paper, yellowing and damage to limestone and marble, damage to leather, increased rate of corrosion of iron, steel, zinc and aluminium.
Hydrocarbons	Automobile exhaust and	Carcinogenic (may cause leukemia)

Pollutant	Source/Cause	Effect
Polynuclear Aromatic Compounds(PAC) and Polynuclear Aromatic Hydrocarbons(PAH)	industries, leaking fuel tanks, leaching from toxic waste dumping sites and coal tar lining of water supply pipes.	
Chlorofluorocarbons (CFCs)	Refrigerators, air conditioners, foam shaving cream, spray cans and cleaning solvents.	Destroy ozone layer which then permits harmful UV rays to enter the atmosphere.
Nitrogen Oxides	Automobile exhausts, burning of fossil fuels, forest fires, electric generation plants, smelting plants, industrial boilers, petroleum refineries and volcanic eruptions	Forms photochemical smog, at higher concentrations causes leaf damage or affects the photosynthetic activities of plants and causes respiratory problems in mammals.
PAN - peroxylacetyl - nitrate	Photochemical reactions of hydrocarbons and nitrogen oxides.	Irritation of eye, throat and respiratory tract, damage to clothes, paint and rubber articles, damage to leaves and stomatal tissue in plants.
Particulate matter Lead halides (lead pollution)	Combustion of leaded gasoline products	Toxic effect in man.
Asbestos particles	Mining activities	Asbestosis - a cancerous disease of the lungs
Silicon dioxide	Stone cutting, pottery, glass manufacturing and cement industries.	Silicosis, a cancerous disease.
Biological matter like the pollen grains	Flowers	Allergy
Fungal spores, bacteria, virus, etc	Microbes	Infectious diseases

Monitoring of air pollution:

- SO_2
- Smoke or soiling index: smoke concentration is estimated and expressed as micrograms/cubic meter of air as an average level over a period time.
- Coefficient of haze: A factor used in USA in assessing the amount of smoke or other aerosols in air.
- Air pollution index: 10 [SO2]+ 2 [CO] + 2 * coefficient of haze.
- SPM: Suspended Particulate Matter: Main monitoring index of air pollution in India; varies between 30 to 60%, with coastal cities and industrial belts showing higher percentage.

National Air quality Monitoring Program (NAMP)

- Started in 1984. Presently operational in 24 states and UTs comprising of about 300 stations. The Nation Ambient Air Quality Monitoring (NAAQM) network is operated through the respective States Pollution Control Boards, the National Environmental Engineering Research Institute (NEERI), Nagpur and also trough the Central Pollution Control Board (CPCB).
- The pollutants monitored are sulphur dioxide (SO2), Nitrogen dioxide (NO2) and suspended particulate Matter (SPM) besides the meteorological parameters, like wind speed & direction, temperature and humidity. In addition to the three conventional parameters, NEERI monitors special parameters, like Ammonia (NH3), Hydrogen Sulphide (H2S), Respirable Suspended Particulate Matter (RSPM) and polyaromatic Hydrocarbons (PAH) [all are oxidants].

National Ambient air quality standards

Pollutant	Time weighed Average*	Limits in resi. areas	Methods of measurement
SO_2	24 hrs	80 $\mu g/m^3$	improved West and Geake method ultraviolet Fluorescence
Oxides of nitrogen as (NOx)	24 hrs	80 $\mu g/m^3$	Gas phase chemiluminescence
Suspended particulate matter (SPM)	24 hrs	200 $\mu g/m^3$	High volume sampling, (average flow rate not less than 1.1 m^3/minute).
Ammonia	24 hrs	0.4 mg/m^3	

*24 hourly/8 hourly values should be met 98% of the time in a year. However, 2% of the time, it may exceed but not on two consecutive days.

The Air (Prevention & control of pollution) Act, 1981

Indoor air pollution-

Sources – Solid fuels, tobacco smoking, outdoor air pollutants, emission from construction materials & improper ventilation & air conditioning systems.

Health hazards –

- Acute respiratory infections (ARI)-10% of total burden of pneumonia is due to indoor air pollution
- COPD & Lung cancers
- Adverse pregnancy outcomes

Indices of thermal comfort

- Air temperature
- Air temperature & humidity
- Cooling power: air temp, humidity and air movement; measured by kata thermometer – dry kata> 6 and wet kata> 20 indicate thermal discomfort
- Effective temperature & corrected Effective Temperature (CET): temp + humidity + air movement sensation of warmth or cold – Effect Temp; when radiant heat is also considered then it becomes CET.

CET values °F (°C)

Pleasant & cool	69 (20)
Comfortable and cool	69-76 (20-25)
Comfortable	77-80 (25-27)
Hot & uncomfortable	81-82 (27-28)
Extremely hot	83+ (28+)
Intolerably hot	86+ (30+)

- Mc Ardle's maximum allowable sweat rate: 4 hour sweating rate – 4.5 litres taken as maximum limit.

	P_4SR
comfortable	1-3 litres
Jus tolerable	3-4.5 litres
intolerable	4.5 +

Ventilation:

- Most standards of ventilation are based on the efficiency of removing body odour. The following are taken into account –
- Cubic space – 3000 c.ft./hr/person – not used now.
- Air change: 2-3 air changes in living rooms, 4 -6 air changes in work rooms.
- Floor space – 50-100 sq.feet
- Types of ventilation:
  Natural: Perflation (Blow) & Aspiration (Suction)
  Mechanical: Exhaust, Plenum, Balanced & Air conditioning

Lighting:

- Basic requirements: 15 to 20 foot candles
- Reflection factor:
  Ceiling and roof: 80% Wall: 50-60%
  Furniture: 30-40% Floor: 15 -20%
- Units: Brightness of point source: luminous intensity – Candela
  Flow of light – luminous flux – Lumen
  Amount of light reaching surface – illumination – Lux
  Amount of light remitted by surface – brightness – Lambert
- Day light factor: $\frac{\text{Instantaneous illumination in in-doors}}{\text{Simultaneous illumination our doors}} \times 100$
  In living rooms daylight factor of at least 8% in kitchen –10%
- Recommended illumination:
  Casual reading - 100 General office working - 400
  Fine assembly - 900 Watch making - 2000-3000

Noise

- Frequency heard by ear – 20-20000Hz
- Phon – psycho acoustic index of loudness- intensity and frequency are included
- Tolerable limit - 85 Db
  Normal conversation - 60-65 Db / Whispering - 20-30 Db
- Auditory fatigue appears at 90 Db/4000Hz; Noise induced hearing loss shows a characteristic dip in audiometry curve at 4000 Hz frequency
- Temporary hearing loss at 4000 – 6000 Hz

- Repeated exposure > 100 dB -> permanent hearing loss
- Speech communication effected at 300 – 500 Hz noise
- For good speech intelligibility – speech sound level must exceed SIL (speech interference level) by 12 db.
- **Health impact of noise levels**

70	Uneasiness, tension and disturbance of sleep
80	Headache, loss of efficiency, annoyance
85	Hearing loss
90	Pain in internal ears
100	Increased heart beats, contraction of blood vessels
120	Impact on central nervous system, loss of memory
140	Permanent hearing loss, stress, abortions
160	Rupture of ear drum

Radiation

- Sources: Natural & man made

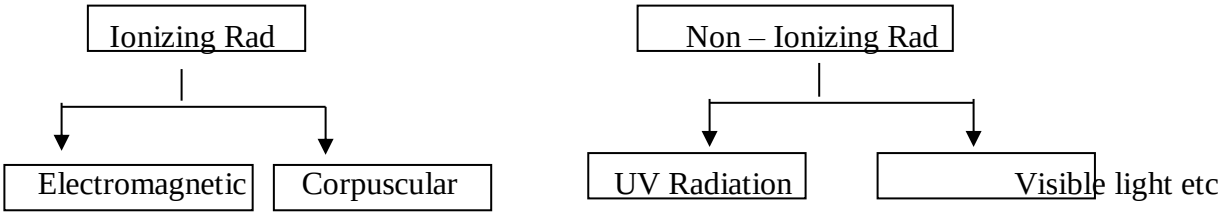
Natural – 0.1 rad/yr

1) Cosmic rays – 35 mrad/yr
2) Environmental
   Terrestrial – 50 mrad/yr
   Atmospheric – 2 mrad/yr
3) Internal radiation – 25 mrad/yr
   K40, Sr90, C14 etc.

b) Man made source

1) X-rays (Medical/Dental) - 0.02-3 rad /x-ray
2) Radioactive fallout – eg. Nuclear explosion
   Sr90 – t1/2 – 28 yrs / Cs137 – 30 yrs
3) Miscellaneous – e.g. TV sets, luminous wrist watches

- Types of radiation:



- Radiation Units:
  Unit of activity: Bq = 1 Bq = 27 picocuries
  Potency of radiation:
  Roentgen: unit of exposure, No. of ions produced in 1 ml. of air
  Rad: Unit of absorbed dose. Amount of energy absorbed per gm of tissue or material
  1 m rad = 0.001 rad
  Rem: product of absorbed dose and modifying factors. Indicates degree of potential danger to health

- SI units Roentgen → Coulomb / kg

Rad → Gray
Rem → Sievert

- 400-500 Roentgen fatal in 50% cases and 600-700 Roentgen fatal in 100% cases

- Effects of Radiation exposure
  I) Somatic

Immediate	Delayed
Radiation sickness	Leukemia
Acute radiation syndrome	Carcinogenesis
	Foetal development abnormalities
	Shortening of life

  II) Genetic-
  Chromosome mutation / Point mutation
  - Somatic effect (carcinogenesis): probability of effect rather than severity is a function of dose without a threshold – **Stochastic effect**
  - For other effect the severity varies with dose, a threshold may exist – Non – **Stochastic effect** Activity: no. of nuclear disintegration / time
    1 beenquered (Bq) = 1 disintegration /sec.

Radiation protection

- Permissible dose in addition to natural sources = 5 rad/yr
- Lead apron – 0.5 mm lead
- Film Badge/Dosimeter-

Biological response to high dose of radiation

< 5 rad – No immediate observable effects
5-50 rad – slight blood changes detected by medical evaluation
50-150 rad – Detectable blood changes + clinical symptoms – Fatigue, Nausea & vomiting
150-1100 rad – Severe blood changes + Clinical symptoms. Also death can occur within 60 days
1100-2000 rad – Death is 100% within 1-2 weeks
>2000 rad – Death is certainty
>5000 rad – CNS control lost over body functions

Meteorology instruments

- Barometer - Atmospheric pressure
- Thermometer - Air temperature
- (Dry/Wet - max & min)
- Globe thermometer – Mean radiant temperature
- Kata thermometer – Air temperature/Humidity/Air movement. Also low air velocities
- Dry & Wet bulb hygrometer – } Relative
- Sling psychomotor/Asmann's psychrometer } humidity
- Symons's rainguage – Rainfall
- Anemometer - Wind velocity
- Wind Wane - Wind direction

Housing

- Floor area per person – 50-100 Sq/ft
- Cubic space – 500 Cu.ft./person
- Window area – 1/5th of floor area
- Doors + Windows – 2/5th of floor area Lighting:
- Overcrowding: Three criteria are used – Person per room; Floor space and sex separation.

Overcrowding: 3 criteria		
1) Person per room	***2) Floor space***	***3) Sex separation***
1 room → 2 persons	< 50sq.ft. (5sq.m) – Nil	2 person of more than 9yrs age,
2 rooms → 3 persons	50-70sq.ft. (5-7sq.m) – ½ person	not husband wife
3 rooms → 5 persons	70-90sq.ft. (7-9sq.m) –1 person	Opposite sex
4 rooms → 7 persons	90-100sq.ft. (9-10sq.m) – 1 1/2 person	Obliged to sleep in same room
5 or more → 10 persons	110sq.ft. (11sq.m) – 2 person	

Waste Disposal

- Per capita daily waste production = 0.25-2.5 kg
- Garbage – food waste
- Sewage: waste water containing excreta (solid & liquid) derived from house, factories, industries, street and yard washings.
- Sullage: waste water which does not contain excreta i.e. water from kitchen & bathroom
- In combined system sewage is 80 -100 gallons / capita & in separate system sewage is 25-50 gallons.
- Average amount of sewage which flows through the sewage system in 24 hrs. – Dry weather flow.
- Wastes are of two types: Solid Wastes & Excreta

Solid Wastes:

- Per capita solid waste produced ranges from 0.25 to 2.5 kg
- Methods of disposal:
  - **a) Dumping**: City of Kolkata disposes its refuse in this fashion
  - **b) Controlled tipping or sanitary land fill**: Three methods viz. trench, ramp and area method – Temp. Rises to > 60°C within 7 days, Kills all pathogens and hastens the decomposition. Cools down in 2-3 weeks and after complete decomposition of organic matter turns units an innocuous mass in 4-6 months
  - **c) Incineration**: Method of choice where suitable land is not available
  - **d) Composting:** Method of combined disposal of refuse and night soil or sludge – Bangalore method (anaerobic) – 4.5-10 m x 90cm. trenches are dug. Refuse 15 cm+ Night soil 5 cm + Refuse + Night soil -> 30 cm. above ground -> Top layer 25 cm refuse → Earth on top. Recommended for municipalities with <1, 00,000 population Mechanical composting (aerobic method)
  - **e) Manure pits**: Used mainly in rural areas
  - **f) Burial**: Suitable methods for small camps

Excreta disposal:

- **Sanitation Barrier:** Segregation of the excreta by imposing a barrier, so that the disease agent cannot reach the new host either directly or indirectly.
- Methods of Excreta disposal-

I) Unsewered area

1) Service type latrine (Conservancy system)
2) Non-service type (Sanitary latrines)
   - Bore hole latrine
   - Dug well/pit latrine
   - Water seal latrine – PRAI/RCA/SS
   - Septic tank
   - Aqua privy
3) Latrines suitable for camps-
   - Shallow trench latrine
   - Deep trench latrine
   - Pit latrine
   - Bore hole latrine

II) Sewered areas

1) Water carriage system & Sewage treatment-

a) Primary treatment – (Solids separated – anaerobic digestion)
Screening/Grit Removal/ Plain sedimentation

b) Secondary treatment – (Effluent separated – aerobic digestion)
Trickling filter/Activated sludge process (aeration tank – heart)

c) Other methods – Sea outfall/River outfall
   - Sewage farming or land treatment
   - Oxidation pond/Waste stabilization pond/Redone pond/Sewage lagoon
   - Oxidation ditches

Strength of sewage

1. Biochemical Oxygen Demand (BOD):
   - Indicator of organic content or strength of sewage
   - The amount of O2 required by living organism for the aerobic destruction of organic matter at 20°C for 5 days
   - < 100 mg/L - Weak Sewage & 300 mg/L - Strong sewage
2. Chemical Oxygen Demand (COD)
3. Suspended Solids
   100 mg/L – Weak & 500 mg/L - Strong

MEDICAL ENTOMOLOGY

Insect	**Arachnida**	**Crustacea**
Mosquitoes	Ticks	Cyclops
Flies	Mite	
Human Lice		
Flea		
Reduviid Bug		

Diseases Transmitted:

Mosquito

Anopheles	***Culex***	***Aedes***	***Mansonoides***
Malaria Filaria (not in India)	Bancroftian Filariasis JE West Nile fever Viral arthritis	YF (not in India) Dengue/DHF Chikungunya fever/CHF Rift valley fever Filaria (not in India)	Brugian Filariasis Chikungunya fever

Hard tick	-Tick typhus -Viral encephalitis -Viral fever/Viral HF (KFD) -Tularemia -Tick paralysis -Human babesiosis -RMSF	***Soft stick***	-Q fever -Relapsing fever -KFD (not in India)
Louse	-Epidemic typhus -Relapsing fever -Trench fever -Pediculosis	***Rat flea***	-Epidemic typhus/Murine typhus -Bubonic plague -Chiggerosis -Hymenolepis diminuta
Sand fly (Phlebotamus)	-Kala-azar (Visceral Leishmania) -Oriental sore (Cut. Leishmania) -Sand fly fever -Oraya fever	***Trombiculid mite*** – Scrub typhus -Rickettsial pox ***Itch mite*** - Scabies	

Housefly -Typhoid/Paratyphoid fever
-Diarrhoea/Dysentery
-Cholera/AGE/Amoebiasis
-Helminthic infestations
-Poliomyelitis
-Conjunctivitis, Trachoma
-Anthrax, Yaws etc

Tse-tse fly (Glossina) -Sleeping sickness (African trypanosomiasis)
Black fly (Simulum) -Onchocerciasis (River blindness)
Reduviid bug- Chaga's disease/American trypanosomiasis
Cyclops -Guinea-worm disease & fish tapeworm (D. Latus)
Cockroach -Enteric pathogens

Transmission Cycle

- Direct
- Mechanical
- Biological
  a. Propagative : Only multiplication e.g. plague
  b. Cyclo-propagative: Multiplication as well as developmental changes; e.g. Malaria
  c. Cyclo-developmental: Only developmental change, no multiplication
     Filaria, Guinea-worm

Mosquito Control Measures:

Anti larval:

- Environmental
- Chemical
  - Malarial larvicidal oils - 40-90L per Hectare
  - Paris green – Copper aceto-arsenite
  - 50% Arsenoius oxide
  - Synthetic - Malathion 224 – 612 gm/h
    - Fenthion 22-112gm/h
    - Chloropyrifos 11-16gm/h
- Biological

Anti Adult Measures

- Residual Sprays
  - DDT 1-2 gm/m^2 Lindane 0.5 gm/m^2
  - Malathion 2 gm/m^2 Propoxur (OMS33) 2 gm/m^2
- Space Sprays- Pyrethrum
  - ULV – Malathion & Fenitrothlon

Protection against Mosquito bites:

- Mosquito net – 0.0475
- Screening
- Repellants : Diethyltoluamide (deet)
  - Indalone
  - Dimethylphthalate

Housefly:

- Egg – hatch in 8-24 hrs(3)
- Larva – 2-7 days
- Pupa – 3-6days
- Adult – 15-25 days

Sandfly

- Egg (7days)→Larva (14days)→ Adult (14days)
- Tsetse fly→
- Larvae (few hrs.)→ Pupa (20-40days)→Adults (100days)

Black fly - Simulum indicum

Lice: Head **–** Antennae (5 jointed)
Throax – Legs with claws
Abdomen – 9segmanet

Flea: P.argentipes, P.papatasi

Insecticides

Pesticide: Generic term that include insecticides, fungicides, rodenticides, herbicides etc.

Classification: Based on mode of action-

- Contact Poisons

- Stomach poisons
- Fumigants

Most of the present day insecticides available for vector control are classified into-

- Group I: Organochlorine compounds e.g. DDT, HCH, dieldrin, chlordane etc.
- Group II: Organophosphorus compounds e.g. Malathion, Fenthion, Chlorpyrifos, abate
- Group III: Carbamates e.g. Propoxur, carbaryl etc.

Some facts

- Most commonly used insecticide in India today – DDT
- Least toxic organochlorine compounds – DDT
- Least toxic organo phosphorus compound – Malathion.
- Longest duration of action – DDT – 18 months.
- Dichlorovos can be combined with solid substances like wax.
- Insecticide of vegetable origin –Pyrethrum.
- Alkyl phosphate metabolites are produced in urine with investigation or toxicity of Malathion.
- Aryl phosphate metabolites are produced in urine with ingestion or toxicity of parazinon, fenitrothlon etc.

The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification, 2009

TABLE 1: Determination of WHO hazard classification based on acute LD_{50}(rat) of formulated product (mg/kg)[6].

WHO Hazard Class	Information to appear on label				Acute LD_{50} (rat) of formulation (mg/kg)			
					ORAL		DERMAL	
	Hazard statement	Band colour	Hazard symbol	Symbols and words	Solid	Liquid	Solid	Liquid
Ia Extremely hazardous	VERY TOXIC	PMS RED 199 C		 VERY TOXIC	5 or less	20 or less	10 or less	40 or less
Ib Highly hazardous	TOXIC	PMS RED 199 C		TOXIC	5 - 50	20 - 200	10 - 100	40 - 400
II Moderately hazardous	HARMFUL	PMS Yellow C		 HARMFUL	50 - 500	200 - 2000	100- 1000	400 - 4000
III Slightly hazardous	CAUTION	PMS Blue 293 C		CAUTION	> 500	> 2000	> 1000	> 4000
Products unlikely too present a hazard in normal use		PMS Green 347 C			> 2000	> 3000		

* PMS is a colour matching system, mainly used by printers, devised and patented by Pantone, Inc. USA. ☞ See Table 5 of the WHO Recommended Classification of Pesticides by Hazard: Bibliography reference 6.

According to **Insecticides Act of 1968** and the **Insecticides Rules of 1971**, toxicity labels viz; red label, yellow label, blue label and green label are mandatory labels employed on pesticide containers in India identifying the level of toxicity of the contained pesticide.

The labeling follows a general scheme as laid down in the Insecticides Rules, 1971, and contains information such as brand name, name of manufacturer, name of the antidote in case of accidental consumption etc. A major aspect of the label is a color mark which represents the toxicity of the material by a color code. Thus the labelling scheme proposes four different colour labels: viz red, yellow, blue, and green.

Label	Name	Level of toxicity	Oral lethal dose mg per kg body weight of test animal	Listed chemicals
	Red label	Extremely toxic	1-50	Monocrotophos, zinc phosphide, ethyl mercury acetate, and others.
	Yellow label	Highly toxic	51-500	Endosulfan, carbaryl, quinalphos, and others.
	Blue label	Moderately toxic	501-5000	Malathion, thiram, glyphosate, and others.
	Green label	Slightly toxic	More than 5000	Mancozeb, oxyfluorfen, mosquito repellant oils and liquids, and most other household insecticides.

****

BIOMEDICAL WASTE MANAGEMENT

- Amount of waste generated per bed in hospital setting – 1.5 – 2.0 kg; of this 75 – 90% are general wastes and 10 – 15 % is hazardous wastes.

Average composition of hospital waste in India

Type	%
Paper	15%
Rages	15%
Plastics	10%
Glass	4%
Inf. Waste	**1.5%**
Metals (sharps)	1%
General waste (Food waste, sweeping)	53.5%

Source – NEERI – 1997

Health effects of wastes: Toxic hazards, Pollution, Vector breeding & Injury

Classification of hospital / health care wastes

1. **General waste**: Largely composed of domestic or house hold type waste. It is non-hazardous to human beings, e.g., kitchen waste, packaging material, paper, wrappers and plastics.
2. **Pathological waste**: Consists of tissue, organ, body part, human fetuses, blood and body fluid. It is hazardous waste.
3. **Infectious waste**: The wastes which contain pathogens in sufficient concentration or quantity that could cause diseases. It is hazardous e.g., culture and stocks of infectious agents from laboratories, waste from surgery, waste originating from infectious patients.
4. **Sharps**: Waste materials which could cause the person handling it, a cut or puncture of skin e.g. needles, broken glass, saws, nail, blades, and scalpels etc.
5. **Pharmaceutical waste**: This includes pharmaceutical products, drugs, and chemical that has been returned from wards, have been spilled, are outdated, or contaminated
6. **Chemical waste**: This comprises discarded solid, liquid and gaseous chemicals e.g., cleaning, housekeeping, and disinfecting product.
7. **Radioactive waste**: It includes solid, liquid, and gaseous waste that is contaminated with radionucleides generated from in-vitro analysis of body tissues and fluid, in-vivo body organ imaging and tumour localization and therapeutic procedures.
8. **Genotoxic waste:** E.g. Waste containing cytotoxic drugs or Genotoxic drugs
9. **Waste with high content of heavy metals** E.g. Batteries, broken thermometers etc.
10. **Pressurized containers**: E.g. Gas cylinders, gas cartridges, aerosol cans

Amount

Country	Quantity (kg/bed/day)	Country	Quantity (kg/bed/day)
U.K.	2.5	Spain	3.0
U.S.A.	4.5	**India**	**1.5**
France	2.5		

Treatment techniques

1. **Incineration**
   - High temperature dry oxidation process
   - No pre treatment required
   - 70-80% V/W reduction

- Temp – Primary chamber – 800±50˚C / Secondary chamber – 1050±50˚C
- Characteristics of waste suitable for incineration are
  - Low heating volume – above 2000 Kcal/Kg for single chamber & above 3500 Kcal/Kg for pyrolytic double camber incineration
  - Content of combustible matter > 60%
  - Content of noncombustible solids matter < 5%
  - Content of non-combustible fines < 20%
  - Moisture content < 30%
- Waste types not be incinerated are- Pressurized gas containers
  - Large amount of reactive chemical waste
  - Silver salts & photographic radiographic work
  - Halogenated plastics like PVC
  - Waste with high mercury/cadmium content
  - Sealed ampoules or ampoules containing heavy metals
- 3 technologies - Double chamber pyrolytic incineration
  - Single chamber furnaces with static grate
  - Rotary kilns

2. Chemical disinfection

Suitable for liquid waste

3. Wet (steam disinfection) & dry (Screw feed technology) thermal treatment

Screw feed technology

- Dry thermal treatment
- Non burn, dry thermal disinfection process
- Waste is reduced by 80% in volume & 20-30% in weight
- Suitable for infection waste & sharps
- Should not be used for pathological, cytotoxic or radioactive wastes

4. Microwaves – frequency – 2450MHz / WL – 12.24nm

5. Land disposal: Open dumps / Sanitary landfill

6. Inertization

Mixing waste with cement &other substances before disposal in order to minimize the risk of toxic substances migrating to surface water

Proportion of medicine-

65% pharmaceutical waste + 15% lime + 15% cement + 5% water

Advantage – relatively inexpensive / Disadvantage – NA for infectious waste

BMW rules, 1998

- Ministry of Environment & Forests – 28th July 1998
- Schedule I - Categories
- Schedule II - Colour coding
- Schedule III - Labels for containers
- Schedule IV - Label for transport
- Schedule V - Standards for treatment & Disposal

Schedule – I: Categories	**Schedule – V: Treatment**
Cat. 1 Human anatomical waste (Tissues, organ, body parts)	Incineration/Deep burial

Cat. 2	Animal waste	Incineration/Deep burial
Cat. 3	Microbiology & Biotechnology waste	Autoclaving/Microwaving/Incineration
Cat. 4	Waste sharps	Disinfection (Chemical treatment/ Autoclave/Microwave)
Cat. 5	Discarded medicines & cytotoxic drugs	Incineration – destruction Secured landfill
Cat. 6	Solid waste (Items contaminated with blood & fluids Cotton, dressings, linen, bedding, plasters)	Incineration /Autoclaving/Microwave
Cat. 7	Solid waste (Disposable items – like tubing, Catheters, Plasters)	Chemical treatment/Autoclave/ Microwave/Mutilation
Cat. 8	Liquid waste	Chemical treatment
Cat. 9	Incineration ash	Landfill
Cat. 10	Chemicals used in production of biological Chemicals used in disinfection	Chemical treatment

Schedule – II -Colour coding

Colour	Container	Category	Treatment
Yellow	Plastic bag	1, 2, 3, 6	Incineration/ Deep burial
Red	Disinfected Container/ Plastic bag	3, 6, 7	Autoclave /Microwave/ Chemical treatment
Blue/white	Plastic bag/puncture proof container	4, 7	Autoclave /Microwave/ chemical treatment/ shredding
Black	plastic bag	5, 9, 10	Secured landfill

Cat 8 & 10 – do not require containers/bags

Schedule III – Labels for containers

Biohazard/ Cytotoxic - signs

Schedule IV – Label for transport

Schedule V – Standards for treatment & Disposal

BMW rules, 2011

	Schedule – I: Categories	**Schedule – V: Treatment**
Cat. 1	Human anatomical waste (Tissues, organ, body parts)	Incineration/Deep burial

Cat. 2	Animal waste	Incineration/Deep burial
Cat. 3	Microbiology & Biotechnology waste	Autoclaving/Microwaving/Incineration
Cat. 4	Waste sharps	Disinfection (Chemical treatment/ Autoclave/Microwave)
Cat. 5	Discarded medicines & cytotoxic drugs	Incineration – destruction Secured landfill
Cat. 6	Soiled waste (Items contaminated with blood & fluids, Cotton, dressings, linen, bedding, plasters)	Incineration /Autoclaving / Microwave
Cat. 7	Infectious Solid waste (Disposable items – like tubing, catheters, Plasters)	Chemical treatment / Autoclave/Microwave/Mutilation
Cat. 8	Chemicals used in production of biological	Chemical treatment

Schedule – II -Colour coding

Colour	**Container**	**Category**	**Treatment**
Yellow	Non-chlorinated Plastic bag	1, 2, 5, 6	Incineration
Red	Non-chlorinated Plastic bag	3, 4, 7	Autoclave / Microwave/ Chemical treatment
	Puncture proof container for sharps		
Blue	Non-chlorinated Plastic bag	8	Autoclave /Microwave/ Chemical treatment/ shredding
Black	Non-chlorinated Plastic bag	Municipal waste	Disposal in municipal dump site

Schedule III – Labels for containers

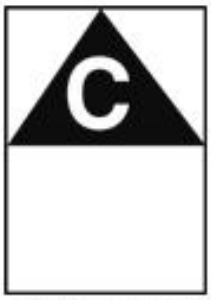
Biohazard/ Cytotoxic - signs

Schedule IV – Label for transport

BIOHAZARD SYMBOL
जैविक परिसंकट चिन्ह

BIOHAZARD
जैविक परिसंकट

CYTOTOXIC HAZARD SYMBOL
कोषिकाविष परिसंकट चिन्ह



CYTOTOXIC
कोषिकाविष

****

OCCUPATIONAL HEALTH

Ergonomics:

- Ergon – work, nomos – law (Greek word)
- Fitting man to job (FMJ) & Fitting job to man (FJM)
- Simply means 'fitting the job to the worker'
- **Objective:** To achieve the best mutual adjustment of man and his work, for the improvement of human efficiency and well-being.

- Physical ergonomics- Deals with human body's responses to physical stress
- Cognitive ergonomics - Mental processes that offset human interaction
- Organizational ergonomics – (Macrorgomomics) - Optimization of system

Occupational environment: sum of external conditions and influences which prevail at the place of work and which have a bearing on the health of the working population.

Occupational Hazards:

Physical hazards

- The commonest physical hazard in most industries is heat. The direct effects of heat are burns, heat exhaustion, heat stroke and heat cramps. The indirect effects are decreased efficiency, increased fatigue and enhanced accident rates.
- Light – Acute effects - Eye strain, Lacrimation / Chronic - Miner's Nystagmus
- Noise - auditory / non auditory effects
- Vibrations - spasm of blood vessels especially extremities
- UV radiations - reversible conjunctivitis and Keratitis
- Ionizing radiations - permissible limit max. ***5 rad per year***.

Disease due to physical agents	
• Heat etc.	heat exhaustion, heat cramps, heat hyperpyrexia
• Cold	Trench foot, frost bite, chilblains
• Light	Occupational cataract, Miner's Nystagmus
• Pressure	Caisson's disease, air embolism, blast (explosion)
• Noise	Occupational deafness

Chemical hazards – Gases (CO_2, CO, SO_2, NH_3, CS_2, H_2S etc.), Dust, Metals, acids, alkalies etc.
Biological hazards - Brucellosis, Leptospirosis, anthrax, actinomycosis, hydatidosis, tetanus etc.
Mechanical hazards – injuries & accidents by machinery or moving parts
Psychological hazards – due to failure to adjust psychosocial environment → Psychosocial & behavioural changes or psychosomatic illnesses

<u>Occupational diseases</u>:

Pneumoconiosis

- Dusts (pneumoconiosis): Dust particles within the size range **0.5 to 3 micron**.
- No known cure, only prevention.
- The hazardous effect of dusts on the lungs depend upon: Chemical composition / Fineness / Conc. / Period of exposure / Health status of the person exposed

• Silicosis	Silica dust (Grinder's disease)	• Berylliosis	Beryllium
		• Siderosis	Iron dust
• Anthracosis	Coal dust (Black lung)	• Compost lung fungus)	Compost (Aspergillus
• Asbestosis	Asbestos dust	• Farmer's lung	Mouldy hay
• **Byssinosis**	**Cotton dust**	• Tobacco	Tobaccosis
• **Bagassosis**	**Sugarcane dust**		

Silicosis:

- First reported from Kolar Gold mines in Karnataka in 1947.
- Now reported from all over especially Puducherry, Central India etc.
- Pathologically – ***Nodular fibrosis*** & X-Ray – ***snow storm appearance***. Prone to pulmonary tuberculosis – Silico-Tuberculosis (mostly AFB negative)
- The ILO/WHO international progamme on the global elimination of silicosis, launched in 1995, aims at the global reduction and eventual elimination of silicosis. It includes:
  The formulation of national, regional and global action plans;
  Mobilization of resources for the application of primary and secondary prevention;
  Epidemiological surveillance;
  Monitoring and evaluation of results; and
  The strengthening of the required national capabilities and establishment of national programmes.

Anthracosis:

- Two definitive stages – simple coal workers pneumoconiosis and progressive massive fibrosis (Non reversible & average time 12 years to develop)

Asbestosis:

- Two varieties – Chrysolite or serpentine and Amphibole.
- Mesothelioma strongly associated with Crocidolite variety of Amphibole.
- Risk of bronchial cancer is higher if combined with cigarette smoking.
- Clinically, X-Ray shows ***ground glass appearance*** in the lower 2/3rd of lung field.

Bagassosis:

- First reported from cardboard manufacturing industry in Kolkata. Widespread disease all over India.
- Due to thermophilic actinomycete – *Thermoactinomyces sacchari*
- Clinical features include – breathlessness, non-productive cough, haemoptysis with fever
- Control by keeping moisture control over 20% and spraying bagasse with 2% propionic acid.

Byssinosis

- Referred as "***Monday morning chest tightness***" or "***Monday morning fever***". This is because of the observation that the sickness is absent on Sundays when exposure is absent.
- Symptoms are chronic cough & progressive Dyspnoea leading to chronic bronchitis and emphysema

Farmer's lung

- Most common pneumoconiosis in India.
- Causative agent – *Mycopolyspora faeni*

Lead poisoning / Plumbism / Saturnism

- Most common cause of metallic poisoning among industrial workers
- Lead is used widely in many industries due to – Low boiling point / Ability to form alloys / easily oxidized / Anti-corrosive

- Clinical symptoms are different for
  Inorganic lead - GI symptoms - colic, constipation, lead line, basophilic stippling;
  Organic lead - CNS symptoms - insomnia, headache, mental confusion.

Lab parameter		Remark
Coproporphyrin in urine (CPU) (Screening)	>150µg/lit	Exposure to lead
δ Aminolevulinic acid in urine (ALAU)	>5mg/lit	lead absorption
Lead in blood	>70µg/100ml	clinical symptoms
Lead in urine	>0.8mg/lit	exposure / absorption

- Management – prevention of further exposure with saline purging with chelating agents like d-pencillamine and Ca-EDTA
- Notifiable disease in India since 1924 (Workmen's Compensation Act)

Occupational cancer:

- Common cancers - Skin / Lung / Bladder / Leukemia
- 3/4th (75%) – skin cancer
- Imp. Carcinogens
  Benzene – leukemia Ethylene oxide – leukemia
  Benzidine – Bladder Ca β-naphthylamines – Bladder Ca
  Asbestos – Mesothelioma Cadmium – lung
  Vinyl chloride – liver
- Characteristics
  - Prolonged exposure (10-25 yrs)
  - May develop even after cassation of exposure
  - Age incidence earlier
  - Localization in occupation – constant

Accidents:

- 3 million man-days are lost due to accidents in India.
- Human and Environmental factor to assess the state of the health workers

Sickness absenteeism:

- Useful index in industry to assess the state of health of workers.
- It's a direct measure of the health status of the factory workers and an indirect measure of the working environment.

Prevention of occupation disease

Medical measures

- Pre-placement examination- foundation of occupational health service

Hazard	**Undesirable condition**
Lead	Anaemia, hypertension, nephritis and peptic ulcer
Dyes	Asthma skin, bladder
Solvents	Liver and kidneys disease; dermatitis
Radium and X-rays	Signs of ill health, especially any blood disease

- Periodic examinations- The frequency and content of periodic examination depends upon the type of occupational exposure
    1. Once a year in most cases
    2. Once a month- lead toxic dyes and radium
    3. Every day – irritant chemicals like dichromates
- Notification – under different acts and legislation e.g. workmen's compensation act 1924, Factories act 1976 (22 diseases), mines act 1952 (3 diseases), Dock labourers act 1948 (8 diseases)
- Medical & health care services

Engineering measures

- Good design, good housekeeping, Substitution, Isolation, local exhaust Ventilation, , personal protection measures etc.

Legislations

Factories act, 1948: last amendment, 1987.

Scope: Factory – ≥ 10 workers where power is used and ≥ 20 workers where power is not used.
Applies to the whole of India except – J & K
Even contract works are included under – 1976 amendment.

Health, safety, welfare measures-

- Minimum 500 cu. Fit space/worker (for factories started before 1948, 350 Cu.ft).
- 1 safety officer ≥ 1000 worker
- 1 welfare officers ≥ 500 workers
- 1 Canteen - ≥ 250 workers
- 1 Creche- >30 female workers

Employment of young persons

Act prohibits employment of children below 14 years of age and between the ages 15 to 18 – considered adolescents.

Hours of work: Max. 48 working hrs/ week @ ≤9 hrs/day (1976 amendment – Upto 12 hrs/day)
But total hrs in a week should not exceed 60 days including overtime.

Leave with wages: After 12 months of continuous service
For adult - @ 1 day for every 20 days of continuous work
For Children - @ 1day for every 15 days of continuous work.
Leave can be accumulated upto – 30 days for adults & 40 days for children.

Complete list of Notifiable diseases under Factories act:

1. Lead poisoning, including poisoning by any preparation or compound of lead or their sequelae.
2. lead tetra-ethyl poisoning
3. Phosphorus poisoning or its sequelae.
4. Mercury poisoning or its sequelae.
5. Manganese poisoning or its sequelae.
6. Arsenic poisoning or its sequelae.
7. Poisoning by nitrous fumes.
8. Carbon disulphide poisoning.

9. Benzene poisoning, including poisoning by any of its homologues, their nitro or amido derivatives or its sequelae.
10. Chrome ulceration or its sequelae.
11. Anthrax.
12. Silicosis.
13. Poisoning by halogens or halogen derivatives of the aliphatic hydrocarbons.
14. Pathological manifestations due to a) Radium or other radio-active substances b) X- rays
15. Primary epitheliomatous cancer of skin.
16. Toxic anaemia.
17. Toxic jaundice due to poisonous substances.
18. Oil acne or dermatitis due to poisonous substances.
19. Byssinosis*
20. Asbestosis*
21. Occupational or contract dermatitis* caused by direct contract with chemicals and paints.
22. Noise induced hearing loss* (exposure to high noise levels).
23. Beryllium poisoning.
24. Carbon monoxide
25. Coal miner's pneumoconiosis.
26. Phosgene poisoning.
27. Occupational cancer.
28. Isocyanide poisoning.
29. Toxic nephritis.

*1976 amendment

List of Occupational Diseases as per Employee Compensation Act 1923 (earlier Workmen Compensation Act, 1923) –

Part A
1. Infectious and parasitic diseases contracted in an occupation where there is a particular risk of contamination. (Anthrax)
2. Diseases caused by work in compressed air.
3. Diseases caused by lead or its toxic compounds.
4. Poisoning by nitrous fumes.
5. Poisoning by organophosphorus compounds.
Part B
1. Diseases caused by phosphorus or its toxic compounds.
2. Diseases caused by mercury or its toxic compounds.
3. Diseases caused by benzene or its toxic homologues.
4. Diseases caused by nitro and amido toxic derivatives of benzene or its homologues.
5. Diseases caused by chromium, or its toxic compounds.
6. Diseases caused by arsenic or its toxic compounds.
7. Diseases caused by radioactive substances or radiations.
8. Primary epitheliomatous cancer of the skin, caused by tar, pitch, bitumen, mineral oil, anthracene, or the compounds, products or residues of these substances.
9. Disease caused by the toxic halogen hydrocarbons (aliphatic and aromatic series).
10. Diseases caused by carbon disulphide.
11. Occupational cataract due to infra-red radiations.
12. Diseases caused by manganese or its toxic compounds.
13. Skin diseases due to physical/chemical/biological agents not included in other items.

14. Hearing impairment caused by noise.
15. Poisoning by dinitrophenol / substituted dinitrophenol / salts of such substances.
16. Diseases caused by beryllium or its toxic compounds.
17. Diseases caused by cadmium or its toxic compounds.
18. Occupational asthma caused by recogn. sensitising agents inherent to work process.
19. Diseases caused by fluorine or its toxic compounds.
20. Diseases caused by nitroglycerine or other nitroacid esters.
21. Diseases caused by alcohols and ketones.
22. Diseases caused by asphyxiants CO & toxic derivatives, hydrogen sulfide.
23. Lung cancer and Mesothelioma caused by asbestos.
24. Primary neoplasm of the epithelial lining of the urinary bladder or kidney or ureter.
25. Snow blindness in snow bound areas.
26. Disease due to effect of cold in extreme cold climate.

Part C

1. Pneumoconiosis caused by sclerogenic mineral dust silicosis, anthraoosilicosis, asbestosis) and silico-tuberculosis provided that silicosis is an essential factor in causing the resultant incapacity or death.
2. Bagassosis.
3. Bronchopulmonary diseases caused by cotton, flax hemp and sisal dust (Byssinosis).
4. Extrinsic allergic alveolitis caused by the inhalation of organic dusts.
5. Bronchopulmonary diseases caused by hard metals.
6. Acute Pulmonary Oedema of High Altitude.

Employees State Insurance Act, 1948

Latest amendment, 1989

Scope: Applies to the whole of India (All states except Arunachal Pradesh, Manipur, Sikkim and Mizoram)
UTs – Delhi & Chandigarh.
Covers all employees getting upto Rs 15,000 per month (w.e.f 1.5.2010)

Includes-

- Establishments with $\geq$10 workers where power is used and $\geq$20 workers where power is not used.
- Shops
- Hotels & Restaurants
- Cinemas & theatres
- Road –motor transport
- Newspaper establishments
- Private medical & educational institutes in some states (> 20 workers)
- Any other agricultural or commercial establishment

Not applicable to – Mines, Railways & Defense services (Educational institutes in some states)

Administration – Autonomus ESI corporation (ESIC) - Chairman – Union Minister of Labour, Vice-chairman – Secretary, Ministry of labour,GOI Standing committee – executive body CEO of corporation is Director general Assisted by 4 commissioners (Insurance/Medical/ Financial/Actuary)	**Finance:** Employer contributes - 4.75% and Employees contribute - 1.75% of the total wages. State Govt share $1/8^{th}$ (Max. upto Rs.1500 per person per year and ESI's share $7/8^{th}$ of the total cost of medical care.

Medical Benefit council – Head – DGHS, GOI assisted by Medical commissioner	Employees with daily wages < Rs.100 (75) - exempted from contribution

Benefits:

Medical benefit

The Employees State Insurance Scheme provides full medical care in the form of medical attendance, treatment, drugs and injections, specialist consultation and hospitalization to insured persons and also to member of their where the facility for Specialist consultation, hospitalization has been extended to the families.

- **Full medical care:** This consists of hospitalization facilities and includes specialist services, drugs and dressing and diets as required for in- patients.
- **Expanded Medical Care:** This consists of consultation with the specialists and supply of special medicines and drugs as may be prescribed by them in addition to the out – patient care. This also includes facilities for special laboratory testa and X- Ray examinations. Apart from the curative services provided through hospitals and dispensaries, the corporation also provides immunization, family welfare services and supply of special aids.
- **'Full Medical care' –** either directly i.e. areas with > 1000 employee concentration – full time service dispensaries,< 750 – part time medical establishment or indirectly i.e. through insurance medical practitioners (max 750 family units). Doctor population ratio in ESI 1:585.

Sickness benefit:

- Periodic cash payments @ 70% (50%) of the average daily wages payable for maximum of 91 days in a year.
- **Extended sickness benefit** for 2 years for certain malignant & long standing disease like TB, Leprosy, Mental Diseases, Malignant disease, paraplegia, hemiplegia, CCF, Immature cataract with vision ≤ 6/60 etc (34 diseases) @ 80% of the average daily wages.
- **Enhanced sickness benefit** for persons who undergo sterilization will get almost double benefit (@100% daily wages) for 7 days (vasectomy) & 14 days (Tubectomy).

Maternity benefit

- 12 weeks for pregnancy & 6 weeks for miscarriage extendable for one month on medical advise @ full wages .

Disablement benefit

- Temporary disablement benefit @ 90% (70%) of the wages is payable till temporary disablement lasts.
- Permanent disablement benefits – @ 90% rate & extent determined by medical board.

Dependent benefit

- The rate of payment is about 90% (70%) of the wages shareable among dependants in a fixed ratio.

Funeral expenses

- Max. up to Rs. 10000 (5000)

Confinement Expenses

- An Insured Women or an Insured person in respect of his wife in case confinement occurs at a place where necessary medical facilities under ESI Scheme are not available.

In addition, the scheme also provides some other need based benefits to insured workers.

- **Vocational Rehabilitation (VR):** to permanently disabled Insured Person for undergoing VR
- **Physical Rehabilitation:** In case of physical disablement due to employment injury.

- **Old Age Medical Care:** For Insured Person retiring on attaining the age of superannuation or under VRS/ERS and person having to leave service due to permanent disability insured person & spouse on payment of Rs. 120/- per annum.

Ref : http://www.esic.nic.in/benefits. Revised Benefits of ESI Scheme 2014.

o The ESI ***act passed in 1948*** (amended in 1975,1984 and 1989) is an important measure of social security and health
insurance in this country.

Finance of ESI scheme:
o The scheme is run by contribution by employees and employers and grants from central and state governments -
i) ***Employers contribution - 4.75% of total wages bills***[Q]
ii) Employee contribution -1.75% of total wages bills
iii) The ***state government's share*** of expenditure on medical care is 1***/8of total cost of medical care***.
iv) The ***ESI corporations share of expenditure*** on medical care is ***7/8 of total cost of medical care.***
So State and Central Government share medical expenditure in ratio of 1:7.
Note - ***Employees earning upto Rs.100/- a day are exempted from payment of their share of contribution(Previously it was Rs 70)***

Benifits	According to PARK 22ND	REVISED ESI SCHEME 2014
Medical Benifit		
The sickness benefit	**50% *o f*** *the average daily wage.X90days*	• **70% *o f wage.X91 Days***
Extended sickness benefit	50% of wages	• **80 % of wage X 2 years** in the case of 34 malignant and long-term diseases
Enhanced Sickness (undergoing sterilization)	100% wage for 7 days/14 days for male and female workers respectively	100% wage for 7 days/14 days for male and female workers respectively
Maternity benefit	100% wages Xs 12 weeks (84 days) For confinement, for miscarriage 6 weeks	100%wages X 3 month(**extendable by further one month on medical advice**)
Temporary disablement benefit	is **about 70%** of the wages	At the rate **of 90% of wage X recovery period**
Permanent disablement	the insured person is given life pension worked out on the basis of loss of earning capacity	**90% of wage X loss of earning capacity**(as certified by a Medical Board)
Dependents benefit	In case of death of employee, a pension at the rate of 70% of wags is payable	**90% of wage** in the form of monthly payment to the dependants of a deceased Insured person in cases where death occurs due to employment injury or occupational hazards.
Funeral expenses	Rs. 5000	**Rs.10,000/-**

Additional benefits:**Medical Care retired old** Insured Person :Medical facility on payment of Rs. 120/- per annum.

Rajiv Gandhi Shramik Kalyan Yojna (RGSKY)

- Unemployment allowance for employees covered under ESI scheme who are rendered unemployed – involuntarily due to retrenchment/closure of factory
- 1st April 2005
- 3 reasons 1) Closure
  2) Retrenchment
  3) Disability (40% or more certified by medical board)
- After 5 yrs contribution to scheme
- Unemployment allowance for 6 mths
- From 01/02/2009 - Unemployment allowance for 12 mths and at least 3 yrs contribution to scheme
- Standard benefit rate – decided by using tables
- Also eligible for medical care

MENTAL HEALTH

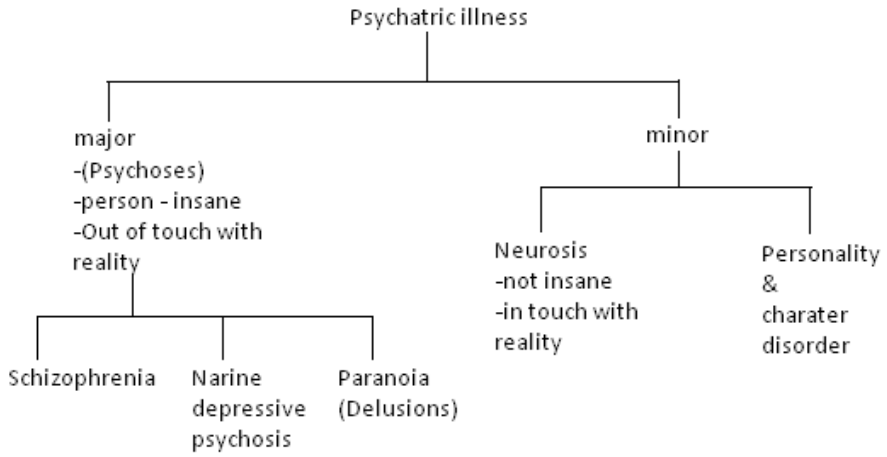
- Point prevalence of Neuropsychiatric conditions – 10% in adults
- Most common cause of DALYs lost – Depression
- Mental morbidity in India – 18-20per1000
- DSM – IV criteria – (TR)
  Diagnostic & Stastical manual of mental disorders – 4th Editions, Text Revision
  Published by American Psychiatric Association (APA)
  Includes all currently recognized mental health disorders
  Coding system corresponds to International classification of Diseases (ICD)

Characteristics of Mentally Healthy person

- Feels comfortable about self
- Feels right towards others
- Able to meet demands of life

Warning signals of poor mental health- William C. Menninger

Psychiatric illnesses: Classification



Causes

- Organic condition
- Heredity – 2 parents schizophrenic – child 40 times chances
- Social pathological causes – eg worry **annually** stress etc

Prevention

- Primary – improving social environment, promotion of social, emotional & physical wellbeing
- Secondary – Early diagnosis & treatment – screening & counseling
- Tertiary – reduce duration of mental illness & reduce stress

Mental health services

- Early diagnosis & treatment
- Rehabilitation
- Group & Industrial psychotherapy
- Mental health education
- Use if modern psychoactive drugs
- After care services

National Mental Health Programme (NMHP)

- Launched in 1982 (7^{th} FYP) / covers 94 districts
- To ensure availability of Mental Health care services for all
- The programme envisages a community based approach for mental health problems. The Govt. of India has constituted Central Mental Health Authority to oversee implementation of Mental Health act 1987, provides safeguards for protecting patients suffering from mental illness from stigmatization and discrimination.
- 11 institutions – for training
- **Aims**

Prevention & treatment of mental disorders
Integration with general health services

- **Objectives**
  To ensure availability & accessibility of minimum mental health care for all
  To encourage application of mental health knowledge in general health care
  To promote community participation (self help)
- **Strategies**
  Integration of mental health with primary health care through NMHP Provision of tertiary care institutes for treatment of mental disorders Eradication of stigma & protection of rights.
- **Components (District Mental health programme)**
  Training programmes for health worker
  Public education – to increase awareness & decreases stigma
  Early diagnosis & treatment
  Modernization of mental hospitals
  Upgrade psychiatry department in medical college
- Mental hospitals in India = 37
- WHO day – 2001 – Theme "Mental health – Stop exclusion – Dare to care"
- National Human Rights Commission – Monitoring agency for NMHP

Mental Health Care Bill, 2013

- The Mental Health Care Bill, 2013 was moved by the Ministry of Health.
- The Mental Health Care Bill, 2013 states that the acts of suicide will not be criminalized.
- All those who attempt suicide will be considered as mentally ill until and unless proven otherwise. Therefore, people who attempt suicide will be exempted from the present provisions of Section 309 of Indian Penal Code.
- In the Section 124 of the Mental Health Care Bill, 2013, it is stated that, "Notwithstanding anything contained in Section 309 of the IPC, any person who attempts suicide shall be presumed, unless proved otherwise, to be suffering from mental illness at the time of the bid and shall not be liable to punishment under the said Section."
- The bill makes it clear that act of suicide as well as mental health of a person who commits suicide, are inseparably linked and so these two should be seen in unison.
- The bill lays down organised provision for treatment of people who commit suicide.
- The bill seeks to offer proper mental care for people with mental illness. It also seeks to protect, promote as well as fulfill rights of people attempting suicide, during the delivery of healthcare services related to mental health.
- It is for the first time that the Union Government of India came up with the rights based on the approach in mental health law.
- The amendment to Criminal Law would be moved separately by the Law Commission and this would eventually be affected by the Home Ministry.
- After it is passed in the Lok Sabha and assented by the President of India, it will replace the Mental Health Act of 1987.
- The new bill ensures various rights to the mentally ill people, which range from right to privacy and right to dignity.
- The bill also prohibits inhuman practices such as electro convulsive therapy without anesthesia, chaining and tonsuring of heads as well as sterilisation as a treatment for illness.
- Stringent penalties are proposed for the ones found running unregistered mental health care

establishments. The fine upto 5 lakh Rupees depending on the frequency of the offence.

- The bill seeks to regulate private as well as public mental healthcare sectors as well as establish a mental health system integrated into various levels of general healthcare.
- The bill provides for Advance Directive to be furnished in writing by the person, without the basis of mental illness.
- The bill also provides for registration of the Mental Board to be set up by the government at both central and state levels.
- The bill provides for Central Mental Health Authority and State Mental Health Authority together with the Mental Health Review Commission for regulating the sector and registering the institutions.

It is important to note that the Mental Health Care Bill, 2013 completed the gap in mental health law in India after it ratified the UN Convention on the Rights of Persons with Disabilities, which requires it to harmonise the laws with the ones present across the world. This convention was signed on 1 October 2007 and came into force on 3 May 2008.

Mental Health Act of 1987

The aim of the Mental Health Act of 1987 is to consolidate and amend the law relating to the treatment and care of mentally ill person, to make better provisions with respect to their property and affairs and for matters connected therewith or incidental thereto.

GENETICS & HEALTH

- Mendel & Galton – Basic principle of Genetics
- Tijo & Levan – discovered 46 chromosomes in human /Karyotype

Genetic disorders – Classification

a) Chromosomal abnormalities
b) Single (Mendelian)/Unifactorial disease
c) Multifactorial disorder

a) Chromosomal disorders

1) Sex chromosomal aneuploidies

- Klinefelters syndrome – 47XXY, 48XXXY
- XYY syndrome-
- Turner's syndrome – 45XO
- Superfemales (XXX, XXXX, XXXXX)

2) Autosomal aneuploidies

- Down's syndrome/Mongolism/**Trisomy** described by Langdon Down in 1866
- Non-disjunction (Trisomy 21 – MC autosomal aneuploidy also due to disjunction)
- Short stature & small round head, narrow, tilled eye – slits, malformed ears, congenital defects like cardiac defects, **atresia** of alimentary canal.
- Frequency increases with increase in maternal age but unaffected by age of father
- At age 20yrs – 1 in 3000 whereas At age 45yrs – 1 in 50

b) Mendelian disorders

1) Autosomal dominant

E.g. Achondroplasia
Neurofibromatosis
Brachydactyly
Retinoblastoma
Hyperlipoproleinemia, I, II, III, IV
Polydactyl
Huntington's chorea
Familial polyposis coli
Marfan's syndrome
ABO blood group
Adult polycystic Kidney disease
Hereditary spherocytosis

2) Autosomal recessive

E.g. Phenylketonuria
Tay Sach's disease
Maple syrup urine disease
Hirschsprung disease
Polycystic kidney disease (children)
Cystic fibrosis
Alkaptanuria
Galactosemia
Haemoglobinopathies
Fibrocystic disease of pancreas
Agammaglobulinemia (swiss type)

3) X-linked dominant

Vitamin D resistant rickets
Familial hypophosphatemia

4) X-linked recessive

Hemophilia type A & B
G-6PD deficiency
Hydrocephalus
Colorblindness
Duchene type of muscular dystrophy
Retinitis pigmentosa

Agammaglobulinemia

c) Multifactorial disorders

Essential hypertension, Schizophrenia, Mental Retardation, IHD, DM, Congenital heart disease

Human Genome Project (HGP)

- To systematize the research on mapping & isolating human genes
- To create a single linear map of the human genome with each coding gene defined & sequenced (USA/UK/France)
- Human Genome Diversity product – to understand human evolution

Population Genetics

- Study of genetic composition of population
- Hardy (England) & Weimberg (Germany) (1908)
- Hardy Weimberg law - Relative frequencies of each gene tend to remain constant from generation to generation in absence of the forces that change the gene frequency
- Factors influencing gene frequencies –

  Mutation / Natural selection / Population movement / Breeding structure (Assortative mating)

Preventive measures for genetic disorders

I. Health promotion

- Eugenics

  Proposed by Galton

  Science which aims to improve genetic endowment of human population

  Aim to decrease hereditary disease & disabilities

  Negative eugenics – Killing weak/defective (Sterilization/debarring from having children)

  Positive eugenics- Carriers of desirable genotype – to assume burden of parenthood
- Euthenics

  Mutual interaction between genetic factors & environment is important

  Environmental manipulation – Euthenics
- Genetic counseling- Prospective / Retrospective – hereditary disorder already occurred in family
- Other measures - Consanguineous marriages / Late marriages – Avoided

II. Specific protection

E.g. X-ray exposure – avoided/lead apron used

No X-ray exposure for pregnant women

III. Early detection & treatment

a) Detection of carriers – Screening e.g. DMD – increases creatine kinase in serum

b) Prenatal diagnosis- Amniocentesis / MS-AFP

c) Screening of newborn infants-

CDH – clinical examination

PKU – Heel prick blood sample on filter (Guthrie card / TMS)

Congenital hypothyroidism

Sickle cell anaemia – Hb electrophoresis

Cystic fibrosis – Measurement of trypsin

d) Recognizing preclinical cares

IV. Rehabilitation

****

DISASTER MANAGEMENT

Disaster management

Disaster management can be defined as the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness, response and recovery in order to lessen the impact of disasters.

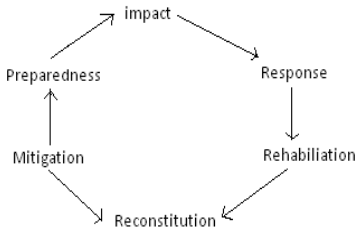


Fig. Disaster cycle

Disaster cycle

Disaster response
Disaster mitigation
Disaster preparedness

Types of disasters

Natural disasters e.g. – earthquakes, floods, landslides

Man made disasters e.g. war, bomb blasts, chemical leaks

Morbidities in disaster –

4 types - Injuries
Emotional stress
Epidemic of disease
Increase in indigenous

Triage:

Triage is rapidly classifying injured on the basis of

- Severity of the injuries
- Likelihood of survived with prompt treatment

Aim: Right patient, Right place, Right time

Triage Category	**Priority**
Red (Immediate)	High priority
Yellow (Observation)	Medium priority
Green (Wait)	Ambulatory low priority
Black (Expectant) – Dead/Moribund	Least priority
White / Dismiss	

- **Black / Expectant**: They are so severely injured that they will die of their injuries, possibly in hours or days (large-area burns, severe trauma, lethal radiation dose), or in life-threatening medical crisis that they are unlikely to survive given the care available (cardiac arrest, septic shock, severe head or chest wounds); their treatment is usually palliative, such as being given painkillers, to reduce suffering.
- **Red / Immediate**: They require immediate surgery or other life-saving intervention, and have first priority for surgical teams or transport to advanced facilities; they "cannot wait" but are likely to survive with immediate treatment.
- **Yellow / Observation**: Their condition is stable for the moment but requires watching by trained persons and frequent re-triage, will need hospital care (and would receive immediate priority care under "normal" circumstances).
- **Green / Wait (walking wounded)**: They will require a doctor's care in several hours or days but not immediately, may wait for a number of hours or be told to go home and come back the next day (broken bones without compound fractures, many soft tissue injuries).
- **White / Dismiss (walking wounded)**: They have minor injuries; first aid and home care are sufficient, a doctor's care is not required. Injuries are along the lines of cuts and scrapes, or minor burns.

Disease outbreaks (Post disaster) – Acute Gastroenteritis (AGE) (Most common)
Acute Respiratory Illnesses
Vector borne disease (after some time)
Zoonosis (Leptosirosis, rickettsiosis, equine encephalitis, rabies etc.)

Most effective & practical strategy of disease prevention & control in post disaster phase- Providing Safe drinking water (5 lit/person/day) & proper excreta disposal

Vaccination - Typhoid / Cholera / Tetanus
- Not for general public (for health care workers & other services)
- Measles vaccine only recommended vaccine

Residual chlorine – Usually more than 0.7 mg/lit

Major disasters:
Bhopal Gas tragedy – 3rd Dec 1984
Union carbide – pesticide plant
Leakage of methyl isocyanate
3000 dead

Chernobyl nuclear power station – Soviet Union
26^{th} April, 1986
Radioactive material release
I^{131}, $Cs^{134\&137}$, Sr^{90}

Indian Meteorological Dept. – five centers
Mumbai, Chennai, Kolkata, Bhubaneswar, Vishakhapattanam

World disaster reduction day – 2^{nd} Wednesday of October

National Disaster Management Authority (NDMA)

- Apex Body for Disaster Management in India.
- On 23 December 2005, the Government of India enacted the Disaster Management Act, which envisaged the creation of the National Disaster Management Authority (NDMA), headed by the Prime Minister, and State Disaster Management Authorities (SDMAs) headed by respective Chief Ministers, to spearhead and implement a holistic and integrated approach to Disaster Management in India.
- Ministry of Home Affairs
- Toll free no. 1070

****

COMMUNICATION FOR HEALTH EDUCATION

Communication

- Two way process of exchanging or shaping ideas feelings & information.
- Goal – to bring about change in desired direction i.e.

Cognitive level - knowledge / Psychomotor level – skills / Affective level - attitude/behavior

Communication process

- Sender (Source)
- Message (content)
- Channel (medium)
- Receiver (audience)
- Feedback (effect)

Channels of communication

a) Interpersonal communication (IPC)
- face to face communication
- more persuasive & effective (direct & personal)
- influence decision of undecided persons
- creation of motivational effect

b) Mass Media
- Relatively large population – covered in short time
- One way channel – no feedback, less effective

c) Folk media (preserving cultural heritage)
- Folk dance, singing, drama, Burakatha in Aandra, Harrikatha, nautanki etc.

Types of communication

1) One way communication (Didactic method)
E.g. Lecture, TV, Radio, news print etc
Drawbacks- Knowledge – imposed
Learning – authorative
Less audience participation
No feedback
Does not influence behavior

2) Two way communication (Socratic Method)
- Active & democratic
- Influence behavior
- Audience can raise question
- Add opinions/information
- E.g. FGO, symposium, Panel discussion

3) Verbal communication & Non-verbal communication
5) Formal & informal communication
6) Visual communication – graphs/charts
7) Telecommunication & internet (point to point communication)

Barriers of communication

- Physiological – difficulty in hearing/expression
- Psychological – intelligence/emotions/language/comparison
- Environmental – noise/invisibility
- Cultural- illiteracy/customs/belief/attitude/level of knowledge/socioeconomic diff.

Health communication

Function

- Information – to provide scientific knowledge about health problem
- Education – to increase knowledge → attitude → behavior
- Counseling
- Motivation – awareness → interest → evaluation → decision making
- Persuasion – art of winning friends & influencing people
- Raising moral
- Health development
- Organization

Counseling

- Face to face communication through which person is helped to make decision or solve a problem.
- Given informed choice
- GATHER approach
  - G – Greet the client
  - A – Ask/ascertain – needs/problems
  - T – Telling different methods/options to solve problem
  - H – Help to make voluntary decision
  - E – Explain fully the chosen decision/action
  - R – Return for follow up visits
- Counselor should show- Patient/sympathy/understanding but should not sensitive

Health Education (HE)

A process aimed at encouraging people to want to be healthy, to know how to stay healthy, to do what they can do individually or collectively to maintain health & to seek help when needed.

Approaches to HE

1. **Regulatory approach** - Managed prevention – e.g. enforcement of law to change behaviour
2. **Service approach** - Providing services at door step (Failure – as they are not based on felt needed)
3. **Health education approach**
   HE → information → awareness → interest → evaluation → decision
   Informed person should be able to take decision
4. **Primary health care approach** - Community participation & involvement in planning & delivery services

Health Education	**Health Propaganda (publicity)**
Knowledge/Skills – Acquired	Instilled
Make people – Think	Discourage thinking
Reflective behaviors	Reflexive behavior
Approach to Reasons	Emotions
Behavior centered	information centered
Self reliant activity	Spoon feeding

Contents of Health Education

- Human biology

Principles of Health Education

- Credibility

- Nutrition
- Hygiene
- Family health
- Disease prevention & control
- Mental health
- Prevention of accidents
- Use of health services

- Interest
- Participation
- Motivation
- Comprehension
- Reinforcement
- Learning by doing
- Known to unknown
- Setting an example
- Good human relations
- Feedback
- Leader

Practise of Health Education

1) Audio-visual (A.V.) aids

Auditory – Radio, tape recorders, microphones, amplifiers, earphones

Visual – No projection required – Chalk-board, leaflets, posters, charts, flannel graphs, exhibits, models, specimen

Require projection – Slides/film strips

Combined- T.V. Cinema, Slide tape combination

Flip chart – series of charts (posters)

Flannel graph – rough flannel or khadi fixed over wooden board used to display

2) Methods in HE-

I) Individual approach-

Personal contact/Home visit/Personal letters

II) Group approach

Lecture

Demonstration

Discussion - FGD – Focused group discussion
- Panel discussion (Expert panel – discusses subject amongst them)
- Symposium (No discussion among members – experts)
- Workshop / Conference / Seminar / Role play

III) Mass approach - TV / Radio, Newspaper / Print material / Posters, Direct mailing / Internet Health exhibitions, Folk methods

Official agencies for HE

- At central level - General Health Education Bureau – in MOHFW New Delhi
- At state level - State Health Education Bureau - in Directorate of health services (DHS)
- Other official agencies
  Directorate of advertising & visual publicity (DAVP) / Press information Bureau (PIB) / Doordarshan (DD) & All India radio (AIR) / NGOs - Indian red cross
- International level-
  International union for Health Education (IUHE) HQ – Paris
  South East Asia Regional bureau of IUHE HQ – Bangalore
- WHO – Health education & health promotion division

Delphi method

- Systematic interactive forecasting method for obtaining consensus forecasts from a panel of independent experts.
- Conducted in 2-3 rounds
- Questionnaire – used
- Summary at end of each round with reasoning
- Participants are encouraged to revise their earlier answers in light of replies of other members of group till it converge towards the correct consensual answer
- Pre-defined stop criterion - No. of rounds / Achievement of consensus / Stability of results
- Most useful to arrive at single decision

HEALTH PLANNING & MANAGEMENT

HEALTH PLANNING

Planning includes the following steps - Plan formulation, Execution & Evaluation.

Purpose - To match with limited resources with problems

To eliminate wasteful expenditure or duplication of expenditure

To develop best course of action to accomplish defined objectives

Key terms used in health planning:

- **Health needs**: Deficiencies in health that call for preventive, curative, control or eradication measures.
- **Resources**: It implies the manpower, money, materials, skills, knowledge, techniques and time needed or available for the performance or support of action directed towards specific objectives.
- **Objective**: It is a planned end-point of all activities.
- **Target:** Usually refers to a discrete activity and permits a degree of achievement.
- **Goal**: Ultimate desired state towards which objectives and resources are directed.
- **Plan**: Blue print for taking action. Five major elements: objectives, policies, programmes, schedules and budget.
- **Programme**: Sequence of activities designed to implement policies and accomplish objectives.
- **Schedule**: is a time sequence for the work to be done.

- **Procedures**: A set of rules for carrying out work which, when observed by all, help to ensure the maximum use of the resources and efforts.
- **Policies**: They are the guiding principles stated as an expectation.
- **Planning cycle**:

Analysis of the situation: From the existing data available, analysis of the present situation.

Establishment of objectives and goals: Modern management techniques like input-output analysis & cost-benefit analysis are used for defining the terms.

Resource analysis: This implies the manpower, money, materials, skills, knowledge and techniques needed or available for the health programme.

Prioritization: order of magnitude or importance of the problems, resource and objectives. Main consideration is always financial.

Write up of formulated Plan: complete detailed report

Programming & Implementation: as per the detailed plan.

Monitoring & Evaluation: Based on the objective.

Steps in planning

1. Process of analyzing a system, or defining a problem,
2. Assessing the extent the problem exists as a need,
3. Formulating goals and objectives to alleviate or ameliorate those identified need,
4. Examining and choosing from alternative interventions strategies,
5. Initiating the necessary action for its implementation and
6. Monitoring the system to ensure proper implementation of the plan and
7. Evaluating the results of intervention in the light of the stated objectives.

Health planning in India (Committee reports):

1. Bhore committee, 1946:

- Health Survey and Development Committee.
- The committee started its work in 1943 and submitted its report in 1946.
- Recommendations:
  - Integration of preventive & curative services at all administrative levels.
  - PHC development in two stages: **Short term**: PHC for every 40,000 population with a secondary health centre as a supervisory and referral centre. **Long term** also referred as 3 million plans: Primary health units with 75 bedded hospital for every 10,000 to 20,000 population and secondary health units for 650 bedded hospitals, again regionalized around district hospitals with 2500 beds.
  - Three months of training in preventive and social medicine.

2. Mudaliar committee, 1962:

- Health Survey and planning committee
- Constitution of an all India health service on the patterns of IAS.
- Regional organization in each state between headquarter organization and district in charge of a Regional Deputy or Asst. Director – supervising 2 or 3 districts and health officers.

3. Chadah Committee, 1963:

- Constituted for the national malaria eradication programme – maintenance phase.

- Vigilance operations in NMEP should be the responsibility of the General Health Service – i.e. PHC at block level.
- One basic health worker per 10,000 populations - also work for family planning and collection of vital statistics.

4. Mukherje committee, 1965 & 1966:

- Delinking Malaria programme from General & family planning work.
- Basic health service – PHC level details were worked out.

5. Jungalwallah committee, 1967:

- Committee on integration of health services.
- Integration at all levels with common seniority, specialist pay and no private practice for doctors.

6. Kartar Singh committee, 1973:

- Committee on multipurpose workers.
- ANMs → female health workers and all others → male health workers.
- PHC for 50,000 population
- Male and female health supervisors for every 3-4 health workers

7. Shrivastava committee, 1975:

- Group on medical education and support manpower.
- Creation of voluntary health workers
- Development of "Referral services compelx".

8. Rural health scheme, 1977:

- ROME in medical colleges
- Voluntary health workers such as anganwadi etc.

9. Krishnan committee, 1983:

- Committee for primary health care services in urban slums.
- Also referred as Urban Revamping Scheme.
- Four types of health posts have been proposed

UHC	Population
Type A	< 5000
Type B	5000-10,000
Type C	10,000-25,000
Type D	25,000-50,000

10. Bajaj committee, 1986:

- Expert committee for health manpower planning production and management.
- Establishment of health science universities in various states and union territories.
- Vocationalization of education at 10+2 levels as regards health related fields with appropriate incentives.

National health policy, 2002: Goals

Goal	Target yr
Eradicate polio & yaws	2005
Eliminate leprosy	2005
Establish integrated system of surveillance, national health accounts & health statistics	2005
Increase state sector health spending from 5.5% to 7% of the budget	2005
Achieve zero level growth of HIV/AIDS	2007
Further increase state sector health spending to 8% of the budget	2010
Eliminate kala azar	2010
Reduce mortality due to TB, Malaria & other vector & water borne diseases by 50% o	2010
Reduce prevalence of blindness to 0.5%	2010
Reduce IMR to 30/100 and MMR to 100/Lakh	2010
Increase utilization of public health facilities from current level of <20% to > 75%	2010
Increase health expenditure by Govt as a % of GDP from the existing 0.9% to 2.0%	2010
Increase share of central grants to constitute at least 25% of total health spending	2010
Eliminate Lymphatic Filariasis	2015

HEALTH MANAGEMENT

Modern management methods

Based on behavioral sciences:

- Organizational design
- Personal management
- Communication
- Information systems
- Management by objectives

Quantitative methods:

- Cost-benefit analysis
- Cost-effective analysis
- Cost accounting
- Input-output analysis
- Systems analysis
- Network analysis – PERT/CPM
- Work sampling

Cost benefit Analysis: Measures and compare the costs and benefits of a proposed course of action in terms o f same units, usually monetary terms such as dollars.

Cost effectiveness analysis: Provides a way of comparing the cost of different proposed means to a particular end in terms of the most appropriate measurement units. Assesses the least costly means, of achieving fixed goal. Usually outcomes measurement used is DALY averted.

Cost accounting – cost control / planning & allocation of financial services / cost structure of program

Cost Utility analysis: A Form of economic evaluation in which the outcomes of alternative procedures or programs are expressed in terms of a single utility based unit of measurement. A widely used utility based measure is QALY.

System analysis – comparison of cost effectiveness of available alternatives

Network analysis PERT/CPM

PERT: programme evaluation and review technique – basically deals with constructing an arrow diagram of logical sequence and knowing about each and every sequence or pathway.

CPM: critical pathway method – the longest path in the network is called the critical path.

PPBS: planning-programming – budgeting system – objective related activities and programmes.
Zero base budgeting (ZBB) – is an approach to planning and decision-making which reverses the working process of traditional budgeting. In traditional incremental budgeting (Historic Budgeting), departmental managers justify only variances versus past years, based on the assumption that the "baseline" is automatically approved. By contrast, in zero-based budgeting, every line item of the budget must be approved, rather than only changes.[1] During the review process, no reference is made to the previous level of expenditure. Zero-based budgeting requires the budget request be re-evaluated thoroughly, starting from the zero-base. This process is independent of whether the total budget or specific line items are increasing or decreasing.

Advantages	**Disadvantages**
1. Efficient allocation of resources, as it is based on needs and benefits rather than history. 2. Drives managers to find cost effective ways to improve operations. 3. Detects inflated budgets. 4. Increases staff motivation by providing greater initiative and responsibility in decision-making. 5. Increases communication and coordination within the organization. 6. Identifies and eliminates wasteful and obsolete operations. 7. Identifies opportunities for outsourcing. 8. Forces cost centers to identify their mission and their relationship to overall goals. 9. Helps in identifying areas of wasteful expenditure, and if desired, can also be used for suggesting alternative courses of action	1. More time-consuming than incremental budgeting. 2. Justifying every line item can be problematic for departments with intangible outputs. 3. Requires specific training, due to increased complexity vs. incremental budgeting. 4. In a large organization, the amount of information backing up the budgeting process may be overwhelming.

Work sampling: systematic observation and recording of activities of one or more individuals, carried out at pre-determined intervals.

Manager's role or functions:
Traditionally a manager's function has been summarized as:

- P- Planning
- O- Organizing
- S- Staffing
- D - Directing
- CO- Coordinating
- R- Reporting
- B - Budgeting

Sources of power for manager:

- Legitimate – because of the hierarchical structure in an organization
- Reward & Punishment – because of the control over both.
- Referent – because of the technical qualification and experience.

Panchayati Raj:

A three tier structure of rural local self Government in India, linking the village to the district. Three institutions are:

- Panchayat at village level: Gram Panchayat, Gram Sabha & Nyay Panchayat
- Panchayat Samiti at block level or Janpada Panchayat

- Zila Parishad – at the district level or Zila Panchayat

Integrated Rural Development Programme (1978): to attack poverty in Rural areas.

Health sector planning:
Subsectors
- Water supply & sanitation
- Control of communicable disease
- Medical education, research & training
- Public health service
- Medical care including hospitals / dispensaries/ PHCs
- Family planning
- Indigenous system

***11th Five year plan (FYP) Achievements (2007-12)**

TABLE 20.1
Eleventh Plan Monitorable Goals and Achievements

S. No.	Eleventh Plan Monitorable Target	Baseline Level	Recent Status
1	Reducing Maternal Mortality Ratio (MMR) to 100 per 100000 live births.	254 (SRS, 2004–06)	212 (SRS, 2007–09)
2	Reducing Infant Mortality Rate (IMR) to 28 per 1000 live births.	57 (SRS, 2006)	44 (SRS, 2011)
3	Reducing Total Fertility Rate (TFR) to 2.1.	2.8 (SRS, 2006)	2.5 (SRS, 2010)
4	Reducing malnutrition among children of age group 0–3 to half its level.	40.4 (NFHS, 2005–06)	No recent data available
5	Reducing anaemia among women and girls by 50%.	55.3 (NFHS, 2005–06)	No recent data available
6	Raising the sex ratio for age group 0–6 to 935	927 (Census, 2001)	914 (census, 2011)

***12th FYP (2012-17)**
- To strengthen initiatives taken in the Eleventh Plan
- To expand the reach of health care and work towards the long term objective of establishing a system of **Universal Health Coverage (UHC)** in the country

Universal Health Coverage (UHC)
High Level Expert Group has defined UHC as follows:
Ensuring equitable access for all Indian citizens in any part of the country, regardless of income level, social status, gender, caste or religion, to affordable, accountable & appropriate, assured quality health services (promotive, preventive, curative and rehabilitative) as well as services addressing wider determinants of health delivered to individuals & populn, with the Govt being the guarantor & enabler, although not necessarily the only provider of health and related services.

Goals
- To reduce MMR to 100/100000 (212)
- To reduce IMR to 25/1000 (44)
- To reduce TFR to 2.1 (2.5)
- To reduce malnutrition among 0-3 yrs age children to 50% of present level

- Prevention and reduction of anaemia among women aged 15–49 years to 28% (55.3%)
- To raise sex ratio for age group 0-6 from 914 to 950
- Prevention and reduction of burden of CD & NCD (including mental illnesses) and injuries
- Reduction of poor households' out-of-pocket expenditure. (Increase in public health spending to 1.87% (1.04) of GDP by end of 12th Plan)

National Health Goals for Communicable Diseases (12th FYP)

- Tuberculosis - Reduce annual incidence and mortality by half
- Leprosy - Reduce prevalence to <1/10000 population and incidence to zero in all districts
- Malaria - Annual Malaria Incidence of <1/1000
- Filariasis - <1 per cent microfilaria prevalence in all districts
- Dengue - Sustaining case fatality rate of <1 per cent
- Chikungunya - Containment of outbreaks
- Japanese Encephalitis - Reduction in mortality by 30 per cent
- Kala-azar - Elimination by 2015 (<1 case per 10000 population in all blocks)
- HIV/AIDS - Reduce new infections to zero and provide comprehensive care and support to all persons living with HIV/AIDS and treatment services for all those who require it.

* *Reference: Planning commission, Govt. of India, Twelfth Five Year Plan (2012–2017):Faster, More Inclusive and Sustainable Growth document*

* **Recommendations of High Level Expert Group on Universal Health Coverage in 12th Five year plan (2012-17)**

1. Health Financing and Financial Protection:
Government should increase public expenditure on health from the current level of 1.2 per cent of GDP to at least 2.5 per cent by the end of the Twelfth Plan, and to at least 3 per cent of GDP by 2022. General taxation should be used as the principal source of healthcare financing, not levying sector specific taxes. Specific purpose transfers should be introduced to equalise the levels of per capita public spending on health across different states. Expenditures on primary healthcare should account for at least 70 per cent of all healthcare expenditure. The technical and other capacities developed by the Ministry of Labour for the RSBY should be leveraged as the core of UHC operations—and transferred to the Ministry of Health and Family Welfare.

2. Access to Medicines, Vaccines and Technology:
Price controls and price regulation, especially on essential drugs, should be enforced. The Essential Drugs List should be revised and expanded, and rational use of drugs ensured. Public sector should be strengthened to protect the capacity of domestic drug and vaccines industry to meet national needs. Safeguards provided by Indian patents law and the TRIPS Agreement against the country's ability to produce essential drugs should be protected. MoHFW should be empowered to strengthen the drug regulatory system.

3. Human Resources for Health:
Institutes of Family Welfare should be strengthened and Regional Faculty Development Centres should be selectively developed to enhance the availability of adequately trained faculty and faculty-sharing across institutions. District Health Knowledge Institutes, a dedicated training system for Community Health Workers, State Health Science Universities and a National Council for Human Resources in Health (NCHRH) should be established.

4. Health Service Norms:
A National Health Package should be developed that offers, as part of the entitlement of every citizen, essential health services at different levels of the healthcare delivery system. There should be equitable access to health facilities in urban areas by rationalising services and focusing particularly on the health needs of the urban poor.

5. Management and Institutional Reforms:
All India and State level Public Health Service Cadres and a specialised State level Health Systems Management Cadre should be introduced in order to give greater attention to Public Health and also to strengthen the management of the UHC system. The establishment of a National Health Regulatory and Development Authority (NHRDA) a, National Drug Regulatory and Development Authority (NDRDA) and a, National Health Promotion and Protection Trust (NHPPT) is also recommended.

6. Community Participation and Citizen Engagement:
Existing Village Health Committees should be transformed into participatory Health Councils.

7. Gender and Health:
There is a need to improve access to health services for women, girls and other vulnerable genders (going beyond maternal and child health).

Health care in India: the road ahead – CII and Mekinsey and Company in 2002
Confederation of Indian Industry (CII)

Summary of the report

1. The total healthcare market in India is expected to grow significantly and its contribution to the country's GDP will increase from 5.2% at present to 8.5% over the next ten years. This is because the expenditure on healthcare will double by the year 2012 and the healthcare spending is expected to increase from Rs.86, 000crore at present to Rs.200,000 crore in the next decade.
2. The largest component of healthcare spending and is expected to double from Rs. 69,000 crore to Rs.156,000 crore by 2012.
3. If health insurance cover becomes operative, the private spending will further go up by an additional Rs.39,000 crore.
4. Public spending could also double from Rs.17,000 crore if the government increases its spending level from the present 0.9% of GDP to the target level of 2%,
5. With the rise in lifestyle diseases such as cancer and cardiovascular, the spending pattern will change dramatically by 2012 with inpatient spending accounting for 47% of the private health care spending, up from the 39% at present.
6. The out patient spending which accounts for 61% of the private spending at present will decrease in terms of share but increase in absolute terms to Rs.74,000 corre.
7. The healthcare study also explains the current situation in the healthcare sector in India and has pointed out the poor performance of the sector in terms of coverage, purchasing and delivery in comparison to other developing countries such as Brazil, Thailand and Korea.
8. Citing an example, the study has pointed out that India has only 1.5 beds / 1000 people in contrast to the average of 4.3 beds / 1000 in other countries
9. In order to meet the growing demand of healthcare in the country, huge investments worth

Rs.100,000 crore to Rs.140,000 crore need to be made in the infrastructure for providing cost effective facilities in the next ten years. The bulk of the investments made will need to come from the private sector, the study has suggested.

10. To facilitate private investment into the sector and to increase its annual investment level from Rs. 4,000 crore to around Rs. 10,000 crore by 2012, the CII-Mckinsey report has urged the Government to offer and launch a set of initiatives.
11. An active government – industry association is required to for the growth and development of the healthcare sector, the CII-Mckinsey study has suggested.
12. The Indian healthcare Federation should work on a three-point agenda – creation and adoption of quality and accreditation standards for healthcare infrastructure and delivery, work with insurers to increase the penetration of health insurance and collaborate with the government on policy issues.

Millenium Developemnt Goals

- Sept 2000 – 189 countries representation meet at Millennium Summit in New York-
- Target year – **2015** (Baseline: **1990**)
- 3/8 goals, 8 /18 targets & 18/48 indicators – health related

Millennium Development Goals (MDGs)	
Goals and Targets	**Indicators for monitoring progress**
Goal 1: Eradicate extreme poverty and hunger	
Target 1.A: Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day	1.1 Proportion of population below $1 (PPP) per day 1.2 Poverty gap ratio 1.3 Share of poorest quintile in national consumption
Target 1.B: Achieve full and productive employment and decent work for all, including women and young people	1.4 Growth rate of GDP per person employed 1.5 Employment-to-population ratio 1.6 Proportion of employed people living below $1 (PPP) per day 1.7 Proportion of own-account and contributing family workers in total employment
Target 1.C: Halve, between 1990 and 2015, the proportion of people who suffer from hunger	1.8 Prevalence of underwt children under 5 yrs of age 1.9 Proportion of population below minimum level of dietary energy consumption
Goal 2: Achieve universal primary education	
Target 2.A: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling	2.1 Net enrolment ratio in primary education 2.2 Proportion of pupils starting grade 1 who reach last grade of primary 2.3 Literacy rate of 15-24 year-olds, women and men
Goal 3: Promote gender equality and empower women	
Target 3.A: Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015	3.1 Ratios of girls to boys in primary, secondary and tertiary education 3.2 Share of women in wage employment in the non-agricultural sector 3.3 Proportion of seats held by women in national

	parliament
Goal 4: Reduce child mortality	
Target 4.A**:** Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate	4.1 Under-five mortality rate 4.2 Infant mortality rate 4.3 Proportion of 1 year-old children immunised against measles
Goal 5: Improve maternal health	
Target 5.A: Reduce by three quarters, between 1990 and 2015, the maternal mortality ratio	5.1 Maternal mortality ratio 5.2 Proportion of births attended by skilled health personnel
Target 5.B: Achieve, by 2015, universal access to reproductive health	5.3 Contraceptive prevalence rate 5.4 Adolescent birth rate 5.5 Antenatal care coverage (at least one visit and at least four visits) 5.6 Unmet need for family planning
Goal 6: Combat HIV/AIDS, malaria and other diseases	
Target 6.A: Have halted by 2015 and begun to reverse the spread of HIV/AIDS	6.1 HIV prevalence among population aged 15-24 years 6.2 Condom use at last high-risk sex 6.3 Proportion of population aged 15-24 years with comprehensive correct knowledge of HIV/AIDS 6.4 Ratio of school attendance of orphans to school attendance of non-orphans aged 10-14 years
Target 6.B: Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it	6.5 Proportion of population with advanced HIV infection with access to antiretroviral drugs
Target 6.C: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases	6.6 Incidence and death rates associated with malaria 6.7 Proportion of children under 5 sleeping under insecticide-treated bednets 6.8 Proportion of children under 5 with fever who are treated with appropriate anti-malarial drugs 6.9 Incidence, prevalence and death rates associated with tuberculosis 6.10 Proportion of tuberculosis cases detected and cured under directly observed treatment short course
Goal 7: Ensure environmental sustainability	
Target 7.A: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources Target 7.B: Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss	7.1 Proportion of land area covered by forest 7.2 CO2 emissions, total, per capita and per $1 GDP (PPP) 7.3 Consumption of ozone-depleting substances 7.4 Proportion of fish stocks within safe biological limits 7.5 Proportion of total water resources used 7.6 Proportion of terrestrial and marine areas protected 7.7 Proportion of species threatened with extinction
Target 7.C: Halve, by 2015, the	7.8 Proportion of population using an improved

proportion of people without sustainable access to safe drinking water and basic sanitation	drinking water source 7.9 % of population using an improved sanitation facility
Target 7.D: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers	7.10 Proportion of urban population living in slums
Goal 8: Develop a global partnership for development	
Target 8.A: Develop further an open, rule-based, predictable, non-discriminatory trading and financial system Includes a commitment to good governance, development and poverty reduction – both nationally and internationally Target 8.B: Address the special needs of the least developed countries Includes: tariff and quota free access for the least developed countries' exports; enhanced programme of debt relief for heavily indebted poor countries (HIPC) and cancellation of official bilateral debt; and more generous ODA for countries committed to poverty reduction Target 8.C: Address the special needs of landlocked developing countries and small island developing States (through the Programme of Action for the Sustainable Development of Small Island Developing States and the outcome of the twenty-second special session of the General Assembly) Target 8.D: Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term Some of the indicators listed below are monitored separately for the least developed countries (LDCs), Africa, landlocked developing countries and small island developing States. Official development assistance (ODA)	8.1 Net ODA, total and to the least developed countries, as percentage of OECD/DAC donors' gross national income 8.2 Proportion of total bilateral, sector-allocable ODA of OECD/DAC donors to basic social services (basic education, primary health care, nutrition, safe water and sanitation) 8.3 Proportion of bilateral official development assistance of OECD/DAC donors that is untied 8.4 ODA received in landlocked developing countries as a proportion of their gross national incomes 8.5 ODA received in small island developing States as a proportion of their gross national incomes Market access 8.6 Proportion of total developed country imports (by value and excluding arms) from developing countries and least developed countries, admitted free of duty 8.7 Average tariffs imposed by developed countries on agricultural products and textiles and clothing from developing countries 8.8 Agricultural support estimate for OECD countries as a percentage of their gross domestic product 8.9 Proportion of ODA provided to help build trade capacity Debt sustainability 8.10 Total number of countries that have reached their HIPC decision points and number that have reached their HIPC completion points (cumulative) 8.11 Debt relief committed under HIPC and MDRI Initiatives 8.12 Debt service as a percentage of exports of goods and services
Target 8.E: In cooperation with pharmaceutical companies, provide access	8.13 Proportion of population with access to affordable essential drugs on a sustainable basis

to affordable essential drugs in developing countries	
Target 8.F: In cooperation with the private sector, make available the benefits of new technologies, especially information and communications	8.14 Fixed telephone lines per 100 inhabitants 8.15 Mobile cellular subscriptions per 100 inhabitants 8.16 Internet users per 100 inhabitants

HEALTH CARE DELIVERY

- **Medical care**: refers chiefly to the services that are provided directly by the physician or rendered as a result of physicians instructions.
- **Health care**: It is a public right. Encompasses all aspects of health. Medical care is a subset of health care.

There are three levels of health care:

- **Primary care level**: First level of contact with the health services where "primary health care" is provided. PHCs with their sub-centers through the MPWs, VHGs and trained Dais are responsible for this type of care.
- **Secondary care level**: first level referral care, provided by CHCs, District hospitals etc.
- **Tertiary care level**: more specialized level than secondary, usually provided by the apex institutes like medical college etc.

Comprehensive health care: concept was given by the Bhore committee in 1946. Also referred as

'womb to tomb' care.
Basic health care: term first used by UNICEF/WHO in 1965. Conceptually similar to comprehensive health care.
Primary health care: also referred as essential health care.

Primary Health Care: Alma Ata conference – 1978 [USSR]
Definition - Essential health care, based on practical, scientifically sound & socially acceptable methods & technology, made universally accessible to individuals & families in the community through their full participation & at a cost that community can afford.

Elements of Primary Health Care
- E-Education concerning prevailing health problems – Prevention & control
- L-Prevention and control of locally endemic diseases
- E-Provision of essential drugs
- M-Maternal and child health care, including family planning
- E(EPI) - Immunization against major infectious diseases
- N-Promotion of food supply and proper nutrition
- T-Appropriate treatment of common diseases and injuries
- S-An adequate supply of safe water and basic sanitation

Principles
- Equitable distribution
- Community participation
- Intersectional coordination
- Appropriate technology

4As – Hallmark of PHC- Affordability / Acceptability / Accessibility / Availability

Primary health care in India
Health centres:
Subcentre (SC)
- Population catered – 5000 (Rural/ Plain) / 3000 (Tribal)
- Staff = 3 (HW-M&F, Voluntary worker)
- Most peripheral & first point of contact between village & health services
- No. of SC in India (2011) -148124

Primary Health Center (PHC)
- Population catered – 30000 (Rural/ Plain) / 20000 (Tribal)
- Staff = 15
- CMO – 1-2 / HA- M & F / Health Educator / PHN / ANM / Lab. Technician / Pharmacist / Driver / Peon / Clerk / Sweeper
- Provision of 4-6 beds
- Referral center 6 SC → 1 PHC
- MO leader of team
- First point of contact between village & MO
- No. of PHCs (2011) – 23887

Functions of PHC:

- Medical care
- MCH including family planning
- Safe water supply and basic sanitation
- Prevention and control of locally endemic diseases
- Collection and reporting of vital statistics
- Education about health
- National health programmes as relevant
- Referral services
- Training of health guides, health workers, local dais & health assistants
- Basic laboratory services

Community Health Center (CHC)

- Population catered – 80000-120000
- Staff – 30-31
- Specialist – Medicine/Surgery/OBGY/Paeds
- 3 additional new posts – Ophthal /Anesthetist / Public health manager
- 1 CHC → 4 PHCs (Referral center)
- Bed strength = 30
- No. of CHCs (2011) – 4809

Health workers:

Village health guides:

Launched along with rural health scheme on 2nd October 1977. They are mostly women. The guidelines for their selection are:

- They should be permanent residents of the local community, preferably women
- They should be able to read and write, having minimum formal education at least up to VI standard.
- They should be acceptable to all the sections of the community and
- They should be able to spare at least 2 to 3 hours every day for community health work
- The training takes place at PHC for about 200 hours spread over 3 months. During the training Rs.200 is paid as stipend. Honorarium of Rs.50 per day is given to them.
- At present there are 3.23 lakh village health guides.
- Govt. does not train another VHG from the same village before 3 years.

Local dais: Training for 30 working days. Stipend Rs.300. training at PHC. On successful completion given DDK and certificate.

Anganwadi workers: ICDS worker, training for 4 months, honorarium of Rs.200-250 per month.

ASHA: Accredited Social Health Activists are community health workers instituted by the Government of India's Ministry of Health and Family Welfare (MoHFW) as part of the National Rural Health Mission (NRHM).

Health problems in India

- Communicable disease

- Non-communicable disease
- Nutritional problem
- Environmental sanitation problem
- Medical care problems
- Population problems

Population problems - India demographic profile at a glance

Criteria	Figures
Total population (2011)	1210 million
Crude birth rate (2010)	22.1*
Crude death rate (2010)	7.2*
Annual growth rate (2011)	1.6%
Population doubling time (at current growth rate)	30 years
Age at marriage, females (2010)	22.4 [NFHS 3]
Annual per capita income (2011)	Rs.60603

*SRS-2010

Communicable disease problem

- Malaria: 1.04 million cases with slide positivity rate of 2.32% (2005). Pf 0.47 million cases and API – 1.62/1000.
- Tuberculosis: about 40% population is infected, 1.5% have radiologically active disease and 0.4% are sputum positive. Official estimates suggest that we have 1.8 million cases out of which 0.9 million are sputum positive. There are about 3,70,000 deaths due to TB annually.
- Diarrhoeal diseases: Almost 7.1 lakh deaths annually.
- ARI: 0.98 million deaths in 2003, also 13.6 percent hospital admissions were due to ARI in paediatric wards.
- Leprosy: The prevalence of leprosy is about 0.84 per 10,000. India still accounts for about 47% of the total cases in the world. Also the proportion of infective cases is between 6-8 %
- Filaria: at risk population is about 420 million.
- HIV/AIDS: Estimated figures about 2.47 million in India (2006)

Nutritional problems

- PEM: The incidence of severe cases is 1-2% among the pre-school children. Majority are mild to moderate (80%).
- Nutritional anemia: 60-80% of pregnant women are anemic; 20-40% of the maternal deaths is attributed to anemia and about a half of the non-pregnant women and children are anemic.
- Low birth weight: 30% of the babies in India are LBWs
- Xerophthalmia: 0.04% of total blindness is attributed to Vitamin A deficiency.

Medical care problems:

Resources:

- Health manpower: This includes both professional and auxiliary health personnel who are needed to provide the health care. Auxiliary is a technical worker in a certain field with less than full professional training.
- Suggested norms for health personnel:

Category of personnel	Norms suggested	Present status
Doctors	1:3500	1:1500
Nurses	1:5000	1:1600

Health worker female & male	1:5000 (plain) & 1:3000 (hilly/ tribal area)	1:4821
Trained dai	One for each village	
Health assistant male & female	1:30,000 (plain) & 1:20,000 (tribal/ hilly area)	1:23986
Pharmacists	1:10,000	1:47445
Lab technicians	1:10,000	1:78684
ASHA	1:1000	

Health manpower in India: March 2011

Categories	Number in position
ANM / HW (F)	2.07,868
MPW (Male) / HW (M)	52,215
Health Assistant (F)	15,908
Health Assistant (M)	15,622
Medical officers (PHC)	26,329

INTERNATIONAL HEALTH

World health organization (WHO)

- Specialized, non political health agency of UN
- 7th April 1948
- HQ – Geneva
- Objective – Attainment by all people's of the highest level of health

Regions – 6 regions with Regional HQ

Region	Regional HQ
1) South East Asia (SEAR)	New Delhi (India)
2) Africa	Brazzaville (Congo)
3) America	Washington DC (USA)
4) Europe	Copenhagen (Denmark)
5) Eastern Mediterranean	Alexandria (Egypt)
6) Western pacific	Manila (Philippines)

- Broad areas of work of WHO-Directing & coordinating Authority on all international work
    1) Prevention & control of specific disease
    2) Development of comprehensive health services
    3) Family health
    4) Environmental health
    5) Health statistics
    6) Binomial research
    7) Health literature & Information
    8) Cooperation with other organizations

Structure

a) World health assembly (WHA)

- Health parliament
- Supreme governing body of WHO
- Meets annually – May
- Technical discussion – recent topics of public health importance
- Recently 63rd WHA – May – 2010
- Functions- To determine international health policy & programmes
  To review work of past year
  To approve the budget needed for next yr.
  To elect member states to designate a person to serve for 3 yrs on executive board & to replace retiring members

b) Executive board

- 30-31 members
- More than 3 from each region
- Technically qualified in field of health member
- Designated by country but do not represent country
- 1/3rd membership renewed every year
- Each member serves for 3 yrs
- Meeting – twice a year – Jan & May (after WHA)
- Function - to give effect to decision & policies of WHA

c) Secretariat

- DG – Director General
- 5 ADGs – Assistant DG
- Regional officer – Regional director, Technical & admin officer

WHO day theme

2001: Mental health: stop exclusion, dare to care
2002: Move for health
2003: Healthy environmental for children
2004: Road safety, No accidents
2005: Make every mother & child count
2006: Working together for health
2007: Invest in health. Build a safe future
2008: Protecting health from climate change
2009: Save lives, make hospitals safe in emergencies
2010: Urbanization & health (1000 cities/1000 live)
2011: Antimicrobial resistance: no action today no cure tomorrow
2012: Ageing & Health: Good health adds life to years
2013: Hypertension (High blood pressure)
2014: Vector-borne diseases (small creatures, big threat)

UNICEF-

- United Nation's International Children's Emergency fund – United Nation's Children's fund
- 1946 – to deal with rehabilitation of children in war ravaged countries
- HQ – New-York
- Regional office – New Delhi
- SCAR region – South Central Asian Region – India

- Services – Child health / Child nutrition / Family & child welfare / Education
- GOBI campaign-
  - G – Growth monitoring
  - O - Oral rehydration
  - B – Breast feeding
  - I – Immunization

UNDP - United Nation's Development Programme
- Main source of funds for technical assistance
- Basic objective is to help poorer nations develop their human & national resources.

UNFPA - United Nation's Fund for Population Activities
- Family planning programme of India

FAO - Food & Agricultural organization
- HQ - Rome
- Aims - To help nations raise living standards / improve nutrition of people in all countries / To increase efficiency of Farming, Forestry & Fishery / To better the condition of rural people
- Prime concern is to increase food production
- Freedom from Hunger Campaign (FFHC) – 1960 - to combat malnutrition & to disseminate information & Education
- Applied nutrition programmes

ILO - International Labour Organization **(**HQ – Geneva)

World Bank –
- HQ – Washington
- Gives loans for projects that will lead to economics growth

USAID – United Statics agency for International development

COLOMBO PLAN –
- Industrial & Agricultural development + Health promotion
- AIIMS – established – financial assistance from New Zealand
- Cobalt therapy units – Canada

SIDA - Swedish International Development Agency
- Assisting National TB control programme in India
- Procurement of X-ray units, microscopes anti-TB drugs

DANIDA - Danish International Development Agency
- Assistance for National Blindness Control Programme

Rockefeller foundation-
- Establishment of AIIH & PH, Kolkata (All India Institute of Hygiene & PH)

- Improvement of agriculture, family planning, rural training centres & medical education (PG institution / professional education / Research)

Ford Foundation-

- Development of rural health services & family planning
- NIHFW, New Delhi (NIHAE)

CARE - Cooperative for Assistance & relief every

- founded by North America
- ICDS – Nutrition programmes

International Red cross-

- Nonpolitical / non-official international humanitarian organization
- Henry Dunant – founder
- Natural disaster & rehabilitation work services to armed forces, to war veterans, disaster services, first aid nursing, health education & Maternal & child welfare

Indian Red cross-

- Service to military hospitals
- 3 objectives – improvement of health / prevention of disease / mitigation of suffering
- Also - Disaster services

Junior Red Cross

- Village uplift/first aid
- Anti epidemic work
- Building up international fraternity of youths

****

MOTHER AND CHILD HEALTH

Maternal and child health refer to the promotive, preventive, curative and rehabilitative health care for mothers and children.

MCH – Population – 57.5% • Women - 15 – 45 age – 22.2% • Children - < 15 yr age - 35.3%	Prenatal Period • Ovum - 0 -14 days • Embryo - 14 days - 9 wks • Fetus - 9th wk to Birth

Why MCH?

- Major consumers of health services
- Vulnerable or specific risk group
- Infant, child and maternal mortality-high
- Sickness/death - preventable

MCH problems

- Malnutrition
- Infection
- Uncontrolled reproduction

Antenatal Care:

Antenatal visits

o ***Ideally the mother should attend the antinatal clinic once a month during the first 7 months, twice a month***

during the next month, and thereafter once a week.

o A high proportion of mothers in India are from lower socioeconomic group and many of them are working women,

o Attendance at antenatal clinic mean loss of daily wages,

o Consequently, it is difficult for them to attend the antenatal clinic so often.

o In these cases, a **minimum of 4 visits** covering the entire period of pregnancy should be the target.

1st visit at 12 weeks or as soon as pregnancy is known.

2nd visit at 14-26 weeks.

3rd visit at 28-34 weeks.

4th visit at between 26 weeks and term

- Registration within 12 wks – is primary responsibility for ANM.
- Estimation of no. of pregnancies in area
  - Estimated no. of live births (LB) = CBR x Population / 1000
  - Expected no. of pregnant women = LB + 10% of LB (10% expected pregnancy loss)
- Investigations - Hb, CBC, Urine, Blood grouping, Stool, VDRL
  - IFA, TT, Health Education, Referral, nutrition Advice
  - IFA - Iron 100mg & Folic Acid – 0.5 mg one Tab daily for 100 days

If HIV testing needs to be done – then it should be done with voluntary counseling & testing.

Hepatitis B:

- Baby is infected when mother is carrier.
- Risk of transmission: 90% when mother has HBeAg, 20% when HBs Ag (+)
- Transmission through blood & genital secretions. Breast feeding not contraindicated.
- Prevention of Perinatal transmission – 0.5 ml HBIg with Hepatitis B vaccine within 24 hrs f/b 6,10 & 14 weeks
- Seroprophylaxis → 2 ml of specific anti – HBs γ-globulin
- Anti hepatitis B immunization

HIV

- Transmission - Mother to Child – 30%
- Virus isolated in breast milk also
- BCG is given to all new born unless specific contraindication that exists
- Prevention of Parent to child transmission – NACO – Drugs – Nevirapine 400 mgs stat to mother during delivery and 2 mg/kg body wt. single dose to infant.

High risk group	
• Age ≥ 30 years [elderly Primi] • Twins • Hydramnios • Elderly grand Multipara • Height ≤ 140 cm • Malpresentations • Preeclampsia, eclampsia • APH, threatened abortion • Anaemia	• Prolonged Pregnancy > 14 days EDD • Previous LSCS / Instrumentation (forceps or vacuum) • Previous still birth, IUD, manual removal of placenta • CVD, Renal disease, DM, TB, Liver disease • Treatment for infertility • ≥ 3 consecutive spontaneous abortions

- Prenatal advice

Diet-

Overall energy consumption – 60000 kcal

Pregnancy = +350 kcal
Lactation = Early +600 / Late +520 kcal
Normal wt. gain = 9-11 kg
Average Indian women = 6.5 kg
Calcium = 1200 mg/day
Iron = 35 mg/day (Lactation = 21 mg/day)
Vit A = 800 mg/day (Lactation = 950 mg/day)

Personal hygiene / Rest and sleep / Smoking and alcohol / Dental care / sexual intercourse / Drugs and radiation exposure

- Warning signs in Pregnancy
  - Swelling of feet
  - Fits
  - Headache
  - Blurring of vision
  - Bleeding, discharge PV

  } Features of eclampsia

- Specific Health Problems

  Anaemia - Premature birth, PPH, Puerperal sepsis, Thromboembolism

  Tetanus - 2 doses -16-20 wk / 20-24 wk, 2nd Dose 1 month before EDD

  Booster – if the gap between two pregnancies is less than 3 yrs (single dose)

  Congenital syphilis - Spontaneous abortion, still birth, perinatal death, mental retardation

  Treatment - PP – 6, 00,000 units- 10 days

  Infection to fetus - After 6 month of pregnancy

Congenital Rubella

Cataract, deafness, congenital Heart disease

Transmission risks: 1st trimester ~ 90% and fetus affected ~ 50 – 100%
2nd trimester ~ 33% and fetus affected ~ 20 – 30%
3rd trimester ~ 11% and fetus affected - Nil

Risk of malformation - 32% up to 16 weeks of pregnancy

Vaccination - all women of child bearing age.

Contraception – For 8 week after vaccination

Intranatal care

Aims of good intra-natal care

- Through asepsis
- Delivery with minimum injury to mother & infant
- Readiness to deal with complication
- Care of baby with delivery.

5 Cleans

- Clean surface
- Clean hands
- Clean cut
- Clean tie
- Clean cord

Elimination of Neonatal Tetanus

The goal of neonatal tetanus elimination is defined as a rate of less than 1 case per 1000 live births in every district.

In India, this goal is targeted to be achieved by 2009. Total cases = 734 (2011)

Classification of district / PHC by status of neonatal tetanus control

NNT	Incidence rate	TT2 coverage	Attended deliveries

High risk	> 1/1000 LB	< 70%	< 50%
Control	< 1/1000 LB	> 70%	> 50%
elimination	< 0.1/1000 LB	> 90%	> 75%

Mother to child transmission (TORCHS)

- Rubella- any trimester /MC & most serious- I
- Varicella - any trimester /MC & most serious- I
- Syphilis- any trimester/ MC- II late trimester/III
- Toxoplasmosis- any trimester/ MC-III / most serious I
- Herpes simplex- during delivery
- HIV – during delivery (30%) / BF (16%)
- Hepatitis B – 90% (HbeAg +ve) / 20 % (HbsAg +ve) / MC- III /BF
- Cytomegalovirus- Any trimester (MC- III)

Warning signs during delivery

- Sluggish pain or no pain after rupture of membranes
- Good pain after an hour but no progress
- Cord or hand prolapse
- Meconium stained liquor; slow irregular or excessively fast H.R.
- Excessive show / bleeding
- PPH
- Temp $>38^0$ C
- Placenta not separated in ½ hr

Postnatal care - 2 components – care of mother and care of newborn
Objectives

- To prevent complications
- To provide care for rapid restoration
- To check adequacy of BF
- To provide FP service
- To provide basic health education

Care of mother
PNC visits – within 48 hrs (2 days) / 7, 14, 28 & 42 days. (5 visits – at least 3-6 visits)
Contraceptive of choice during first 6 months after delivery – Copper – T / Conventional
Complications of post partum period:

- Puerperal Sepsis within 3 wks.
- Thrombophlebitis
- Secondary hemorrhage – 6 hr after delivery

Care of child:
Childhood is divided in to following age periods:

1) Infancy (up to 1 year of age) - 2.92%
    a) Neonatal period (1^{st} 28 days of life)
    b) Post neonatal period (28 day – 1 year)
2) Pre – school age (1-4 years) / Toddlers (12%)

3) School age (5-14 years)

Immediate care of newborn

- Clearing the airway
- Apgar score-

	0	1	2
Appearance (colour)	Blue/pale	Body pink Extremities blue	Complete pink
Pulse	Absent	< 100	> 100
Reflex	No	**G**rimace	Cry
Muscle tone	Flaccid	Some flexion at extremities	**A**ctive movements
R-Respiration	Absent	Slow irregular	Good crying

Total score = 10

0 - 3 = Severe depression / 4 – 6 = Mild depression / 7 – 10 = No depression (Score < 5 – prompt action)

- Care of the cord
- Care of eyes
- Care of skin
- Maintenance of body temperature
- Breast feeding.

Neonatal Screening (secondary level of prevention / Prescriptive screening)

- PKU – Guthrie's test (PUK , MSUD , galactosemia)
- Neonatal hypothyroidism – Radioimmunoassay of T4 / TSH
- Rh – incompatibility – Coomb's test
- Sickle cell anaemia & Hbpathies – (thalessemia,G-6PD deficiency)- Agar gel electrophoresis
- Congenital dislocation of hip (CDH) – Clinical examination

At risk infant

- Birth weight <2.5 kg
- Wt. < 70% of expected
- Twins
- Birth order ≥ 5
- Artificial feeding
- Failure to gain wt. During 3 successive months
- Children with PEM & diarrhea
- Working mother / 1 parent

Low Birth Weight (LBW)

- Birth wt. - single most important determinant of its chance of survival, healthy growth & development.
- Two main groups of LBW – Preterm & Foetal growth retardation (SFD)
- Countries where LBW prevalence less – Preterm LBW is major cause
- In India – Fetal growth retardation major cause (high prevalence) – B.wt < 10^{th} percentile
- Target birth wt. at least 2.5 kg. for 90 % of HFA by 2000 AD / < 2.5 kg in less than 10 % - target HFA 2000AD
- Internationally, Birth wt. within 1^{st} hr. of life - < 2.5 kg. (2499 gm)→ LBW

- LBW = live born babies with Birth wt. < 2.5 kg X 100
  Total no. of LB
  (Based on measurement on at least 500 born newborn babies)
- Incidence - World – 14 % / **India - 28 %**
- India-Mean B.wt. 2.8 kg (2.7 – 2.9)
- **Risk factor**: Malnutrition / Infection / Unregulated fertility
- **Kangaroo Mother Care -** Introduced in Columbia in 1979 by Dr. Hector Martinez and Dr. Edzar Ray.
  Four components of KMC
  - Skin to skin positioning of a baby on mother's chest
  - Adequate nutrition through BF
  - Ambulatory care as a result of earlier discharge from hospital
  - Support for the mother & her family in caring for the baby
- **Prevention**
  Direct intervention – ↑ food intake / controlling infection / early diagnosis & treatment medical disorders
  Indirect intervention - Family planning / avoidance of smoking / improved sanitation improved nutrition & health of young girls.
- **Treatment -** Incubatory care / Feeding / Prevention of infection
- **Leading cause of death**- Atelectesis / Malformation / Pulmonary hemorrhage / Intracranial hemorrhage / Pneumonia & other infections

Breast feeding:

- Exclusive BF – 6 months.
- BF continued – min for 2 yrs.
- Colostrum – First milk / Immune milk - all five Immunoglobulin present
- Mean output of breast milk per day (ml) is max. - Towards end of first half of lactation (5 – 6 months)
- Average – Indian mother 450 – 600 ml / day
- Few occasions where BF might harm –
  Infants with galactosemia
  Mother with untreated pulmonary TB
  Mother on immunosuppressant drugs
  Mother with exposure to heavy metal
  Mother HIV +ve
  Mother using harmful drugs like cocaine, amphetamines

	Cow's milk	Human milk (100gm)
Lactose (gm)	4.4	7.4
Proteins (gm)	3.2	1.1
Fats (gm)	4.1	3.4
Calcium (mg)	120	28
Iron (mg)	0.2	1.0
Water (gm)	87	88
Energy (Kcal)	67	65 (70 Kcal)

Human milk - rich in carbohydrates (lactose), iron & water content
Human milk protein – Cystine & Taurine

Human milk is rich in Vit. A, C, & D, rich in Cu, cobalt, selenium
Richer in iron & high bioavailability less sodium.
Cow's milk – rich in fats, proteins, calcium & energy content
Cow's milk fats – High level of PUFA, Linoleic & ά – Linolenic acid

- Fat, Protein & Energy content: Buffalo > Cow > Human milk
- Lactose: Buffalo < Cow < Human milk
- Caesin ratio in milk – 7:3

Artificial feeding

Principles – Infant

100 kcal energy / kg body wt/day (150ml of milk / kg / day)
Proteins – 2 gm/kg – 1st 6 months
1.5 gm/kg – end of 1 year (13-14 gm/day)
Carbohydrates – 10 gm/kg body wt

After 4 months – undiluted boiled & cooled milk
Frequent intervals 6-8 times/day
Older baby 5 times a day
During illness increased calorie intake

Infant milk substitutes, Feeding bottles & Infant food (Regulation of production, supply & distribution) Act – 1992
Infant milk substitutes, Feeding bottles & Infant food (Regulation of production, supply & distribution) Amendment Act – 2003

Goals for year 2007

- Reduce prevalence of underwt. children from current 47% to 40% (47% → 40%)
- Reduce severe under-nutrition in 0-6 yrs children by 50%
- Increase early initiation of BF from 15.8% → 50%
- Enhance exclusive BF for 6 mths from 55.2% → 80%
- Enhance complementary feeding at 6 mths from 33.5% → 75%

National guidelines in Infant & Young Child feeding (IYCF)

- Exclusive BF for 6 mths
- Complementary feeding / Weaning at 6 mth.
- Continued BF upto 2 years

Baby Friendly Hospital Initiatives (BFHI)

WHO & UNICEF initiatives to promote proper infant feeding practices starting at birth
Ten steps – Hospital must fulfill

- Help mother to initiate BF within first hours of birth in normal delivery & 4 hours following Caeserian section
- Encourage BF on demand
- Allow mothers & infants to remain together for 24 hours a day. – Rooming in
- Give newborn infants, no food or drinks other than breast milk unless medically indicated. Exclusive BF – 6 months
- No advertisement, promotional material or free products for infant feeding

- Show mother how to breast feed & how to maintain lactation even if she is separated from her infants.
- Give no artificial teats or pacifiers to breast feeding infants
- Encourage mothers to assist each other & to develop BF support group. Nursing staff should be available to counsel family & mother in support of BF.
- Have a return BF policy that is routinely communicated to health care staff.
- Train all health care staff in skills necessary to implement this policy.

Measuring the baby:

- Birth weight should be measured within 1st hour. Salter scale used (nearest 100g)
- Length - Infantometer (nearest 0.1cm)
- Head circumference – occipito-frontal diameter

Growth & Development

- Best single parameter for assessing growth: Weight for Age
- Baby weight Doubles - 5 months / Triples - 1 year.
- Length: At birth - 50 cm. 1yr. - 75 cm. (Double by 4-5 yrs age)

Weight monitoring

- Monthly from birth 1 yr, every two months during second yr, and every 3 monthly till 5yrs of age.
- Done by using growth charts

Growth charts

- WHO prototype – 2 curves upper reference curve represents the media (50th percentile) for boys and the lower reference curve the 3rd percentile for girls
- 3rd percentile corresponds approx. to 2 SD below the media of the weight foe age reference curves.
- Growth chart used by GOI
  - 4 reference curves
  - Topmost curve corresponds to 80% of media (50% percentile of WHO standard)
    - Lower lines represent 70, 60, 50% of the standard
  - Classification of malnutrition
    - 80-70% mild (first degree) MN
    - 70-60% moderate MN
    - < 60% - third degree or severe MN
    - < 50% - Grade IV
- New standards generated for age 0-60 months: Percentiles and Z-score for length/height-for-age, weight-for-age, weight-for-height, weight-for-length and BMI-for-age
- India has adopted new WHO child growth standards (2006) in 2009 for NRHM + ICDS
  - Direction of growth is MORE IMPORTANT than position of dots
  - *Zones in the growth chart:*
    - Normal zone (weight-for-age)
    - Under-nutrition: Below – 2SD
    - Severe under-weight zone: Below – 3SD

Growth chart / Joint *"Mother and Child Protection Card"* provides space to record:

- Family Identification and registration
- Birth record
- Pregnancy record
- Institutional identification
- Care in pregnancy
- Delivery Preparation
- Registration in Janani Suraksha Yojana (JSY)
- Immunization
- Breast feeding
- Supplementary foods introduction
- Milestones
- Birth spacing (Contraception)
- Reasons for Special care

Under five clinic: 5 components

- Care in illness
- Preventions care → Immunization, nutritional **s**urveillance, Health check up, ORS
- Family Planning
- Growth monitoring
- Health education to mother

Child labour (prohibition and regulator) act 1986- below 15 children
Child Marriage restraint act, 1978
Child guidance clinic – deal with children or adolescents who for one reason or other , are no fully adjusted to their environment (juvenile delinquency)

Policies for children in India	**Rights of the child**
National policy for children, 1974 National policy on education, 1986 National children fund, 1979 National health policy, 2002 National charter for children, 2003 Commission for protection of child Right act, 2005 National plan of action, 2005 Integrated child protection scheme, 2009-10	Article 24-prohibits employment of children below age of 14 in factories Article 39-prevents abuse of children in tender age Article 40 provides for free and compulsory education for all children until they complete the age of 14 years.

MCH – current level of achievements (2010)

A) FP indicators-

- CBR – 22.8 per 1000
- TFR – 2.6
- Couple protection rate – 40% (2011)

B) Morality indicators

- IMR – 48/1000
- NMR – 32/1000 (2007)
- MMR – 212/100000 (2007-09)
- USMR – 63/1000

C) Services - % coverage

- Infants (fully immunized) – 77.3% (2011)
- Measles – 74%
- DPT3/OPV3 – 72% / 70%
- BCG – 87%
- HBV – 37%
- Pregnant women – TT – 87%
- ANC visits – at least one – 75%
  At least four – 51%
- Institutional deliveries – 47%

- Deliveries by trained personal – 53%

D) Prevalence of LBW – 28%

Indicators of MCH

Maternal mortality Rate (MMR)

$$MMR = \frac{\text{Total no. of female deaths due to c/s of Pregnancy, childbirth or within 42 days of delivery from "puerperal causes" in an area during a yr}}{\text{Total no. of live births in same area \&yr}} \times 1000 \text{ or } 100000$$

- Late maternal death - > 42 days but < 1 yr of delivery
- Incidence- World – 210/100000 (287000 deaths/yr)
  India – 212/100000 (2007-09) (56000 per year)
  (Assam – 390 / UP – 359 / Kerala – 81)
- Reflects overall effectiveness of health system / quality of maternity services
- Lifetime chances of maternal death – 1 in 180 / India – 1 in 170
- RHIME – new method included in Sample Registration System (SRS) - Representative, Resampled, Routine household interview of mortality with medical evaluation – Verbal autopsy
- MDG – 5 – Reduce Maternal mortality by $3/4^{th}$ (2015)
- Approaches for measuring maternal mortality
  Civil registration system
  Household survey
  Sisterhood methods
  Reproductive age mortality studies
  RHIME (Verbal autopsy)
  Census
- Causes-

  Hemorrhage (38%) (MC)
  Sepsis (11%)
  HT disorder (5%)
  Obstructed labor (5%)
  Abortion (8%)
  Other conditions (34%) (Anaemia - 19%)

There are 3 Es to reduce maternal mortality:
E1- Essential Obstetric Care for all
E2- Early detection of complications
E3- Emergency services for those who need it.

Mortality in Infancy & childhood

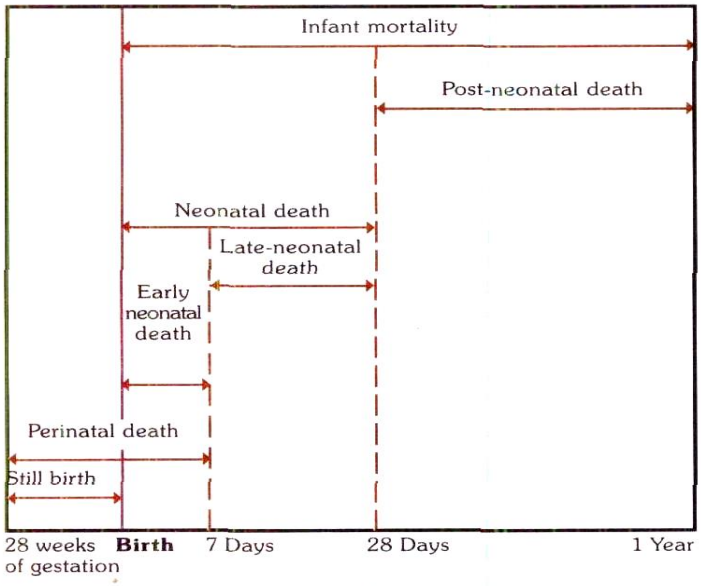


FIG. 9
Mortality in and around infancy

Stillbirth rate

- Foetus born dead, > 500 gm birth wt & gestational period – 22 weeks
- For international comparison, Birth wt. ≥ 1000gm & GA ≥ 28weeks
- Stillbirth rate =
  Foetal deaths weighing over 1000 g at birth X 1000
  Total live + SB weighing >1000 g at birth
- India – 7/1000 (SRS-2010) (High – Karnataka-14, Chattisgarh-12 / Low - Bihar & Jharkhand-1)

Perinatal mortality rate (PNMR)

- Late foetal deaths (SB) + early neonatal deaths – Perinatal deaths
- 8th revision of ICD - Perinatal period 28 wks to 7 days after birth (9th & 10th revision)
- Birth wt. ≥ 1000gm / GA ≥ 28 weeks / Body length (crown to heel) ≥ 35cm

$$\text{PMR} = \frac{\text{Late foetal deaths (28 wks gestation \& more) + Early neonatal deaths (1st wk) in one year}}{\text{Live births in the same year}} \times 1000$$

- For international comparison - > 1000gm
- PMR – 32/1000 LB India. (SRS-2010)
- Low-Kerala (12) /High – MP (42), Odisha (41)

Neonatal mortality Rate (NMR)

- Indicator of both maternal & newborn factors
- Endogenous factors (Low birth wt. & birth injuries)

$$\text{Neonatal mortality Rate (NMR)} = \frac{\text{No. of deaths of children under 28 days of age in a year}}{\text{Total live births in the same year}} \times 1000$$

- Causes-
  - LBW & prematurity (MC)
  - Birth injury & difficult labor
  - Sepsis
  - Congenital anomalies
  - HDN
  - Condition of placenta & cord
  - Diarrhoeal disease
  - ARI
  - Tetanus
- **NMR in India – 33/1000** (SRS-2010)
- Lowest – Kerala (7) & Highest – MP (44) / Odisha (42)
- Early NMR in India – 25/1000 (SRS-2010)
- Lowest – Kerala (5) & Highest – MP (34) / Odisha (33)

Neonatal mortality – most difficult part of IMR to alter MCC of NMR – Preterm birth MCC – Early NMR – Prematurity & cong. anomalies Late NMR – Infections ((diarrhea/Tetanus) NMR Boys > girls

Post – neonatal mortality Rate (PNMR)

- Exogenous factors (Environmental & social)

$$\text{Post – neonatal mortality Rate (PNMR)} = \frac{\text{No. of deaths of children between 28 days \& one year of age in a given yr}}{\text{Total live births in the same yr}} \times 1000$$

- India - 14/1000 (SRS-2010)
- Lowest – Kerala (6) / Highest – Assam (25), Odisha (19)
- Causes
  - Diarrhoeal disease (MC)
  - ARI
  - Other communicable disease
  - Malnutrition
  - Congenital anomalies
  - Accidents

Infant mortality Rate (IMR)

- $1/5^{th}$ (18.5) of all deaths
- Indicator of health status of community
- Level of living & effectiveness of MCH service (Socioeconomic development)

$$\text{IMR} = \frac{\text{No. of deaths of children less than 1 yr of age in a year}}{\text{No. of live births in the same year}} \text{ X } 1000$$

- **India – 47/1000 (2010)** Low - Kerala (13) / High – MP (62), Odisha (61)
- Causes –

Prematurity & LBW (51%)
ARI (17%)
Diarrhoea (4%)
Congenital malformations (5%)
Cord infection (2%)
Birth injury (3%)
Unclassified (18%)

- MCC – in India – LBW & prematurity
- MCC – in world – Pneumonia

Target for IMR	
HFA 2000 AD-	IMR < 60/1000 (2000)
NHP 2000 / NPP 2002	IMR < 30/1000 (2000)
12th IYP (2012-17)	IMR < 25/1000
MDG 4	Reduce child mortality (27)

Child death rate (1-4 yr mortality rate)

- More refined indicator of social situation than IMR
- Second year of life – highest risk (50% of all deaths)
- Child death rate (1-4 yr mortality rate) =

$$\frac{\text{No. of deaths of children aged 1-4 yrs during a year}}{\text{Total no. of children aged 1-4 yrs at the middle of the year}} \times 1000$$

- Leading causes-

Developing countries	**Developed countries**
• **Diarrhoeal diseases**	• **Accidents**
• ARI	• Congenital anomalies
• Malnutrition	• Malignant neoplasms
• Infectious diseases	• Influenza
• Other febrile illnesses	• Pneumonia
• Accidents & injuries	

Under 5 mortality rate (Child mortality rate)

- India – 59/1000
- Single MCC – Pneumonia (18%)
- Causes –

Neonatal causes (40%)
ARI (14%)
Diarrhoeal disease (11%)
Malaria (7%)
Measles (1%)
HIV/AIDS (2%)
Injuries (5%)
Other causes (18%)

Under 5 mortality rate (Child mortality rate)

$$= \frac{\text{No. of deaths of children < 5yrs age}}{\text{No. of LB in same year}} \times 1000$$

Under 5 – specific death rate

$$= \frac{\text{No. of deaths of children < 5yrs age}}{\text{Total population of children < 5 yrs age}} \times 1000$$

Under – 5 – Proportionate mortality rate

$$= \frac{\text{No. of deaths of children < 5yrs age}}{\text{Total no of deaths}} \times 1000$$

Child survival index =

$$\frac{1000 - \text{Under 5 mortality rate}}{10}$$

India – 94.1% (2008)

MCH programmes in India

- 1952-Family planning programme
- 1961-Dept.of Family planning created
- 1971-MTP act
- 1977-Renaming of FP to family welfare
- 1978-EPI
- 1985-UPI+ORT
- 1992-CSSM
- 1996-Target free approach
- 1997-RCH 1
- 2005- RCH 2 / NRHM
- 2007 - IMNCI

Milestones in Child Survival Programmes in India

- **1992 – Child Survival and Safe MotherhoodProgramme (CSSM)**
- **1997 – RCH I**
- **2005 – RCH II**
- **2005 – National Rural Health Mission**
- **2013 – RMNCH+A Strategy**
- **2013 – National Health Mission**
- **2014 – India Newborn Action Plan (INAP)**

India Newborn Action Plan (INAP): Launched : **September 2014**

- The India Newborn Action Plan (INAP) is India's committed response to the Global Every Newborn Action Plan (ENAP), launched in June 2014 at the 67th World Health Assembly, to advance the Global Strategy for Women s and Children's Health
- Builds on existing commitments under the National Health Mission and 'Call to Action' for Child Survival and Development
- Aligns with the Global Every Newborn Action Plan (ENAP); defines commitments based on specific contextual needs of the country
- Aims at attaining **Single Digit Neonatal Mortality Rate by 2030,** five years ahead of the global plan
- Emphasizes strengthened surveillance mechanism for tracking stillbirths
- Focuses on ending preventable newborn deaths, improving quality of care and care

beyond survival

- Prioritizes those babies that are **born too soon, too small, or sick**—as they account for majority of all newborn deaths
- Aspires towards ensuring equitable progress for **girls and boys, rural and urban, rich and poor, and between districts and states**
- Identifies major guiding principles under the overarching principle of Integration: **Equity, Gender,Quality of Care, Convergence, Accountability, and Partnerships**
- **Defines six pillars** of interventions:

  - Pre-conception and antenatal care;

  -Care during labour and child birth;

  - Immediate newborn care;

  -Care of healthy newborn;

  -Care of small and sick newborn; and

  -Care beyond newborn survival
- Serves as a framework for states/districts to develop their own action plan with measurable indicators.

Reproduction & Child Health Program

RCH I: This program started in 1997 -05,

RCH II: stated to start from 2006.

- Need based
- Client centered
- Demand driven
- High quality
- Integrated services – Fertility regulation , Maternal & Child health Reproduction health

The paradigm shift in RCH

Item	Previous approach	New approach
Goal	Two child norm	Enable clients to meet their goals
Approach	Top down, centralized	Bottom up, decentralized, driven by client needs
Service	Mainly family planning	Full range of MCH care
Quality	Not cared	High quality
Attitude to client	Motivation , persuade	Listen ,assess need, inform and advice
Performance monitoring	Targets	Quality of care, client satisfaction, coverage measures
Accountability	To bureaucracy	To client and community

CSSM + STD + RTI + Adolescent health

1. Community Need Assessment Approach (Target Need Approach)
2. Decentralizing Participatory Planning

Essential Components

- ANC, INC, PNC Care
- Safe Abortion
- STI /RTI Management
- Vaccine Preventable Diseases – Prevention & Management
- Essential Newborn Care
- ARI / Diarrhea

Categorization of District
=>Crude birth rate
- Female literacy rate
- Total fertility rate
- Percentage of ANC registration
- Percentage of institutional deliveries

Category A-58 Districts => MCH+FP+STI
B-184 Districts => MCH+FP
A-265 Districts => Home Based MCH Care

RCH 1 interventions in all districts

- Child survival strategies – immunization, Vit A, ORT, ARI control
- Safe motherhood strategies - ANC, TT, safe delivery , anaemia control
- TFA – target training at all levels
- RCH package for urban slums, tribal areas
- District sub projects under local capacity Enhancement
- RTI/STI clinic district- where not available
- Safe abortion facility at PHC – equipment / contractual doctors
- Community participation
- Adolescent health and reproduction hygiene

RCH 1 interventions – Selected States / Districts

- Screening & treatment of RTI/STI at sub divisional level
- Emergency obstetric acre at selected FRUs by providing drugs
- Essential obstetric care by providing drugs and PHN/staff nurse at PHCs
- Additional ANM at sub center in the weak districts
- Improve delivery services, emergency care – provision of equipment kits, IUD insertions, ANM kits at Subcentres
- Facility of referral transport for pregnant women during emergency to the nearest referral centre through Panchayat in weaker districts

Drug and equipment kits

- At subcentre level - Drug kit A,B. Mid wifery Kit, equipment kit – Kit C
- At PHC level - PHC equipment kit – Kit D
- At CHC/FRU level - Kit E- Kit P

Kit A Contents	**Kit B Contents**
ORS -150	Tab methyl ergometrine maleate (0.125 mg) – 500
IFA Large – 15000	**Tab PCM(500) – 500**
IFA Small – 13000	Inj methyl ergometrine(100)- 300
Vit. A- 6 Bottles 100ml	Dicylomine HCL(10)- 250
Tab Cotrimoxazole (Paeds) – 1000	Chloroamphenicol – eye oint 50

	Ointment povidone iodine – 5 tubes Cetrimide Powder – 125 gm

RCH II

- Proposed time period 1st April '05 to 31st of March '10
- Focus of the programme to reduce the Maternal & Child Mortality & Morbidity with emphasis on rural health care States requested to make their own PIP
- The Immediate adjectives of RCH programme are to improve routine immunization coverage, reduce the unmet need for contraception.
- The medium term objective as outlined in NPP 2000, is to bring TFR to replacement level by 2010. (TRF 2.1, NRR 1, CPR 60)
- The long term objective is to achieve a stable population by 2045.

- Specific Objectives in the context of eleventh five – year plan NPP 2000 are:
  Reduce the decadal rate of population growth from 21.34%(1991-2001) to 16.2%(2001-2011)
  Raising sex raton (0-6 yrs) from 927 to 935 by 2011-12 and 950 by 2016-17.
  Improve full antenatal care coverage to 89% in 2010.
  Improve coverage of fully immunized children to 100% in 2010

Packages for Mothers: Essential Obstetric for all

- Early registration of pregnancy
- Three or more antenatal checkup during pregnancy
- Anemia prophylaxis and treatment
- Two doses of tetanus toxoid or a booster
- Skilled care at birth: Institutional deliveries , 5 cleans
- Birth spacing and birth limiting to avoid pregnancies before 20 yrs and after 30 yrs. Birth interval to be least 3 yrs.
- Home based postnatal care along with care of new born: This will be provided through TBAs, AWWs, and link workers. These workers will visit on days 1, 2. 7. 14 and 28.

Training of MBBS doctors in Anesthetic Skills for EM OBS Care at FRUs:18 weeks training programme

Obstetric Management Skills: Training of MBBS doctors in obstetric Management skills / FOGSI training for 16 weeks in all obstetric management skills

Settings up of Blood Storage Centres (BSC) at FRUs

Developing a cadre of Community Level Skilled Birth Attendant

- Training in midwifery for one year
- To provide maternal care at the community level
- Selected from the community
- Serve in the same community for a minimum period of three years
- They will be given stipend for the training period and hostel facility will be provided at ANM training centers

Janani Suraksha Yojana

- Modification of National Maternity Benefit Scheme
- 100% centrally sponsored scheme
- **Objectives -** Reduce in MMR & IMR / Focus on institutional Delivery in BPL families
- **Features**

  Encouraging Small Family Norms
  Provision for Caesarean Section
  Encouraging Tubectomy / Laparoscopy
  Trainee TBA to be Effective Link Between Field Level Health Functionary & the BPL Women
  Payment of incentive to Dai/ASHA

Eligibility for Cash assistance

LPS states	All pregnant women delivering in government health centres like SC/PHC/CHC/FRU/general wards of district and State hospitals or accredited private institutions.
HPS states	BPL pregnant women, aged 19 years of above.
LPS and HPS	All SC and ST women delivering in a government health centre like SC/PHC/CHC/FRU/general wards of district and state hospitals or accredited private institutions.

	Rural area			Urban area		
Category	Mother's package	Package to accredited worker	Total	Mother's package	Package to accredited worker	Total
LPS	1400	600	2000	1000	200	1200
HPS	700	------	700	600	-------	600

JANANI-SHISHU SURAKSHA KARYAKRAM (JSSK):

- Government of India decided to launch the Janani-Shishu Suraksha Karyakram (JSSK), a new national initiative, to make available better health facitlies for women and child.The new initiatives provide the following facilities to the pregnant women
- - All pregnant **women delivering in public health** institutions to ***have absolutely free*** and no expense delivery, including **caesarean section**.
- The entitlements include free drugs and consumables***, free diet upto 3 days during normal delivery and upto 7 days for*** **caesarean** ***section,*** free diagnostics, and free blood wherever required.

- This initiative would also provide for **free transport from home to institution**, between facilities in case of a referral and drop back home. Similar entitlements have been put in place for ***all sick newborns accessing public health institutions for treatment till 30 days after birth.***

Navjat Shishu Suraksha Karyakram (NSSK)(Page:423)

NSSK is a programme aimed to train health personnel in basic newborn care and resuscitation. It has been launched to address care at birth issue i.e. prevention of hypothermia, prevention of infection, early initiation of breast-feeding and basic newborn resuscitation. The objective of the new initiative is to have a trained health person in basic newborn care and resuscitation unit at every delivery point

Vande Mataram Scheme

- PPP with the involvement of FOGSI and Private Clinics
- Aim: To reduce the maternal mortality and morbidity of the pregnant mothers by involving and utilizing the vast resources of specialists / trained work force available in the private sector
- Provide free ANC and postnatal check, counseling on nutrition, breastfeeding, spacing of birth etc.
- Any OBGY specialist, maternity home, nursing home can volunteer
- IFA, oral pills, TT, injections etc. provided by the respective DMO
- Vande mataram logo

Safe abortion services

- Medical method of abortion – early pregnancy termination – Mifepristone (RU 486) + Misoprostol
- Recommended upto 7 weeks (upto 49 days) of amenorrhea in a facility with provision of safe abortion services and blood transfusion
- MVA – facility in PHC

Special Schemes:

Schemes launched in RCH Phase 1 and continued in phase 2 :

1. Contractual staff
2. Safe motherhood consultant scheme
3. RCH camps
4. Traditional birth attendants

Imp: Permit ANMs to administer obstetric first aid. They have ben permitted to give Inj. Oxytocin, Inj Magnesium Sulphate, Misoprostol (Oral), ampicillin (oral), Inj gentamicin, and oral metronidazole. They also have been permitted to start 4 Infusion in an emergency.

Referral Unit (FRU):

It is a district or sub divisional hospital or a CHC which has facilities for obstetric surgery, blood transfusion, anesthesia, specialist pediatric care, Operation Theater, and required equipment. This

center also has facilities for MTP, tubectomy, vasectomy, and paediatric care for high risk neonates and other severe problem of early childhood

Integrated Management of Neonatal and Childhood Illness (IMNCI)

The principles of IMNCI guidelines are:

- All sick young infants aged upto 2 months must be examined for signs of **possible serious bacterial infections/ jaundice** which indicate the need for immediate referral or admission to a hospital.
- All sick children must be routinely assessed for major symptoms (for young infants up to 2 months: diarrhea; and for children age 2 months up to 5 yrs: cough or difficult breathing, diarrhea, fever and ear problem). They must also be routinely assessed for **nutritional and immunization status, feeding, problem, and other potential problems.**
- Only a limited number of carefully selected clinical signs are used, based on evidence of their sensitivity and specification to detect disease.
- A combination of individual signs leads to a child's classification(s) rather than a diagnosis.
- The classifications are color coded
  - **Pink** suggests Urgent pre referral treatment & referral
  - **Yellow** indicates initiation of specific medical treatment and advice
  - **Green** calls for home treatment Simple advice on home management
- 2 manuals - 1 week to 2 months / 2 months – 5 yrs
- **IMNCI strategy has three components:** Improve case management, Health systems strengthening & Improved household practices
- Assess / Classify / Treat / Counsel / Follow-up
- Guidelines do not address management of trauma and other acute emergencies due to accidents or injuries. AIDS not addressed directly

Differences between generic IMCI and India IMNCI

Features	Generic IMCI	India IMNCI
Coverage of 0-6 days (early newborn period)	No	Yes
Basic health worker module	No	Yes
Home visit module by provider for care of newborn and young infant	No	Yes
Training Home-based training Duration of training on newborn/young infant Sequence of training	 No 2 of 11 days Child first then young infant	 Yes 4 of 8 days Newborn / young infant first then child

Home Based Newborn Care: (HBNC)

- This programme was launched in 2011
- These guidelines revised as on March 2014

- Care of the Newborn baby and mother by **ASHA through regular home visits** on 1st, 3rd, 7th, 14, 21st, 28 and 42nd day for Home deliveries
- 3rd, 7th, 14, 21st, 28 and 42nd day for Institutional deliveries

Services offered:

- Essential care of the newborn,
- examination of the newborn,
- Early recognition of danger signs, stabilization, and referral,
- Counseling of mother for Breastfeeding,
- Warmth, Care of the baby,
- Immunization,
- Post Partum Care and
- use of Family Planning Methods

Adolescent Health Initiative (AGI): will be implemented in districts where IMR<60/1000

Goal: To achieve optimum health and development of the adolescent segment of the population, in a phased manner

Objectives: To introduce a comprehensive Adolescent Health Initiative (AHI) in selected districts in collaboration with partner departments and other stakeholders

Components:

- Adolescent friendly clinical and contraceptive services
- Adolescent Health Initiative in terms of counseling

Clinical services:

Confidential MTPs, RTI / STI related treatments, nutritional advice, detection and treatment of anemia ANC and advise regarding child birth and other health concerns

Counseling:

- Growth and development , nutrition, reproductive and sexual health, marriage and parent hood and life skills education

The RMNCH+A Strategy (2013): *Ongoing Programs for Neonates, Children and Adolescents*
In 2013, the government reviewed maternal and child health program under NRHM and launched a StrategicApproach to Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+A) under the XII Plan.

INTEGRATED CHILD PROTECTION SCHEME (ICPS 2009-10)

Beneficiaries: Children in need of care and protection, Children in conflict, Children in contact with law, Children of migrant families, Children of prisoners/prostitutes, Working children, Street children, Trafficked children, Sexually-exploited children, Child drug abusers, Child beggars.

Objectives of ICPS: [**Mnemonic: S**uch **I**mportant **R**elease **E**merged **R**esponsibly]

- **S**tructures establishment at all government levels for children in difficult circumstances.
- **I**mprove access to and quality of CPS
- **R**aise public awareness about rights of children
- **E**vidence based monitoring and evaluation system
- **R**esponsibility and accountability of child protection articulated.

Services under ICPS: **[Mnemonic:Emergency WINGS]**

- **Emergency** outreach service (Helpline 1098: 24-hour)
- **W**eb-enabled child protection management system
- **I**nstitutional services (Shelter home, Child home, Observation home)
- **N**on-institutional family-based care (sponsors, adoption, foster-care, cradle-baby centres, after care)
- **G**eneral grant-in-aid for need based interventions
- **S**helters (open) for children in need in urban, semi-urban areas.

Congenital malformations

Congenital malformations - Structural defects at birth
Congenital anomalies - Biochemical, structural & functional disorders at birth
Incidence – 30-70/1000 LB
Neural tube defects- MC congenital malformation in India
Punjab 1/116 births / Rajasthan 1/145 / Lowest Kolkata
Maternal age – Down's syndrome / Overall risk – 1:800 / 1:67 (40-45 yrs age)
Prenatal diagnosis:
MSAFP – Neural tube defects
USG – Anomaly scan
Amniocentesis – II trimester (after 12 weeks)
Chronic villi sampling – 9-11 weeks

School health Service

Suggested minimum standards / Criteria for healthy school environment

- Location – away from noisy surroundings, fenced
- Site – 5 acre – primary school/10 acre – elementary school, 1 acre/100 students
- Classroom – 40 students/classroom, Per capita space > 10sq.feet
- Furniture – Single desk of minus type
- Doors & window – area > 25% of floor area
- Colors – White
- Lighting – Natural light from left side
- Water supply – safe & portable water
- Lavatory – 1 urinal/60 students & 1 latrine/100 students

Common morbidities in school children - Dental defects / Refractive errors / Malnutrition
School age children > 25% population
Medical examination at time of entry & every 4 yrs

The Juvenile Justice (Care and Protection of Children) Act, 2000

It is the primary legal framework for juvenile justice in India. The Act provides for a special approach towards the prevention and treatment of juvenile delinquency and provides a framework for the protection, treatment and rehabilitation of children in the purview of the juvenile justice system. This law, brought in compliance of Child Rights Convention, repealed the earlier Juvenile Justice Act of 1986. This Act has been further amended in year 2006 and 2010.
"Juvenile" or "child" means a person who has not completed eighteenth year of age;

Orphanges- children who have home or who some reason could not be cared for by their parents are placed in orphanages
Foster homes – several type of facilities for rearing children other than in natural families child is

provided with love , security , affection

Borstal homes – boys over 16 yrs who are too difficult to handle in a certified school or have misbehaved there –are sent to Borstal home, sentence for 3 yrs ,6 homes in India, governed by state inspector general of India

Remand homes- child placed under the care of doctors, psychiatrics and other trained personnel-to improve the mental and physical well being of the child

Rashtriya Kishor Swasthya Karyakram (RKSK)
• Launched in 2014 • Indias first comprehensive adolescent health programme developed by The Ministry of Health and Family Welfare (MoHFW)
Target : Adolescents **aged 10–19 years** constitute about 21% of India's population which in absolute numbers translates to 253 million.
7critical component: 1. Coverage 2. Content 3. Communities 4. Clinics 5. Counselling 6. Communication 7. Convergence
6strategic priorities: 1. Improve nutrition 2. Imrove sexual and reproductive health 3. Enhance mental health 4. Prevent injuries and violence 5. Prevent substance misuse 6. Address NCDs(non-communicable diseases)
Ref:RKSK Strategy MODULE.

Rashtriya Bal Swasthya Karyakram(RBSK):

- *Launched in January 2013*
- It is a new initiative under Under National Health Mission(NHM)

Target group under Child Health Screening and Intervention Service Categories**:**

Categories	**Age Group**
Babies born at public health facilities and home	Birth to 6 weeks
Preschool children in rural areas and urban slum	6weeks to 6 years
School children enrolled in class 1st and 12th in government and government aided schools	6yrs to 18 yrs

*Screening of all children for **30 disorders (4Ds)***

- *Defects at birth*
- *Deficiency condition*
- *Diseases in children*
- ***Development delays and disabilities***

Defects at Birth	**Deficiencies**	**Diseases of Childhood**	**Developmental delays and Disabilities**
1. Neural tube defect 2. Down's Syndrome 3. Cleft Lip & Palate / Cleft palate alone# 4. Talipes (club foot) 5. Developmental dysplasia of the hip 6. Congenital cataract 7. Congenital deafness 8. Congenital heart diseases 9. Retinopathy of Prematurity	10. Anaemia especially Severe anaemia 11. Vitamin A deficiency (Bitot spot) 12. Vitamin D Deficiency, (Rickets) 13. Severe Acute Malnutrition 14. Goiter	15. Skin conditions (Scabies, fungal infection and Eczema) 16. Otitis Media 17. Rheumatic heart disease 18. Reactive airway disease 19.Dental conditions 20. Convulsive disorders	21. Vision Impairment 22. Hearing Impairment 23. Neuro-motor Impairment 24. Motor delay 25. Cognitive delay 26. Language delay 27. Behavior disorder (Autism) 28. Learning disorder 29. Attention deficit hyperactivity disorder
30. Congenital Hypothyroidism, Sickle cell anemia, Beta thalassemia (Optional)			

Mechanisms for screening at Community & Facility level:
Child screening under RBSK is at two levels community level and facility level. While facility based new born screening at public health facilities like PHCs / CHCs/ DH, will be by existing health manpower like Medical Officers, Staff Nurses & ANMs, the community level screening will be conducted by the Mobile health teams at Anganwadi Centres and Government and Government aided Schools.

Screening at Anganwadi Centre:
All pre-school children below 6 years of age would be screened by Mobile Block Health

Screening at Schools- Government and Government aided:
School children age 6 to 18 years would be screened by Mobile Health teams

Composition of mobile health team:

Member	**Number**
Medical officers (AYUSH) - 1 male and 1 female at least with a bachelor degree from an approved institution	**2**
ANM/Staff Nurse	**1**
	1

1. National Rural Health Mission is now called as National Health Mission (NHM)

Ref:www.nrhm.org.com

IMPORTANT HEALTH DAYS:

World Health Day	7 April[Q]
Anti-Leprosy day	*30th January*
No Smoking day	*2nd Wednesday o f March[Q]*
International Women s day	*8th March*
Anti-TB day	*24th March*
World Malaria Day	25 April[Q]
World Red cross day	*8th M ay*
No Tobacco day	*31st May[Q]*
World Blood Donor Day campaign i	14th june
Doctors day	*I st July*
World Literacy day	*8th September*
World Hepatitis Day	28 July [Q]
World AIDS day	*1st December:[Q]*

Ref:www.who.int

****

NATIONAL HEALTH PROGRAMME

NATIONAL TUBERCULOSIS CONTROL PROGRAMME (NTCP)

Situation analysis:

- 1.8 million New cases in the country.
- 0.8 million new smear positive cases.
- About 300,000 die from TB every year
- Progression to active disease from latent infection each year is about 5 – 15 % each year if HIV infections is superimposed
- The disease is 3 – 5 times more common in males.
- Control is defined as prevalence of tuberculosis < 1 % in 0-14 years age group.

NTCP

Launched in 1962 / Implemented through district TB center

	Target	Achieved
Case detection	**55%**	**22%**
Treatment completion	**70%**	**30%**

REVISED NATIONAL TUBERCULOSIS CONTROL PROGRAMME (RNTCP)

1993-DOTS

Goals of RNTCP: operational

- To cure at least 85% of all newly detected cases of pulmonary tuberculosis with supervised, short course chemotherapy ,and
- To detect at least 70% of estimated smear positive pulmonary tuberculosis case

The basic principles of the RNTCP are:

- Political commitment.
- Diagnosis primarily by microscopy of patients to health facilities.
- Regular and uninterrupted supply of anti –TB medications
- Direct observation of every dose of treatment in the intensive phase and at least the first dose in the continuation phase of treatment
- Systematic monitoring supervision and cohort analysis

"Annual drop in risk of infection is by 10-15% on an average by the successful implementation of DOTS strategy."
Without DOTS at is likely to drop by 1-3% per annum.

	NTP	**RNTCP**
Objective:	Early diagnosis and treatment	Breaking the chain of transmission
Operational	Not defined	CR=85%, CF=70%
Strategy:	SCC un supervised conventional	DOTS / Uninterrupted drug supply
Diagnosis	More emphasis on X-rays 2 sputum smears 1 sputum positive is a case	Mainly sputum microscopy 3 sputum smears One positive is not a case

Strategy

- Case finding – passive based on 3-sputum smears (Recapitulate additive sensitivity is higher in parallel testing where original sensitivity was low)
- Case holding and T/T - Directly observed
- Operational management -
  TB unit (TU) at sub district level: One for every 5,00,000 population
  Designated Microscopy centre (DMC): One for every 1,00,000 population
- The present coverage is 100%, which was achieved by December 2005.

Type of cases

- New: Never had T/T for TB or <1 month
- Relapse: Declared cured but again sputum + ve
- Failure: Smear +ve even after 5 month Rx
- Default: Received T/T for > 1 month and stopped ATT for > 2 month
- Chronic: Smear +ve after completing T/T regimen.
- Transfer in: Into TB unit/ district after starting T/T in another

Treatment categories & sputum examination

Cat.	Type of patient	Regimen	Pre-Rx sputum	Test at monthly	If result is	Then
I	New sputum	2 (HRZE)	+	2	- +	Start continuation phase Continue intensive phase for one mth
	Seriously ill smear negative Seriously ill extra pulmonary	4 (HR)3	-	2	- +	Start continuation phase

II	Sputum smear +ve relapse sputum smear	2 (HRZES)3		3	-	Continue intensive phase for 1> more month
	+ve failure sputum smear +ve Rx after default	1 (HRZE)3 5 (HRE)3	+		+	Continue intensive phase for 1> months.
III	Sputum smear ve not seriously ill Extra pulmonary not seriously ill	2 (HRZ)3 4(HR)3	-	2	+	Start continuation phase Re-register patient begin category II Rx

Phase & duration of treatment

Category	Duration (no. of doses)	
	Intensive	Continuation
Category I	8 weeks (24 doses)	18 weeks (54 doses)
Category II	12 weeks (36 doses)	22weeks (66 doses)
Category III	8 weeks (24 doses)	18 weeks (54 doses)

Medication & dosage:

Medication	Dose (thrice A week)	No. of pills in (IP) combi pack
Isoniazid	600 mg	2
Rifampicin	450 mg	1
Pyrazinamide	1500 mg	3
Ethambutol	1200 mg	3
Streptomycin	0.75 g	-

Technical and managerial indicators

Indicator	Value
Proportion of symptomatic patient OPD to be referred to DOT centre	2 - 3%
Proportion of symptomatic patients who are smear positive	8 - 12%
Percent smear positive among new TB cases	50%
Sputum conversion for new smear-positive TB cases at 3 months	> 85%
Percent of new smear-positive patients who are cured	>85%

Pediatric TB Diagnosis

"Suspect cases" of PTB will include children presenting with: fever and / or cough for more than 3 weeks, with or without weight loss or no weight gain; and history of contract with a suspected or diagnosed case of active TB disease within the last 2 year.

Diagnosis - "Based on a combination of presentation, sputum examination wherever possible, Chest X ray (PA view), Montoux test (1 TU PPD RT23 with Tween 80, positive if induration >10mm after 48-72 hours) & history of contact"

Chemoprophylaxis (Pediatric)

Asymptomatic Children under 6 years of age, exposed to an adult with infectious (smear positive) tuberculosis from the same household, will be given 6 month of Isoniazid (5 mg per kg daily) chemoprophylaxis.

Tuberculosis treatment during pregnancy & breastfeeding

- Streptomycin should not be given during pregnancy
- Pregnant women with active tuberculosis should start or continue their anti – tuberculosis treatment.
- Breastfeeding of infants should continue irrespective of the TB status of the mother.

If Mother is sputum-positive for AFB:	**If the mother is sputum negative for AFB:**
The child should be given chemo prophylaxis for 3 months and then vaccinated with BCG if the child is tuberculin-negative. If the child is tuberculin positive then child should be given chemoprophylaxis for another 3 mths.	The child is vaccinated with BCG and no chemo prophylaxis is necessary.

Diagnosis of TB in patients with HIV

- **HIV**- infected patient are more likely to have negative sputum smears.
- X-ray abnormalities, which are not specific for TB in HIV-negative patients, are even more non-specific in HIV-infected patients.
- Patient infected with HIV have frequent pulmonary infections. Each time such an infection occurs, the patient must be evaluated for TB.
- Extra-pulmonary forms are more common.
- Treatment of HIV infected TB patient is identical to that of HIV-negative TB patients.

HIV and TB: "Failure to use DOTS in the face of the HIV can lead explosive spread of TB and increase in drug resistance."

Antibiotic Resistance

In a population of 10^8 bacilli, the probability of finding resistance bacilli varies depending on the anti-tuberculosis drug:

- 1 single mutant resistance to Rifampicin,
- 10^3 to Isoniazid,
- 10^3 to Streptomycin,
- 10^4 to Pyrazinamide.

DOTS – Plus

- Based upon DOTS, DOTS-plus is a comprehensive management strategy under development & testing that includes the five tenets of the DOTS strategy.
- DOTS-Plus take into account specific issues (such as the use of second-line anti-TB drugs) that need to be addressed in areas where there is high prevalence of MDR – TB.
- DOTS-Plus
- DOTS-Plus works as a supplement to the standard DOTS strategy.
- By definition, it is impossible to conduct from DOTS-Plus in an area without having effective DOTS – based TB control programme in place.
- To date, there is only little evidence from which policy can be established for low - & middle income settings.

MDR – TB

- Prevalence – levels less than 1-3% in new cases.
- In re-treatment cases- 12%
- Overall resistance to Rifampicin – 2%
- Initial resistance to INH – 18%
- Failure rates in RNTCP – Cat I – 2%, Cat II – 6%
- MDR TB is a lab based diagnosis, now provision of one such lab in each state – to diagnose MDR IRL – Intermediate Reference laboratories
- Suspect of MDR TB – Cat II pt. who is smear +ve at the end of 4th month or later

CAT IV – Treatment

- 6 (9) km Ofx Eto Cs ZE/
- 18 ofx Eto Cs E
- Intensive phase treatment should be at least for 6 months, can be extended upto 9 months in patients who have a positive culture results taken at 4th month.
- Follow up in Cat IV patients - Smear examination (Culture) – should be conducted monthly in IP & quarterly during CP. Culture examination to be done at 4, 6, 12, 18 & 24 months.

Extensively Drug Resistant TB
MTB is resistance to: At least INH + Rifampicin Resistant to Fluoroquinolones Resistant to one or more of Injectable: Amikacin, Capromycin, Kanamycin

TUBERCULOSIS: Daily self-administered Non-DOTS regime: ONLY if there are adverse reactions to drugs or patients compliance is not possible.

Non-DOTS regime 1 (ND1)	
o Pulmonary (SS+ve) seriously ill	2 (SHE) + 10 (HE)
o Extra-pulmonary seriously ill	
Non-DOTS regime 2 (ND2)	
o Pulmonary (SS-ve) not seriously ill	12 (HE)
o Extra-pulmonary not seriously ill	

RNTCP-Phase II

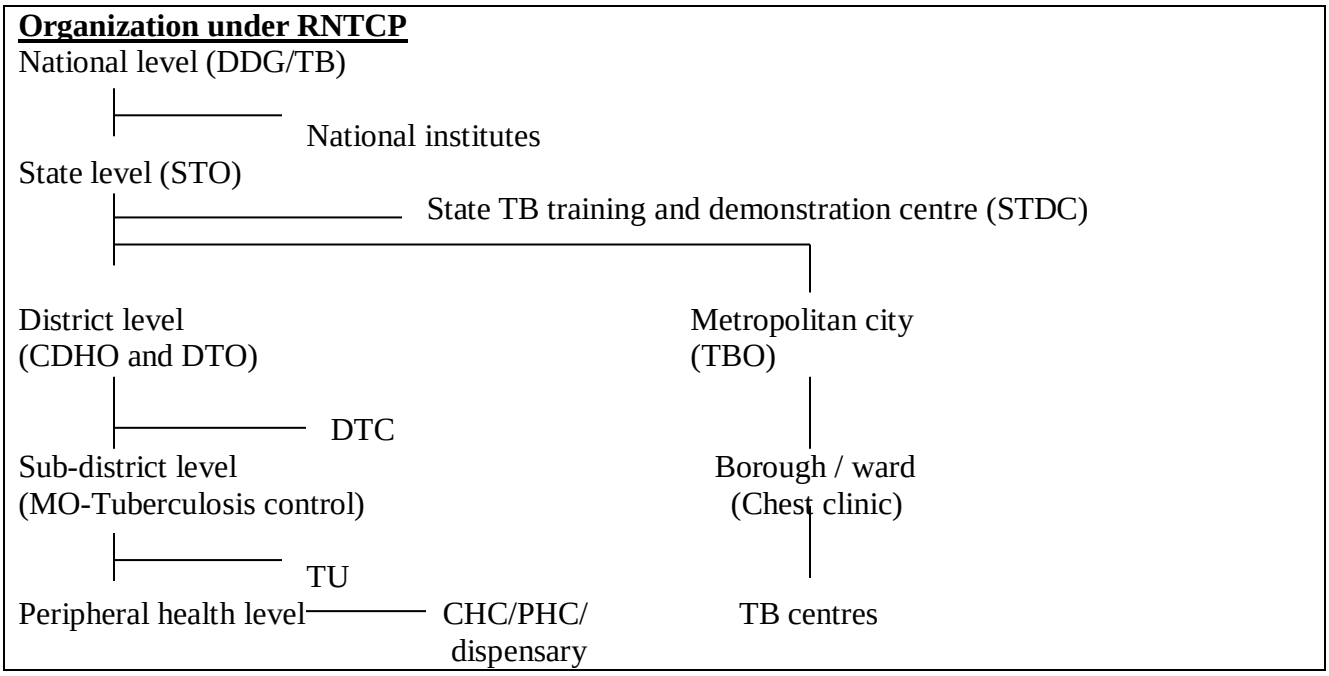
2006 – 2nd phase RNTCP has started

New components

- HIV TB coordination
- Weight wise boxes for Pediatric TB management
- Management of MDR TB – DOTS plus
- External Quality Assurance mechanisms for laboratory improvement

RNTCP: New Structure under District Tb programme (DTP)

- The RNTCP strengthens the existing NTP infrastructure by creating a sub-district-level supervisory team (know as the TB unit), consisting of a treatment supervisor (Senior Treatment Supervisor, STS) and a laboratory supervisor (Senior TB Laboratory Supervisor, STLS).



Sub District level

At the sub- district level, a **TB Unit (TU)** – for about 500,000 population

Stationed either at a (CHC) or Taluka Hospital or Block Primary Health Center (PHC).

Staffed with special paramedical personnel (**Senior TB Laboratory Supervisor [STLS] and - Senior Treatment Supervisor [STS])**

Monitoring, supervision, Maintains TB records and prepare Quarterly reports.

Medical officer (MO) from the exiting health facility where the sub – district team is located will be designated as MO responsible for Tuberculosis Control (MO-TC).

The Tuberculosis Unit is the most peripheral reporting unit under the programme organization under RNTCP

Sub – district level

Delivery of health care including that for TB is done by the general health services, using the programme guidelines.

Providing DOT through the health workers in the general health services (Primary Health Care services) and community volunteers.

Microscopy center: The diagnostic component (Microscopy Center) will be located either in the CHC or in PHC or in Taluka Hospital.

Established for approximately 100,000 population (50,000 for tribal and hilly areas.)

RNTCP – urban areas: Municipal Corporation assumes the responsibility for TB control. Corporation Tuberculosis Officer is responsible. City is divided into geographical areas of responsibility, each under the jurisdiction of a TB dispensary or chest clinic, with laboratory and X-ray facilities as well as physicians experienced in TB.

Global TB strategy: Stop TB strategy – 2006-2015

Focuses on 5 indicator - Case Detection / Treatment Success / Incidence / Prevalence / Deaths

Following information has been added in *22nd* of Park:

Case of tuberculosis : For the purpose of case notification, a TB case is defined as follows .
(a) A patient diagnosed with at least one sputum specimen positive for acid fast bacilli, or culture-positive for *M. tuberculosis,* or RNTCP endorsed rapid diagnostic molecular test positive for tuberculosis

or

(b) A patient diagnosed clinically as a case of tuberculosis without microbiologic confirmation, and initiated on anti-tuberculosis drugs.

- **Liquid culture increases t**he case yield by 10 per cent over solid media. Confirmation is usually done from the biological characteristics of culture growth and with selected molecular or biochemical tests.Rapid immunochromatographic assay (so called strip speciation tests) for species identification on culture isolates provide a definitive identification of M. *tuberculosis* in 15 minutes and are recommended.Molecular tests, biochemical methods and strip speciation assays are suitable for laboratories where culture and drug sensitivity tests are performed.
- ***Cartridge based nucleic acid amplification test (CBNAAT):***The second generation **NAAT-based TB** diagnostics offer the prospect of **very high sensitivity**, approaching that of **liquid culture** - **the current gold standard for TB diagnosis**. In addition, some versions of NAAT also provide information on drug susceptibility to rifampicin, which is a surrogate marker in most countries for identification of patients who are most likely to have MDR-TB, thus allowing the early initiation of standardized 2nd line TB treatment

- In microscopy following method are used for early diagnosis in large scale: *Fluorescence microscopy, Light-**emitting diode fluorescence microscopy (LEDs)***

Recent changes in RNTCP(salient points):

1.Now only 2 categories are included,third one is removed.....ie.CAT I and CAT II
CAT I : New cases irrespective if their status
CAT II : Previously Treated case with Treatment Failure

New* CAT-I	**Previously treated** CAT-II**
• New sputum smear-positive, • New sputum smear-negative, • New extrapulmonary tuberculosis, • New others	• Sputum smear-positive relapse, • Sputum smear-positive failure, • Sputum smear-positive treatment after default, • others#
$2\mathbf{H}_3\mathbf{R}_3\mathbf{Z}_3\mathbf{E}_3 + 4\mathbf{H}_3\mathbf{R}_3$	$2\mathbf{H}_3\mathbf{R}_3\mathbf{Z}_3\mathbf{E}_3\mathbf{S}_3 + 1\mathbf{H}_3\mathbf{R}_3\mathbf{Z}_3\mathbf{E}_3 + 5\mathbf{H}_3\mathbf{R}_3\mathbf{E}_3$
2 months Intensive phase + 4 months continuation phase Four drugs at Thrice-weekly Schedule for 2 months Intensive phase & Two drugs at Thrice-Weekly Schedule for remaining 4 months continuation phase.	3 months Intensive phase + 5 months continuation phase Five drugs at Thrice-weekly Schedule for initial 2 months followed by Four drugs for next 1 month Intensive phase.Three drugs at Thrice-weekly Schedule for remaining 5 months continuation phase.

H: Isoniazid (600 mg), R: Rifampicin (450 mg), Z: Pyrazinamide (1500 mg), E: Ethambutol (1200 mg), S: Streptomycin (750 mg)

1. Patients who weigh 60kg or more receive additional Rifampicin 150mg.
2. Patients who are more than 50 years old receive Streptomycin 500mg. Patients who weigh less than 30kg receive drugs as per Pediatric weight band boxes according to body weight.

Notes:

*****New categories includes former Categories I & III

******Previously treated is former Category II

Others include patients who are Sputum Smear-Negative or who have Extra-pulmonary disease who can have recurrence or resonance.

2. Sputum samples collected are only "2"

- **If one of two samples is positive then it is sputum smear positive**

3. Change in TB Suspect Definition Among HIV-infected Individuals:
   - cough for 2 weeks alone is not a sensitive indicator of TB among HIV-infected people
   - A combination of 4 symptoms will be used for screening – "**Any cough, any fever, night sweats and weight loss**".
   - It has been decided that chest radiography may be used upfront along with sputum

microscopy among chest symptomatics without having to recourse to antibiotic trial

4. Protease inhibitor (PIs)cannot be used with rifampicin-containing regimens due to hepatic enzyme inducing capacity of rifampicin rendering PI levels sub-therapeutic. Therefore NACP and RNTCP have recommended the substitution of Rifabutin (which is equally effective but not affected by drug drug
interactions) for rifampicin for the duration

NATION LEPROSY ERADICATION PROGRAMME

Milestones
1925-Hindu Kusht Nivaran Sangh
1955- National Leprosy Control Program
1983- National Leprosy Education Program
1991- Resolution of World Health Assembly.
2001-2004- NLEP-II.

Hansen's disease

- Mycobacterium Leprae
- Resp. secretions, prolonged contact
- Incubation period – 9m to 20yrs
- 95% people are naturally immune to the leprosy germ.
- Only less than 20% of leprosy patients are of infections type
- Interstate variations
- 70% are in the 5 major states of Bihar, UP, West Bengal, Orissa and M.P including Jharkhand, Chattisgarh & Uttaranchal
- Bihar & Jharkhand 28.8% of cases

Modes of transmission in leprosy

- Respiration droplet infection
- Contact transmission
  - Direct – skin to skin
  - Indirect – contact with soil, fomites such as contaminated clothes and linen.
- Less important routes
  - Breast milk from lepromatous mothers
  - Insect vectors
  - Tattooing needles

Leprosy patches

Which skin patches are leprosy	Which skin patches are not leprosy
• Can be pale or reddish or copper colored, can	• Present from birth

be flat or raised do not itch, usually do not hurt, lack sensation to heat, touch or pain, can appear anywhere • Other signs of leprosy – reddish or skin colored nodules or smooth, shiny diffuse thickening of skin without loss of sensation	• Where there are normal sensations • That itch • That are white, black, or dark red • With scaling of skin • Those appear or disappear suddenly and spread fast.

- **Leprosy patient :** a patient who has a skin patch with a definite loss of sensation and who has not yet completed a full course of treatment with MDT.
- **Cured patients :** with residual disabilities are not considered to be leprosy patients
- **Newly diagnosed :** diagnosed, not taken MDT in past
- **Defaulter-**diagnosed->started Tt. Not completed Tt. Or not collected MDT during consecutive 12 months

Case: A case of leprosy is a person showing clinical signs of leprosy with or without bacteriological confirmation of diagnosis. Case detection is mainly on clinical grounds and bacteriological index is not now used in the programme.

Disease activity status: indicated by

- Erythema and infiltration
- Tender nerves
- Extension and appearance of new skin lesions
- Extension of anesthesia and paresis or occurrence of new anesthetic areas
- Presence of acid – fast bacilli in new skin lesions.

Defaulter who returns to the health center for treatment should be a new course of MDT when he or she shows one or more of the following signs:

1. Reddish and/ or raised skin lesions
2. Appearance of new skin lesions (since the previous examination)
3. New nerve involvement (eg. changes in skin sensation) since the previous examination
4. Lepromatous nodules
5. Signs of reversal reaction or ENL.

For registration purposes, returning defaulters are not considered as newly detected cases.

Distribution of districts according to prevalence of leprosy

High endemic district - ≥ 5/10,000
Moderate endemic district – 2-5/10, 000
Low endemic district - <2/10,000

Categorization was done during 1997 at the start of MLEC

National Leprosy Control Programme

- 1955
- Objective of controlling Leprosy with help of Dapsone Monotherapy

National Leprosy Eradication Programme [NLEP]

- 1983. Centrally sponsored scheme, after MDT.
- Phase I of the programme was completed by 2000. Vertical programme.
- Phase II of the programme was l launched in 2001 and extended up to Dec 2005.
- In 1991,WHO-elimate Leprosy as a public health problem by 2000

- National Leprosy Education Programme [NLEP] - supported by World Bank [2nd phase 2000-2004], the WHO DANLEP and nine international leprosy NGOs [ILEP].

Objectives

- To decentralize the NLEP responsibilities to the states/UTs,
- To accomplish integration of leprosy service into the general health care [GHC]system,
- To achieve elimination at the national level.
- To ensure a wide coverage of leprosy service, especially in remote rural areas and in urban slums,
- To ensure social rehabilitation of disabled leprosy patients,
- To sustain advocacy and IEC activities to increase awareness and the decrease the stigma attached to leprosy

Components

- Decentralization and institutional development.
- Strengthening and institution of service delivery.
- Disability care, prevention and rehabilitation.
- IEC
- Training of general health services

Strategies

- Creation of State and District Leprosy Societies.
- Training of General Health Care functionaries.
- Dismantling of the vertical infrastructure and redeployment
- Increased accessibility to leprosy service.
- Provision of free treatment [MDT] through WHO,
- Surveillance through the establishment of a Simplified Information System [SIS],
- Intensifying case detection through five national campaigns [1998-2004],
- Focused active detection for difficult to areas/communities through Special Action Project [SAPEL,LEC],
- Intensified IEC activities.
- Prevention of disability [POD] and care, through POD camp.
- Monitoring and evaluation on a regular basis.
- Leprosy Elimination Monitoring.

Epidemiological situation

- Prevalence Rate fell from 0.95 in December 2005 to 0.84 at the end March 2006.
- Total number of cases under treatment has fallen from 106,666 to 95,151 in same period.
- First time in history that the number has gone below the one hundred thousand mark.

NLEP Indicators as on June 2007

- Prevalence Rate - 0.80 per ten thousand
- Annual New Case Detection rate -1.21 per ten thousand population
- MB Proportion :49.38%
- Female proportion :33.63%
- Child proportion:9.25%
- Visible Deformity:2.06%
- Number of states which have achieved elimination: 27 (out of 35)

- 4310/6204 block have achieved elimination
- 30 blocks have a PR of >5,
- PR < 1 - 74.3% of states, 73.6% of district & 69.5% of blocks

Components:

- Early detection by Active Surveillance
- Multi Drug Therapy
- Health Education
- Rehabilitation

Strategy:

- Decentralization of NLEP to states and districts
- Integration of leprosy services health with general health care system
- Leprosy training of general health care functionaries
- Surveillance for early diagnosis and prompt MDT through routine and special efforts
- Intensified IEC using local and mass media approaches
- Prevention of disability and care
- Monitoring & evaluation on regular basis as well as special efforts such as independent evaluation, Leprosy Elimination Monitoring (LEM), annual survey and validation of elimination.

Special efforts for Leprosy case detection & prompt MDT

- Special Action Project for Elimination of Leprosy (SAPEL) and Leprosy Elimination Campaign (LEC) mainly in difficult rural/tribal areas and also in slums of urban areas as well.
- Designed for early case detection and prompt MDT of leprosy cases along with proper IEC.

Modified Leprosy Elimination Campaign (MLEC):

- Package of teaching, training, intensified IEC, case detection and prompt MDT.
- Five such nationwide campaigns have been carried out .Fifth MLEC was synchronized with SAPELs/LECs strategy -

Urban areas:
Cities/towns with > 2 lakh population – VRC (Voluntary case Reporting) + LEC in slums

Rural areas:
Blocks with PR>5/10.000-VRC in all area +SAPEL in selected pockets (where PR>3/10,000)
Blocks with PR>5/10,000-Active search for cases.

District Classification:

High Endemic districts – District Leprosy Unit (DLU) Leprosy control unit (LCU) – 1/450000 population – 1 MO, 2 NMS, 20 PMW Urban Leprosy centre (ULC) – 1/50,000 -1 PMW	Moderate Endemic Districts SET centre: 1 per 20000-25000 population Survey of 8000 population per year	Low endemic districts Mobile Leprosy Treatment Units at district level Active case detection Contact survey - < 1 /1000 Group survey – 1 to 10 /1000 Mass survey - ≥ 10 /1000

Classifications

Multibacillary patients	Paucibacillary patients
• All skin smear + ve patients • All clinical BL, LL • All skin + ve relapses • All active BT cases with ≥ 6 skin lesions • All pure neuritic cases ≥ 2 skin lesions	• Active I, TT, BT (skin ≤ 5 skin lesions) • Pure neuritic with single nerve involvement • All active PB cases on Monotherapy • Newly diagnosed PB cases

Classification of Leprosy:

	MB	**PM**
Indian Ass L. (1981)	L	I
	BL	T
		Pure neuritic
		BT
International Madrid (1955)	L	T
	B	I
Ridley & Jopling	BB	I
	BL	TT
	LL	BT
Clinical	> 5 lesion	2-5 lesion
	Many nerve trunk	No or only one nerve trunk

Treatment:

MB - L, B, A smear +ve	**PB** - Smear –ve, I, T, BT & Pure neuritic
Rifampicin 600 mg once a month Dapsone 100 mg daily Clofazimine 300 mg once a month & 50 mg daily Duration: 12 pulses in 18 months or up to smear – ve (1 pulse – 1 month treatment)	Rifampicin 600 mg/once a month Dapsone 100 mg daily Duration: 6 pulses in 9 months or up to cessation of active disease clinically

Regular treatment – if a patient has taken two third of the treatment for any given time period and the interval between doses is not more than 2 months, it is considered regular
Adequate treatment: if PB – 6 months completed in p months; MB – 12 months completed in 18 months.
Surveillance: Done by clinical examinations at the time of completion of treatment and subsequently annually for 2 years in PB and 5 years in MB cases.

Single lesion PB - Rifampicin 600
Ofloxacin – 400 mg
Minocycline 100 mg
} **ROM therapy** (Single Dose)

Reactions in leprosy:

- Immunologically mediated episodes of acute or sub acute inflammation
- Two major types: Reversal – Type I & ENL – type II
- Drug of choice in treating reversal reactions – Prednisolone for twelve weeks
- Other drugs that can be given are: Thalidomide, Clofazimine, Pentoxifylline.

LEPRA reactions:

- Signs of severe reversal reaction: Loss of nerve function, Pain/tender nerve, Silent neuritis/nerve-paralysis, Red swollen skin patch on face/over nerve trunk, Ulceration of ENL nodule, Ulcerated skin lesion, marked edema of hands/feet/face, Pain of eyes, orchitis/dactylitis, Marked arthritis / lymphadenitis.
- Treatment of lepra reactions: Bed rest + Splint to rest nerves + Analgesics + Prednisolone (Add Clofazimine in ENL)
- Follow-up after steroid treatment:
  For patients on MDT: Monthly check-up of Nerve function
  For patients MDT completed: 3 months and 6 months after course.
- Steroids contraindicated in (without starting treatment): TB, Diabetes, Deep ulcers, Osteomylitis, Corneal ulcers, other serious conditions.

Lepromin testing

- CMI
- Read at 48 hrs and 21 days
- 2 reactions
  Early – Fernandez 24 – 48 hrs, disappear after 3- 4 days, positive ->10 mm
  Delayed hypersensitivity reaction to soluble constituents of the leprosy bacilli.
  Superior than late reaction
  Late reaction – Mitsuda – nodule > 5mm positive
  Apparent 7-10 days following the injection, reaches maximum at 3- 4 wks
  Bacillary component of the antigen
- Value of Lepromin test- prognosis

Tests for humoral responses to M. leprae

- Fluorescent leprosy antibody absorption test FLA-ABS- widely used for identification of sub clinical infection
- Monoclonal antibodies
- Radio – immunoassay

ELISA test – Phenolic glycolipid antign.

Indicators in Leprosy Control:

Epidemiological indicators: • Incidence: ONLY measure of effectiveness of measures taken • Prevalence: Case-load	Main/core indicators to monitor progress: • Number and rate of new cases detected per 100,000 population per year • Rate of new cases with Grade-II disabilities per 100,000 population per year • Treatment completion/cure rate	
Main/core indicators to evaluate case detection: • Proportion of new cases with Grade-II disabilities. • Proportion of child cases among new cases • Proportion of MBL cases among new cases	Main/core indicators to assess quality of services: • Proportion of new cases verified as correctly diagnosed. • Proportion of treatment defaulters • Number of relapsers • Proportion of patients developing additional disabilities during MDT.	

• Proportion of female cases among new cases.		

Disability Prevention and Medical Rehabilitation (DPMR) 2009-10: (NLEP)

- Implementation of DPMR activities and reporting its outcome (treatment of reactions, ulcers, physiotherapy, reconstructive surgery, MCR footwear)
- Integration of DPMR activities
- Developing a referral system

WHO global strategy for further reducing the leprosy burden 2006-10

- Sustain leprosy control activities in all endemic countries.
- Use case detection as the main indictor to monitor progress.
- Ensure high quality diagnosis, case management, recording and reporting in all endemic communities
- Strengthen routine and referral services.
- Discontinue the campaign approach
- Develop tools and procedures that are home/community based, integrated and locally appropriate for the prevention of disabilities/ impairments, and for the provisions of rehabilitation services.

NATIONAL AIDS CONTROL PROGRAMME

- 1987
- 1st Case – 1986
- India – 1, 82787 AIDS Cases in India on July 2007
- Maximum - Tamilnadu, Maharashtra, Andhra Pradesh

Epidemiological analysis of reported AIDS cases reveals that:

- AIDS is affecting mainly young people in the sexually active age group. The majority of the HIV infections (87.7%) are in the age group of 15-44 years, 4.9% are in children.
- The predominant mode of transmission of infection in the AIDS patients is through heterosexual contact (85.7%), followed by injecting drug use (2.2%), blood transfusion and blood product infusion (2.6%), Perinatal transmission as 2.7% and others as 68%.
- In the HIV sentinel surveillance, 2003, males account for 73.5% of AIDS cases and female 26.5%. the ratio being 3:1 , 2007 - ratio is 2.2:1
- The most predominant opportunistic infection among AIDS patients is tuberculosis, indicating a potential future high spread of the HIV-TB co- infection.

HIV Estimates 2006: India

- 2.47 million HIV +
- Prevalence = 0.36%
- Of the total PLHA in 2006, 87.9% are adults, 8.6% are aged more than 50 years, while 3.5% are children.
- The proportion of children and adults > 50 yrs of age among PLHA has increased slightly over last 5 years.

- Greater infections in urban population rather population.

Transmission:

Categories	Percentage
Sexual	86.3
Perinatal Transmission	4.3
Blood and blood products	1.88
Injectable drug users	1.80
Others (not specified)	5.66
Total	100.00

Most common opportunistic Infection Tuberculosis in 50-60%

National AIDS Control Programme Phase I: 1992-1997 (extended to 1999)

- Nationwide capacity building in managerial and technical aspects of the programme.
- Increase awareness and condom usage in targeted high risk population.

National AIDS Control Programme Phase II: 1999-2004 (extended to 2007)

- Slow the spread of HIV infection
- Decrease the mortality and morbidity associated with HIV infection and
- Minimize the socio- economic impact resulting from HIV infection

NACP III – 2007-2010

The goal is to halt and reverse the epidemic in India over next five years through a four pronged strategy of:

- Prevention of new infections in high risk groups and general population through
  Saturation of coverage of high groups with targeted interventions (TIs)
  Scaled up interventions in the general population.
- Increasing the proportion of people living with HIV/AIDS who receive care, support and treatment
- Strengthening the infrastructure, system and human resources for scaling up preventions, care, support and treatment programmes at districts, state and national levels.
- Strengthening a nation wide strategic information management system.

Project Outcomes

- Generalized epidemic: ANC $\geq$ 1% in Maharashtra, Tamil Nadu and Manipur, A.P.
- Concentrated epidemic: High risk group $\geq$ 5% but ANC < 1% in Gujarat, WB, Nagaland
- Low level of epidemic: High risk group < 5% in all other states.

Categorization of Districts under NACP

- Category A- >1% ANC prevalence in any of the sites in last 3 years
- Category B- <1% ANC prevalence in all the sites during last 3 years with > 5% prevalence in any HRG site (STD/FSW/MSW/IDU)
- Category C - < 1% ANC prevalence in all the sites during last 3 years with < 5% in any HRG sites with known hot spots (migrants, truckers, large aggregation of factory workers, tourist etc.)

- Category D - < 1% ANC prevalence in all the sites during last 3 years with < 5% in any HRG sites with no known hot spots or no or poor HIV data.

Tenth five year plan goals

- 80% coverage of high risk groups through targeted interventions
- 90% coverage of schools and colleges through educational programmes
- 80% awareness among general population in rural areas
- Reducing transmission through blood to less than 1%
- Establishing at least one VCTC in every district
- Scaling up PPTCT up to district level
- Achieve zero level increase of HIV/AIDS prevalence

To achieve these objectives, various programmes launched by NACO –

- Targeted interventions
- Blood safety
- Information , Education and Communication (IEC)
- Control of Sexually Control Disease
- Condom promotion
- Family Health awareness Campaign
- Voluntary Counseling and Testing
- Multi- sectoral collaborations

Prevention programmes

- AIDS Vaccine research
- Prevention of Parent to Child Transmission
- Anti retroviral treatment
- Post exposure prophylaxis

Care and support programmes

HIV/AIDS Surveillance

Sentinel Surveillance –

In Limited Sites with Special Population Group - STD Clinics, IV Drug users & Pregnant Women

Behavioral Surveillance Survey (2001-02) also done in 2005-06

- Surveillance used to be done on infection alone mainly through tracking of AIDS cases and the spread of the HIV virus.
- But low prevalence in a subpopulation group does not necessarily mean that the group is not involved in high – risk behavior the virus may not have reached a critical mass and the prevalence rate might shoot up suddenly once the critical mass is crossed.
- Therefore, risk behaviors, need to be well documented

Blood safety programme:

Initiatives in Phase - I

Establishment of HIV Testing Facilities:

- NACP-I, 154 zonal blood testing centers
- Support for Testing for other Blood Transmissible Diseases:
- Syphilis, malaria, hepatitis-B, and hepatitis – C
- Modernization of Blood Banks:

- NACO under the Central scheme of assistance provides financial support for blood banks equipment, contingency and purchase of consumables, chemicals and reagents.

Blood safety – New Initiatives in Phase – II

- Establishment of Model Blood Banks: centrally coordinated national Blood Transfusion Services is one of the major long term goals of the Blood safety programme. To facilitate this goal and to set up demonstration projects, it is planned to set up 10 state of the art model blood banks in underserved areas of the country-
- Appropriate clinical use of Blood: Approximately 30 per cent transfusions are either unnecessary or wasteful. So units to be set up which can separate the blood components.
- Training and Personnel Development MD course in transfusion medicine.
- Promotion of voluntary Blood Donation: through IEC materials. Today is (1st Oct) the National Voluntary Blood Donation Day.

Blood safety – New Initiatives in Phase-III

- National Blood Transfusion Policy: this policy is expected to function as a strategic framework for developing a safe, reliable and efficient Blood Transfusion Services in the country.
- Establishment of Blood Transfusion councils = national and state

National Family Health Awareness Campaign: The specific objectives are:

- To raise awareness on RTI/STD and HIV/AIDS in rural areas and other vulnerable groups of the population
- To encourage health seeking behavior in the general population for RTI/STD.
- To make people aware about the services available in the Public health system for the management of RTI/STD.
- To facilitate early detection and prompt treatment of RTI/STD by mainstreaming the program.
- To implement a focused JEC strategy for the male population.

Voluntary counseling & Testing

The potential benefits of VCT are

- Improve Health status through good nutritional advice
- Earlier access to care and treatment
- Prevention of HIV related illness
- Emotional Support
- Better ability to cope with HIV related anxiety
- Awareness of safer options for reproduction and infant feeding
- Motivation to initiate or maintain safer sexual practices
- Motivation for drug related behavior
- Safer blood donation

National HIV testing policy

Objective of testing	Prevalence of infection	Testing strategy
1) Transfusion / transplant	All prevalence	1
2) Surveillance	> 10% ≤ 10%	1 2
3) Diagnosis Clinical features of HIV infection	> 30% < 30%	1 2
Asymptomatic	> 10%	2

	≤ 10%	3

ELISA Testing - Screening

⇨ Rapid / Simple Test

I Passive Particle Aggregation Assays
- Latex Aggregation Test
- Gelatin Particl Aggregation
- Passive Haemoglutination Test

II Dot Immunoassay - Immuno Comb
- Colloid Gold

III Line Immunoassay – Immuno Strip

Confirmatory Test

Western Blot
Immuno Flour Assay
Radio Immuno Ppt Assay

- **Behavioural Changes Through IEC:**
  Condom Use
  Needle & Syringe Sterilization
  Voluntary Blood Donation
- **STD Control Programme (Syndromic Approach)**
  - Diagnosis
  - T/T
  - Counseling
  - Partner Notification
  - Screening
- **Condom promotion programme** - Social Marketing
- **Blood Safety Programme**
  National Blood Transfusion Council HIV / Malaria / Hepatitis B & C / Syphilis

Guidelines for Post Exposure Prophylaxis

Definition – An occupational exposure that may place a worker at risk of HIV infection is a Percutaneus injury, contact of mucous membrane or contact of skin (especially when the skin is chapped, abraded or afflicted with dermatitis or the contact is prolonged or involving an extensive area) with blood, tissue or other body fluids to which universal precautions apply.

Regimens:

- Basic regimen: Zidovudine (AZT) – 600 mgs in daily divided doses (300 mgs BD or 200 mg TID) + Lamivudine (3TC)-150 mgs BD x 4 weeks.
- Expanded regimen: Basic + Indinavir – 800 mgs TID x 4 weeks

Testing and Counseling: Baseline at the time of exposure; repeat test at 6 weeks and 12 weeks

RISK of MTCT/PTCT -15 - 45 % / 30 %

PPTCT Intervention Package

- Ante-Natal Care
- Group Education / Pre- Test Counselling
- HIV Testing: after Informed Consent
- Post – Test Counselling
- Institutional Delivery: Safe Birthing Practices
- Administration of Nevirapine to the women during labour

- Administration to the BABY of SINGLE DOSE of Suspension Nevirapine (2 mg/kg) within first 72 hours
- PPTCT PLUS - Counselling of mother for Infant Feeding Options
- Care & Support, follow – up
- Use of Nevirapine for prevention of parent to child transmission of HIV infection will be upscaled in NACP III to cover at least 80% of estimated numbers.

HIV/AIDS: WHO RECOMMENDATIONS ON ART (2010):

- *Start ART:* CD4≤350 cells/mm^3
- *First line therapy:* 1 NNRTI + 2 NRTIs (including Zidovudine/Tenofovir)
- *Second line therapy:* PI + 2NRTIs (including Zidovudine/Tenofovir)
- *Treatment 2.0:* is a new approach 'to simplify the way HIV treatment is currently provided, and to scale up access to life-saving medicines.
  Could reduce newly HIV+ upto 1 million annually & avert 10 million death by 2025
- Requires progress across five areas: [Mnemonic: C^2D^3]
  Reduce Costs
  Mobilize Communities
  Optimize Drug regimes: "Smarter, better pill"
  Adopt Delivery systems
  Provide access to point of care Diagnostics.

Specific Objective during eleventh Five yr plan (NACP III)

- To reduce new infections by 60% in high prevalence states so as to obtain reversal of the epidemic
- To reduce new infections by 40% in vulnerable states so as to stabilize the epidemic. Saturating coverage in HRG. NACP III aims to saturate 80% population of HRG within the programme period with the aim of reducing infections amongst this group.
- Scaling up interventions in Bridge population. Peer led intervention to create awareness of vulnerability and increase demand for product and services.
- Development of linkages with others sectors
- Creation of peer support groups and safe space at destination sites for migrants. Interventions for the General population
- Set up a cadre of link workers to approach women and young people in villages and tribal areas with BCC, condom provision and linkages to health to health services.
- Establish red ribbon clubs of youth friendly information services.

STI CONTROL PROGRAMME

Syndromic Management of RTIs/ STIs

Traditional clinical approach	Laboratory – assisted approach	Syndromic approach
Interviews patient for	Interviews patient for symptoms	Interviews patient for symptoms **Picks the relevant flowchart**
Dose a clinical examination	Dose a clinical examination	Dose a clinical examination for finding signs **Uses flow charts as tools**

Uses clinical experience to identity symptoms and signs of a specific STI	Collects samples for testing/refers to laboratory for tests	**Syndrome identification**
.10	Treats for STIs identified by the results of the laboratory tests	**Teats patients for the most common organisms** Responsible for that syndrome (usually 2-3 STIs**)**
Educate patients for compliance and prevention, promotes condoms and emphasizes the importance of partner management	Educate patients for compliance and prevention, promotes condoms and emphasizes the importance of partner management	Educate patients for compliance and prevention, promotes condoms and emphasizes the importance of partner management

RTI/STI Syndromes for Men

Symptoms	**Syndrome**	**RTIs/STIs**
Urethral Discharge	Ur`ethral discharge syndrome	Gonorrhoea, Chlamydia, trichomonas
Genital ulcers	Genital ulcer syndrome	Chancroid, syphilis, genital herpes
Inguinal bubos	Inguinal bubo syndrome	Lymphogranuloma venerum, chancroid
Scrotal swelling	Painful scrotal swelling	Gonorrhoea, Chlamydia
Genital skin conditions	Genital skin conditions	Genital warts, molluscum contagiosum, Pediculosis pubis, scabies

RTI/STU Syndrome for Women

Symptoms	**Syndrome**	**RTIs/STIs**
Vaginal discharge	Vaginal discharge syndrome	Gonorrhoea, Chlamydia, trichomonas, herpes simplex candidates, bacterial vaginosis, cervicitis
Lower abdominal pain	Lower abdominal pain syndrome	Gonorrhoea, Chlamydia, mycoplasma Gardnerella, anaerobic bacteria, bacteroids e.g. gram positive cocci
Genital Ulcers	Genital Ulcers syndrome	Syphilis , Chancroid, Genital herpes
Genital skin conditions	Genital skin conditions	Genital warts, molluscum contagiosum, Pediculosis pubis, scabies

STD management Kits under NACP 3

Kit	Syndrome	Color	Contents
1.	Urethral discharge , Anorectal discharge, Cervicitis	Grey	Tab Azithromycin 1g (1) Tab cefixime 400mg (1)
2.	Vaginitis	Green	Tab Secnidazole 2g (1) Tab Fluconazole 150 mg (1)
3.	Genital Ulcers Disease	White	Inj. Benzathine Penicillin 2.4 MN (1) Tab. Azithromycin 1g Dispo. syringe 10cc / 21 needle (1) Sterile water 10 ml (1)

4.	Genital Ulcers Disease	Blue	Tab Doxycycline 100 mg (30) Tab Azithromycin 1g (1)
5.	Genital Ulcers Disease	Red	Tab Acyclovir 400 mg (21)
6.	Lower abdominal pain	Yellow	Tab cefixime 400 mg (1) Tab Metronidazole 400 mg (28) Cap Doxycycline 100 mg (28)
7.	Inguinal bubo	Black	Tab Doxycycline 100 mg (28) And Tab Azithromycin 1g (1)

NATIONAL VECTOR BORNE DISEASES CONTROL PROGRAMME

- This program started from 2004**.**
- The program converge five different program related to vector diseases in India viz. Malaria, Filaria, Japanese encephalitis, Dengue and Kala azar.
- A 100% centrally sponsored program.
- The anti malaria directorate was upgraded to include all the other programs.

National Anti Malaria Programme

Targets; in Tenth Plan (2002-2007)

- ABER to 10%
- API to 1.3 or less
- 25% reduction in morbidity and mortality by 2007 and 50% by 2010.

Vector

An. culicifacies- Rural / An. stephensi – Urban +Desert
An. Fluviatilis - foothill
P Vivax-55-65% / P Falciparum-35-45%
2003*- Cases-1.87 million; Deaths-1006.
API-1.62/1000, Pf-0.86million, Maximum No. of cases in Orissa;
*source;NVBDCP,2004

Year	Programme	Remarks
1953	National Malaria Control Programme	Strategy-Residual insecticide spray; 75 million cases
1958	National Malaria Eradiation Programmed	Residual + Active search of cases &Radical T/T; following reduction in cases to about 2 million
1965-66	--	Minimum no. of cases – 0.1 million with no deaths
1971	Urban Malaria Scheme	Flowing rise of malaria cases; 131 town were covered; strategies – passive treatment of malaria cases ,anti larval measures, minor engineering methods like closing ditches, MLO etc, biological control and awareness camp
1976		Cases increased to 6.5 million with 59 deaths
1977	Modified Plan of Operations(MPO) (Also include P	Objectives: - Elimination of deaths from malaria - Morbidity due to malaria

	falciparum containment programme)	-↓ Maintaining gains achieved earlier in programme by transmission whenever possible. Strategies 1) Selective insecticide spray API > 2 2) Active surveillance –Forth nightly visits –Blood smear collection &TT 3) Anti-larval operation in urban areas 4) DDCs, FTDs
1995	Malaria Action Plan	Envisages decentralized planning (akin to RCH)Covers a total of 199 million(20.6%)population living in high risk areas; I. Tribal areas II. Epidemic prone areas III. project areas IV. Triple insecticide resistant areas –DDT/BHC Malathion <u>A) Rural Areas</u> 1) Death due to malaria (pf)-last 3 years 2) Doubling SPR in last 3 years ≥ 4% 3) no doubling but average SPR in 3 years ≥ 5 4) P. falciparum ≥ 30%with SPR ≥ 3% in 3years 5) Chloroquine resistant Pf. 6) Aggregation of endemic /receptive and vulnerable area FTD/DDC-1/1000, VLM-1/3000, Microscope /30,000 <u>B) Urban Areas</u> 1) SPR ≥ 10%During any of last 3 years 2) Population ≥ 50000&SPR>5%with ratio malaria ;fever cases .1/3 1 worker for ACD>20.000 populations 1 worker passive case detection .200 OPD attendance in any dispensary - FTD/DDC -1/2000, Microscope /50,000
1997	Enhanced Malaria Control Project	1045 PHC in 100 districts of AP, Jharkhand, Gujarat, MP, Maharashtra, Orissa and Rajasthan through World Bank assistance. Component; 1)Early detection +prompt T/T Link Worker / 2000 populn 2) Selective vector control Anti larval –Temiphos (Abate) Anti adult → Residual spray → DDT, malathion -space application -malathion
1981	Roll Back Malaria	World Heath Organization and other partners Key interventions; • Vector Control o Insecticide treated nets (ITN) o Indoor residual spray (IRS) • Intermittent preventive therapy during pregnancy (IPT) Prompt and effective case management in particular Artimisinin based combination therapy
2003	National Vector Borne Disease Control	

	programme	
2005	Intensified Malaria Control project	Global fund assistance; NE states ,selected states of Orissa, Jharkhand, West Bengal

- Larvivorous fish –Gambusia affinis, Lebister reticularis,
- Biosides - Bacillus thuringiensis and B. spharicus
- Bed nets – impregnated with Deltamethrin 2.5%, Cyfluthrin 5%

Chemoprophylaxis: 1 wk before entering endemic area & 4 wk after leaving the endemic area.
Indications: Pregnant women , Travelers, Service personnel entering endemic areas
Drugs

- Chloroquine 300 mgs base once every week or Mefloquine 250 mgs every week or Doxycycline 100 mgs every day
- In chloroquine resistant areas chemoprophylaxis is recommended with chloroquine 5 mg/kg weekly and proguanil 100mg daily.
- In chloroquine sensitive areas chloroquine is to be given
- In chloroquine resistance areas chloroquine is to be supplemented by proguanil

Regimen

- Chemoprophylaxi**s** is to be started a week before arriving to malarious area for visitors and for pregnant women prophylaxis should be initiated from second trimester.
- Start with loading dose of 10 mg/kg bi weekly and followed by a weekly dose of 5 mg/kg bi weekly. This is to continue till month after delivery in case of pregnancy and in travelers till one month after return from endemic area. The terminating dose should be 10 mg/kg bi weekly along with 0.25 mg/kg bi weekly of Primaquine for five days
- Chemoprophylaxis with chloroquine is not recommended beyond 3 years because of its cumulative toxicity.

National Drug Policy on Malaria 2007

- All fever cases should preferably be investigated for malaria by microscopy or Rapid diagnostic Kit (RDK)
- The first line of treatment is Chloroquine and the second line for falciparum is Artemisin Combination therapy (ACT) consisting of Artesunate + Sulphadoxine/ Sulphalene + Pyrimethmine. In case of resistance to these formulations and to treat severe and complicated malaria, quinine will be drug of choice. ACT is not to be used for treatment of P. vivax cases as it is not effective against it.
- Microscopically positive P falciparum cases should be treated with chloroquine in therapeutic dose 25 mg/kg body weight over three days and single dose of Primaquine 0.75 mg/kg on the first day. This practice is to be followed at all levels including VHWs like DDC/FTD/ASHA as well.
- Microscopically positive P. vivax cases should be treated with chloroquine in full therapeutic dose of 25 mg/kg over three days. This practice is to be followed at all levels including VHWs like DDC/FTD/ASHA etc. Primaquine can be given in dose of 0.25 mg/kg daily for 14 days under medical supervision only to prevent relapse.
- ACT is the first line of Antimalarial drug for treatment of P.falciparun in chloroquine resistant areas.

Drug Policy:

In high risk areas:	**In low risk areas:**
▪ Presumptive treatment: 25 mg/kg bw of Chloroquine over three days along with 0.75 mg/kg bw of Primaquine on day first ▪ Radical Treatment (on confirmation) ▪ Pf positive cases – no further treatment ▪ Pv positive cases – Primaquine 0.25 mg/kg bw daily for 5 days	▪ Presumptive treatment: Chloroquine – 10mg/kg bw Stat ▪ Radical Treatment (on confirmation) ▪ Pf cases single dose of Chloroquine 10mg/kg bw along with 0.75 mg/kg bw of Primaquine ▪ Pv cases single dose of Chloroquine 10mg/kg bw and 0.25mg/kg bw of Primaquine daily for 5 days
A. High Risk Presumptive → CQ 600+600+300 = 1500mg + Primaquine 45mg For DDC, FTDs VLW (voluntary link worker) Only – 600 mg CQ < 1 year – 75 mg 1 – 4 year - 150 mg, 5 - 8 Years – 300 mg 9 – 14 Years 450 mg > 14 years 600 mg Radical Rx P Vivax 15 mg/day x 5 days P falciparum → No T/T By DDC, VLW, FTD P. vivax – CQ 600 mg+ Primaquine 15 mg x 5 d P. falcipuram – CQ 600+ 600 + 300 Primaquine 45mg state	**B. Low risk area:** Presumptive – CQ 600 mg Radical – vivax – CQ 600+PR. 15mg / day 5 days Falciparum - 600 + PR 45mg Chloroquine Resistant Pf malaria – pyrimeth / sulfadoxin or sulphalene Day (1) 25 + 500 → 3 Tab Day (2) Primaquine 45 mg stat

Severe & complicated malaria: Quinine 10 mg/kg I. V with 5 % dextrose or Artemisinin derivatives

Artesunate + SP Combination Therapy

Artesunate: 4mg/kg for 3 days PLUS Sulphadoxine – Pyrimethmine: 25 mg per kg Sulphadoxine plus 1.25 mg / kg Pyrimethmine in single dose.

Mefloquine can be given to chloroquine / other resistant uncomplicated P.falciparum cases only

For severe and complicated P.falciparun malaria cases IV Quinine / parental Artemisinin derivatives (for adults and non pregnant women only)

Drug Resistance

R1 = PS for MP negative in 7th day after treatment & positive from 8th to 28th day

R2 = PS for MP positive on 7th day

R3 = PS for positive in more than 75% on day 2

Treatment failure – asexual parasite seen within 14days of treatment

Anti Malaria Month - June every year

Malariometric indices

Pre eradication era	**Eradication era**

• Spleen rate (2-10yrs) • Average enlarged spleen • Parasite rate (2-10)yrs • Parasite density index (average degree of parasitemia) • Infant parasite index – most sensitive index – recent transmission – zero for 3 consecutive years – absence of malaria transmission even though anopheles vectors responsible for malaria may remain • Proportional case rate – (every 100 patients attending hospitals / dispensaries)	• API – Annual parasite index Confirmed cases during one year * 1000 Population under surveillance • ABER Number of slides examined * 100 Population • Annual falciparum incidence • Slide positive rate • Side falciparum rate

NATIONAL VECTOR BORNE DISEASE CONTROL PROGRAM (NVBDCP)-MALARIA:

Operational principles:

- Delivery of malaria control services by ASHA at community level
- Supervision and monitoring by DVBDC consultants (district level) and Malaria technical Supervisors (MTS) (sub-district level)
- Strengthening of SPOs by project monitoring units
- Streamlined procurement and supply chain management

Malaria Control Strategies: [Mnemonic: SIPS]

Surveillance and case management • Case detection (Active + Passive) • Early diagnosis and complete treatment • Sentinel surveillance	**Integrated vector management** • Indoor residual spray • Insecticide treated bed nets (ITBN)/Long lasting Insecticidal nets (LLIN) • Antilarval measures (source reduction)
Epidemic preparedness and early response	**Supportive interventions** • Capacity building • Behaviour change communication (BCC) • Inter-sectoral collaboration • Monitoring and evaluation • 5) Operational and applied field research.

.

Surveillance:

Active + Passive surveillance

Pf Rapid diagnostic kits (RDT) are used where microscopy results are not available in 24 hours:

- Test Falciparum Rate (TfR) ≥1%
- Pf ≥30%

Sentinel surveillance: 1-3 sentinel sites established in large hospitals for recording OPD/IPD cases + deaths.

Objective of program:

- >80% fever cases (suspected malaria) to be diagnosed either by RDTs or microscopy within 24 hrs.

Criteria for Indoor Residual Spray (IRS): Village as UNIT OF INTERVENTION

- Spray all areas with API ≥ 5, where ABER ≥10% (Subcentre as unit)
- Spray all areas with SPR ≥ 5, where ABER ≤10%
- Pf > 50% proportion of cases
- Spray all areas with API/SPR < 5, in case of drug resistant foci, vulnerable migrant population
- Epidemics
- Entomological/ecological criteria.

Goals for Strategic Plan 2007-12:

- ≥50% mortality reduction of malaria by 2010.
- ≥80% malaria sufferers get appropriate affordable treatment by 2012.
- ≥80% of those at high malaria risk protected by ITBN/LLIN or IRS by 2012.

National Filariasis Control Programme

- In operation since 1955 / Now operates under the aegis of NVBDCP
- Filariasis: Endemic in 261 districts evening 19 states/UTs.
- Areas free from filaria: All north eastern states except Assam, Rajasthan, J & K, Punjab, Haryana, Himachal Pradesh, Chandigarh, and Uttaranchal & Delhi.
- **Goal**: Elimination of lymphatic Filariasis by 2015.
- Current strategy for control:
  - Recurrent and larval measures
  - Detection and treatment of microfilaria carriers and clinical cases.
  - IEC – community awareness.
  - Treatment: DEC 6mgs/kg body wt dose x 12 days (total of 72 mgs/kg body wt) given 6 days a week for 2 weeks.
  - New Strategy: Single day mass therapy in selected districts.
  - Supplements to existing NFCP strategy: DEC/DEC and albendazole is given once a year for 5 consecutive years (Dose DEC 6mg/kg and Albendazole 400 mgs)
- **WHO's Global Alliance for Elimination of Lymphatic Filariasis**: A future free of LF
  Strategy: There are two principle goals programme to Eliminate Lymphatic Filaria:
  To interrupt transmission of infection;
  To alleviate and prevent both the suffering and disability caused by the disease.

Mass Drug Administration

The transmission of infection can be stopped by treating the entire eligible population living in filarial endemic areas with **Mass Drug Administration (MDA)** with **DEC** given once a year for 5-7 years i.e. during the life span of adult filarial worm which gives birth to millions of microfilaria. With every treatment there will be a heavy reduction in the circulating microfilaria. This will markedly reduce or stop the transmission of the infection by the mosquitoes to other healthy persons.

Diethylcarbamazine (DEC)

DEC is available as 50 mg tablets. The drug has been in use in India for more than five decades. It is a safe drug at the recommended dose. The dose of DEC is 6mg/kg body weight. The following dose schedule was being followed

Conventional Drug Schedule	
Age (in years)	**Dose of DEC**
<2	Nil
2-3	50 mg
4-5	100 mg
6-11	150 mg
12-17	200 mg
>18	300 mg

However, a simplified dose schedule was administered in Tamil Nadu for the mass drug administration campaigns. This was monitored by the state government and the Vector Control Research Centre (VCRC), ICMR and found to be safe and effective. The results were discussed by the National Task Force on Lymphatic Filariasis and the following simplified schedule has been recommended for MDA in the country.

Age (in years)	DEC Dose	DEC (Tablets of 100mg)
<2	Nil	Nil
2-5	100mg	1 tablet
6-14	200mg	2 tablets
15 & above	300mg	3tablets

Side effects

DEC at the above dose is safe. Person with high microfilaria density may experience general side effects in the form of headache, body ache, nausea and vomiting which result from the death of the microfilaria. The side effects are temporary and subside in a day or two after symptomatic treatment. Rarely, localized reactions in the form of swelling and tenderness of lymph nodes may occur. Temporary side effects that may occur in 1 to 10% of the population on an empty stomach.

Contraindications

DEC is a safe drug. However as a matter of precaution, it should not be given to children under two years and to pregnant women. Severely ill patients may also avoid taking the drug.

NATIONAL VECTOR BORNE DISEASE CONTROL PROGRAM (NVBDCP) – FILARIA

Definition of Elimination of Lymphatic Filariasis (by 2015):

No. of microfilaria carriers <1% + Children born later are free of circulating antigenemia.

Strategy of Elimination of Lymphatic Filariasis (by 2015):

- Annual Mass Drug Administration (MDA) of single dose of Anti-filarial drug for 5 years to eligible population (EXCEPT Pregnant, Child <2 years, Seriously ill)
- Home-based management of lymphoedema + Upscaling Hydrocele operations at higher levels.

Kala azar control programme

- Situation analysis: 50 districts in 4 states
- About 129 million population at risk
- Endemic in 33 districts of Jharkhand, 10 districts of West Bengal and 2 districts of UP.
- Centrally sponsored programme launched in **1990 -91**
- **Goal:**

NHP, 2002 – Kala azar elimination by 2010.
10th FYP plan –
Prevention of deaths due to kala azar by 2004 with annual reduction of at least 25 %.
Zero level incidences by 2007 with at least 20% annual reduction using 2001 as base year
Elimination of kala azar by 2010.

- **Strategy:**
  Interruption of transmission for reducing vector population by undertaking indoor residual insecticide spray twice annually
  Early diagnosis and treatment through primary health care system
  Health education and community participation.

- In Bihar, programme is under way with active search for kala azar, combined with malaria, tuberculosis and cataract – Kala azar week.
- Introduction of Kala-azar rapid test – rK39

Treatment guidelines

Name of the drug		Dosages
Injection SSG	1st line drug for treatment	20 mg. per kg. body weight daily for 20 days Maximum 8.5 ml per day
Injfection amphotericin -B	2nd line drug	1 mg. per kg. body wt alternate days (15 inj)
Tab. Miltefosine		50 mg. bd below 12 years 100 mg. bd above 12 years 2.5 mg./ kg body weight bd (56 tablets) for 28 days (adult Dose)
Other drugs: Liposomal amphotericin-B & Injection paramomycin		Not in programme

Japanese Encephalitis Control programme

- Situation analysis: Major problems are in states of Andhra Pradesh. West Bengal, Assam, Tamil Nadu, Karnataka, Bihar, Harayana, Kerala and Uttar Pradesh.
- Strategy:
  - Care of patient
  - Development of safe and standard indigenous vaccine
  - Sentinel surveillance including clinical surveillance of suspected cases
  - Studies to identity high risk groups by measuring the blood levels of antibodies
  - Epidemiologic monitoring of the disease for effective implementation of control measures.

1952- First evidence of JE viral activity by VRC (NIC) during sero-surveys for arbo- viruses.
1955- First human case of JE.
1956- First viral isolation from mosquitoes.
1958- First viral isolation from IE case.
1973- First outbreak in India in Bankura and Burdwan in West Bengal.
1976- Repeat outbreak in Burdwan.

1978- Widespread occurrence of suspected JE cases.
National level monitoring initiated by NMEP in 1978.
Initiation of immunization using inactivated mouse brain vaccine
2003 - JE prevention and control being implemented under integrated NVBDCP.

Japanese Encephalitis

- Zoonosis caused by Flavivirus
- Basic cycles of transmission:
  Pig → mosquito → pig &
  Ardeid bird → mosquito → Ardeid bird
- Pigs are amplifier hosts(they do not manifest the disease, but virus circulates, mosquito can bite and aid in transmission of disease)
- Cattle and buffalo – mosquito attractants,
- Horses only animals show signs;
- Birds – cattle egrets, pond herones, duck, poultry
- Culcine mosquitoes – Culex tritaeniorhynchus, culex visnhui, C.geldius
- Incubation period 5 to 15 days
- Case fatality rate is high varies between 20-40%; may reach 58% and over
- The average period between the onset of illness and death is about 9 days
- Vaccination –
  a) A killed mouse vaccine – mouse brain vaccine, Nakayama strain of JE virus
  Primary immunization 2 doses 1ml each (0.5ml for children under 3 yrs) SC at interval of 7-14 days,
  A booster injection after few months (before 1 yr) in order to develop full protection.
  Revaccination after 3 yrs may be given
  Vaccine given best in inter epidemic period
  b) Live, attenuated JE vaccine (SA 14 – 14-2 vaccine) – S/C 0.5ml at 1 and 2 yr

NATIONAL POLIO ERADICATION PROGRAMME

- 3 serotype
  P1- most common cause of epidemic
  P2- rare- but more serious
  P3- vaccine associated polio 1 in 2.5 million doses
- Even a single case of polio is taken as outbreak
- 1 paralytic polio – 1000 children and 75 adults clinically inapparent infection
- Incubation Period: 7 to 10 days

Poliomyelitis eradication – Epidemiological Basis:

- Man is the only known host.
- Long term carrier state is not known.
- Half life of excreted virus is about 48 hrs in sewage and can spread only during this period.
- Good, efficacious and cheap oral vaccine is available.

Vaccine - Oral Polio Vaccine (sabin) stores at -20^0 C,
Diff. diagnosis of AFP – Poliomyelitis, G.B syndrome, Transverse myelitis, Traumatic neuritis

Polio	GBS
Fever just before paralysis	Fever – 2-3 weeks prior
Descending paralysis	Ascending
asymmetrical	Symmetrical
proximal	Distal
CSF protein normal, WBC ↑	CSF protein ↑ (20mg) WBC normal

Case definition

- Wild polio virus in stool sample
- Residual paralysis after 60 days
- Died or Lost to follow up – compatible (expert review)

Strategies for eradication of poliomyelitis:

1) Routine immunization –

- OPV0 at birth / 3 doses at 6,10 & 14 wks f/b Booster at 18 mths of age
- Should be maintained at high level > 90%

2) Pulse polio immunization (Mass Immunization)

- OPV → wild virus is replaced by vaccine virus → local IgA anti bodies in intestine
- < 5 years age
- No contraindication

Intensified PPI - ensure 100% coverage

- Three or Four NI Days
- House to House immunization activity

3) Acute Flaccid Paralysis surveillance

- Weekly AFP reporting
- Even nil reports
- Investigation within 48 hours

4) Mopping up

- The last stage of polio eradication.
- This strategy involves door to door immunization in high risk districts, is know or suspected to be still circulating.

National Polio surveillance Project WHO – 1997

- Ensure reporting of AFP
- Investigation of cases stool sample
- Follow up for residual paralysis 60 days.

Adequate surveillance:

- Non Polio AFP rate: Minimum one case of AFP should be reported in a year per 100000 children below 15 years – India (2008) - 4. 86
- Percentage of AFP cases with 2 stool samples taken within 2 weeks after onset of paralysis – should be greater than 80%; India (2004) - 85%

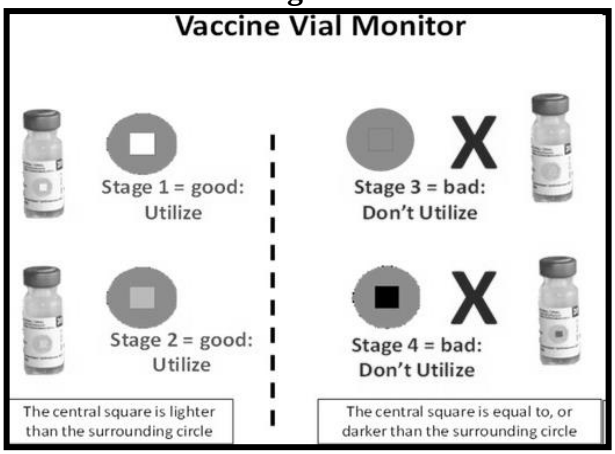
Outbreak response immunization (ORI) - 500 children 5 years age around AFP case given OPV

Epidemic of Poliomyelitis: Now defined as 2 or more local cases caused by the same virus type in any 4 week period.

Certification for Polio Eradication:

- There is no virologically confirmed indigenous case of poliomyelitis for 3 years,
- Absence of wild polio viruses from the communities as indicated by stool samples from normal children and from waste water from high risk population whenever possible.
- Appropriate measures established to deal with importations.

Vaccine vial monitor – vaccine can be used in stage 1 & 2



INTEGRATED DISEASE SURVEILLANCE PROGRAMME (IDSP)

- **IDSP** is a decentralized, state based surveillance programme in the country.
- It is intended to detect early warning signals of impending outbreaks and help initiate an effective response in a timely manner
- It is also expected to provide essential data to monitor progress of on-going disease control programme and help allocate health resources more efficiently

Specific objective of the programme

- To establish a decentralized district- based system of surveillance for communicable & NCD disease so that timely and effective public health actions can be initiated in response to health challenges in the urban and rural areas
- To integrate existing surveillance activities (to the extent possible without having a negative impact on their activities) so as to avoid duplication and facilitate sharing of information across all disease control programmes and other stake holders, so that valid data available for decision making at district, state and national levels.

List of diseases included under IDSP 2004-2009

Regular surveillance

- Vector borne disease - Malaria
- Water borne disease - Acute diarrheal diseases (cholera), Typhoid
- Respiratory disease - TB

- Vaccine preventable disease - Measles
- Diseases under eradication - Polio
- Other conditions - RTA (Road traffic accidents)
- Other international commitments - Plague
- Unusual clinical syndromes - Meningoencepalitis/ respiratory distress, haemorrhagic fevers, other undiagnosed conditions IDSP

Sentinel surveillance

- STDs/Blood borne disease - HIV/HBV, HCV
- Other conditions - Water quality, outdoors air quality (large urban areas)

Regular periodic survey

- NCD risk factors – STEPS methodology - Anthropometry, physical activity , BP , tobacco , Nutrition , blindness and any other unusual health condition

- In addition, each state may identify up to 5 additional conditions for surveillance
- GOI may include in a public health emergency any other unusual health condition and projects funds could be used for such emergencies.

Tests common under IDSP

Disease	Test
Tuberculosis	Sputum AFB smear
Malaria	Blood smear for malaria
Typhoid	Rapid diagnostic test (Typhi Dot)
Water quality	Kit for chlorination test
Water quality	Rapid test kit for faecal contamination

Syndrome under surveillance in IDSP

- Fever
  - Less than 7 days duration without any localizing signs
  - With rash
  - With altered sensorium or convulsions
  - Bleeding from skin or mucous membrane
  - Fever more than 7 days with or without any localizing signs
- Cough more than 4 weeks duration.
- Acute flaccid paralysis
- Diarrhea
- Jaundice
- Unusual events causing death or hospitalization

Syndrome and disease associated:

- Fever with or without localizing signs**:** Malaria, typhoid, JE, dengue, Measles
- Cough more than 3 weeks Tuberculosis
- Acute Flaccid Paralysis Polio
- Diarrhea Cholera
- Jaundice Hepatitis, Leptospirosis, dengue, Malaria, YF
- Unusual syndrome Anthrax, Plague, emerging epidemics

MINIMUM NEED PROGRAMME

(Fifth Five Year Plan)

- Elementary Education And Education
- Rural Health Services
- Rural Water Supply
- Rural Roads
- Rural Electrifications
- Housing – Rural Landless Laborers
- Environment Improvement of Urban Slum
- Nutrition
- Rural Domestic Cooking Energy
- Public Distribution System
- Rural Sanitation

NATIONAL RURAL HEALTH MISSION (NRHM)

- Aim: To improve rural health care delivery
- 2005-2012 (Extended to 2017)

STATE OF PUBLIC HEALTH - Few facts

- Public health expenditure in India has declined from 1.3 % of GDP in 1990 to 0.9% of GDP in 1999.the Union Budgetary allocation for health is 1.3% while the State's budgetary allocation is 5.5%.
- Union Government contribution to public health expenditure is 15% while states contribution about 85%.
- Curative services favor the non-poor: for every Re.1 spent on the poorest 20% population, Rs. 3 is spent on the richest quintile.
- Only 10% Indians have some from of health insurance, mostly inadequate
- Hospitalized Indians spend on an average 58% of their total annual expenditure

Over 25% of hospitalized Indians fall below poverty line because of hospital expenses

Vision:

- The National Rural Health Mission (2005-12) seeks to provide effective healthcare to rural population throughout the country with special focus on 18 states, which have public health indicators and/ or weak infrastructure.
- These 18 states are Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Himachal Pradesh, Jharkhand, Jammu & Kashmir, Manipur, Mizoram, Meghalaya, Madhya Pradesh, Nagaland, Orissa, Rajasthan, Sikkim, Tripura, Uttaranchal and Uttar Pradesh.
- The Mission is an articulation of the commitment of the Government to raise public spending on health from 0.9% of GDP to 2-3% of GDP.
- It has it key components provision of a female health activist in each village; a village health plan prepared through a local team headed by the Health & Sanitation Committee of the Panchayat; strengthening of the community through India Public Health standards (IPHS); and

integration of vertical Health & Family Welfare Programme and Funds for optimal utilization of funds infrastructure and strengthening delivery of primary healthcare.

The mission has some core strategies and some supplemented strategies:-

Core strategies

- Train and enhance capacity of Panchayati Raj Institutions (PRIs) to own, control and manage public health services.
- Promote access to improved healthcare at household level through the female health activist (ASHA).
- Health Plan for each village through Village Health Committee of the Panchayat.
- Strengthening sub- center through an untied fund to enable local planning and action and more Multi Purpose Workers (MPWs).
- Strengthening existing PHCs and CHCs, and provision of 30-50 bedded CHC per lakh population for improved curative care to a normative standard (Indian Public Standards defining personnel, equipment and management standards).
- Preparation and Implementation of an intersectoral District Health Plan prepared by the District Health Mission, including drinking water, sanitation & hygiene and nutrition.
- Integrating vertical Health and Family Welfare programmes at National, State, Block, and District levels.
- Technical support to National, State and District Health Missions, for Public Health Management.
- Strengthening capacities for data collection, assessment and review for evidence based planning, monitoring and supervision.
- Formulation of transparent policies for deployment and career development of Human Resources for health.
- Developing capacities for preventive health care at all levels for promoting healthy life styles, reduction in consumption of tobacco and alcohol etc.
- Promoting non – profit sector particularly in under served areas.

Supplementary Strategies:

- Regulation of private Sector including the informal rural practitioners to ensure availability of quality service to citizens at reasonable cost.
- Promotion of public Private Partnerships for achieving public health goals.
- Mainstreaming AYUSH – revitalizing local health traditions.
- Reorienting medical education to support rural health issues including regulation of Medical care and Medical Ethics.
- Effective and viable risk pooling and social health insurance to provide health security to the poor by ensuring accessible, affordable, accountable and good quality hospital care.

Important Targets

- Reduction in Infant Rate and Maternal Mortality Ratio by 50% from existing levels in next 7 years
- Increase utilization of First referral Units less than 20% (2002) to more than 75% by 2010

ASHA – Accredited Social Health Activist

- Interface between community & public health system

- Accountable to panchayat
- Norm – 1/1000 population
- (other grass workers for 1000 population AWW, Trained Dai, Village Health Guide – now scheme abolished)
- Act as a bridge between ANM and village
- Honorary volunteer – receiving performance based compensation for promoting
- Immunization, referral & escort services for RCH services, construction of toilets
- House services, delivery of other national health programmes

Profile of ASHA worker

- 25 to 45 years of age
- Resident of the village
- Women (married/widowed/divorced)
- Preferences to women having interest in social activities.
- Formal education up to 8th class with preference to more educated
- Communication skills
- Leadership qualities
- Resource persons for ASHA: Anganwadi Worker (AWW) and the Auxiliary Nurse Midwives (ANM).
- Currently 8.66 lakhs ASHAs are functional (2012)
- **Remuneration for ASHA:** Although ASHAs are considered volunteers, they receive outcome-based remuneration and financial compensation for training days. For example, if an ASHA facilitates an institutional delivery she receives Rs. 600, Rs. 150 for each child completing an immunization session, and Rs. 150 for each individual who undergoes family planning.

Training of ASHA

Induction Training:

- Total duration of 23 days
- First training after selection for seven days
- Subsequent four training exposures for four days each: Flexible intervals

Periodic Training –

- Will start once induction training is over
- Held for about 2 days, once in every alternate month**.**

Monitoring and evaluation of ASHA's work

Process indicator	***Outcome indicator***	***Impact indicator***
• No. of ASHA selected • No. of ASHA trained • % of ASHAs attending review meeting after one year	• % of newborns who were weighed and families counselled • % of children with diarrhoea and who received ORS • % of deliveries with skilled assistant • % of institutional deliveries	• Infant mortality rate • Child malnutrition rates • No. of cases of TB or leprosy reported as compared to the previous year.

	• % of completely immunized children in 12-23 mths age group • % of unmet need for spacing contraception among people below the poverty line • % of people who received chloroquine within first week in a malaria endemic area	

Strengthening Health Level Structures

Subcentres:

- Each SC will have an untied fund for local action @ Rs.10,000/ per annum

PHCs:

- Adequate and regular supply of essential quality drugs and equipment (including supply of auto disabled syringes for immunization) to PHCs
- Provision of 24 hour services in at least 50% PHCs by addressing shortage of doctors, especially in high focus states, through mainstreaming AYUSH manpower

CHCs:

- Operationalizing 3,222 existing community health centres as 24 hr First Referral units, including posting of anesthetists
- Codification of new Indian public health Standards, setting norms for infrastructure, staff, equipment, management etc. for CHCs
- Promotion of stakeholder committees (Rogi Kalyan Samitis) for hospital management
- Developing standards of services and costs in hospital care
- Develop, display and ensure compliance to citizen's charter at CHC/PHC level.

Times lines for implementation:

Merger of multiple societies constitution of district / state mission	June 2005
Provision of additional generic drugs at SC/PHC/CHC level	December 2005
Operational programme management units	2005-2006
Preparation of village health plans	2006
ASHA at village level (with drug kit)	2005-2008
Upgrading of rural hospitals	2005-2007
Operationalizing district planning	2005-2007
Mobile medical unit at district level	2005-08

Disease programme covered under umbrella NRHM

- National Vector borne disease control programme
- National Leprosy Elimination Programme
- RNTCP
- National Programme for Control of Blindness
- Iodine deficiency disorders control programme

Some of the **key achievements** under National Rural Health Mission are:

- Accelerated improvements in key reproductive health indicators e.g. Maternal Mortality Ratio (MMR), Infant Mortality Rate (IMR), Total Fertility Rate (TFR) and Institutional Delivery Rate.
- Upgradation and operationalization of 8250 Primary Health Centers (PHCs) as 24X7 facilities
- Operationalization of 2312 FRUs which includes Community Health Centers (CHCs), Sub District Hospitals and District Hospitals for providing OPD and 24*7 indoor facilities especially for comprehensive emergency obstetric and newborn care.
- 374 Special Newborn Care Units, 1638 Newborn Stabilization Units, and 11432 Newborn Care Corners have been established at different levels of health facilities.
- Augmentation of the availability of skilled manpower by means of different skill- based trainings such as Skilled Birth Attendance for Auxiliary Nurse Midwives/Staff Nurses/Lady Health Visitors; training of MBBS Doctors in Life Saving Anaesthetic Skills and Emergency Obstetric Care including Caesarean Section.
- Over 1.4 lakh Human Resources have been engaged across the country on contractual basis under National Rural Health Mission which includes- ANMs, Staff Nurses, Paramedics, AYUSH Doctors, Doctors, Specialists and AYUSH Paramedics.
- Engagement of 8.61 lakhs Accredited Social Health Activists (ASHAs) to generate demand and facilitate accessing of health care services by the community.
- As per the Health Management Information System (HMIS) under the National Rural Health Mission, total institutional deliveries at public and private accredited health facilities increased from 1.62 Crores in the year 2009-10 to 1.68 Crores in the year 2010-11

The **key strategies** adopted by the Government of India **to strengthen NRHM** are:

- Creation of strong institutional mechanisms at National and State level through Mission Steering group, State/District Health Mission.
- Strengthening Programme Management units for effective public health management through State, District and Block Programme management units.
- Enhanced fund allocation to NRHM for additional funding to States.
- Preparation of inter-sectoral District Health Plans.
- Integrating vertical Health and Family Welfare programmes at National, State, District and Block levels.
- Supporting States through united funds for the functioning of Village Health Sanitation & Nutrition Committees and thereby focusing on creation of Village Health Plans.
- Promoting access to healthcare at household level through ASHA.
- Supporting the States to train and enhance capacity of Panchayati Raj Institutions.
- Strengthening facilities from PHCs and above through grants to RogiKalyanSamitis (RKS).
- Promotion of Public Private Partnership through NRHM to improve service delivery.

	Goals	Achievements
National Rural Health Mission (By 2012)	❖ MMR: 100/100,000 Live Births ❖ IMR: 30/1000 Live Births ❖ TFR: 2.1	❖ MMR : 301- SRS (RGI) (2002) 254- SRS (RGI) (2005) 212- SRS (RGI) (2008) ❖ IMR: 60 - SRS (RGI) (2003) 57 - SRS (RGI) (2006) 47 - SRS (RGI) (2010) ❖ U5 MR: 85- SRS (RGI) (2000) 77 - SRS (RGI) (2005) 64 - SRS (RGI) (2009) • Institutional Delivery : ❑ 40 .9% - DLHS-II (2003) ❑ 47% - DLHS-III (2007) ❑ 72.9 % - CES (2009) • Complete Immunization: ❑ 45.9% - DLHS-II (2003) ❑ 54% - DLHS-III (2007) ❑ 61% - CES (2009) • Total Fertility Rate: • 3 - SRS (RGI) (2003) • 2.6- SRS (RGI) (2008)
Millennium Development Goal (By 2015)	❖ MMR: Reduce by 3/4ths; 424 (1993) to 106/100,000 Live Births. ❖ IMR: Reduce by 2/3rds 80 (1990) to 27/1000 Live Births ❖ Under 5 MR: Reduce by 2/3rds; 118 (1990) to 42/1000 Live Births	

RGI – Registrar General, India
Coverage Evaluation Survey 2009 (CES-2009)
District Level Household and facility Survey (DLHS)

National Programme for prevention of deafness

- Prevalence of Significant Hearing loss in India – 6.3%
- **Common causes include** – Genetic, Otitis Media, Presbyacusis, Excessive Noise, Ototoxic drugs, antenatal and Perinatal problems, infections, wax and foreign bodies,
- **Less Common causes**- nutrition related, trauma, Menieres disease, tumours, and cerebrovascular disease.
- **Overall Objective** – To prevent and control major causes of hearing impairment and deafness – so as to reduce the total disease burden by 25% of the existing burden by the end of eleventh five year plan.

****

NON COMMUNICABLE DISEASE

- Epidemiological transition - CD → NCD
- **Key features of NCDs:**
  Multifactorial causation
  Latent period
  Insidious onset
  Non- reversible changes
  Modifications in lifestyle
  Multi- directional approach
- 32 million deaths attributable to non communicable disease all aver the globe.
- Risk factors for NCD

Non-modifiable	***Modifiable***
• Age	• Obesity
• Sex	• Salt
• Genetic	• Sat. fats
• Ethnicity	• Life style
• Personality	• Stress
	• Smoking / Alcohol
	• Environmental factors

Cardiovascular disease (CVD)

- 25% DALYs lost due to NCD / IHD (40%)
- Prevalence (estimated) – 96.7/1000 – urban 27.1/1000 – rural

Decreased risk	Increased risk
Regular physical activity	Myristic & palmitic acids
Linoleic acid	Trans fatty acids
Fish & fish oil (EPA & DHA)	High salt intake
Veg. & fruits	Overweight
Potassium	High alcohol intake
Low/mod. Alcohol	Dietary cholesterol

CHD

- Modern epidemic in India
- 25-30% deaths in industrialized countries
- Presentation – Angina pectoris/MI/**Arrhythmia**/Cardiac failure/Sudden death
- Measuring burden of disease-
- Best indicator – Proportional mortality ratio (30% M – 25% F)
- MONICA – WHO Project
  Multinational monitoring if trends & determinants in cardiovascular disease (1984-1994)
- Highest mortality due to CVD - European region f/b SEAR
- Rose – calculated Incubation period – 10 yrs or more
- India- CHD expected no. one cause of death in 2015

	Urban	Rural
Prevalence	6.4%	2.5%
Death rate	0.8/1000	0.4/1000

Risk Factors

Non modifiable	**Modifiable**	**Novel Risk Factors**

- Age
- Sex
- Family history
- Genetic factors
- Smoking / Alcohol
- HT / DM
- ↑S. cholesterol
- Obesity
- Stress
- Sedentary habit
- Oral contraceptive
- Type A personality
- Excess Homocyteine
- Inflammation
- Abnormal blood coagulation

CHD- Epidemiological indicators:

- Proportional mortality ratio
- Loss of life expectancy
- CHD incidence
- Age specific death rate
- Prevalence rate / case fatality rate (28 days)
- Medical care
- Measure of risk factor levels.

Pattern of CHD in India

- Occurs a decade earlier as compared to developed countries
- Peak – 51-60 yrs of age, Males > females
- HT & DM > 40% cases
- Systolic BP – Most important indicator to identify high risk
- Protective: Cholesterol/HDL < 3.5 / HDL > 30mg/dl
- Alcohol > 75gm/day – independent risk factor

Smoking & CHD

Modifiable major RF
25% death in < 65 yrs-age, Filters – not protective
Risk decease cassation of smoking

Lipid profile

Threshold for Serum Cholesterol < 220 mg/dl
Protective: HDL
Direct association: LDL cholesterol
Better prediction: Apolipolrotein A-1 (HDL) & B (LDL)
Premature atherosclerosis – VLDL /Peripheral Vascular Disease
Total cholesterol/HDL < 3.5 – clinical goal for CHD prevention

Prudent diet/Dietary goals

- Reduction of fat < 20-30% of total energy intake
- Saturated fats < 10 % of total energy intake
- Decrease dietary cholesterol to < 100mg/1000cal
- Increase carbohydrates consumption
- Decrease salt < 5 gm/day
- Avoid alcohol

Major Risk factor Intervention Trials

Framingham study – (USA)

Best known large prospective trial for CHD risk factors

Cohort design

Stanford-Three-Community study-

To determine role of Health Education in CHD
Northern California
Reduction in prevalence – 23-28%

North Kerelia Project- (Finland)

To reduce cardiovascular RF & promote early Δ, treatment & Rehabilitation

Multiple Risk Factor Intervention Trial (MRFIT) – (USA)

To reduce RF (Smoking, BP, Cholesterol)

Oslow diet/Smoking intervention study (Norway)

Serum lipid lowering & smoking cessation – effect on CHD
Decreases by 47%

Lipid Research Clinics study

Double blinded RCT. Cholestyramines (study) group & Placebo (control) group

Hypertension (HT)

Incidence – Urban – 5-6 %; rural – 3%

Sir George Peckering – B.P. is normally distributed in population

	SBP	DBP
Normal	< 120	< 80
Pre HT	120-139	80-89
HT-Stage-I	140-159	90-99
Stage-II	≥ 160	≥ 100

When SBP & DBP are difficult to categorize → take high value
SP > 140 & DBP < 90 – Isolated systolic HT

WHO recommendation – BP measurement

- Sitting position
- Either Rt/left arm
- SBP – first heart (phase-I)
- DBP – Muffled (phase IV)/Disappeared sound (phase V)
- 3 readings over 3 min
- Lowest reading recorded

Classification – Primary or Essential (90%) / Secondary (10%)

Rule of halves	**Tracking of BP**
• 50% are aware • 50% of those aware- 50% know treatment available • 50% known – 50% adequately treated	• Low BP tend to remain low & high BP tend to remain high • Applied to identifying children & adults at risk of developing HT in future

Risk factors

Non-modifiable	Modifiable
• Age	• Obesity
• Sex	• Salt
• Genetic	• Sat. fats

- Ethnicity
- Personality
- Life style
- Stress
- Smoking / Alcohol
- Environmental factors

Prevention

Primary prevention-

a) Population strategy – Nutrition / Wt reduction / Exercise promotion / Behavioral changes
Health education / Self care

b) High risk strategy – Tracking of BP

Secondary prevention- Early detection (Screening) & treatment / Patient compliance

Stroke (apoplexy)

- Acute severe manifestation of cerebrovascular disease
- Rapidly developing clinical signs of focal disturbance of cerebral function, lasting more than 24 hrs or leading to death.
- India- Prevalence – 1.54/1000 (Highest prevalence – Japan) / Death rate – 0.6/100
- Causes - Cerebral thrombosis (MC) / Cerebral hemorrhage / Subarachnoid hemorrhage / Cerebral embolism
- Risk factors

Non-modifiable	Modifiable
• Age • Heredity and gender • Prior history of stroke	• Hypertension / DM • Smoking • Carotid artery disease • Other heart disease • Sickle cell disease • Hypercholesterolemia • Physical inactivity

- Mn – Control of HT
  Early diagnosis & treatment of HT/TIA
  Diet / Control of DM / Smoking cessation / Mn of other risk factors

Rheumatic Heart Disease (RHD)

- Result of communicable disease – RF due to streptococcal throat infection (strepto. pharyngitis)
- RF – febrile illness affecting connective tissue in heart & joints
- One of most readily preventable chronic diseases group
- MC cause of heart disease in 5-30 yrs age throughout world
- India- Prevalence – 5-7 per 1000 in 5-15 yrs age group
  20-30% of hospital admission due to CVD
  1-3% of streptococcal sore throat → RF
- Jai Vigyan Mission mode project- Community control of RF/RHF
  4 main components
  To study epidemiology of strepto sore throat
  To establish RF/RHD registry
  To develop vaccine for strepto infection
  To conduct advanced studies for pathology of RF/RHD

- Causative agent - Group A β-hemolytic streptococci (M-5 strain)
  Recently Coxsackie virus B4 – causative & streptococci –conditioning agent
- High risk group – School going children in 5-15 yrs age group
- MC cardiac lesion – children – MS / Adult – MR
- **Diagnosis:** WHO criteria for the diagnosis of rheumatic fever and rheumatic heart disease These revised WHO criteria facilitate the diagnosis of:
  A primary episode of RF
  Recurrent attacks of RF in patients without / with RHD
  Rheumatic chorea
  Insidious onset rheumatic carditis / Chronic RHD

- **Revised Jone's criteria**

Major	Minor –
• Carditis • Polyarthritis • Chorea • Erythema marginatum • Subcutaneous nodules	• Clinical - fever, poly-arthralgia • Laboratory - increase acute phase reactants (ESR or TLC) • Supporting evidence of a preceding Strepto infection within last 45 days • ECG – prolonged PR interval • Increase ASLO titre / Recent scarlet fever • +ve throat culture / Rapid Ag test +ve

- **Prevention**
  Primary – to prevent RF & treatment strepto sore throat
  High risk – school age children
  Adult Single IM inj 1.2mu Benzathine penicillin
  Children Single IM inj 0.6mu Benzathine penicillin
  Or oral Penicillin V/Penicillin G x 10 days Or Erythromycin
  Secondary - Penidura prophylaxis

Cancer

Total cancer burden globally (in decreasing order)
Lung cancer > Colorectal cancer > Breast cancer > Prostatic cancer

Globally- **Incidence**		**Mortality**	
Male	Female	Male	Female
Ca-lung	Ca-breast	Ca-lung	Ca-breast
Ca-stomach	Ca-cervix	Ca-stomach	Ca-lung
Ca-Prostate	Ca-colon	Ca-liver	Ca-stomach
Ca-colon	Ca-lung	Ca-colon	Ca-colon

India: **Incidence**	
Male	Female
Ca-oral cavity	Ca-cervix
Ca-esophagus	Ca-breast
Ca-stomach	Ca-oral cavity
Ca-lung	Ca-esophagus

Urban area – Ca-breast /
Rural area – Ca-cervix

HPV vaccine – Bivalent (16 & 18)

- Recommended in age group 9-25 yrs

- 3 dose vaccine
- Should not be frozen

Warning signs of cancer-

- A lump or hard in breast
- A change in wart or mole
- A persistent change in digestive/bowel habits
- A persistent cough or hoarseness
- Excessive loss of blood at monthly period /outside the dates
- Blood loss from natural orifice
- A sore that does not heal
- Unexplained wt. loss

Cancer screening

Ca cervix – Pap smear by a physician / Thermography / Mammography
Ca-lung – chest X ray/sputum cytology

National Cancer control programme

- 1975-76 / 2004
- Objectives – I / II / III prevention
- Schemes under revised strategy
  - Regional cancer centre scheme (3 crore)
  - Oncology wing development scheme (3 crore)
  - District cancer control programme (22 lacs / 17 lacs)
  - Decentralised NGO scheme
  - IEC activities
  - Research & Training
- Tobacco control legislation

National Cancer Control Programme, 1975

Situation analysis:

- 2.5 million Cases of cancer in India at any given point of time.
- Incidence of 0.7 million every year

Objectives:

- Primary Prevention: Health Education regarding hazards of tobacco consumption and necessary genital hygiene for prevention of genital cancers.
- Secondary Prevention: Early detection of common cancers i.e. cervix, mouth, breast and other tobacco related cancers
- Tertiary: Strengthening of exiting institutions for surgical, radio and chemotherapy and provision of palliative care

Schemes

- Financial assistance to voluntary organizations
- District cancer control scheme
- Financial assistance for cobalt unit installation

- Development of oncology wings in Government Medical College hospitals
- Assistance for regional research and treatment centers current status
- 205 cancer treatment centers; 22 regional cancer center s; 325 teletherapy units; 113 remote brachytheraphy machines
- Availability or oral morphine tablets in registered medical institutions since 1991

November 7 – National cancer Awareness day

National Cancer Registry Programme 1982 – ICMR

Aim: To study Prevalence and Incidence

- Population Based – 5 Urban Bombay, Bangalore, Madras, Bhopal, Delhi & 1 Rural – Barshi
- Hospital Based – 6 Hospitals – Chandigarh, Dibrugarh, Trivandrum, Bombay, Bangalore, Madras

Diabetes Mellitus (DM)

- Prevalence World – 5.4% / Currently – 150 million cases – double by 2025
- SEAR – 20% current global DM population which will triple by 2025
- High prevalence – Sri Lanka / Low prevalence – DPR Korea
- India – Rural – 2.4% Urban – 4.0-11.6%
- Screening test-
  Urine sugar after 2 hrs of meal (Sensitivity – 10-50% & Specificity – 90%
  Blood sugar – OGTT- 2 hrs after 75 gm oral glucose
- High risk groups-

Age > 40yrs	Women with excessive wt. gain during pregnancy
Obese	Women with baby > 4.5 kg (> 3.5kg)
F/h/o DM	Patients with premature atherosclerosis

- **WHO/ American diabetes association diagnostic criteria**
  Symptoms of diabetes plus RBS $\geq$ 200 mg/dl or
  Fasting plasma glucose 126 mg/dl or Two hour plasma glucose 200mg/dl – GTT

- **National Diabetes Control Programme**

This was started in 7th yr plan in 3 states – Tamil Nadu, Karnataka, Jammu and Kashmir on pilot basis but due to paucity of funds in subsequent years this programme could not be expanded further in remaining years.

Objectives

- Prevention of diabetes through identification of high risk subjects and early intervention in the form of health education;
- Early diagnosis of disease and appropriate treatment morbidity and mortality with reference to high risk group;
- Prevention of acute and chronic metabolic, cardiovascular, renal and ocular complication of the disease;
- Provision of equal opportunity for physical attainment and scholastic achievement for the diabetic patients; and
- Rehabilitation of those partially or totally handicapped diabetes people.

Components: Identification of High Risk

Health education
Early diagnosis & treatment
Prevention of Complication

Diabetes action now

- Joint initiative of WHO and international diabetes federation
- Goals for preventing complications
  - Fasting blood sugar < 120 mg/dl and 2 hrs postprandial < 140 mg/dl
  - Blood pressure < 130/80 mm of Hg
  - HbA1c < 7%
  - HDL > 45 mg/dl in males and > 55 mg/dl in females
  - LDL < 100 mg/dl
  - Total TGs < 150 mg/dl
  - S. Creatinine < 104 mg/dl
  - Spot urinary albumin - creatine ratio < 30 mg/g

Obesity

- Obesity – most prevalent form of malnutrition
- Hypertrophic & Hyperplastic or combination

BMI – Internationally accepted method of assessment of obesity

Classification	**BMI (Global)**	**Asians**
Underwt	< 18.5	< 18.5
Normal range	18.50-24.99	18.5-22.99
Overwt	≥ 25.00	23-26.99
Preobese	25.00-29.99	≥ 27
Obesity-I	30.00-34.99	(Obesity)
Obesity-II	35.00-39.99	
Obesity-III (Morbid)	≥ 40.00	

Assessment of obesity

a) Body weight-

- +2 SD above median wt – obesity
- BMI (Quetlets index) = Wt (kg) / $Ht(m)^2$
- Broca's index = Ht – 100 (Ideal wt)
- Lorentz's formula = Ht (cm) -100 - {[Ht (cm)-150] / 2 (Woman) or 4 (Man)}
- Corpulence index = Actual wt. / Desirable wt. < 1.2 (Ht. independent)
- Underwt – 17.00-18.49 – Grade I / 16.00-16.99 – Grade II / < 16.00 - Grade III

b) Skin fold thickness

- Noninvasive method for body fat assessment at 4 sites – biceps / midtriceps / Subscapular & suprailiac region
- Normal - < 40mm in boys / < 50mm in girls
- measured by – Harpenden skin caliper
- Limitation – Poor repeatability
- Single best measurement – Midtriceps [Obesity ≥ 18mm (boys) / ≥ 32mm (girls)]

c) Waist circumference (WC) & Waste Hip Ratio (WHR) (Ht. independent)

- WC ≥ 102 cm (men) / ≥ 88cm (women) → increased risk

- WHR > 1.0 (men) / > 0.85 (women) → Abdo. fat accumulation

d) Others - Total body water / Total body potassium / Body density

Hazards of obesity: Relative risk of health problems associated with obesity

Greatly increased	**Moderately increased**	**Slightly increased**
Type 2 DM Gall bladder disease Dyslipidemia Insulin resistance Breathlessness	CHD Hypertension Osteoarthritis (knees) Hyperuricemia and gout	Cancers (breast, endometrial and colon) Reproductive hormone abnormalities Polycystic ovarian disease Impaired fertility Low back pain Increased aesthetic complications Fetal defects associated with maternal obesity

Prevention and control

- Three cornerstones – dietary changes, increased physical activity and other like anorectic drug etc.
- Diet – **Atkin's diet or Atkin's nutritional approach –**
    - Low carbohydrate diet. The low – carbohydrate diet produces a "metabolic advantage" where the body burns more calories, overall, than on normal diets, and also expels some unused calories.
    - Has typically four phases – (1) Induction (2) Ongoing weight loss (3) Pre-maintenance and (4) Lifetime maintenance.
- During the induction phase – calorie intake is limited to < 1000 Cal and carbohydrate intake limited to 20 net grams per day. Food that is allowed in liberal quantities is shelled fish, chicken, fish and even eggs.

National programme for NCDs

- 2008
- Pilot project - 7 states with 1 district each
- Assam /Punjab /Rajasthan /Karnataka /TN /Kerala /AP
- Financial outlay – Rs. 5 crore
- 3 components
    - Health promotion for general population
    - Disease prevention for high risk group
    - Assessment for prevalence of risk factors

National Programme for control of cardiovascular disease, diabetes and stroke (NCDs)

- NCDs accounted for 53% of all deaths in India in 2005.
- January 2008- programme was launched

Programme Objectives:

1. Reduction of
    - Prevalence of risk factors of common NCDs
    - Morbidity and mortality due to DM, CVD and stoke.
2. Capacity Building.

Main activities during preparatory phase:

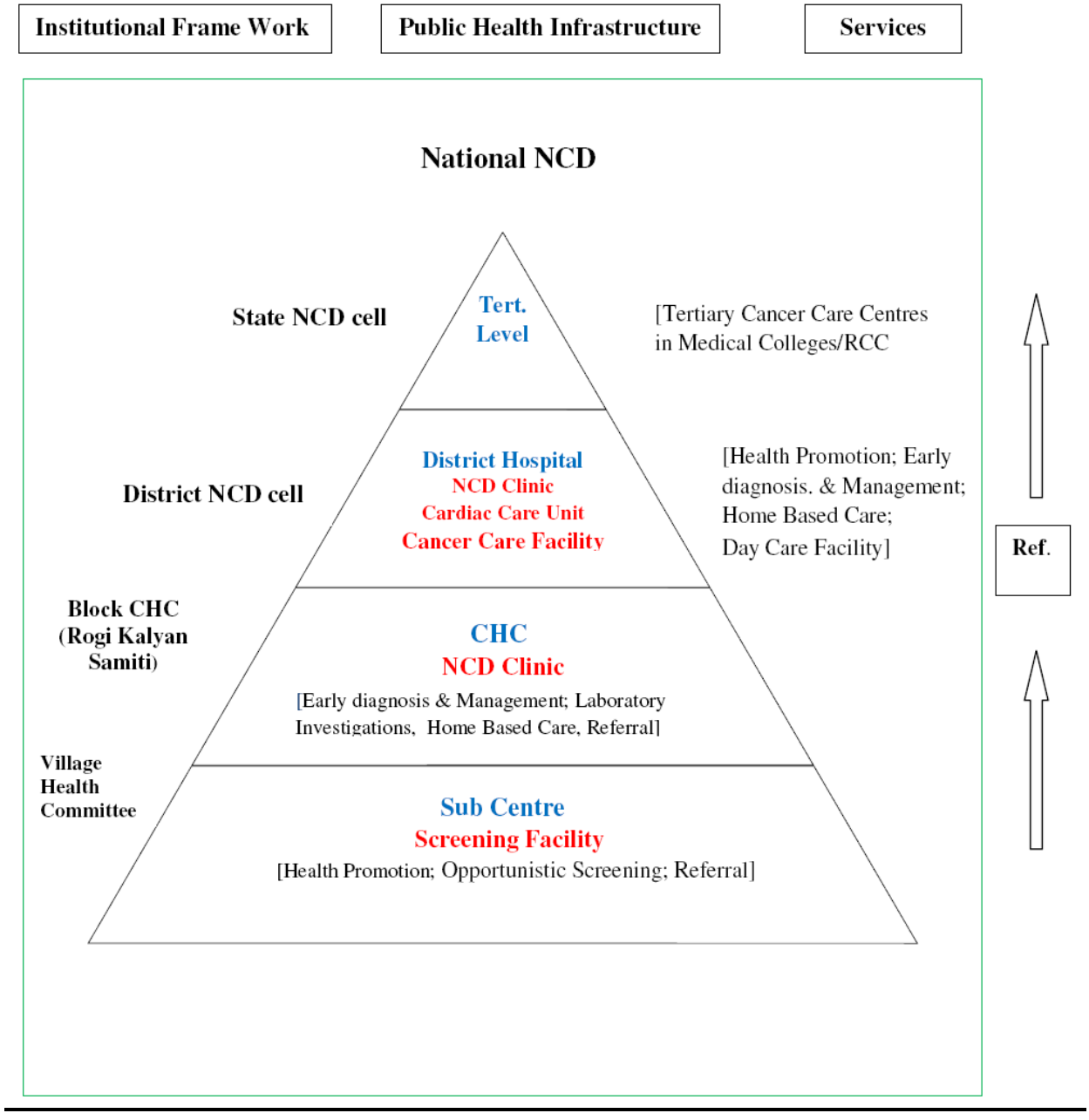
- Establishment of one National NCD cells
- Establishment of 6 state NCD and 6 regional resources centers; one medical college involvement in 6 regions – North, South, East, West, North East, Central.

- Identification of one district under each Medical college for setting up district healthy lifestyle centers and strengthening of district and sub district facilities.
- Finalization and dissemination of management guidelines on NCDs and their risk factors.
- Health Promotion in specific settings.

Packages of services to be made available at different levels under NPCDCS

Health Facility	Packages of services
Sub centre	1. Health promotion for behavior change 2. 'Opportunistic' Screening using B.P measurement and blood glucose by strip method 3. Referral of suspected cases to CHC
CHC	1. Prevention and health promotion including counseling 2. Early diagnosis through clinical and laboratory investigations (Common lab investigations: Blood Sugar, lipid profile, ECG, Ultrasound, X ray etc.) 3. Management of common CVD, diabetes and stroke cases (out patient and in patients.) 4. Home based care for bed ridden chronic cases 5. Referral of difficult cases to District Hospital/higher health care facility
District Hospital	1. Early diagnosis of diabetes, CVDs, Stroke and Cancer 2. Investigations: Blood Sugar, lipid profile, Kidney Function Test (KFT),Liver Function Test (LFT), ECG, Ultrasound, X ray, colposcopy , mammography etc. (if not available, will be outsourced) 3. Medical management of cases (out patient , inpatient and intensive Care) 4. Follow up and care of bed ridden cases 5. Day care facility 6. Referral of difficult cases to higher health care facility 7. Health promotion for behavior change
Tertiary Cancer Centre	Comprehensive cancer care including prevention, early detection, diagnosis, treatment, minimal access surgery after care, palliative care and rehabilitation

Figure 3: Services available under NPCDCS at different levels



Blindness

- **NPCB definition of Blindness**
  Visual acuity of < 6/60 in better eye with best possible corrections
- **WHO definition of Blindness**
  Visual acuity of < 3/60 in better eye with best possible corrections

< 6/18-6/60	Low vision	PL-	Absolute blindness
< 6/60-3/60	Economic blindness	< 6/60	Work vision

< 3/60-1/60 Social blindness < 1/60-PL+ Manifest blindness	< 3/60 Walk vision

World: Prevalence –0.6% -180 million disabled / 45 million blind – 80% avoidable Major causes of blindness - Cataract Glaucoma Trachoma Childhood blindness Onchocerciasis Other	**India** Prevalence -0.7 % Major causes Cataract – 62.6% Refractive error – 19.7% Glaucoma – 5.8% Post segment pathology – 4.7% Corneal opacity – 0.9% Others – 6.2%

- Goal for NPCB – to reduce prevalence to 0.3% by 2000
- NHP – 2002 – to reduce prevalence to 0.5% by 2010
- India – first country to introduce NPCB (1976)

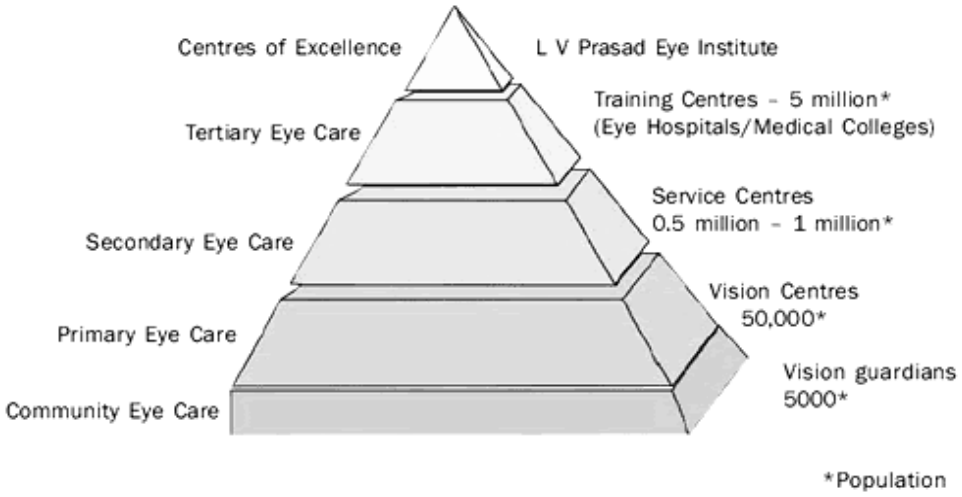
Vision (2020) – Right to Sight

- Aims to eliminate avoidable blindness by 2020
- Launched by WHO – Feb. 1998
- Diseases

World (5)	India (7)
Cataract	Cataract
Refractive error	Refractive error
Childhood blindness	Childhood blindness
Trachoma	Trachoma
Onchocerciasis	Glaucoma
	Diabetic retinopathy
	Corneal blindness

- Five basic strategies to combat blindness
  - Disease prevention & control
  - Training of personnel
  - Strengthening of existing eye care infrastructure
  - Use of appropriate & affordable technology
  - Mobilization of resources
- Infrastructure

Vision centers 20000	(I eye care - screening)
Service centers 2000	(II eye care - Sx referral)
Training center 200	(III eye care - retinal Sx / Corneal Sx / Glaucoma Sx)
Center of Excellence 20	(Professional leadership / Research standards & QA)



VISION 2020: Right to Sight, is a global initiative to eliminate avoidable blindness by year 2020. The programme is a partnership between the **World Health Organization (WHO) and the International Agency for Prevention of Blindness (IAPB),** a large umbrella organization for eye-care professional groups and nongovernmental organizations (NGOs) involved in eye-care.

IAPB VISION 2020 Task Force Members	*IAPB VISION 2020 Supporting Members*
• Christian Blind Mission International (CBM) • Helen Keller International • IMPACT- EMRO • International Centre for Eye care Education • International Federation of Ophthalmological Societies (IFOS) • International Trachoma Initiative (ITI) • Operation Eyesight Universal • **ORBIS International** • Sight Savers International • The Fred Hollows Foundation • Lighthouse International • World Council of Optometry • Vision CRC	• Agenzia Internazionale per la Prevensione della Cecita • American Academy of Ophthalmology • Asian Foundation for the Prevention of Blindness • Foundation Dark & Light Blind Care • Lions Clubs International Foundation • Swiss Red Cross • Seva Foundation • Canadian National Institute for the Blind • Royal National Institute for the Blind • Mirada Solidaria Foundation • UK Vision Forum, UK
Corporate Patron • Bausch & Lomb ***Corporate Sponsor*** • Carl Zeiss Meditech	***Corporate Donor*** • Alcon • Merck • Task Force Sight & Life

- **Manpower**

	2000	**2010**	**2020**
Ophthalmologists	1:200000	1:100000	**1:50000**
Ophthalmic medical Assistant and nurses	1:200000	1:100000	**1:50000**
Refractionists	1:250000	1:100000	**1:50000**

National Blindness Control Programme (NBCP)

- 1976
- 100% centrally sponsored
- Goal – to reduce prevalence of blindness from 1.4% → 0.3%
- Objectives
  - To reduce backlog of blindness through identification & treatment of blind
  - To develop eye facility in every district
  - To develop human resource to provide eye care services

To improve quality of service delivery to ensure NGOs participation

Revised strategies under NBCP

- Strengthening services for other causes of blindness corneal blindness, refractive errors in school children, Flu services for cataract Sx, Glaucoma
- Eye camp approach → fixed facility surgical approach
- Conventional Sx → IOL implantation
- Construct dedicated eye OT, eye wards at district level, training of eye surgeons in modern cataract Sx & other eye Sx
- To strengthen participation of NGOs & earmark geographic areas to NGOs & Govt.hospitals to avoid duplication
- To cover tribal & uncovered area

- IOL implementation – 83%
- Cataract Sx rate – 400 operation/100000 population
- Eye donation fortnight – 25th Aug – 8th September
- Grant-in-aid for NGOs- Rs. 700/Case cataract
  Rs. 1000/case of other major eye disease
  Rs. 850 & Rs. 1100 (N.E. states)
- 11th FYP Rs. 1550 crore

- **Organizational structure**
  Primary level – Sub district hospital/CHC, Mobile eye units, Upgraded PHCs
  Secondary level – DH/NGO hospitals
  Tertiary level – Regional institute of Ophthal, Upgraded Medical colleges, Eye bank
  Apex institute – National Institute of ophthalmology
  (Dr. Rajendra Prasad Centre for ophthalmic sciences, AIIMS, New Delhi)

- **School eye Screening Programme**
  Focus on Middle School (V-VIII STD) 10-14 years age
  1 teacher – 150 students
  1 day training of teachers at PHC
  Visual cut off < 6/9 in either eye.

Interventions proposed in 12th five year plan (2012-17) to combat NCDs

Interventions to Combat Non-Communicable Diseases (NCDs)

Non-Communicable Disease (NCD)	Interventions
1. Tobacco control	Raise taxes on tobacco Clean indoor air legislation Tobacco advertising ban • Information and labelling • Brief advice to help quit tobacco • Counselling to quit
2. CVD prevention	Salt reduction in processed food via voluntary agreement with industry, and/or via legislation Health education through mass media Treatment for high Blood pressure, cholesterol and education
3. Diabetes and complications	Health education on diet and physical activity Diabetes detection and management in primary health care Intensive glycaemic control Retinopathy screening and photocoagulation Neuropathy screening and preventive foot care
4. Cancer	Screening for cervical, breast and oral cancer Strengthening of cancer therapy in District Hospitals
5. Dental Caries	Education on oral health and hygiene; reducing dietary sugars; water fluoridation
6. General measures	• Promote physical activity in schools and society • Restrict marketing of and access to food products high in salt, sugar or unhealthy fats • Targeted early detection and diagnosis using inexpensive technologies

** Reference: Planning commission, Govt. of India, Twelfth Five Year Plan (2012–2017):Faster, More Inclusive and Sustainable Growth document*

Categories of Visual Disability

All with correction

Category	Severity	Better eye	Worse eye	% Impairment
Category 0	Mild	6/9-6/18	6/24 to 6/36	20%
Category I		6/18-6/36	6/60 to Nil	40%
Category II	Moderate	6/40-4/60 or field of vision 10^o -20^o	3/60 to Nil	75%
Category III	Severe	3/60 to 1/60 or field of vision 10^o	F.C. at 1 ft. to Nil	100%
Category IV	Profound	F. C. at 1 ft. to Nil or Field of vision 10^o	F.C. at 1 ft. to Nil	100%
One eyed persons		6/6	F. C. at 1 ft. to Nil or field of vision 10^o	30%

Note: F.C. means Finger Count

Process of Certification

A disability certificate shall be issued by a Medical Board duly constituted by the Central/State Government having, at least three members. Out of which, at least one member shall be a specialist in ophthalmology.

Source:
http://planningcommission.nic.in/reports/sereport/ser/stdy_ied.pdf
http://www.sadarem.ap.gov.in/SADAREM/DisabilityUI/Downloads/GOs/SADAREM/GO%20MS%20No%2031.pdf

****

CONCEPT OF HEALTH AND DISEASE

Concept of Health

WHO definition of Health:

A State of complete physical and social well being and not merely an absence of disease or infirmity

Ability to lead a socially & economically productive life (In 1977, WHA (30th) - Social target - HFA-2000 AD)

Positive health - Perfect functioning of body & mind.

Dimension of health

Physical	Mental	Social
Emotional	Spiritual	Vocational
Political	Environmental	Educational
Cultural	Socioeconomic	Philosophical
Preventive	Curative	Nutritional

Health for all (2000 AD)

- Main social goal decided in world health assembly 1977
- The attainment by all the people of the world by the year 2000 AD of a level of health that will permit them to lead a socially and economically productive life.
- Major principle – Equality in health – all people – rich/poor urban/rural should have an opportunity to enjoy health.
- It implies the removal of obstacles to health.
- Holistic concept – involvement of other sectors.

Health for all (2000 AD)

Goals to achieve by 2000AD

- To reduce IMR from 125 to <60
- To raise life expectancy from 52 to 64
- To reduce CDR from 14 to 9/1000
- To reduce CBR from 33 to 21/1000
- To achieve NRR = 1
- 6) To provide portable water to entire rural population

Wellbeing – 2 components - Subjective component – Quality of life
Objective components – Standard of living & Level of living

Standard of living

- Objective components
- WHO criteria - Income & Occupation
  Standard of housing
  Sanitation & Nutrition
  Level of provision of health
  Educational, recreational, &other services
- Measured by comparison of Per capita GNP

Level of living

- 9 components – Health, Food consumption, Education, Occupation & working condition, Housing, Social security, Clothing, Recreation & Leisure, Human rights

Quality of life

- Subjective component
- PQLI / HDI / HPI / GDI / GEM

Physical Quality of Life Index (PQLI)

- IMR, LE_1 & literacy – average of 3 indices
- used for national & international comparison
- Range 0 to 100 where 0 - worst / 100 - best
- Per capita GNP – Not considered – does not measure economic growth.
- India - rank - 63
- Ultimate objective is to attain PQLI = 100

Human development index :

o HDI is a composite index combining indicators representing three dimensions -
i) *Longevity (life expectancy at birth)*
ii) *Knowledge (Adult literacy rate and mean years o f schooling, i.e. Gross enrolement ratio)*
iii) *Income (real GDP per capita in purchasing power parity in US dollars)*
o The HDI is an index used to rank countries by level of ***human development,***
o According to HDI countries are divided -
0 ***Developed countries (High HDI ->>0.8) -> USA, Canada, Norway***
ii) ***Developing countries (medium HDI —>0.5 - 0.79)*** —> ***India***
iii) ***Underdeveloped countries (Low HDI***—> ***<0.5) -> Seiera, Ethopia***

Following information has been added in 22M/e of Park

o Components of **human development index have changed.** Now it includes expected years of schooling (instead of adult literacy rate) and GNl per capita (instead of GDP per capita).

Components of HDI:

Recent (22nd/e of Park)	**Old (Previous editions)**
1 *)Longevity* ^{Q} **:** - Life expectancy at birth 2) ***Knowlede*** ^{Q} □ Mean years of schooling □ Expected years of schooling 3) ***Income :*** - GNI per capita	**1) *Longevity:*** - Life expectancy at birth 2) ***Knowledge*** □ Mean years of schooling (gross enrolment ratio) □ Adult literacy rate 3) ***Income:*** - GDP per capita

Human poverty index

- Measures deprivation in basic dimension of human development (complementary to HDI - achievement)

HPI-1 (Developing countries) 3 basic dimensions **A long & healthy life** = vulnerability to death at early age P (of not surviving to age **40**) **Knowledge** – adult literacy rate **Descent Standard of living** – average of 2 indicators % of population not using improved water source % of children underweight for age	**HPI – 2 for developed countries** Additional dimension added - **Social exclusion** – measured by long term unemployment P1 = Probability (not surviving to age 60) % P2 = % adults lacking functional literacy = 1 – b P3 = % of population BPL (50% of median adjusted household income) P4 = rate of long term unemployment (≥ 12 mth)

- HPI Rank India – 62/108,
- HPI-31.3% (HDR 2007 – 08)

Gender Related Development Index

- Achievement in basis human development adjusted for gender inequalities.
- A composite index measuring average achievement in three basis dimensions captured in the human development index – a long and healthy life, Knowledge and a descent standard of living adjusted to account for inequalities between men and women.
- India Rank – 113/157,
- GDI – 0.6000 (HDR 2007-08)

Gender empowerment measure (GEM)

- Gender inequalities in economic and political opportunities.
- A composite index measuring gender inequality in 3 basic dimensions of empowerment:
  Economic participation and decision making
  Political participation
  Decision making and power over economic resources.

Sullivan's Index: Expectation of life free of disability.
Sullivan's index = LE - (Bed disability i.e. Inability of perform major activities)

DALY (Disability adjusted life years); One DALY is one lost year of healthy life. Measure Burden of disease & effectiveness of any health programs**.**

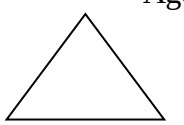
HALE - Health Adjusted Life expectancy **-** Expectancy at birth but includes an adjustment for time in poor health. No of years in full health a newborn can expect to live based on current rates of ill health and mortality.

QALY - Quality adjusted life years**.** A health status index incorporates both life expectancy and the perceived impact of illness and disability on quality of life.

Concept of Disease

Disease: Physiological / Psychological dysfunction
Illness: Subjective state of the person who feels aware of not well being.
Sickness: A state of social dysfunction.

Epidemiological triad



Natural history of disease

- The way in which a disease evolves over time from the earliest stage of its Prepathogenesis phase to its termination, as recovery, disability or death in the absence of treatment of prevention.
- Pre pathogenic phase - man at risk of disease
- Pathogenic phase - begins with entry of the disease agent in the susceptible human host
- Infectivity - Ability of an infectious agent to invade and multiply in a host
- Pathogenicity - Ability to induce clinical apparent Illness.

- Virulence - Proportion of clinical cases resulting in severe clinical manifestations.

Spectrum of disease

Graphical representation of variations in the manifestations of disease.

Iceberg phenomenon of disease

- Clinical cases – Tip of iceberg
- Carrier + Latent + Inapparent + Presymptomatic + Undiagnosed - Submerged portion
- Waterline represents the demarcation between apparent and inapparent disease.

Disease control- reduction of - Incidence (and not prevalence) / Duration / Effect of infection / Financial burden

Control: Disease cases to be a public health problem.

Elimination: Measles. Diphtheria, polio in sight

Eradication: Termination of all transmission of infection by extermination of infectious agent

Evaluation: Results are compared with intended objectives.

LEVELS OF PREVENTION

Level of prevention	Phase of disease	Target
Primordial	Underlying conditions leading to causation	Total population & selected groups
Primary	Specific causal factors	Total populations, selected groups & healthy individuals
Secondary	Early stage of the disease	Patients
Tertiary	Late stage of disease (treatment, rehabilitation)	Patients

MODES OF INTERVENTION

1. Health promotion
   - Health education
   - Environment modification - Safe water, housing
   - Life style & behavioral changes
   - Nutritional intervention - Supplementary feeding program, food fortification
2. Specific protection - Immunization, Nutrition, Chemoprophylaxis, Helmet for Accident
3. Early diagnosis & treatment
4. Disability limitation

   Impairment - Any loss or abnormality of psychological or anatomical structure or function

   Disability - Unable to carryout certain activities.

   Handicap - Disadvantage from an impairment or disability
5. Rehabilitation
   - Combined & coordinated use of medical, social, educational & vocational measures for training & retraining the individuals to the highest possible of functional ability.
   - Medical / Vocational / Social / Psychological

ICD 10 – International Classification of diseases

- Revised every 10 yrs
- Latest revision- 10^{th} - 1^{st} January 1993
- 21 major chapters

- Alpha-numerical coding - The first character of ICD -10 code is letter and each letter is associated with a particular chapter except letter D-chapter II and III and H- chapter VII and VII chapter I, II, XIX, XX –use more than one letter in the first letter in the first of their codes each chapter – 3 coding.
- ICD 10 - 3 volumes
- Ultimate purpose – to contribute uniform classification.

Emporiatrics: Traveller's health
Desmoteric medicine - branch of medical practice that deals with health problems occurring among prison inmates.
Psephology - a branch of political science which deals with the study and scientific analysis of elections. Psephology uses historical precinct voting data, public opinion polls, campaign finance information and similar statistical data.

****

COMMUNICABLE DISEASES

Respiratory infections

SMALLPOX

- Eradicated (A public health success)

History:

- Last indigenous case occurred on 17th May 1975 (Bihar)
- 24th May 1975 last case occurred in India (Bangladesh)
- 5th July 1975 India proclaimed as non-endemic
- 23rd April 1977 India declared smallpox free
- 26th October 1977, world's last case occurred
- 8th May 1980, who declared smallpox eradication
- Discontinued compulsory vaccination 1982.

Epidemiological basis of eradication:

- No known animal reservoir
- No long term carrier state

- Immunity life-long
- Easy diagnosis
- Sub clinical cases did not transmit disease
- Highly effective vaccine
- International cooperation
- Seasonal variation of disease
- Transmission is slow (Secondary Attach Rate – 30-45%)

Human infection with animal poxviruses monkeypox; tanapox, cowpox, taterpox etc.

Human moneypox:

Rare disease limited to African settings. Zaire accounts for 95% of all cases of human mokeypox; most victims are small children; is an infrequent and sporadic zoonosis; most commonly spread by close contact with infected wild animals.

Case (confirmed) definition for notification under IHRs (2005) : **[Mnemonic:FRALL]**

- Fever (≥38.3º C/101º F) acute onset at any age, malaise, prostration, headache, backache occurring 2-4 days prior to onset of rash AND
- Rash maculo-papular starting from face & forearms, evolving to vesicles (48 hours) and pustules (umblicated/confluent) later AND
- Lesions at same stage of development at any part of body AND
- Absence of Alternative diagnosis to explain illness AND
- Laboratory confirmation.

CHICKENPOX

Agent: Varicella Zoster Virus or Human a Herpes virus 3 (note: a double stranded DNA virus)

Source:

- Case of chickenpox or H.Z. (rarely); the virus can be readily isolated from the vesicular fluid during the first 3 days of illness.
- Infectivity : 1-2 days before & 4-5 days after rash appearance
- Secondary attack rate : 90%

Host factors:

- Age: primarily < 10 yrs of age
- Immunity: durable second attacks are rare
- Pregnancy: risk to fetus & neonate

Environmental factors: Occurs during first 6 months of the year (Oct – April)

Transmission:

- By droplet infection or droplet nuclei
- Portal of entry: respiratory tract
- Can cross-placental barriers: Congenital Varicella Syndrome
- Virus extremely labile – fomites unlikely to be infective

Incubation period: 14-16 day (7-21 days)

Clinical features:

- Wide spectrum; inapparent infections in susceptible children: 5%
- Pre-eruptive stage
- Eruptive stage: Prodromal mild; rash centripetal, axilla affected, palms & soles appear red, rashes flexor, unilocular, dew drop, pleomorphic, rapid evolution, scabs in 4-7 days non-infective, temp rises with each crop.

Complications: Mortality < 1%

- Hemorrhages, pneumonia, encephalitis, acute cerebellar ataxia & Reyes syndrome
- Congenital: Fetal wastage, Cutaneous scars, atrophic limbs, Microcephaly & low birth weight
- Life time risk of HZ – 10 to 20% and majority occur > 45 years
- The risk is up to 15 times higher in HIV positive person and about 25% of all patients with Hodgkin's lymphoma develop herpes zoster.
- 20% develop post herpetic neuralgia (risk is 15 times higher in persons over 50 years of age)

Diagnosis: Epidemiological surveys – serology
Control: Notification & isolation (6 days) and instituting disinfection measures for articles soiled by nose and throat discharge.

Prevention:
VZIg (as 16.5% solution) within 72 hrs; Dose: 1.25-5 ml I/M
Vaccine: Live attenuated OKA vaccine; 2-12 years one dose; > 12 years – 2 doses;
Lyophilized – Subcutaneous. Efficacy – 90-95%.

MEASLES

Problem statement

- Endemic all throughout the world
- Epidemic occurs when proportion of susceptible children reaches 40%.
- 90% infection rate in virgin community (attack rate).
- 20 million children contract annually with 242,000 deaths (who, 2007)
- In India cyclical peaks occur every 3rd year.
- Case fatality rate 4% (1.8 – 7.6%) [Indian settings]

- Coverage of 1st dose of Measles vaccine in world: 82% [2007]
- Proportional mortality rate in children <5 years: 1% [2008

Agent factors:

- Agent: SS RNA Morbilli-virus, paramyxoviridae family
- Can't survive outside human body; only one sero type.
- Source of infection: A case only. No carrier state
- Infective material : Respiratory secretions
- Communicability : 4 days before and 5 days after rash appearance
- Secondary attack rate: 90% or more in susceptible individuals (Ref: WHO)

Host factors:

- Age : 6 months – 3 years
- Immunity: maternal Ab protect up to 6 months. Immunity after infection life – long

Environmental factors: winter & early spring (Oct-April)

Transmission: portal of entry: respiratory tract – droplet infection & droplet nuclei, occasionally conjunctiva. Recipients of measles vaccination are not contagious to others

Incubation period: 10 days from exposure to onset of fever and 14 days to appearance of rash (Vaccination rash 7^{th} day)

Clinical features:

1. Prodromal stage: constitutional symptoms Koplik spots: a day or two before appearance of rash; opposite first and second upper molars
2. Eruptive phase: Dusky red, macular or maculo-papular rash which appears behind first
3. Post-measles stage – infections, cancrum oris etc.

Complication:

- Blindness, measles associated diarrhea, pneumonia, otitis media, febrile convulsions encephalitis (1/1000) and SSPE (7/1m).
- Pneumonia is the most common cause of death;
- Measles associated diarrhea is the most common complication in India.
- Severe measles is particularly likely in poorly nourished young children, especially with vit. A deficiency or with immune deficiency such as HIV/AIDS.
- Vitamin a supplementation reduces the mortality by 50% in measles.

Measles vaccination:

HDC freeze dried, Edmonston – Zagreb strain; reconstituted vaccine to be used within 1 hour, Vaccine efficacy 95% (95% protection), immunity develops 11-12 days after vaccination. Complication – TSS. Immunoglobulin: 0.025 ml/kg within 3-4 days of exposure; live measles vaccine is administered 8 to 12 weeks later.

Control measure:

- Isolation for 7 days
- Immunization of contacts within 3 days of exposure
- Prompt immunization at the beginning of epidemic

Elimination strategy –

- Catch – up (9 mts – 14 years); keep – up (> 95% coverage) & follow – up (every 2-4 years)
- Control – Routine coverage > 90%, catch – up rounds case based surveillance
- Supplementary vaccinations with vit. A in high- risk areas

Global measles mortality reduction goals: Reduction of measles deaths by 90% by end of 2010 compared to 2000 mortality levels. **<u>Epidemiological basis for eradication</u>** • Distinctive rash • No animal reservoir	**WHO / UNICEF comprehensive strategy for sustainable measles mortality reduction (2006-10):** • Strong routine immunization > 90% • Second opportunity' for measles immunization – assures measles vaccination to all children < 14 years of age who have not received any

• No vector • Seasonal • No transmissible latent stage • Effective vaccine	previous dose or have failed to develop immunity to first dose at 9 months [failure rate for 9 months vaccines – 10 to 15%] • Surveillance – for outbreak response. • Clinical management of measles case is improved; also includes vitamin A supplementation and adequate treatment of complications with antibiotics

RUBELLA

- An acute childhood infection of short duration (3 days) characterized by low-grade fever, lymphadenopathy and macular rash
- Tends to occur every 6-8 yrs in epidemic form

Agent factors:
- Agent: RNA virus of togaviridae family (Rubivirus)
- Source: clinical or sub-clinical case, no carrier for post-natally acquired rubella
- Infectivity: one week before to one week after onset of rash. Infectivity maximum when rashes are erupting.

Host factors;
- Age: 3-10 yrs
- Immunity : one attack gives lifelong immunity
- In India 40% women of child – bearing age are susceptible to rubella

Transmission: by droplets and droplet nuclei
- Portal : respiratory tract
- Virus can cross placenta congenital rubella syndrome

Incubation period: 2-3 weeks (Average- 18 days)

Clinical features: 50-65% infections are asymptomatic
- Prodromal – mild
- Lymphadenopathy – post auricular & posterior cervical – 7 days before rash
- Rash : 1st discrete, pinkish, non-confluent appears first on face disappears by 3rd day
- Diagnosis – clinical and confirmation can be done with HAI test (Haem Agglutination inhibition)

Complication: Arthralgia (most common in adults), thrombocytopenic purpura (most common in children), encephalitis

Congenital rubella: IgM Ab persists beyond 6 months birth or IgG Ab persists beyond 6 months Rubella infection inhibits cell division

Most common defects: Deafness, cardiac malformations and cataracts
Other: Glaucoma, Retinopathy, Microcephaly, Cerebral palsy, IUGR, Hepatosplenomegaly, mental and motor retardation

Congenital Rubella: Triad – PDA, cataract, and deafness

- Infection in 1st Trimester: Spontaneous abortion, still birth or PDA, Deafness, cataract
- Infection in 2nd Trimester: Deafness
- Infection in 3rd Trimester: no major abnormality

Stage of gestation when mother infected	Fetus infected (%)	Fetus damaged (%)	Overall risk of damage to fetus (%)
< 11 weeks	90	100	90
11-16 weeks	55	37	20
17-26 Weeks	33	0	0
27-36 Weeks	53	0	0

Prevention: by live attenuated RA 27/3 vaccine

Vaccination strategy:

- Immunize women of 15-39 yrs
- Interrupt transmission: 1-14 yrs all children
- Then Routine Universal Immunization of all children age 1 yr

MUMPS

- An acute infectious disease caused by Paramyxoviurs parotiditis, an RNA virus which has a predilection for glandular and nervous tissues.
- Family – Paramyxoviridae, Genus – Paramyxoviurs

Agent factors:

- Agent: only one serotype
- Source of infection: both clinical and sub-clinical
- Sub clinical cases account for 30-40% of all cases
- Period of communicability: 4-6 days before onset of symptoms and a week or more thereafter (once swelling subsides person becomes non infectious)
- Secondary attack rate: 86%

Host factors:

- Age: most frequent cause of parotitis in 5-15 yrs age group
- Immunity: one attack confers life – long immunity

Environment factors:

- Largely endemic cases occur throughout the year peaking in winter & spring

Mode of transmission: droplet infection & direct contact

Incubation period: 2-3 weeks (18 days)

Clinical features: Parotitis may also affect submandibular or sublingual glands as well, testes, pancreas, CNS, ovaries and prostrate. Swelling subsides in 1-2 wks.

Prevention: Live attenuated vaccine 0.5ml s/c- Jeryl – Lynn strain

Control: Difficult because of sub clinical cases & incubatory carriers; cases isolated till clinical manifestations subside.

Mumps surveillance: WHO Case definitions

- *Clinical mumps:* Acute onset unilateral or bilateral ender self limiting swelling of parotid or other salivary gland lasting for >2 days and without other apparent cause.
- *Lab. Confirmed mumps*: A patient with clinical mumps and lab confirmation with IgM Ab (without mumps immunization in previous 6 wks) or seroconversion with 4 fold greater rise in mumps IgG titre or isolation of mumps virus from saliva, urine or CSF
- *Epidemiologically confirmed mumps*: A patient with clinical mumps who is epidemiologically linked to a lab confirmed mumps case.

INFLUENZA

- An acute respiratory infection characterized by sudden onset of chills, malaise, fever, muscular pain and cough.
- Caused by influenza virus – A (pandemics), B (sporadic & epidemics), C (Endemic throughout the world). Type B & C exclusively human viruses.

Problem statement

- Worldwide in distribution. Outbreaks of influenza occur every year.
- Major epidemics occur at intervals of 2-3 years in Type A; 4-7 years Type B
- Pandemics occur at intervals of 10-15 yrs

1955-58	Pandemic	$H_2 N_2$	
1968	Pandemic	$H_3 N_2$	H = Haemaglutinin
1977	Pandemic	$H_1 N_1$	N = Neuraminidase
2003		$H_5 N_1$	
2009	Pandemic	$H_1 N_1$	

Epidemic behavior

- Suddenness
- Rapid spread (Attack rate 10-50%)
- Short incubation period (18-72 hours)
- High proportion of susceptible population (immunity is very short lived)
- Short duration of immunity and absence of cross immunity
- Large no. of sub clinical cases
- In annual influenza epidemics 5 -15% of populations are affected by upper respiratory tract infection.
- $H_3 N_2$ is associated with more deaths

Agent factors:

- Agent: family Orthomyxoviridae subtypes A, B, C
- 2 surface Antigens: H (1-3) & N (1-9)

Antigenic variation

- Shift; Sudden complete & major change – genetic recombination causes major epidemics & pandemics
- Drift: gradual antigenic change over a period of time – point mutation

Currently H_1 N_1 H_3 N_2 – A and B are in pandemic mode

Reservoir of infection: Animals and birds:

Source of infection: Usually a case or sub-clinical case
Respiratory secretions are infective

Period of infectivity: 1-2 before and 1-2 days after onset of symptoms

Host factors:

- Age & sex: Affects all ages and both sexes. Highest infection rate in children 5-9 years of age
- High risk groups : Old>65 years, children<18 months, DM, chronic heart disease, kidney & respiratory ailments
- Immunity: Ab to H Ag neutralizes the virus and Ab to N Ag modifies the infection

Mode of transmission: Droplet infection or droplet nuclei

Incubation period: 18-72 hrs

Clinical features: Viraemia fever, chills, aches and pains coughing, gen, weakness. Fever lasts 3 days. Pneumonia most serious complications

Lab diagnosis:

- Virus isolation – Nasopharyngeal secretions, indirect fluorescent Ab test
- Paired sera – 4 fold rise in titer

Prevention:

- Vaccines don't control epidemics
- It must be administered at least 2 week prior to onset of epidemic or preferably 2 to 3 months before influenza is expected –in-high risk groups

Influenza vaccine:

- Killed Vaccines, one dose contain 15 μg of HA; one dose of 0.5 ml is given S/C (2 doses in unprimed)
- Protective value 70-90%; immunity lasts 3-6 months
- Live attenuated vaccine – temp sensitive mutants, nose drops
- Newer vaccines
  i. Split- virus vaccine; also called sub-virion vaccine requires several injection
  ii. Neuraminidase specific vaccine sub unit vaccine containing Nag only
  iii. Recombinant vaccine

Note: WHO recommends two different categories of vaccines – one trivalent, inactivated influenza vaccines: they are split / recombinant variety and live attenuated vaccines – especially in the Russian Federation (Cold Adapted Influenza Vaccine Trivalent – CAIV-T). the strains to be used for vaccine preparation are notified by WHO for the coming year in advance.

Antiviral drugs: There are two classes of anti-influenza agents:

- Inhibitors of influenza A cell entry/uncoating (Amantadine, Rimantidine)
- Neuraminidase inhibitors (Oseltamivir, Zanamavir); these agents inhibit the cellular release of both influenza A and B = "broad spectrum" influenza antiviral.

AVIAN FLU:

Avian influenza is an infectious disease of birds caused by type A strains of the influenza virus. The disease, which was first identified in Italy more than 100 years ago, occurs worldwide.

- Fifteen subtypes of influenza virus are known to infect birds, thus providing an extensive reservoir of influenza viruses potentially circulating in bird populations. To data, all outbreaks of the highly pathogenic form have been caused by influenza A viruses of subtypes H5 and H7.
- Of the 15 avian influenza virus subtypes, H5N1 is of particular concern for several reasons. H5N1 mutates rapidly and has a documented propensity to acquire genes from viruses infecting other animal species. Its ability to cause severe disease in humans has now been documented on two occasions.
- The epidemic of highly pathogenic avian influenza caused by H5N1, which began in mid December 2003 in the Republic of Korea and is now being seen in other Asian countries, is therefore of particular public health concern.
- In India outbreak of H5N1 took place among the domestic poultry in January, February and March 2008- in West Bengal – Murshidabad district. Till date no human case of avian flu in India.

WHO proposes that clusters with the following features be immediately investigated for evidence of infection caused by a novel influenza A virus:

Three or more persons with unexplained 1 moderate –to-severe acute respiratory illness 2 (or who died of an unexplained acute respiratory illness0 and with onset of illness within 7 to 10 days of each other

AND

With a history strongly suggesting potential exposure to the H_5 N_1 virus, including:

- Travel to or residence in an area affected by avian influenza outbreaks in birds or others animals.
- Direct contact with dead or diseased birds or other animals in an affected area
- Close contact with an patient (living or decreased) or a person with unexplained moderate-to-severe acute respiratory illness
- A possible occupational exposure, including employment as an animal culler, veterinarian, laboratory worker, or health care worker.

Control measures: The decision to launch containment measures should be undertaken when compelling evidence of avian flu is available. Such evidence should be derived from combination of epidemiological, clinical and laboratory investigations.

Treatment and prevention; Case management is important. The hospitalized cases should be preferably put in isolation wards or single rooms with personal protective equipment like masks and gloves given to all the patients. Treatment is by administration of Oseltamivir (Tamiflu)
Dosage schedule: same as in table for influenza

PANDEMIC (H1N1) INFLUENZA (2009)

- WHO declaration of Influenza pandemic: 11 June 2009
- World is now post-pandemic EXCEPT: INDIA & NEW ZEALAND (locally intense transmission)

Problem statement

- India: 37000 cases, 1833 deaths [May 2009- August 2010]

Incubation period: 2-3 days

Clinical features:

- Uncomplicated influenza: Influenza like illness (Fever, cough, sore throat, rhinorrhoea, headache, muscle pain), GIT illness (diarrhoea WITHOUT dehydration)
- Complicated/severe influenza: Pneumonia, CNS involvement, severe diarrhoea, Secondary complications, Exacerbation of chronic diseases.
- Progressive disease: Oxygen impairment/cardiopulmonary insufficiency, CNS complications, Invasive secondary bacterial infection, severe dehydration.

Risk factors of severe disease:

- Infants & children < 2 years
- Pregnant females
- COPD
- Chronic cardiac disease
- Metabolic disorders
- Chronic renal / hepatic / neurological / hemoglobinopathies /immuno-suppression (including HIV) disorders
- Children on aspirin therapy
- Persons aged ≥ 65 years
- Morbid obesity.

Laboratory diagnosis:

- Most timely & sensitive detection: RT-PCR test
- Samples: Nasopharyngeal + throat swabs [Tracheal/bronchial aspirates in lower respiratory tract infection cases]
- Point-of-care/Rapid diagnostic tests: Not recommended.

Duration of isolation:

- For 7 days after onset of illness OR
- 24 hours after resolution of fever/respiratory symptoms whichever is longer.

H1N1 Inactivated vaccine:

- Single i/m injection
- Strain : A/California/7/2009 (H1N1) V like strain
- Storage temperature: +2º to +8 º C
- Contraindications: History of anaphylaxis/severe reaction/Guillian Barre Syndrome, Infants <6 months, Moderate-to-severe illness with fever.
- Protective immunity: Develops after 14 days (NOT 100%).

H1N1 Live attenuated vaccine:

- Nasal spray
- Side effects: Rhinorrhoea, nasal congestion, cough, sore throat, fever, wheezing, vomiting

Priority groups (in order) for Influenza vaccines:

- Pregnant women
- Age > 6 months with chronic medical conditions
- 15-49 years healthy young adults
- Healthy young children
- Healthy adults 49-65 years
- Healthy adults >65 years.

Antiviral therapy:

- Severe/progressive clinical illness: Oseltamivir / Zanamavir
- High risk of severe/complicated illness: Oseltamivir OR Zanamavir
- Not high risk OR Uncomplicated confirmed/suspected illness: No need of treatment.

Dosage:

- Oseltamivir 75 mg BD X 5 days
- Zanamavir 2 inhalations (2 X 5 mg) BD X 5 days

DIPHTHERIA

- An acute infectious disease caused by toxigenic strains of C diphtheriae.
- The bacilli produce a powerful exotoxin that is responsible for
    - Formation of a membrane (pseudo membrane)
    - Localized congestion, edemas; tissue destruction
    - Enlargement of lymph nodes
    - Signs and symptoms of toxemia
    - Fatality 10% in untreated; 5% in treated

Agent factors

- Agent: C diphtheriae. Gram positive, non motile, non-lactose fermenting, (Gravis – daisy head colonies; intermedius – frog egg; mitis – packed egg) toxigencity strain – bacteriophage – beta phage:

Source of infection: Case or carrier

- Carrier : case – 95:5
- Incidence of carrier 0.1 – 5%
- Immunization does not prevent carrier state
- Infective material: Nasopharyngeal secretions, discharges from skin lesions, fomites or infected dust
- Period of infectivity: 14-28 days from the onset of disease

Host factors:

- Age: Children 1-5 yrs of age
- Herd immunity over 70% prevents epidemics

Environmental factors: occurs in all seasons, winter months favor its spread

Mode of transmission: mainly by droplet infection

- Portal of entry: respiratory route; occasionally – skin, eye, genitalia or middle ear

Incubation period: 2-6 days

Clinical features: site dependent

- Pharygotonsillar
- Larygotracheal
- Nasal
- Combination
- Others – conjunctiva and genital

Schick test:

- Detects immunity status
- State of hyper sensitivity to diphtheria toxin or other proteins of diphtheria cells
- Nowadays largely replaced by hemagglutination tests

Control of diphtheria:

Cases & carriers	**Contacts:** Should be throat swabbed and immunity tested
• Early detection • Isolation : At least 14 days or until proved free of infection • Treatment: Antitoxin – 10000 – 80000 or more I/M or I/V • Penicillin (0.25 million units 6 hrly) or Erythromycin (250mg 6 hrly for 5-6 days) • Carriers : Erythromycin for 10 days	• Pr. Immunization or booster within 2 yrs → no actions • Pr. Immunization or booster < 2 yrs → booster does of DR • Non-immunized close contacts → prophylactic penicillin or Erythromycin + 1000-2000 U antitoxin & active immunization against diphtheria. • Contacts under daily surveillance for 7 days; Bacteriological surveillance weekly for several weeks.

- **Community:** Active immunization of all infants with DPT/DT as early as possible with booster every 10 yrs vaccine is not directed against organism. So carrier state is not protected i.e. non-immune individual are not protected by a high level of immunity.

Diphtheria immunization

Type	**Details**	
Combined or mixed vaccines	DPT, DT and dT	
Single vaccines	FT; APT; PTAP; PTAH; TAF	
Antisera	Diphtheria anti toxin	
Contents	**DTP (Glaxo)**	**DPT (Kasauli)**
Diphtheria toxoid	25 Lf	30 Lf
Tetanus toxoid	5 Lf	10 Lf

B. pertussis (millions)	20,000	32,000	
Al. phosphate	2.5 mg	3.0 mg	
Thiomersal, B.P	0.01%		0.01%

- **Dose of Antisera:** Prophylactic – 500 to 2000 units by sub-cutaneous or intramuscular injection. Therapeutic – 10,000 to 300,000 units IM route or 40,000 to 100,000 units by IV route.
- **Complication**: Fever (2-6%) indurations (5-10%); Neurological 1 in 170,000 (due to Pertussis component)
- **Contraindications –** progressive neurological deficit, previous reactions

MENINGOCOCCAL MENINGITIS

- Cerebro-spinal fever
- Mortality 80% in untreated cases, < 10% in treated cases
- **Geographic distribution –** zone lying between 5 and 15 degree N of equator in tropical Africa "meningitis belt." In India occurs as sporadic cases or small clusters

Agent:

- N meningitides is a gram – negative Diplococcurs – serotypes A, B, C, D, X, Y 29E, W135.
- A, C and to a lesser extent B are capable to causing epidemics
- Source of epidemics : found in nasopharynx of cases or carriers
- Carriers are the most imp source of infection, 5-30% if normal population harbor organism; carrier rate in epidemics – 70-80%
- Cases are negligible source infection.

Infectivity: lose infectiousness within 24 hrs of specific treatment

- Immunity: All ages are susceptible (> children & young adults)
- Immunity acquired by sub clinical infection (mostly), clinical disease, vaccination

Environmental factors: outbreaks occur more frequently in dry and cold months of year
Mode of transmission: by droplet infection
Incubation period: 3-4 days (2-10days)

Prevention and control

- Cases: treatment with penicillin, isolation is of limited use because carriers outnumber the cases
- Carriers: Rifampicin is needed to eradicate the carrier state
- Contacts : 1/3 of close contacts develop diseases within 4 days
    - Rifampicin 600mg BD for 2 days
    - Ciprofloxacin 750 mg twice a day for 2 days
    - Sulphadiazine 1 gm BD for 2 days
    - Mass chemoprophylaxis in closed and medically supervised communities

Immunization: purified group, A, C, Y, W135 mono or polyvalent vaccines

- Immunity lasts for 3 years, so boosters every 3 yr are recommended.

- Not recommended for infants and children < 2 yrs. C/I in pregnant women.
- Recommended for travel to Saudi-Haj pilgrims

Meningitis

- Neonate - Gr. B Streptococci, E.coli, Staph, Listeria
- 3 mths - 5 years – H.influenza
- Any age – Meningococci, Pneumococci

ACUTE RESPIRATORY INFECTIONS (ARI)

- 90% of ARI deaths to bacterial pneumonia
- High mortality due to –malnutrition, delayed recognition & care seeking, inappropriate case management
- In India out of total 13.6% admission are due to ARI and of all deaths 13% are due to ARI
- Children <5 years suffers 5 episodes of ARI per year.
- In India out of total 13.6% admissions are due to ARI and of all the deaths 13% are due to ARI

Causative agents

- **Bacteria:** B Pertussis, C diphtheriae, H influenzae, K.pneumoniae, L.pneumophila, Staph pyogenes, strep. Pneumoniae, strep. Pyogenes
- **Viruses**: adenoviruses endemic (1,2,5) epidemic (3,4,7) Enteroviruses (ECHO & Coxsackie), influenza ABC, Measles, Parainfluenzae ABC, Respiratory syncytial virus, Rhinoviruses and coronavirus
- **Others:** Chlamydia B (psittacosis), C burnetii (B), M Pneumoniae

Clinical assessment:

History taking & physical examination

- Count the breaths in one min
- Look for chest in drawing
- Look and listen for stridor
- Look for wheeze
- See if the child is abnormally sleepy / difficult to wake
- Feel for fever and low body temp
- Check for severe malnutrition
- Check for cyanosis

Performance indicators of case management of ARI

- % inappropriate antibiotic use for cough & cold
- Children with pneumonia. Not given antibiotic
- Respiratory rate counted
- Chest in drawing checked
- Mother knowing correct home care

ARI/PNEUMONIA: KEY INDICATORS (INDIA)

- % under-five deaths due to Pneumonia: 20%

- % under-weight children : 46% (moderate to severe); 18% (severe)
- % exclusive breast-fed infants <6 months:46%
- % 1-year old immunised against Measles: 67%
- % under-five taken to appropriate health care provider for Pneumonia: 69%

Classification: 2 moths – 5 years

	Very severe disease	**Severe pneumonia**	**Pneumonia**	**No pneumonia**
SIGNS	▪ Not able to drink ▪ Convulsions ▪ Abnormally sleepy or difficult to wake ▪ Stridor in a calm child ▪ Severe malnutrition	▪ Child respiratory rate and ▪ Chest in drawing	▪ No chest in drawing with only faster breathing Faster breathing: ▪ ≥ 50 per min 2 months to 1 year ▪ ≥ 40 per min 1 year to 5 year	▪ No chest in drawing and no faster breathing
TREATMENT	▪ Refer to hospital urgently ▪ Treat fever and wheeze if present ▪ Treat cerebral malaria if possibility exists ▪ Give first dose of antibiotics	▪ Refer to hospital urgently ▪ Treat fever and wheeze if present ▪ Give first dose of antibiotics ▪ (if referral not feasible, treat with close follow up)	▪ Home care by mother ▪ Antibiotic ▪ Treat fever and wheeze if present ▪ Reassess the child after 2 days	▪ If cough > 30 days, refer for assessment ▪ Advice mother to give home care ▪ Treat fever and wheeze if present.

< 2 months – No / Severe pneumonia / very severe disease

POLIOMYELITIS

- Continent polio free – America
- Eradication has resulted in reduction of polio endemic countries from 125 in 1988 to just 4 in 2006.
- These countries are – India, Pakistan, Afghanistan and Nigeria

Total cases	**Year-to date 2008**	**Year –to-date 2007**	**Total in 2007**
Globally	146	35	1307
In endemic countries	139	30	1201
In non-endemic countries:	7	5	106

(Circulating) vaccine derived poliovirus (cVDPVs) – pose the greatest challenge to polio eradication at present. This is more difficult as high OPV coverage will not have any effect on this. Development of strategies to prevent emergence of cVDPVs e.g. usage of IPV in the post eradication may be a possibility.

- **Global polio eradication initiative strategic plan 2004-2008:**
  - Replace the 2000 plan
  - Central theme – achieve global certification and then prepare for OPV cessation plan
- India – 866 cases in 2007 – PI 83, P3 786 with mix P1+P3 – 3; thus more cVDPV cases than wild polio cases.
  - Surveillance indicators – non polio AFP rate – 9.06 and % stool samples collected and sent – 84% (WHO requires 2.00 and 80%)
- Polio prevalence – house to house survey of lameness and muscle wasting in children 5-10 yr age – identify 80% of cases
- Total prevalence of polio (Paralytic)
  - Lameness (> 5 yr age) x 1.25 (Residual paralysis 25%)
  - Al clinical case = Prevalence 'R' of Residual paralysis x 1.33

Agent:

- Viral classification - Group IV (-ve) ssRNA, Family picornaviridae, Genus: enterovirus
- Three serotypes:
  - Type 1 or P1 – wild virus – most outbreaks are due to this
  - Type 2 or P2 – most antigenic and least paralytic – eliminated from India
  - Type 3 or P3 – vaccine associated polio virus
- Virus in cold environment can survive in water for four months and in feces for 6 mths
- Man is the only reservoir
- Sub clinical infections common source of infection
- Age 6 month to 3 yr
- No chronic carrier state known

Epidemiological trends

• Sporadic to epidemic diseases • Increase in topical countries	• Higher age group affected • 60% cases occur from June to September

Risk factors – I/M injections
Incubation period – 7-14 days

Route of spread – Faeco-oral + Droplet

- < 6 month protection by maternal antibody
- Transmission mainly in rainy season - June to September

Clinical feature

- In-apparent (sub-clinical) infection ⇒ commonest 95%
- Abortive or minor illness 4-8%
- (virus isolation, Ab titer)
- Non paralytic polio (1%) ⇒ aseptic meningitis
- Paralytic polio (<1%)
  - No sensory loss

- Asymmetrical Flaccid paralysis
- Descending
- Cranial nerve involvement in bulbo-spinal form of polio

Vaccine:

Salk (Killed)	**Sabin – OPV**
• Killed formalized	• Attenuated
• SC or IM	• Oral
• Circulating Ab	• Humoral + Local (intestinal quick Ab)
• Not useful in controlling epidemics	• Control epidemics
• Difficult to manufacture costly	• Type 1-3,00,000 TCID 50 • Type 2-100,000 TCID 50 • Type 3-3,00,000 TCID 50
• Storage 4-8	Storage – 20 degree Celsius
Herd immunity level to prevent polio – 66%	

Vaccination strategy in developing world:

- Use of oral polio vaccine rather than IPV
- Pulse strategy of immunizing all <5 years children in the whole country
- Use of repeated dosage of polio vaccines
- In India, OPV polyvalent variety is being used throughout the country except, northern region of Bihar, UP, Delhi, Haryana, Uttarakhand, Himachal Pradesh, where monovalent vaccines are being used.

WHO strategic plan 2010-2012: is based on fact that >95% immunity is required (among under-five children)

In India / Pakistan and 80-85% in sub-saharan africa.

Approaches indicated:**[mnemonic: bus me scrap]**

- **Bivalent** OPV (p1, p3) in some SIAs + trivalent OPV in routine immunization & some SIAs + monovalent OPV in some mop-ups & few SIAs as appropriate.
- **U**nder-served population; special teams/tactics
- **S**hort-interval additional dose (SIAD) strategy (increase immunity + terminate outbreaks)
- **M**onitoring SIA coverage
- **E**xpanded environmental sampling
- **S**erological surveys (program status, prospects, adjustment)
- **C**ommunication / mobilization enhanced in priority areas
- **R**ehabilitation of polio-affected individuals
- **AFP** surveillance enhanced
- **P**lans specific for state/district/block (endemic/re-established transmission areas)

107 block plan: approaches for persistent transmission area:

- Optimize SIA coverage and additional activities against WPV transmission
- Newborn tracking data for routine immunization
- Special strategies for mobile population
- Supplementary approaches to reduce force of infection, increase mucosal gut immunity, and reduce risk factors.

HEPATITIS

Hepatitis A

- Annual incidence about 10-50 persons per 100,000 population (WHO SEAR, 2007)
- 1-5% of total case of hepatitis in adults in India
- 10-25% of total cases of hepatitis in children
- Poor hygiene & sanitation are main associated causes
- 90% children immune by 10 yr age

Agent:

- Enterovirus type 72 of the Picornaviridae family
- Only one serotype
- Sub clinical case are very common
- Faeco – oral route
- Only human cases are reservoir of infection
- No chronic carriers
- Period of infectivity 2 wk before 1 wk after onset of jaundice.
- Infectivity falls rapidly with jaundice.

Features

- More frequent infection in children
- IgM- 90 day and IgG for many years
- Incubation period – 15-45 days – length of the incubation period is proportional to the inoculation dose
- Past infection by – IgG Ab
- Lab Diagnosis – HAV or special Ag in the faeces or increases Anti HAV Tiler or IgM Ab (3-4 times)
- Vaccines: Inactivated and live attenuated have been developed. WHO recommends only use of inactivated vaccines. Currently 4 are in use – HAVARIX, VAQTA etc. schedule is 0, 6-18 months (two doses). Combination with Hep. B is also available.

Hepatitis B

- Parenteral route – Contaminated blood earlier known as 'serum hepatitis'
- Hepatocellular carcinoma
- Carrier rate – low Endemicity : < 2% / Intermediate Endemicity : 2 - 8% / High Endemicity : ≥ 8%
- 2 billion people worldwide have evidence of past or current illness and 350 million are chronic carriers.
- India-medium – 6% (2-10%) carrier rate – estimated number of carriers 40 million (GOI/WHO, 2005) (Infant up to 80%)
- Causative agent for 60 -80% of all primary liver cancer

Agent

- Double shelled DNA virus known as DANE particle
- Antigens - 's' surface Ag-Australia Ag HBsAg
  's' core Ag-HBcAg
  'e' antigen – HbeAg

- HBsAg 1st - to appear, during incubation period.
- Cleared during convalescence [4-6 months]- epidemiological marker
- HBeAg next to appear, persists for 2-6 wk; Marker of virus replication → infectivity
- 'e' Ag to 'e' Ab → Good prognostic signs
- 1st antibody – Anti HBc remain for long period

Reservoir of infections: only man

- Period of communicability → until disappearance of HBs Ag and appearance of surface Ab
- Antibody: 1st 'c' Ab, then 'e' Ab and then 's' Ab

Carriers:

- Chronic carriers – persons harboring HBsAg for six months or more
- Persistent carrier: HBsAg> 9 months.

Disinfection: Sodium Hypochlorite 1% - 5% or Autoclave – 30-60 min

HBV serological tests

- Hepatitis B surface antigen (HBsAg): Marker of current infection
- Hepatitis B e Antigen (HBeAg): marker of active infection\
- Hepatitis B surface antibody (HBsAb); marker of recovery or immunity.
- Hepatitis B e-antibody (HBeAb): marker of inactive virus (generally)
- Hepatitis B core antibody (HBcAb): marker of present or past infection
- HBV DNA : measure virus activity

Horizontal transmission – child to child by physical contact
Incubation period → 45-180 days

Table 1 : serological markers of HBV infection

Clinical condition	HBs Ag	HBsAb	HBcAb total	HBcAb IgM	HBeAg	HBeAB	HBV-DNA
Acute infection	Pos	Neg	Pos	Strong Pos	Pos to neg	Neg to pos	Pos
Resolving infection	Pos	Neg	Pos	Pos	Neg	Pos	neg
Immune status (exposure)	Neg	Pos	Pos	Neg	Neg	Pos	Neg
Immune status (Vaccination)	Neg	Pos	Neg	Neg	Neg	neg	Neg
Chronic infection or carrier	Pos	Neg	Pos	Pos or neg	Pos or neg	Pos or neg	Pos or neg

Table 2: Serological tests to request for HBV infections

Infection type	Tests to order	Abbreviation
Acute infection	Hepatitis B core antibody	HBCaB IqM

	Hepatitis B surface antigen Hepatitis B e antibody	HBsAg HBeAb
Resolving infection	Hepatitis B core antibody Hepatitis B surface antigen Hepatitis B surface antibody	HBcAb HBsAg HBsAb
Immune status (exposure)	Hepatitis B core antibody	HBcAb
Immune status (vaccination)	Hepatitis B surface antibody	HBcAb
Chronic infection or carrier	Hepatitis B surface antigen Hepatitis B e antigen	HBcAg HBcAg

Treatment Guidelines:

- Currently, there is no treatment available for acute hepatitis B symptomatic treatment of nausea, anorexia, vomiting, and other symptoms may be indicated.
- Treatment of chronic hepatitis B is aimed at
  - Eliminating infectivity to prevent transmission and spread of HBV.
  - At halting the progression of liver disease and improving the clinical and histological picture, and
  - At preventing HCC from developing, by losing markers of HBV replication in serum and liver like HBV DNA, HBeAg, and HBcAg.
  - Normalization of ALT activity, resolution of hepatic inflammation and
  - The improvement of patients' symptoms usually accompanies these virological changes.

Agent	**Effective**	**Ineffective**	**Toxic**	**Under evaluation**
Interferon	Interferon- α	Interferon-γ		Interferon - β
Antiviral	Lamivudine famciclovir	Acyclovir dideoxyinosine azudothymidine foscarnet	Fialuridine adenine arabinsoide	Ribavirin lamivudine (long term) famciclovir (long term) adefovir entecavir
Immunomodulatory		Prednisone interleukin-2 thymosin levamisole		Adoptive immune transfer

Vaccine

- Plasma derived – HBs Ag (sub unit) – 3 doses – 95% effective
- RDNA yeast derived – not useful for HBs Ag carriers

Hepatitis C

- Earlier designated as non A non B hepatitis
- Parenteral; 50% in injection drug users.
- Globally about 3% of the world's population is infected with Hepatitis C and 170 million people are chronic carries. 3-4 million new infections every year.
- Single stranded RNA virus similar to Flavivirus
- HCV is classified into eleven major genotypes (designated 1-11), many subtypes (designated a, b, c, etc). And about 100 different strains (numbered 1, 2, 3 etc.) based on the genomic sequence heterogeneity.
- Traditional practices like tattooing, circumcision etc. can spread.

Incubation period – 6-7 wks

Chronic hepatitis 80% cases → Cirrhosis occurs in 20% → liver cancer develops in 1 to 5%

Confirmatory test

- Anti HCV Ab- Recombinant immunoblot Assay (RIBA) test
- HCV RNA by polymerase chain reaction
- Screening mandatory in blood banks w.e.f. July 1st, 1997.

Treatment guidelines:

- HCV positive persons should be evaluated by their doctor for liver disease.
- Interferon ad ribavirin is two drugs licensed for the treatment of person with chronic hepatitis C.
- Interferon can be taken alone or in combination with ribavirin. Combination therapy, using pegylated interferon and ribavirin, is currently the treatment of choice.
- Combination therapy can get rid of the virus in up to 5 out of 10 persons for genotype 1 and in up to 8 out of 10 persons for genotype 2 and 3.

Hepatitis E

- Water borne part of non A-non B group
- Most common cause of non parenterally acquired hepatitis in India.
- No chronic cases / Fulminating acute disease 0.5% to 4%
- Pregnancy – 20% → 80% mortality.

Agent

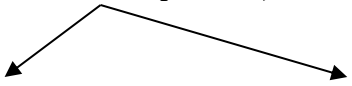
- Single stranded RNA virus of Hepeviridae family.
- Previously classified under Calciviridae family

Incubation period -2-9 wks (mean 40 days)
Diagnosis: Anti HEV Ab in the serum

CHOLERA

Cholera

- West Bengal, M.P. Maharashtra, Delhi, TN, Karnataka, Kerala & Gujarat – 80% of all cases
- 1011 organisms are required to produce the disease
- Vibrio cholerae 01 (Endemic & epidemic) | Non agglutinating vibrios V. parahaemolyticus



CLASSICAL

Rapid decline epidemics

ELTOR

(Inaba, Ogawa and Hikojima serotypes)
-agglutinate erythrocytes chicken and sheeps
- Resistant to classical stage IV
- Resistant to polymyxin B 50
- VP reaction & haemolysis not consistent

- Epidemics of Cholera are abrupt and create an acute public health problem
- "force of infection" – two components; force of infection through water and through contacts

- 'Tail' of epidemic in Cholera is due to sustained transmission through contacts even after the discontinuation of contaminated water.
- The agent V cholera is killed within 30 minutes by heating or within a few seconds by boiling. Drying and sunshine kills them within a few hours.
- Human are the only reservoir of infection.
- 10^{11} organisms are required to produce the disease.
- Exotoxin – act via Adenylate cyclase cAMP – V. cholerae colonizes the gastrointestinal tract, where it adheres to villous absorptive cells via filaments, and secretes a Binary toxin, called cholera toxin (CT). The two CT subunits are named A and B, and are synthesized in a 1:5 ratio. B subunits bind and internalize A subunits, which are processed to A1. The A1 form catalyses ADP ribosylation from NAD to the regulatory component of adenylate cyclase, thereby activating it. Increased adenylate cyclase activity increase cyclic AMP (cAMP) synthesis causing massive fluid and electrolyte efflux, resulting in diarrhea.

Acts only on small intestine and causes secretion of fluids from all over the small intestine → diarrhea

- Cases

	Severe : mild / Inapparent		
In classical	1	:	5
In E1 Tor	1	:	25 to 100

Carrier ------- temporary mainly
Rarely chronic (1 month to 10 yrs)

Carriers:

- Incubatory carrier – 1 – 5 days duration
- Convalescent carrier 2 - 3 wks
- Contact or healthy carrier (important role in spread)
- Sub clinical infection contracted through association with source of infection
    - Duration < 10 days
    - Stoll culture +ve
    - Gall Bladder not infected
- Chronic carrier – gall bladder infected (up to 10 years)

Host factors:

- Attack rate highest in children
- Gastric and barrier – if reduced increase in chance of acquiring the infection

Mode of transmission

- Faecal contamination of water
- Contaminated food & drinks – Bottle feeding
- Direct contacts – responsible for tail of the epidemic

Clinical features:

a) Stage of evacuation: abrupt, profuse watery diarrhea and vomiting. May pass up to 40 stools per day.
b) Stage of collapse: signs and symptoms of dehydration. Death usually occurs at this stage.
c) Stage of recovery: mild cases recover within 1 -3 days.

Epidemiologically, E1 Tor variant differs from classic cholera in the following aspects:

1. Higher incidence of mild and asymptomatic infection.

2. Fewer secondary cases in the affected families.
3. Occurrence of chronic carriers
4. E1 Tor variant survives in the extra intestinal environment longer that classical variety

- Rice water stool in classical cholera
- Stool collection via Rubber catheter & Rectal Swab (Carry Blair medium)
- V.R., Alkaline peptone water sterile plastic Bag
- Direct examination by dark field illumination (80%); Gram – negative rod – culture – peptone water tellurite medium; Bile salt agar; Produce acid in sucrose & mannose
- Slide agglutination test
- International notification
- Homemade ORS – 5g salt + 20 g sugar
  Antibiotics – Doxycycline 300 mg single dose (antibiotic of choice), pregnancy – Furoxone, children – septram: tetracycline can also be used.

Antibiotic	**Single Dose (PO)**	**Multiple Dose (PO)**
Doxycycline	7 mg/kg; not to exceed 300 mg/dose	2 mg/kg bid on day 1; then 2 mg/kg od on days 2 and 3, not to exceed 100 mg/dose
Tetracycline	25 mg/kg not to exceed 1 g/dose	40 mg/kg/d divided qid for 3 d; not to exceed 2 g/d
Furazolidone	7mg/kg; not to exceed 300 mg/dose	5 mg/kg/d divided qid for 3 d; not to exceed 400 mg/d
Trimethoprim and sulfamethoxazole	Not evaluated	≥ 2 months: 5-10 mg/kg/d (based on trimethoprim component) divided bid for 3 d; not to exceed 320 mg/d trimethoprim and 1.6 g/d of sulfamethoxazole
Ciprofloxacin	30 mg/kg: not to exceed 1 g/dose	30 mg/kg/d divided q12h for 3 d; not to exceed 2 g/d
Ampicillin	Not evaluated	50 mg/kg/d divided qid for 3d; not to exceed 2 g/d
Erythromycin	Not evaluated	40 mg/kg/d erythromycin base divided tid for 3 d; not to exceed 1 g/d

Oral Rehydration Salt:

- WHO states that citrate ORS better than bicarbonate ORS
- Reduced osmolarity ORS has better prognostic value
- Invention of century – LANCET

Ingredient	**Standard ORS (mosmol/L)**	**Reduced Osmol. ORS (mosmol/L)**
Glucose	111	75
Sodium	90	75
chloride	80	65
potassium	20	20
Citrate	10	10
Total	**311**	**245**

Cholera vaccine

- Parental vaccines have been discontinued because of their poor efficacy.
- WHO advises use of oral vaccines – 3 are licensed in some countries for use

1. **WC/rBS vaccine:** One vaccine consist of killed whole – cell V cholerae O1 with purified recombinant B-subunit of cholera toxoid (WC/rBS). Clinical trials have been performed in Bangladesh, Peru, and Sweden. Efficacy trails have shown that this vaccine is safe and confers 85-90% protection during 6 months in all age groups after administration of 2 doses, 1 week apart. In Bangladesh, protection declined rapidly after 6 months in young children but was still about 60% in older children and adults after 2 years.
2. **Variant WC/rBS vaccine**: As a result of technology transfer, a variant of the WC/rBS vaccine containing no recombinant B-subunit has been produced and tested in Vietnam. It is administered in 2 doses, 1 week part. A field trial conducted in 1992-1993 in Vietnam showed a protective efficacy of 66% at 8 months in all age groups. The vaccine is licensed only in Vietnam.
3. **CVD 103 – HgR vaccine**: Another vaccine consists of an attenuated live oral genetically modified V cholerae O1 strain (CVD 103-HgR). Placebo- controlled trials in several countries have demonstrated the safety and immunogenicity of a single dose of CVD 103-HgR. The efficacy of this oral caccine has been investigated in adult volunteers in the United States, where it has been found that a single dose confers high protection (95%) against V cholerae classical and 65% protection against V cholerae E1 Tor following a challenge given 3 months after administration.

ACUTE DIARRHOEAL DISEASES

- >3 stools per day; recent change in consistency more important than number of stools.
- In India diarrheal diseases a major public health problem; 17% of all deaths in indoor patients are due to diarrheal diseases.

Pathogen		% of cases
Viruses	Rotavirus	15 - 25
	ETEC	10 - 20
	Shigella	5 - 15
	C jejuni	10 - 15
	Non Typhoid salmonella	1 - 5
	EPEC	1 - 5
Protozoa	Cryptosporidium	5 - 15
No pathogens found		20 - 30

Typhoid fever

- Worldwide occurrence whenever the standards of hygiene are low and water supply standards are compromised.
- 17 million case worldwide with estimated 600,000 deaths.
- Case fatality rates – 10-50%
- Chronic carriers are those who excrete typhoid bacilli after clinical attack for more than 12 months
- Gall bladder (typhoid Mary) 2-5%

Agent – S typhi – O, H & Vi antigens
Disinfectant – drying, pasteurization
Reservoir of infection – man

Source of infection – faeces & urine
O > in diseases / H > in immunity / Vi > carrier

Host factor – 5-19 yr, Males >females. Carrier rate more in females

Incubation period – 10 to 14 days

Mode of transmission – Faeco-oral

Drug of choice – Chloramphenicol if bacilli are sensitive to it or ciprofloxacin is used.

For chronic carriers – Ampicillin (4-6 grams per day) with probenecid (2 g/day) x 6 weeks antibiotic therapeutic options for enteric fever:

Antibiotic		**Dosage**
First line	Ciprofloxacin	500mg twice a day x 10 days
	Ceftriaxone	1 -2 g IV or IM x 10- 14 days
Alternative (NARST*)	Azithromycin	1 g orally X 5 days
	Ciprofloxacin	10 mg/kg orally twice a day x 10 days

*NARST = "nalidixic acid resistant salmonella typhi"

Vaccine

- Live oral Ty 21a vaccine (Typhoral)
  - 109 live attenuated salmonella typhi, Ty 21 a strain
  - Children > 6 yr day, 1, 3 X 5: immunity 7 days after the last dose
  - Booster every 3 yr
- Vi Polysaccharide vaccine : one dose to > 2 years age, revaccinate every 3 years

CHOLERA: ORAL VACCINES

- Monovalent formalin/heat killed whole cells (Classical, El Tor, Inaba & Ogawa) + recombinant cholera toxin B subunit
- 3 ml single dose vials + bicarbonate buffer: Shelf life 3 years (2º - 8 º C) or 1 year (37 º C)
- In children aged 2-5 years: 3 doses more than 7days apart (1 booster every 6 months)
- In children ≥6 years: 2 doses more than 7days apart (1 booster after 2 years)

CHOLERA: ORAL VACCINES

- Monovalent formalin/heat killed whole cells (Classical, El Tor, Inaba & Ogawa) + recombinant cholera toxin B subunit
- 3 ml single dose vials + bicarbonate buffer: Shelf life 3 years (2º - 8 º C) or 1 year (37 º C)
- In children aged 2-5 years: 3 doses more than 7days apart (1 booster every 6 months)
- In children ≥6 years: 2 doses more than 7days apart (1 booster after 2 years)

Sanchol and mORCVAX:

- Bivalent oral cholera vaccines based on serogroups 01 and 0139
- 2 liquid doses 14days apart for age more than 1 year (1 booster after 2 years)

CVD103-HgR:
Single dose live attenuated vaccine NO LONGER PRODUCED

Microbial food poisoning: Differentiating features

	Salmonella Sp.	Staph	Cl. botulinum & perfringens	B. cereus	V. parahemolyticus	Norwalk virus
Type	Infective	Toxin	Toxin	Toxin	Infective	Infective
Source	Meat, milk or eggs of infected mammals or birds	Contaminated desserts	Canned Foods	Contaminated bolied rice	Infected shell fish	Infected shell fish
Incubation period	12 – 24 hrs	1-6 hrs	6-24 hrs (perfringens) 12-36 hrs (botulism)	Emetic – 1-6 hrs Diarrheal – 12-24 hrs	12-18 hrs	15-50 hrs

DRACUNCULIASIS

- Guinea worm disease
- India declared free from this disease in 1999.
- Asia declared free from this disease in 2000.
- Presently most of the cases are from Northern Africa and Latin America
- 63% of the cases are from Sudan, followed by Nigeria and Ghana.

Agent: D. medinensis, nematode affects S/C tissue to legs

Intermediate host: Cyclops

- Disease in man: consumption of water infected Cyclops

Last case: July 1996

Eradication: the following strategies were used:

- Provision of safe drinking water (e.g. piped water supply, installation of hand pumps)
- Control of Cyclops
- Health education regarding using safe water for drinking e.g. sieving through muslin cloth, boiling etc.
- Surveillance – active search for new cases.
- Treatment of cases – Nirdazole, Mebendazole and Metronidazole used.

DENGUE

- Some 2500 million people – two fifths of the world's population – are now at risk from dengue.
- WHO currently estimates there may be 50 million cases of dengue infection world wide every year.
- India has recorded dengue cases from 1945 and ranges from 7-16 thousand per annum. The epidemic surge in 1986 was the maximum.
- In 2007, there were 4620 cases all over India with 59 dengue related deaths giving a case fatality rate of 1.27%

Agent:

- Four serotypes of the virus – DEN 1 - 4

Clinical types:

- **Classical dengue fever**: also referred to as 'break bone fever' due to the pain associated with it.
    - Usually be infection by single strain e.g. DENI or DEN 2
    - Incubation period is 3-10 days
    - Onset sudden – fever with chills and rigors ⇒ retro orbital pain with photophobia (reasonably specific symptom)
    - Treatment is symptomatic
- **Dengue hemorrhagic fever**: severe form of dengue fever usually resulting from double or multiple infections.
    - Children < 15 yr are commonly affected
    - Plasma leakage is a distinguishing feature with abnormal hemostasis – positive tourniquet test

Grading of DHF

- Grade I – non specific constitutional symptoms + touniquest test
- Grade II – spontaneous bleeding
- Grade III – circulating failure narrowing pulse pressure < 20 mm kg & hypotension
- Grade IV – profound shock

Lab –

- Thrombocytopenia < 100,000 / mL
- Hemoconcentration – haemotocrit ↑ by 20%

Dengue shock syndrome

- Narrowing of pulse pressure (20m kg or less) or hypotension

Treatment:
Volume replacement: Dextran 10-20 ml/kg/hr
Children: - 5% dextrose in ½ normal saline
Rough estimate of IV flow ml/hr = drop/min for 3

Dengue Hemorrhagic Fever
Febrile phase:

- Incubation period 4-6 days
- Maculopapular rash less common than classical dengue fever
- Rising hematocrit + Moderate to marked thrombocytopenia

Critical phase: Shock, hemorrhage, organ damage may occur
Recovery phase: If patients survives 24-48 hours of critical phase

Severe dengue:

- Shock and/or fluid accumulation with/without respiratory distress
- Severe bleeding, and/or
- Severe organ impairment

Treatment guidelines:

- **Group A** (Patients with uncomplicated disease who may be sent home):Encourage ORS + PCM + Tepid sponge + Immediate visit to hospital if no improvement or worsening
- **Group B** (Patients for in-hospital management): Assess hematocrit + Fluid therapy with 0.9% Saline/RL/Hartmann's + Maintain good perfusion, urine output 0.5ml/kg/hr.
- **Group C** (Patients who require emergency treatment and urgent referral):Admission to hospital + intravenous fluid resuscitation [isotonic crystalloid solution or colloid dextran solution (for shock)]

Dengue Entomological Indices

- House Index = % of house infested with larvae & /pupae

$$= \frac{\text{No. of house infested}}{\text{No. of houses inspected}} * 100$$

- Container Index - % of water – holding contains infested with larvae or pupae

$$= \frac{\text{No. of positive containers}}{\text{No. of containers inspected}} * 100$$

- B1= Breteau Index

no. of positive contains per 100 houses inspected

$$= \frac{\text{No. of positive containers}}{\text{No. of houses inspected}} * 100$$

MALARIA

- The incidence of malaria worldwide is estimated to be 300-500 million clinical cases each year and 1.1 to 2.7 million people are still at risk.
- More than 2.4 billion population in the world is at risk.
- 400 million people are at risk of getting drug resistant malaria.
- **Roll Back malaria**: WHO initiated plan to contain malaria all throughout the world. The other major players are UNICEF, UNDP and the World Bank. The main strategies of the initiative are:
  - Strengthen district and community level health care delivery systems.
  - Ensure the proper and expanded use of insecticide treated bed nets.
  - Ensure adequate access to basic health care and training of health care workers.
  - Improve the efficiency of health delivery system by inducting all classes of health care workers.
  - Encourage the development of more effective and new anti malaria drugs and vaccines.
- 1.81 million cases of malaria (including 0.80 million P. falciparum cases) and 963 deaths were reported from the country in 2005.
- Provisional figures for 2006 were 1.04 million including 0.47 million falciparum cases and 890 deaths
- Orissa, followed by Gujarat, Chhattisgarh, West Bengal, Jharkhand, Karnataka, Uttar Pradesh and Rajasthan have recorded the maximum number of cases.
- Maximum deaths are reported from Orissa followed by West Bengal, Mizoram, Jharkhand, Meghalaya, Karnataka, Tripura and Assam.
- Major types of malaria – Tribal malaria, Rural malaria, Malaria in project areas and border malaria.

Agent:

- 4 distinct species of Plasmodium- vivax, falciparum, malariae and ovale.
- P vivax – 70% of all infections in India. P falciparum 25-30% and mixed 4-8%. P malariae is found in Tumkur and Hassan districts of Karnakata.

Reservoir of infection: Man; only exception is chimpanzees which harbor P malariae infection.

Period of communicability: communicable as long as mature, viable gametocytes are circulating in the blood. For vivax the latent period is 4-5 days & 10-12 days for falciparum.

Relapse / Recrudescence: vivax and ovale malarias show relapses due to long latent period before bursting (hypnozoite stage) to allow for original sporozoite induced liver schizonts to come out and start afresh. In case of malariae and falciparum the liver schizonts don not appear to occur, but low level infection persist in blood itself. "Recrudescence" occurs and the infection reappears.

Host factors: except new born infants (due to HbF) all others are susceptible to malaria. Due to activities and clothing, male are more affected by malaria than females.

- Pregnancy increase the risk
- Lower socio – economic factors increase the risk
- Migration increases the risk
- Immunity to malaria occurs slowly and after repeated infections

Environmental factors: Seasonal disease-maximum prevalence is from July to November. Above 2500 meters, anopheline species do not survive, so malaria is minimal above that altitude.

Vectors of malaria: Anopheles culicifacies is the major vector in India (mainly rural).
Nocturnal feeding habits. Female species.
Six primary Malaria vectors in India:

- *Anopheles culicifacies:* Rural and peri-urban areas [Species A-P, vivax & P, falciparum; Species B-P.falciparun]
- *Anopheles stephensi :* Urban and industrial areas
- *Anopheles fluviatilis:* Hilly, forest and forest fringe areas
- *Anopheles minimus:* Foot-hills of NE states
- *Anopheles dirus :* Forests of NE states
- *Anopheles epiroticus:* Andaman & Nicobar islands

Incubation period:

- Falciparum – 12 (9-14) days
- Vivax – 14 (8-17) days
- Malariae – 28 (18-40) days
- Ovale – 17 (16-18) days

Clinical features:

- Typically, malaria produces fever, headache, vomiting and other flu-like symptoms. Peaks of fever coincide with release of successive broods of merozoties in the blood.
- Three stage – Cold, hot and sweating stage

Diagnosis:

- Demonstration of parasite in blood – thick and thin smears in the same slide.
- For epidemiological studies – malaria fluorescent anti body test is done.
- Dipstick test – immuno chromatographic test. It detects plasmodium falciparum histidine rich protein in blood. Formation of pink line in 3-5 min. confirms Pf malaria.

Malariometric indices:

Pre-eradication era: Most indices were clinically based as case detection machinery was weak. They provide information about the trend of the disease. • Spleen rate - % children 2-10 years of age showing enlargement of spleen : > 50% is hyper endemic and > 75% is holoendemic. • Infant parastire rate – percentage of infants showing malaria parasites in their blood stream. Most sensitive indicator of recent transmission of malaria in a locality.	**Eradication era:** mostly parasitological parameters used for designating an area of operation or efficacy. • Annual parasite incidence (API) – number of confirmed cases of malaria of all species per 1000 population under surveillance for a period of one year. • Annual blood examination rate – number of slides examined per 100 populations under surveillance for 1 year. • Annual falciparum incidence – number of confirmed cases of falciparum malaria per 1000 population for 1 year. • Slide passivity rate- number of slides positive for malaria out of all examined. • Slide falciparum rate – number of slides positive for falciparum malaria out of all examined.

Malaria control: Being a vector borne disease, eradication in true sense may not be possible. Control is a distinct possibility. Approaches are-

- Management of malaria cases in the community and
- Active intervention to control or interrupt malaria transmission with community participation

Treatment strategies

- In high risk areas – presumptive treatment is 1500 mgs of chloroquine + 45 mgs of primaquine. If microscopic confirmation is available – then add 15 mgs adult dose of primaquine for 5 days.
- Chloroquine resistant falciparum cases – sulphalene/Sulphadoxine + Pyrimethmine combination (500mg + 25mg), 3 tablets + 45 mg of Primaquine.
- In low risk areas – Presumptive treatment is 600 mgs of chloroquine only. Once confirmed – complete the full dose as above.
- Cerebral malaria – Drug of choice remains quinine IV 10 mg/kg in 5% dextrose saline run over 4 hours every 8 hourly. Switch over to oral dose as early as possible to minimize the risk of 'torsades de pointes' (ventricular tachycardia characterized by polymorphic QRS complex that change both in amplitude and cycle length (QT > 0.60s) – cause hypokalemia, hypomagnesaemia, quinidine, phenothiazines and tricyclic antidepressants). Total duration of treatment should be 7 days.
- In severe and complicated malarias Artemisinin derivatives can be used.
- In chloroquine resistant cases – mefloquine is an alternative, though not widely available every where.
- Mass drug administration : API > 5

Chemoprophylaxis:

Indications:

- Pregnant women
- Travelers
- Service personnel entering endemic areas
- 1 week before entering the endemic area & 4 week after leaving the endemic area.

Drugs:

- Chloroquine 300 mgs base once very week or
- Mefloquine 250 mgs every week or
- Doxycycline 100 mgs every day
- In chloroquine resistant areas chemoprophylaxis is recommended with chloroquine 5 mg/kg weekly and proguanil 100 mg daily.

Regimen

- Chemoprophylaxis is to be started a week before arriving to malarious area for visitors and for pregnant women prophylaxis should be initiated from second trimester.
- Start with loading dose of 10 mg/kg bi weekly and followed by a weekly dose of 5 mg/kg bi weekly. This is to continue till 1 month after delivery in case of pregnancy and in travelers till one month after return from endemic area. The terminating dose should be 10 mg/kg bi weekly along with 0.25 mg/kg bi weekly of primaquine for five days.
- Chemoprophylaxis with chloroquine is not recommended beyond 3 years because of its cumulative toxicity.

Drug resistance

- Drug resistance is the ability of the parasite species to survive and/or multiply despite the administration and absorption of a drug given in doses equal to or higher than those usually recommended but within the limit of tolerance.
- Drug resistance is most commonly seen in P. falciparum. Only sporadic cases of resistance have been reported in vivax malaria. Resistance to chloroquine is most prevalent.
- Degree of resistance – WHO – smears are taken on 2^{nd}, 7^{th} and 28^{th} day to grade the resistance patterns from R1 to R3.

Prevention of drug resistance:

Resistance develops most rapidly when a population of parasite encounters sub therapeutic concentration of Antimalarial drugs. The following points will be helpful in reducing the emergency of resistance.

1. Selection of drugs – use conventional drugs first in uncomplicated cases. Greater the exposure, higher will be the emergency of resistance.
2. Avoid drugs with longer half-life if possible.
3. Avoid basic antimalarials for non malarial indications (e.g. chloroquine for rheumatoid arthritis in a malarial endemic area).
4. Ensure compliance
5. Monitoring for resistance and early treatment of these cases to prevent their spread.
6. Clear policy of using newer antimalarials.
7. Use of combinations to inhibit emergence of resistance.

Sensitive (S): the asexual parasite count reduces to 25% of the pre-treatment level in 48 hours after starting the treatment and completes clearance after 7 days, without subsequent recrudescence –

complete recovery.
RI, Delayed recrudescence: The asexual parasitemia reduces to < 25% of pre-treatment level in 48 hour, but reappears between 2-4 weeks.
RI, early recrudescence: the asexual parasitemia reduces to < 25% of pre-treatment level in 48 hours, but reappears earlier.
RII resistance: marked reduction in asexual parasitemia (decrease > 25% but < 75%) in 48 hours, without complete clearance in 7 days.
RIII resistance: minimal reduction in asexual parasitemia, (decrease < 25%0 or an increase in parasitemia after 48 hours.

Malaria drug resistance – kind courtesy – Dr. Chakrapani & Dr. B.S. Kakkilaya, Kasturba medical college, Mangalore.

Stage of plasmodium	**Antigens**	**Salient features**
Pre-erythrocytic	Irradiated sporozoite, circum sporozoite protein (CSP) or peptides, liver stage antigens – 1 (LSA-1)	Stage / species specific antibody blocks infection of liver; large immunizing dose required; can abort an infection
Merozoite and erythrocytes	Erythrocyte binding antigen (EBA-175), merozoite surface antigen 1&2 (MSA – 1&2); ring infected erythrocyte surface antigen (RESA); serine repeat antigen (SERA); rhoptry associated protein (RAP); histidine rich protein (HRP); apical membrane antigen -1 (APM-1)	Specific for species and stage; cannot abort an infection; prevents invasion of erythrocytes, thus reducing severity of infection
Gametocytes & gametes	Pfs 25, 48/45k, Pfs 230	Prevents infection of mosquitoes; antibody to this antigen prevents either fertilization or maturation of gametocytes, zygotes or ookinetes; is of use in endemic areas but not suited for travelers; antibody blocks transmission cycle
Combined vaccine (cocktail)	SPf 66 (based on pre-erythrocytic and asexual blood stage proteins of Pf)	Based on incorporation of antigens from different stages into one vaccine to produce an immune response, blocking all stages of the parasite development

Malaria vaccine:

- Cocktail vaccine SPf66- reduces the risk of developing malaria by about 30%.
- Pfs 25 is a transmission blocking vaccine.
- Both are not used widely, but have cleared phase III trails.

Diagnosis of Malaria in India:

- *Microscopy:* Thick smear (High sensitivity in searching for parasite, parasite load estimation) + Thin file (for species identification, stages)
- *Serological testing:* Malaria Fluorescent Antibody Test (MFAT) necomes +ve after 2 weeks of infection (not indicative of current infection)
- *Rapid diagnostic test (RDT):* Detect circulating parasite antigens.

LYMPHATIC FILARIASIS

Active intervention measures for Malaria control:

- Micro-stratification of problem
- Vector control strategies
  1) Anti-adult measures: Indoor residual spray (DDT, Malathion, Fenitrothlon), Space
  2) Anti-larval measures: Larvicides (Temiphos), Source reduction, Integrated control.

Changes in WHO recommendations for Malaria control [2008]

- New ACT recommended: Dihydroartemisin-piperaquine
- Artemisin derivatives should not be used as Monotherapy for uncomplicated malaria
- Single dose of Primaquine (anti-gametocyte) added to ACT treatment of P, falciparum.

- Causative organism - W Bancrofti
- Vector - Culex
- B Malayi – mansonis
- B timori – mansonis
- Population at risk of Filariasis – 553.7million
- Endemic in – Bihar, TN, Orissa, Kerala, UP, Gujarat, AP
- River blindness – Onchocerca volvulus by simulum flies
- Loa causes – s/c swellings; vector – chrysopes flies
- Best time for collecting blood sample 20pm to 2 pm

Bancroftian Filariasis

- Man is the definitive most
- Adult worm lives in lymphatic vessel – 15 years
- Microfilaria is picked by vector mosquito during feeding
- Females – viviparous; give birth to about 50,000 Mf per day

Source of infection: person with infection in blood (average life 1 yr)

- In vector – 10-14 days
- Larvae : 1st stage larvae
- 2nd stage larvae
- 3rd stage larvae
- In human – larvae to adult – males
  - Females
- W bancrofti only human reservoir

Host

- All ages, Even in infants

- Increase up to 20-30 yr and especially men

Environment factors

Culex quinquefaciatus 22 degree Celsius – 38 degree Celsius & Relative humidity 70%
Pre-patent period: time between inoculation of infective larvae & 1st appearance of Mf
Clinical incubation period – 8-16 months

Lymphatic Filariasis – stages

1. Asymptomatic amicrofilaraemia
2. Asymptomatic microfilaraemia – night blood examination
3. Stage of acute manifestations – glands lymphangitis adenitis
4. Chronic obstructive lesions
   No mf in blood — Hydrocele
   Elephantiasis – leg
   Chyluria

Occult Filariasis – Mf not found in blood due to hypersensitivity reaction to filarial Ag – tropical pulmonary eosinophilia

Survey

- Mass blood survey
  Thick film
  MFC (membrane filter concentration) most sensitive
  DEC provocation test (100 mgs of DEC)- increases in 15min – 2 hr
- Clinical survey
- Serological – immunofluorescent, complement fixation
- Xenodiagnosis
- Entomological
  Microfilaria rate – ml in blood
  Microfilaria endemicity rate – ml in disease
  Average infestation rate prevalence of ml in population
- Most effective mean of control – insecticide

Mass DEC administration

- DEC 6 mg/kg alone or along with Ivermectin 400 μg/kg
- In India, mass drug administration (MDA) has started from 2004 and during 2005, 243 endemic districts with about 500 million population were covered.

National Filaria day – 5th June

Treatment

1. Bancroftian Filariasis – Diethylcarbamazine 6 mg/kg per day orally in divided doses x 12 days (total dose 72 mg/kg body weight) to be completed in two weeks. Ivermectin is not used in Indian programme.
2. Brugian Filariasis – DEC 3-6 mg/kg per day orally up to total dose of 18-72 mg/kg.

RABIES

- Hydrophobia, a highly fatal disease of central nervous system

Case

- Long variable incubation period
- Short period of illness- ducts encephalomyelitis
- Case fatality rate - 100%

Problem statement:

- Rabies is widely distributed across the globe. More than 55000 people die of rabies each year. About 95% of human deaths occur in Asia and Africa.
- Most human deaths follow a bite from an infected dog. Between 30% to 60% of the victims of dog bites are children under the age of 15.
- Rabies free countries – China, Australia, Japan New Zealand, UK, Sweden, Norway
- India- Lakshadweep, Andaman and Nicobar island
    - Water seems to be a natural barrier to rabies
    - No case in last 2 yrs (indigenous)

Agent

- Lyssavirus type I, serotype I (G serotype) Bullet shaped neurotropic RNA virus
- **Street virus:-** It was naturally occurring cases IP -2-60 days in dog
- **Fixed virus: -**
    - Fixed incubation period, short 4-6 days
    - Does not form Negri bodies
    - Dose not multiply in extra- neural tissue
    - Used for preparation of anti rabies vaccine

Reservoir for infection

- Urban: - domestic dogs, cats
- Wild life:- sylvatic from – jackal, for, hyena, mongoose
- Bat: -Latin America

Source of infection

- Only 50% of bite by proven rabid animal, result is rabies (variable in saliva); the virus may be present in saliva of dogs and cats for 3-4 days before the onset of clinical symptoms and during the entire course of illness.
- Symptomatic animals—Dead end infection

Mode of transmission –

- Lick, bite, aerosol [not ingestional] & corneal, organ transplant
- Virus spread centrifugally in peripheral nerves from CNS
- IP – 3- 8 week depends on – Site / Severity / Species / No of wounds

Specific prodromal symptoms

- Tingling at the site of bite
- Pathogenic - hydrophobia [sensory aerophobia muscle spasm saliva, Lacrimation -convulsions]

Diagnosis: -

- Ag detection using immuno- fluorescence of skin biopsy

- Virus isolation from saliva [CSF –Ab after 8 days]

Vaccines

1. Sample vaccine (inactivated vaccine produce in sheep or goat brain tissue- usually 5% emulsion) – neuroparalytic effects – 1:200 to 1:1600 and lethality upto 14%
2. Suckling mouse brain (fuenzalida)→ devoid of neuroparalytic effects Duck embryo vaccine (not available in India)
3. Cell culture vaccine – HDC vaccine – (1967) based on the Pitman- Moore L503 strain and Flury strain of rabies virus- considered gold standard for all rabies vaccine
    - 2nd generation vaccine - Purified chick cell embryo vaccine (Rabipur) – Flury LEP-25 strain / Non tumorigenic continuous cell lines (vero cells) – wistar strain

Categories of contact and recommended post-exposure prophylaxis (PEP):

Categories of contact with suspect rabid animal	Description	Post-exposure prophylaxis measures
Category 1	Touching or feeding animals, licks on intact skin	None
Category II	Nibbling of uncovered skin, minor scratches or abrasions without bleeding	Immediate vaccination and local treatment of the wound
Category III	Single or multiple transdermal bites or scratches, licks on broken skin; contamination of mucous membrane with saliva from licks, contacts with bats	Immediate vaccination and administration of rabies immunoglobulin; local treatment o f the wound

All category II and III exposures assessed as carrying a risk of developing rabies require PEP
This risk is increased if *:*
- the biting mammal is a known rabies reservoir or vector species;
- the animal looks sick or has an abnormal behaviour;
- a wound or mucous membrane was contaminated by the animal's saliva;
- the bite was unprovoked;
- the animal has not been vaccinated; and
- if biting animal cannot be traced or identified.

In developing countries, the vaccination status of the suspected animal alone should not be considered when deciding whether to initiate prophylaxis or not.

- Post-exposure prophylaxis may be discontinued if the suspected animal is proved by appropriate laboratory examination to be free of rabies or, in the case of domestic dogs, cats or ferrets, the animal remains healthy throughout a 10 day observation period starting from the date of the bite

Regimen	Dose
5-dose regimen	**1 dose on each of days 0, 3,**

	7, 14, and 28;
4-dose abbreviated multisite regimen	**2 doses on day 0 (1 in each of the 2 deltoid or thigh sites) followed by 1 dose on each of days 7 and 21,**
The 2-site regimen	**Injection of 0.1 ml at 2 sites (deltoid or thigh) on days 0, 3, 7 and 28.**

Pre-exposure prophylaxis (PrEP):
PrEP schedule requires intramuscular doses of 1ml or 0.5 ml, depending on the vaccine type, or intradermal administration of 0.1 ml volume per site (one site each day)given on **days 0, 7 and 21 or 2**

ARBOVIRAL DISEASES

Yellow fever:

- Exotic disease in India
- Endemic in south America and African continent
- World wide 200,000 case with 30,000 deaths
- Clinical spectrum varies from clinically indeterminate to severe cases
- Death occurs between 5^{th} and 10^{th} day of illness

Agent

- Flavivirus fibricus belonging to group IV positive single stranded RNA virus. This is one of the smallest RNA virus isolated.
- Reservoir of infection - Monkey & forest mosquitoes in rural / Man & mosquito in urban

Clinical features

- Biphasic illness
- First phase- sudden onset with high fever, severe headache, chills, nausea, vomiting, abdominal pain and generalized myalgia.
- Second phase – starts about 1-2 days after the first phase and is characterized by return of fever and appearance of jaundice. May be associated with generalized bleeding from different orifices

Transmission patterns:

- Two cycles are seen in the South American settings – sylvan and urban cycle
- Incubation period: 3-6 days [period of -6 days –IHR]
- Vaccine – 17 D vaccine live attenuated freeze- dried; 0.5 ml/s/c;
  - Temperature- +5 to -30^0 Celsius [cholera vaccine at least 3 wks aparts as interferes with antibody production]
  - Immunity – starts after 7 days / Re vaccinate after 10 years
- Aedes aegypti Index- % houses showing breeding of aedes aegypti larvae.
- WHO recommends the index to be < 1% towns, seaports and airports in endemic areas.
- Perimeter of 400 meters around seaport and airports should have AE index < 1.
- Quarantine period - 6 days

Other Arbovirus

- Group A – Alpha virus – Chickungunya, sindbis
- Group B – Flavi – Dengue, KFD, JE, West Nile

Japanese Encephalitis

- Mosquito borne encephalitis
- Virus infects extra human host
- Man is an incidental dead end host (no man to man transmission)
- JE viral activity has been widespread in India. The first evidence of presence of JE virus dates back to 1952. First case was reported in 1955.
- Outbreaks have been reported from different parts of the country.
- During recent past (1998-2004), 15 states and union territories have reported JE incidence
- Annual incidence ranged between 1714 and 6727 (2005) and deaths between 367 and 1682 (2005). I 2008, NVBCP reported 3838 cases with 684 deaths.

Transmission cycle

- Only animal manifest disease – horse
- Pig – only multiplier
- Vector : Culex tritaeniorhynchus, C visnhui and C gelidus
- In northern India, vector is predominantly C visnhui and in the South C tritaeniorhynchus
- Incubation period 5-15 days
- Ratio of overt to inapparent infection varies from 1:300 to 1:1000.

Course of the disease:

- Prodromal
- Fever, malaise 1-6 days
- Acute encephalitic stage 38-40.7 degree Celsius fever; nuchal rigidity, CNS signs & convulsion
- Late state – case fatality 20-40%

Control of JE

- Vector control – using ULV insecticides e.g. malathion, fenitrothion etc
- Vaccine – currently three types of vaccines
    - Mouse brain derived, purified and inactivated vaccine (Nakayama or Beijing strain) - 2 doses (7-14 days interval) & booster before 1 yr, 1 ml S/C [<3yr age 0.5ml] / revaccination – after 3 yr / Best used in inter epidemic period / Immunity – 1 month after first dose
    - Cell culture derived inactivated JE virus based on Beijing P3 strain and Live attenuated SA 14-14-2 strain

MANAGEMENT OF ACUTE ENCEPHALITIS SYNDROME (AES) & JE :

Case definition of suspected case: Acute onset fever, <5-7 days duration + Change in mental status with/without new onset of seizures (EXCEPT febrile) or enhanced irritability/somnolence/abnormal behaviour

Case classification:

- *Laboratory confirmed case:* IgM in CSF/serum OR 4-fold antibody titre rise in paired sera OR viral isolation from brain tissue OR antigen detection by immunofluorescence OR

nucleic acid detection by PCR.

- *Probable case:* Suspected case in close geographic and temporal relationship to a lab-confirmed case in outbreak
- *AES due to some other agent:* Suspected case + diagnostic testing + some other agent identified.
- *AES due to unknown agent:* Suspected case + No diagnostic testing/ No etiological agent/Indeterminate test results.
- *Management :* Symptomatic.

Kyasanur Forest Disease

- Mainly in Karnataka

Agent: Group B Flavivirus

Transmission cycle – monkey → tick → monkeys; cattles play an important part in increasing the number of ticks, but no role in transmission of the disease.

- Monkey – amplifying host (but die due to disease)
- Man is the incidental dead end host.
- January – June is the most common period of transmission.

Main reservoir – Rats / Squirrels

Vector: Haemophysalis spinigera / Haemophysalis turtura

Host: 20-40 years mainly males, especially who accompany their cattle to the forest

Incubation period: 3-8 days

Clinical features:

- Fever, Myalgia, GI disturbances + Hemorrhages;
- 2^{nd} phase → Meningoencepalitis after 7-21 days

Case fatality rate – 5-10%

Control:

- Hot spot: monkey death
- Vector control – ticks – carbaryl
- Vaccine – killed KFD vaccine
- Insect repellents like DEET and DMP

Chikungunya fever

- Caused by alpha virus, toga viridae family, group IV +ss RNA viruses (Group A)
- The name is derived from the Makonde word meaning "that which bends up" in reference to the stooped posture developed as a result of the arthritic symptoms of the disease.
- WHO estimates 200 deaths associated in 2005-06
- Spread in India – widespread outbreaks in Southern India especially TN, AP, Kerala and Karnataka.
- In 2007, 43111 suspected cases in 14 states have been reported
- Vector – Aedes aegypti, culex and mansonia
- Incubation period 3-12 days
- No specific treatment – symptomatic management is advised
- Vector control – control of Aedes – ULV malathion

LEPTOSPIROSIS

- Referred to as disease of 3 "R' s- Rainfall, Ricefield and Rats
- Essentially an animal infection by several serotypes of Leptospria. It is considered to be the most widespread disease transmissible from animals to man.
- High prevalence in hot and humid areas, but also seen in the temperate zones.
- Recent outbreaks have occurred almost regularly since 1999. Latest being in 2005 in Mumbai during the floods.
- Agent factors – Leptospria species especially L. interrogans and L. icterohaemorrhagiae, L. biflexa is non pathogenic.
- Source of infection - Urine of infected animals
  Reservoir – rats and small rodents. R norvegicus & Mus musculus are most important reservoir
- Host- children
- IP – 10 days

Mode of transmission: Most commonly by direct contact with urine of infected animals through skin abrasions etc.

Clinical features: unapparent infections range from 15 to 40 % of all infections. Symptomatic cases show wide variety of features from mild to severe disease

- Anicteric variety: Presents with acute influenza like illness with fever, chills, severe headache etc. Recovery within 7 days, but after an interval of 1-3 days recurs back → coincides with antibody development
- Severe Leptospirosis (Weil's Syndrome) – most severe form of Leptospirosis
  - Jaundice, renal dysfunction, hemorrhagic diathesis
  - Mortality of 5-15%

Diagnosis – IgM; Dark field extension
Serological test – MAT (microscopic agglutination test) and ELISA

Treatment and Chemoprophylaxis:

Type of Leptospirosis	Drug regimens
Mild Leptospirosis	Doxycycline 100 mgs orally twice a day or amoxicillin 500 mgs four times a day
Moderate or severe Leptospirosis	Penicillin G 1 -1.5 million units IV every 6 hrly or Ampicillin 1 g IV every 6 hrly or Erythromycin 500mg IV 6 hrly
chemoprophylaxis	Doxycycline 200 mgs orally once a week

Vaccines: Russian Federation, Italy and china have vaccines available. They incorporate the recently transmitted strains. Immunization is done for pets as well as persons who are at high risk for contacting Leptospirosis.

PLAGUE

- After 1966, the return of plague in 1994 after 28 years gap

- During that period 4780 suspected cases were reported, 167 tested positive for plague and there were 53 deaths. In 2002, 16 cases were reported from Himachal Pradesh. Since then no outbreaks have been reported.
- Notifiable disease to WHO under international health regulations.

Agent: Y pestis gram negative coccobacilli, Non- motile, Wayson's stain – bipolar staining

Reservoir: Wild rodent (Tatera indica)

Source of infection: infected rodents and fleas and cases of pneumonic plague.

Host:

- All ages and sex are susceptible
- Immunity after recovery is relative
- Seasonal – September – May
- Free from plague – Bengal
- Vector : X cheopis, both sexes, X astia, X brasiliensis and Pulex irritans
- If cheopis index > 1 – significant and regarded as indicative of potential explosiveness should plague outbreak occur.

Blocked flea:

- 0.5 mm blood + 5000 bacillus (partially blocked flea a more efficient transmitter)

Cycle – Natural foci maintained by Rat → Flea → Rat; several other mechanism have been propagated

- Latent infection in rodents → Relapse → fresh epizootic
- Development or resistance to plague bacilli and localization of bacilli in certain organs → may become source of infection if eaten by other rodents.
- Survival of rat fleas for as long as 4 years in rat burrows under optimum microclimatic conditions.
- Variations in pathogenicity of Y pestis.
- Survival and multiplication of plague bacilli in the soil of rat burrows.

Incubation period:

- Bubonic : 2-7 days
- Septicemia: 2-7 days
- Pneumonic : 1-3 day
- Man to man possible in pneumonic plague

Transmission – bite of infected rat flea, droplet infection

Clinical features:

- Bubonic plague – Most common. Fever with chills, prostration and painful lymphadenitis; fatality 50% in untreated case
- Pneumonic plague – usually a complication of bubonic or septicemia variety and show typical signs and symptoms of pneumonia; fatality almost 100% in untreated cases
- Septicemic plague – rare except for accidental infections in laboratory – typical signs of gram negative septicemia; fatality almost 50% in untreated cases.

Treatment:

- Drug of choice is Streptomycin 30 mg per kg body weight daily in divided doses; alternately tetracycline, cotrimoxazole, gentamicin, doxycycline and chloramphenicol could be used.
- Chemoprophylaxis – Tetracycline is the drug of choice; suphonamide is a cheaper alternative.
- Most effective method: control of rat flea

Vaccination – formalin killed

- 2 doses s/c – immunity 6 moths
- Area free of plague –
    - 3 month – last sign in wild rodent
    - 1 month – last sign in domestic rodent
    - Twice the IP

LEISHMANIASIS

- Group of Protozoal disease caused by genus Leishmania and transmitted by female phlebotomine Sandfly
- Kala azar – Visceral Leishmaniasis – most common
- CL – cutaneous Leishmaniasis
- MCL – muco cutaneous leishmaniasis
- ACL – anthropnotic cutaneous leishmaniasis
- ZCL – zoonotic cutaneous leishmaniasis
- PKDL – post kala azar dermal leishmaniasis

Epidemiology

- Worldwide in distribution and 88 endemic countries and 9 out of 10 cases are there in Bangladesh, Brazil, India and China.
- Association with HIV/AIDS in southern Europe - 25-70% of adult VL cases.
- India – Assam, West Bengal, Bihar, eastern UP, Sikkim are endemic areas
- In 2006, there were 39,178 cases recorded with 187 deaths; provisional figures upto June 2007- 22,751 with 101 deaths
- Non-Zoonotic – Indian kala azar
- Transmission – by bite of P argentipes (Sand Fly)
- Kala Azar – L donovani - (PKDL) / Cutaneous (Oriental Sore) L tropica / MCL – L braziliensis
- Peak age 5-9 yr male
- Life long immunity. No cross immunity
- Reservoir of infection – Dog, Jackal, Foxes; Rodents
- Incubation period – 1-4 months; range is 10 days to 2 years

Clinical features: Fever / Hepatosplenomegaly / Darkening of skin

Test for surveillance

- Aldehyde test
- Leishman test: - based on skin reaction; negative during active phase of Kala azar
- LD bodies in spleen, liver, bone marrow – identify group at risk
- Serology – ELISA, I FAT

Treatment

- Kala – azar drugs available in India
  - Sodium Stibogluconate SSG (indigenous manufacture, registered for use & sale)
  - Pentamidine isethionate: (imported, registered for use)
  - Amphotericin B : (indigenous manufacture, registered for use and sale)
  - Liposomal Amphotericin B:(indigenous manufacture & imported, registered for use & sale)
  - Miltefosine (registered for use & sale)

First line Drugs

A. Short term

- Areas with SSG sensitivity > 90%
  - SSG IM/IV 20mg/kg/day X 30 days
- Areas with SSG sensitivity <90%
  - Amphotericin B 1mg/kg body wt. IV infusion daily or alternate day for 15-20 infusions. Dose can be increased in patients with incomplete response with 30 injections.

B. Long term

- Areas with high level of SSG resistance (>20%)
  - Miltefosine 100 mg daily x 4 weeks
- Areas with SSG sensitivity >80%
  - SSG IM/IV 20mg/kg/day x 30 days
  - Miltefosine 100 mg daily x 4 weeks

Second line drugs

A. SSG failures

- Amphotericin B 1 mg/kg b. w. IV infusion daily or alternate day for 15-20 infusions. Dose can be increased in patients with incomplete response with 30 injections.

B. SSG and Miltefosine Failures

- Liposomal Amphotericin B

Sand fly control – insecticide – DDT

First line Drugs A. Short term • Areas with SSG sensitivity > 90% o SSG IM/IV 20mg/kg/day X 30 days • Areas with SSG sensitivity <90% o Amphotericin B 1mg/kg body wt. IV infusion daily or alternate day for 15-20 infusions. Dose can be increased in patients with incomplete response with 30 injections. B. Long term • Areas with high level of SSG resistance (>20%) o Miltefosine 100 mg daily x 4 weeks • Areas with SSG sensitivity >80% o SSG IM/IV 20mg/kg/day x 30 days Miltefosine 100 mg daily x 4 weeks	**Second line drugs** A. SSG failures • Amphotericin B 1 mg/kg b. w. IV infusion daily or alternate day for 15-20 infusions. Dose can be increased in patients with incomplete response with 30 injections. B. SSG and Miltefosine Failures • Liposomal Amphotericin B Sand fly control – insecticide – DDT

TRACHOMA

- Chronic infection of conjunctiva and cornea, caused by Chlamydia trachomatis.
- Classification – blinding and non-blinding.
- 540 million and at risk of infection all over the globe, 152 million suffer and require treatment and 6 million have been rendered blind.
- In India trachoma is responsible for 0.2% of all visual impairment and blindness.

Agent factors:

- C trachomatis of immune types A, B or C; sexually transmitted types D-K may also infect children with active disease and chronically infected older children and adults
- Ocular discharges of infected persons.

Host factors:

- Children 2-5 years of age
- Slight female preponderance in adults

Incubation period – 5-12days

Control of trachoma

- SAFE strategy - Surgery for tarsal and cornea, Antibiotics, Facial cleanliness and environmental sanitation.
- Chemotherapy – 1% tetracycline ointment or 1% Azithromycin ointment. Treatment may be mass treatment or selective treatment. Mass treatment (blanket) is indicated – prevalence of severe and moderate trachoma > 5% among children under 10 years.
- Control program – integrated with National Program for control of Blindness.
- Part of VISION 2020: The Right to Sight-global initiative for tacking the preventable cause of blindness
- GET 2020 – Global alliance for Elimination of Trachoma. This emphasizes the SAFE strategy.

HOSPITAL ACQUIRED INFECTIONS / NOSOCOMIAL INFECTIONS

- **Nosocomial infections:** Infections acquired during hospital care (occurring AFTER 48 HOURS OF ADMISSION)
- **Most common Nosocomial infections:** Urinary tract (UTI) > Lower respiratory tract > Surgical sites > Skin & soft tissue > Respiratory tract > Bacteraemia > Eye/ENT > Others.
- Standard precautions for all patients:
  - Wash hands promptly after contact with infective material
  - Use no-touch technique
  - Wear gloves when in contact with fluids/blood/secretions/excretions

PROBLEM STATEMENT OF DISEASES IN INDIA:

Diphtheria *:* 4286 cases, 112 deaths, Case fatality rate 2.61% [2011]
Whooping cough*:* 39091 cases [2011]
Meningococcal meningitis*:* 6629 cases, 464 deaths [2011]
Tuberculosis: (July 2011)

- Incidence: 185 cases/100000 population
- Incidence: 75 new sputum smear +ve cases/100000 population
- Prevalence: 256 cases/100000 population
- Mortality: 26 deaths/100000 population
- % TB with HIV: 5%
- % new cases TB with Multidrug resistance: 2.1%

Poliomyelitis:

- AFP: 47399 [2012]
- Non-polio AFP rate: 10.89 [2009]
- AFP with adequate specimens: 87 [2012]
- Polio cases: 756 [2009]; 46 [2010]; 0 [2011] ; 0 [2012]

Dengue:

- Cases: 18059, Deaths 119 [2011]
- Case fatality rate: 0.65% [2011]

Malaria:

- Cases: 1.31 million (Plasmodium falciparum: 0.65 million – 50.3%); Deaths: 463 [2011]
- API: 1.10 [2011]
- SPR: 1.41 [2010]

Japanese encephalitis:

- Cases: 7838 Deaths 1137 [2011]

Kala azar:

- Endemic in 52 districts of Bihar, WB, UP, Jharkhand
- Cases: 33133; Deaths: 80 [2011]

Tetanus (other than NNT):

- Cases: 1809; Deaths: 112
- NNT: Cases:734; Deaths: 14 [2011]

Leprosy:

- Prevalence: 0.72 per 10000 population [2009]
- ANCDR:1.03 per 10000 population
- Cases: 83000; 49% MBL cases; 9.7% children; 37 % females; 3.0% visible deformity
- Cure rate: 90% (MBL) to 95% (PBL)

HIV/AIDS:

- WORLD: Total People living with HIV 34.2 million (children 3.4 million)
- INDIA: Total people living with HIV 2.39 million
  HIV prevalence: 0.31%
  Heterosexual route: 88.2% cases.

****

MCQ'S

Epidemiology -1 - Man and Medicine

1.Disease prevention, health promotion and study of man as a social being in relation to his total environment' is the definition of:
A. Socialization of medicine
B. Socialized medicine
C. Social medicine
D. Sociology

2. Socialized Medicine is:
A. Health care at people's expense
B. Charitable care at government expense
C. Free medical care at government expense, regulated by professional groups
D. Integration of social medicine with health care

3. Health for All by 2000 AD means a level of health which enables a person to:
A. Be devoid of disease in future
B. Lead socially and economically productive life
C. Have healthy and happy life and no death and suffering
D. Lead economically productive life

Health and Disease

1. "Physical quality of life index" consolidates following three indicators, *except:*
A. lnfant mortality rate
B. Life expectancy at age one
C. Maternal mortality rate (ratio)
D. Literacy rate

2. Regarding PQLI which is *false?*
A. It include IMR, life expectancy at age one and literacy
B. It is highest in Kerala in state of India
C. It can be sued for comparison of national and international standards
D. Income affects PQLI

3. WHO target for expenditure of each country's GNP on health care to achieve the national social demographic goals is:

A. 3%
B. 5%
C. 7%
D. 10%

4. Expectation of life, free of disability is known as:
A. Park's index
B. Smith's index
C. Sullivan's index
D. All of the above

5. Which of the following is a measure of the burden of disease in a defined population and effectiveness of interventions
A. Park's index
B. Disability adjusted life year
C. Bed disability days
D. Activities of daily living index

6. Secondary health care is provided by:
A. Primary health centre
B. Community health centre
C. Teaching hospitals
D. Apex hospitals

7. Heath for all by year 2000 means:
A Medical care· for everybody in world for all their medical ailments
B. By year 2000 communicable diseases will be controlled.
C. Even distribution of available health resource among the population
D. Availability of health resources to urban and rural poor

8. The web of causation for chronic disease implies that the- disease cannot be controlled unless:
A. All the multiple causes are removed
B. Chains of causations are controlled
C. A number of multiple causes are controlled
D. None of the above

9. Consider the following statements: The term disease control' describes ongoing operations aimed at reducing the:
I, Incidence of disease
2. Financial burden to the community
3. Effects of infection including both physical and psychogical complications
4. Duration of disease and its transmission
Of this statements
A. 1, 2 and 3 are correct
B. 1, 3 and 4 are correct
C. 1, 2 and 4 are correct
D. 1, 2, 3 and 4 are correct

10. All of the following statements about eradication programme are true excepted
A. There is complete interruption of disease transmission in the entire area of the community
B. Eradication programme is over once the disease has been certified as having been eradicated
C. Case finding is of secondary importance
D. The object is to eliminate the disease to the extent that no new case occurs in the future

11. Sentinel surveillance indicates:
A. Identifying the missing cases
B. Identifying high risk groups
C. Surveillance of water pollution
D. Surveillance of environmental control

12. Process by which the results are compared with intended objective is
A. Evaluation
B. Monitoring
C. Input – output analysis
D. Network analysis

13. In an area with fluoride rich water, the defluoridation of water is which level of prevention:
A. Primary
B. Secondary
C. Tertiary
D. Primordial

14. Which of the following is an example of secondary prevention?
A. Measles vaccination
B. Skin surgery in lepromatous patient
C. Chemotherapy of tuberculosis
D. INH to a child breastfed on a tuberculosis mother on chemotherapy

15. All are interventions aimed at specific protection *expect:*
A. Screening for diabetes
B. Use of helmets
C. Avoidance of allergen
D. Chemoprophylaxis

16. Prophylactic administration of Vitamin A in a child is:
A. Health promotion
B. Specific protection
C. Treatment
D. Rehabilitation

17. All are activities in secondary prevention' *except:*
A. Chemoprophylaxis
B. Case finding measures
C. Screening surveys
D. Periodic examination

18. Arrange the following in sequence:
1. Disability
2. Handicap
3. Impairment
a. 1,2,3
b. 2,1,3
c. 2,3,1
d. 3,1,2

19. Any loss or abnormality of psychological, physiological or anatomical structure or function is.
A. Impairment
B. Disability
C. Handicap
D. None of the above

20. Most important epidemiological tool used for assessing disability in children is:
A. Activities of daily living scale
B. Wing's Handicap, Behaviour and Skills (HBS) schedule
C. Binets and Simon's IQ test
D. PQLI

Screening for disease

1. Active search for unrecognized disease among apparently healthy people is:
A. Screening
B. Surveillance
C. Case finding
D. Notification

2. The time interval between diagnosis by early detection and diagnosis by other means is:
A. Incubation period
B. Lead time
C. Serial interval
D. Latent period

3. In a community, identification of high risk individuals for coronary artery disease and the prevention of risk factors is:
A. Selective screening
B. Surveillance
C. Tertiary prevention
D. Primary prevention

4. The best and most economical method of screening for a disease is: ,
A. High risk screening
B. Multiple screening
C. Mass screening
D. Opportunistic Screening

5. "The disease to be screened should fulfill the following criteria:
A. Prevalence should be high
B. There should be recognizable latent stage
C. Early detection and treatment should reduce morbidity arid mortality
D. All of the above

6. A good screening test must be:
A. Acceptable
B. Repeatable
C. Valid
D. All of the above

7. Repeatability of a screening test depends on:
A. Observer variation
B. Biological variation
C. Errors relating to technical methods

D. All of the above

8. Intra- observer variation can be minimized by:
A. Taking average of several measurements at the same time
B. Standardization of procedures for obtaining measurements
C. Intensive training of observers
D. Repeated measurement over time

9. Sensitivity is defined as:
A. True positive / True positive + False negative
B. True negative / False positive + True negative
C. True positive / True positive + False positive
D. True positive / False negative + False positive

10. Specificity is defined as:
A. True positive / True positive + True negative
B. True positive / True positive + False positive
C. True negative / False positive + True negative
D. True negative / True negative + False negative

Que. Results of a screening test by diagnosis are:

Test results	diseased Disease	non-	total
Positive	80	20	100
Negative	10	90	100
Total	90	110	200

11. In the above example, number of false positives is
A. 20
B. 80
C. 90
D. 10

12. In above example, number of true negatives is:
A. 20
B. 80
C. 90
D. 10

13. Using the above example the sensitivity and specificity of the test would be (approximately)
A.50% and 50% respectively
B.90% and 80% respectively
C.80% and 90% respectively
D.100% and 60% respectively

14. Sensitivity is ability of a test to detect
A. True positive
B. True negative
C. False positives
D. False negatives

15. Specificity is ability of a screening test to detect
A. True positive
B. True negative
C. False positives
D. False negatives

16. Specificity is ability of a diagnostic test to detect
A. Negative result in those who have disease
B. Positive result in those who have disease
C. Negative result in those who have no disease
D. Positive result in those who have no disease

17.Diagnostic power of the test is reflected by
A. Sensitivity
B. Specificity
C. Predictive value
D. Population attributable

18. True positive as a percentage of all positives is:
A. Sensitivity
B. Specificity
C. Positive Predictive value
D. Negative Predictive value

19. The predictive accuracy of a screening test depends on:
A. Sensitivity
B. Specificity
C. Disease prevalence

D. All of the above

20. An ideal screening test should have all except:
A. High sensitivity
B. Low specificity
C. High yield
D. High specificity

21. Amount of previously unrecognized disease that is diagnosed as a result of screening effort is:
A. Predicative valve
B. Yield
C. Prevalence
D. Surveillance

22. If the cutoff point in the interpretation of the test is raised one of the following may occur:
A. Sensitivity decrease and specificity increase
B. Sensitivity increase and specificity decrease
C. Sensitivity and specificity both increase
D. Sensitivity and specificity both decrease·

23. The following table gives the result of a screening test: Result of screening test

	Disease	No disease	Total
Positive	350	100	450
Negative	150	100	250
Total	500	200	700

The positive predicative value of the test is:
A. 40.0%
B. 50.0%
C. 70.0%
D. 77 .7%

24. In a communicable disease with high mortality, test must be:
A. Highly sensitive
B. Highly specific
C. Easy to perform
D. Economical

25. Most important in screening test is:
A. Sensitivity
B. Specificity
C. Predictive value of +ve test.
D. Detectability

26. A drug company is developing a new pregnancy-test kit for use on an outpatient basis. The company used the pregnancy test on 100 pregnant women, 99 showed positive tests. Upon using type same test on 100 non pregnant women, 90 showed negative results. What is the sensitivity of the test?
A. 90%
B. 99%
C. Average of 90 and 99%
D. Cannot be calculated from the given data

27. In a village having a population of 1000 we found patients with certain disease. The results of a new diagnostic test on that disease are as follows: Disease are follows:

Disease		
Test result	present	absent
+	180	400
-	20	400

What is the percentage prevalence of the disease?
A. 0.20
B. 2
C. 18
D. 20

28. A screening test is used in the same way in two similar populations; but the proportion of false positive results among those who test positive in population A is lower than those who test positive in population B. what is the likely explanation?
A. The specificity of the test is lower in population A
B. The prevalence of the disease is lower in population A
C. The prevalence of disease is higher in population A
D. The specificity of the test is higher in population A

29. The response which is graded by an observer on an agree or disagree continuum is based on:
A. Visual analogue scale
B. Guttmann scale

C. Likert scale
D. Adjectival scale

30.In two communities X and Y, Y shows more false positive cases as compared to X, the possibility is:
A. X has low prevalence
B. Y has high prevalence
C. X and Y have same incidence
D. Y has low prevalence

Epidemiology and Epidemiologic Methods-II

1. The numerator is not a component of denominator in
a) Rate
b) Ratio
c) Proportion
d) None of the above

2. Midyear population refers to population as on
a) 31st March
b) 1st January
c) 1st July
d) 31st December

3. In international death certificate, most important information to be entered is
a) Underlying cause of death
b) Disease directly leading to death
c) Significant associated condition contributing to death
d) None of the above

4. Which of the following *is not true* about case fatality rate?
a) Ratio of deaths to cases
b) Case fatality rate varies different epidemics
c) Closely related to virulence
d) Useful even for chronic diseases

5. The killing power of a disease is represented by
a) Attack rate
b) Proportional mortality rate
c) Case fatality rate
d) Survival rate

6. Which of the following is *not true* about proportional mortality rate?
a) Used when population data are not available
b) Of value in making comparison between population groups
c) Does not indicate the risk of dying from the disease
d) Useful indicator of importance of the specific disease, as a cause of death within any population group

7. **Standardized mortality ratio is**
a) $\frac{\text{Observed deaths}}{\text{Expected deaths}} \times 100$
b) $\frac{\text{Observed deaths} + X}{\text{Expected deaths}} \times 100$
c) Observed deaths + Expected deaths -X 100 Standardizing factor
d) $\frac{\text{Observed deaths}}{\text{Expected deaths}} \times \text{Standardizing factor}$

8.**True about standardized mortality rat.io are all, *except***
a) Ratio of observed death and excepted death
b) Total number of deaths per year
c) Can be calculated even if age specific data is not available
d) Is useful for comparison Age adjusted summary of all current causes mortality is

9.Age adjusted summary of all current causes mortality is:
a) Multivariate analysis
b) Proportional mortality rate
c) Life table
d) Regression, standardization

10. Which of the following indicates severity of illness?
a) Case fatality rate
b) Prevalence rate
c) Proportional mortality rate
d) Incidence rate

11. All are features of point sources epidemic except
a) Epidemic curve rises and falls rapidly

b) Epidemic tends to be explosive
c) Epidemic curve shows no secondary waves
d) Epidemic continues over more than one incubation period

12. "CHERNOBYL" tragedy is an example of:
a) Point source epidemic
b) Propagated epidemic
c) Modem epidemic
d) Continuous epidemic

13. Which is *not* a likely explanation for cyclic trend of disease?
a) Build up of susceptible
b) Antigenic variations
c) Environmental conditions
d) Herd immunity variations

14. Secular trend of disease refers to its:
a) Change of pattern over a long period of time
b) Seasonal trend
c) Occurs due to naturally occurring variation in herd immunity
d) Current disease status problem

15. Data about prevalence and distribution of illness and state of health of a community at one point of time is given by
a) Longitudinal study
b) Cross sectional study
c) Double blind study
d) Surveillance

16. A study conducted (2012) on babies born between 1st Jan, 1970 to 31st Dec. 1970 would be:
a) Retrospective cohort
b) Prospective cohort
c) Cohort study
d) None of the above

17. Which of the following is true about 'case control study
a) Both the exposure and disease have occurred before the start of study
b) Study proceeds backwards from effect to cause to caute
c) Uses comparison group to support an inference
d) All of the above

18. Which one of the following is n*ot true* about 'case control study?
a) Only newly diagnosed cases within a specified time are eligible
b) The controls must be free from disease under study
c) Relative risk can be exactly determined from case control study
d) Ensure comparability between cases and controls

19. Confounding bias' in a case control study can be removed by:
a) Double blinding
b) By properly recalling events
c) Matching
d) By selecting representative population

20. All of the following are true about case control study *except*
a) Multiple disease aetiology is studied
b) No risk to subjects
c) Disease sequence is not traced
d) Variable outcomes studied

21. Which of the following is *not* true about 'cohort study?
a) Prospective study
b) Type of analytical study
c) Study "proceeds from cause to effect
d) Study is" short-lived and technique is crude

22. Which of the following statements is *not* true about 'cohort study'?
a) Provides incidence of disease
b) Indicated when there is good evidence of association between exposure and disease
c) Done when "incidence of disease is very low among exposed
d) Done when ample funds are available

23. About Cohort studies all are true *except*
a) Two groups should be comparable
b) Groups should be equally susceptible

c) Eligibility criteria disease can be defined as time passes on
d) Cohorts must be free from disease under study

24. All the following can be obtained from prospective study *except*
a) Attributable risk
b) Prevalence rate
c) Relative risk
d) Incidence rate

25. Relative risk of developing a disease is indicated by:
a) Incidence among exposed/ incidence among non exposed
b) Incidence among exposed - incidence among non exposed population at risk
c) Incidence among exposed-incidence among non-exposed /population at risk
d) Incidence among exposed-incidence among non - exposed

26. Relative risk in the following data is

		Carcinoma	
		+	-
Smoking	+	40	990
	-	2	1028

a) 1
b) 5
c) 10
d) 20

27. The amount of disease that might be eliminated if the factor under study could be controlled is indicated by
a) Odds ratio
b) Gross product ratio
c) Relative risk
d) Attributable risk (traction)

28. All are advantages of cohort study *except*
a) Several possible outcomes related to exposure can be studied simultaneously
b) Dose response ratio can be calculated
c) Bias is minimized
d) Suitable for study of rare diseases

29. Disadvantage of cohort study is
a) Selection of comparison group is a limiting factor
b) Study itself may alter people's behaviour
c) Involves a large number of people
d) All of the above

30. Which of the following is *not true* about experimental epidemiology?
a) Provide scientific proof of aetiological factor that may permit control of those diseases
b) Provide a method of measuring effectiveness and efficiency of health services
c) Epidemiologist observes the natural course of events
d) Conditions in which study is carried out are under the direct control of the investigator

31. Randomized controlled trial is a type of
a) Descriptive study
b) Case control study
c) Experimental study
d) Cohort study

32. Experimental epidemiology deals with
a) Epidemics
b) Intervention
c) Screening of disease
d) Early diagnosis

33. Which of the following are associated with 'randomized controlled trials'?
1. Randomization
2. Selecting reference and experimental population
3. Avoidance of manipulation (intervention)
4. Assessment of the outcome of the trial in terms of positive and negative results
Select the correct answer using the codes given below
a) 1, 2 and3
b) 1,2 and 4
c) 1 and 4
d) all are correct

34. Which of the following is *not true* about RCT?
a) The groups should be representative of population

b) Randomization is an attempt to eliminate bias and allow for comparability
c) Investigator has control over allocation of participants to either study or control group
d) Experimental population should have the same characteristics as reference population
e) Blinding is done to reduce bias

35. Randomization is
a) Mixing control with cases
b) Mixing different types of control groups
c) Statistical procedure of allocating participants into study and control groups
d) Selecting characteristics of case group

36. Use of a double blind trial is to
a) Avoid false negative results
b) Avoid subject bias
c) Avoid observer bias
d) Increase true negative

37. In epidemiological survey, study is 'double blind' when
a) The subjects know that they belong to the control group
b) The investigators do not understand the pathology of condition
c) Neither observer nor participant knows of the group allocation and treatment received
d) All of the above

38. Host in which parasite attains maturity or passes its sexual stage is called:
a) Definitive host
b) Secondary host
c) Intermediate host
d) Facultative host

39. Man is obligate host for:
a) Measles
b) Malaria.
c) KFD
d) Rabies.

40. Match the following

a) Endemic in	1. Unusual occurrence of disease excess of expected occurrence
b) Epidemic populations	2. Disease affecting large over wide geographic area
c) Sporadic in	3. Constant presence of disease given geographical area
d) Pandemic from	4. Haphazard occurrence disease time to time

41. An example of exotic disease in India is:
a) Toxic shock syndrome
b) Yellow fever
c) Chikungunya fever
d) Kala azar

42. Sub-clinical infection is not seen in:
a) Mumps
b) Rubella
c) Measles
d) Poliomyelitis
e) Diphtheria

43. Which of the following is *incorrectly* matched?
a) Agent changes in form and number: Cyclopropagative transmission
b) Agent merely multiples in vector, but no change in form Propagative transmission
c) Agent undergoes only development but no multiplication: Cyciodevelopmental transmission
d) Agent transmitted from nymph to adult vector: Transovarial transmission

44. Which of the following is a dead end infection?
a) Rabies
b) Tetanus
c) Bubonic plague
d) Trichinosis
e) All of the above

45. Incubation period is useful to determine:
a) Source of infection
b) Period of surveillance
c) Prognosis of disease
d) All of the above

46. Incubation period less than 1 week is of all *except*

a) Influenza
b) Staphylococcal food poisoning
c) Typhoid
d) Cholera

47. Incubation period ranges from 10 days to 3 weeks in all *except*
a) Bacillary dysentery
b) Typhoid
c) Measles
d) Mumps

48. Which of the following statement is *not* true about herd immunity?
a) It is level of resistance of community to a particular disease
b) Provides an immunological barrier to spread of disease in human herd
c) Ongoing immunization programme keeps the herd immunity at a very high level
d) Herd immunity played a crucial role in eradication of small pox

49. Herd immunity depends on:
a) Sub clinical infection
b) Immunization status of herd
c) Herd structure
d) All of the above

50. Herd immunity does *not* protect an individual in:
a) Diphtheria
b) Poliomyelitis
c) Measles
d) Tetanus

51. All are true about live vaccine *except:*
a) More potent than killed vaccine' because organism can multiply in host resulting in larger antigenic' dose
b) More potent than killed vaccine because is has all the major and minor antigenic components
c) Produces a durable immunity
d) Boosters are required to maintain immunity

52. At the health centres, most vaccines can be stored at a temperature range of:
a) - 1 to - 20°C
b) 0 to 5°C
c) 4 to 8°C
d) 20 to 25°C

53. At the primary health centres, the vaccines can be stored up to:
a) One day
b) One week
c) Five weeks
d) Three months

54. Opened multi dose vials of live virus vaccine, containing preservative should be discarded within:
a) One hour
b) 3 hours
c) 12 hours
d) 3 days

55. All of the following diseases are notifiable under international Health Regulation *except:*
a) Cholera
b) Plague
c) Yellow fever
d) Japanese encephalitis

56. Quarantine is defined as:
a) The limitation of freedom of movement of such well persons or domestic animals exposed to communicable disease for a period of time not longer than the longest usual incubation period
of the disease, in such manner as to prevent effective contact with those not so exposed.
b) It is mass means of protecting the greatest number of people
c) Termination of all transmission of infection by extermination of the infectious agent through
surveillance and containment
d) The continuous scrutiny of factors that determine the occurrence and distribution of disease and other conditions of ill-health

57. If a 11-month old child has received two doses of DPT and polio, comes for further immunization after 5 months of the last dose, what should be done?

a) Repeat the whole course
b) Repeat the 2nd dose and continue rest of the course
c) Give 3rd dose and continue the course
d) Give only booster dose

58. A one-year-old un-immunised child attends the immunization clinic. He should be advised
a) BCG and measles to be followed 6 weeks later by the 1st dose of OPV and DPT and called after 1 month for the second dose of OPV and DPT
b) BCG the first doses of OPV, DPT and measles and call after 1 month for 2nd doses of OPV and DPT
c) The first doses of OPV and DPT, measles 1 week later and call after 1 month for a booster dose of OPV and DPT
d) BCG and the dose of OPV and 1 month later DPT and OPV and the subsequent doses adjusted accordingly

59. Drug for chemoprophylaxis of pneumonic plague is:
a) Tetracycline
b) .Erythromycin
c) Sulphadiazine
d) Rifampicin

60. Emporiatrics refers to study of:
a) Occupational disease
b) Air pollution
c) Environmental factor
d) Health of travellers

61. Pasteurization of milk is an example of:
a) Concurrent disinfections
b). Terminal disinfections
c) Pre-currier disinfections
d) Absolute disinfections

62. In an epidemic, first to be done is:
a) Confirmation of existence of an epidemic
b) Confirm the diagnosis
c) Identify the population of at risk
d) Evaluation of ecological factors

63. The area is declared free of epidemic
a) Till last secondary case recovers
b) No new case reported for the incubation period of the disease since the last case
c) No new case reported for twice the incubation period of disease since the last case
d) No new case reported for six months since the last case

64. Residents of three villages with three different types of water supply were asked to participate in a study to identify cholera carriers. Because several cholera deaths had occurred in the recent past, virtually everyone occurred in the time submitted to examination. The proportion of carriers was in each village who were carriers was computed and compared. This study is a:
a. Cross-sectional study
b. Case-control study
c. Concurrent cohort study
d. Non-concurrent

65. The most useful study in a hospital setting is:
a. Cross-sectional
b., Longitudinal
c. Cohort
d. case control

66. When launching a study many respondents are invited some of whom fail to come. This is called:
a. Response bias
b. Volunteer bias
c. Selection bias
d. Berkesonian bias

67. One a study, it was established that the disease (carcinoma cervix was 5 times more common in those who had multiple sexual partners than those with single partners. The attributable risk of exposure in the former group is:
a. 20%
b. 40%
c. 80%
d. 50%

68. Crossover study is done when:
a. Control and case are the same

b. Case and control are different
c. Control is same and case is different
d. Case is the same and control is different

69. Incubation period is helpful for all *except:*
a. Quarantine
b. Source identification
c. Preventive immunization
d. Isolation

70. The following is true about prevalence and incidence
a. Both are rates
b. Prevalence is a rate but incidence is not
c. Incidence is a rate but prevalence is not
d. Both are not rates

71. The rate adjusted to allow for the age distribution of the population is
a. Perinatal mortality rate
b. Crude mortality rate
c. Fertility rate
d. Age - standardized mortality rate

72. The following statements are true about DPT vaccine *except:*
a. Aluminum salt has an adjuvant effect
b. Whole killed bacteria of Bordetella pertussis has an adjuvant effect
c. Presence of acellular pertussis component increases its immunogenicity
d. Presence or' *H.infhtenza* type B component increases its immunogenicity

73. All of the following are used as proxy measures for incubation period except:
a. Latent period.
b. Period of communicability.
c. Serial interval.
d. Generation time

74. A study began in 1970 with a group of 5000 adults in Delhi who were asked about their alcohol consumption. The occurrence of cancer was studied in this group between 1990-1995. This is an example of:
a. Cross-sectional study.
b. Retrospective cohort study.
c. Concurrent cohort study
d. Case-control study

75. A 37-weeks pregnant women attends an antenatal clinic at a Primary Health Center. She has not had any antenatal care till now. The best approach regarding tetanus immunization in this case would beta:
a. Give a dose of Tetanus Toxoid (IT) and explain to her that it will not protect the newborn and
she should take the second dose after four weeks even if she delivers in the meantime.
b. Do not waste the IT vaccine as it would anyhow be of no use in this pregnancy.
c. Given one dose of IT and explain that it will not be useful for this pregnancy.
d. Give her anti-tetanus Immunoglobulin along with the IT vaccine.

76. A 3 ½ year old child has not received primary immunization. Which of the following is the best vaccination advice to such a child?
a. BCG, DPTl, OPV1 and DPT2, OPV2 after 4 weeks.
b. BCG, DTl, OPVl, measles, vitamin A
c. BCG, DPT1, OPV1, measles, vitamin A
d. DTl, DT2, and booster after 1st year.

77. Consider the following:
1. Disease control phase.
2. Health promotional phase.
3. Social engineering phase.
4. Health for all phase.
The correct sequence of distinct phases demarcated in the history of public health is
a. 1,2,3,4
b. 2,3,4,1
c. 2,1,3,4
d. 1,4,2,3

78. Retrospective cohort studies are *not* characterized by
a. The study groups are exposed and non-exposed
b. Incidence rates may be computed
c. The required sample size is smaller than that needed for a concurrent cohort study

d. The required sample size is similar to that needed for a concurrent cohort study.

79. A case-control study is *not* characterized by
a. Cases with the disease are compared to controls without the disease.
b. Assessment of past exposure may be biased
c. Definition of cases may be .difficult
d. Incidence rates may be computed directly

80. The number of years of healthy life lost due to all causes whether from premature mortality or from disability is called
a. Quality adjusted life years (QALYs)
b. Disability adjusted life years (DAL Ys)
c. Sullivan's index
d. Standardized mortality ratio (SMR)

81. Human Development Index (HDI) does not consider
a. Life expectancy
b. Literacy
c. Income
d. Infant mortality

82. Which of the following statements is true about BCG vaccination:
a. Distilled water used as diluents for BCG vaccine
b. The site of injection should be thoroughly cleaned with spirit
c. Mantoux test becomes positive after 48 hours of vaccination
d. WHO recommends Danish 1331 strain for vaccine production

83. The following is true about prevalence and incidence:
a. Both are rates
b. Prevalence is a rate but incidence is not
c. Incidence is a rate but prevalence is not
d. Both are not rates

84. If the *prevalence* is very *low* as compared to incidence of the disease, it implies:
a. Disease is very *fatal* and /or easily *curable*
b. Disease is non *fatal*
c. Calculation of prevalence and incidence is wrong
d. Nothing can be said as they are independent

85. Which of the following is characteristic of single exposure common vehicle outbreak?
a. Frequent secondary cases
b. Severity increases with increasing age
c. Explosive
d. Cases occur continuously beyond the longest incubation period

Epidemiology 1
1.C
2.B
3.C

Health & disease
1.C
2.D
3.B
4.C
5.B
6.B
7.C
8.C
9.D
10.C
11.A
12.A
13.A
14.C
15.A
16.B
17.A
18.D
19.A
20.B

Screening test
1.A
2.B
3.D
4.A
5.D
6.C
7.D
8.A
9.A
10.C
11.A
12.C
13.B
14.A
15.B
16.C
17.C
18.C
19.D
20.B
21.B
22.A
23.D
24.A
25.C
26.B
27.D
28.C
29.C
30.D

Epidemiology and epidemiologic methods – II
1. B
2. C
3. A
4. D
5. C
6. B
7. A
8. B
9. C
10. A
11. D

12. A
13. C
14. A
15. B
16. A
17. D
18. C
19. C
20. D
21. D
22. C
23. C
24. B
25. A
26. D
27. D
28. D
29. D
30. C
31. C
32. B
33. B
34. C
35. C
36. C
37. C
38. A
39. A
40. A:3,B:1,C:4,D:2
41. B
42. C
43. D
44. E
45. D
46. C
47. A
48. D
49. D
50. D
51. D
52. C
53. C
54. B
55. D
56. A
57. C
58. B
59. A
60. D
61. C
62. B
63. C
64. A
65. D
66. B
67. C
68. A
69. D
70. C
71. D
72. C
73. C
74. C
75. A
76. B
77. A
78. D
79. D
80. B
81. D
82. D
83. C
84. A
85. C

BIOSTATISTICS

1. A measure of location which divides the distribution in the ratio of 3: 1 is:
a) Median
b) First quartile
c) Third quartile
d) Mode

2. The deviation from inference of the truth and the process which leads to such a deviation is:
a) Standard deviation
b) Error
c) Bias
d) Variance

3. Which of the statements are false about normal distribution curve?
a) Median is mid value
b) 95% of the values lie within ISD on either side
c) Mean, median and mode coincide
d) Mode is the commonly occurring value

4. The cluster sampling technique used for evaluating Universal Immunization Programme (UIP) coverage is:
a) 30 clusters of 5 children
b) 20 clusters of5 children
c) 30 clusters of 10 children
d) 30 clusters of 7 children

5. The probability of two mutually exclusive events is given by:
a) Poisson's distribution
b) Binomial distribution
c) Normal distribution
d) t test

6. In a heterogeneous population, to draw a random sample one should go in for:
a) Multi-stage sampling
b) Purposive sampling
c) Stratified random sampling
d) None of the above

7. A pictorial diagram of frequency distribution of quantitative data is denoted by which of the following
a) Histogram
b) Pictogram
c) Pie chart
d) Bar chart

8 Line diagrams are used to show
a) Trends of events with passage of time
b) Relationship between two variable
c) Most commonly occurring value
d) Frequency distribution

9. The percentage is depicted by
a) Bar chart
b) Pie chart
c) Histogram
d) Pictogram

10. All the following are method of presentation of statistical data except
a) Bar chart
b) Pie diagram
c) Normal curve
d) Frequency polygon

11. Best way to study relationship between two variables is
a) Bar chart
b) Scatter diagram
c) Histogram
d) Pie chart

12. Central value of a series is termed as
a) Mean
b) Mode
c) Average
d) Median

13. All are measures of central tendency of a given observation except
a) Mode
b) Arithmetic mean
c) Median
d) Range

14 Median is almost equivalent to
a) 100th percentile
b) 75th percentile
c) 50th percentile
d) 95th percentile

15 If the data is arranged in descending order the middle value
a) Mean
b) Mode
c) Geometric mean
d) Median

16 The most frequently occurring value in a data is
a) Median
b) Mode
c) Standard deviation
d) Mean

17. In a statistical analysis, dispersion of data is measured by
a) Mode.
b) Range
c) Standard error of mean
d) Mean

18 All are measures of dispersion except
a) Range
b) Mode
c) Standard deviation
d) Mean deviation

19 Root mean square deviation denotes.
a) Standard deviation
b) Standard error
c) Mean deviation

d) All of the above

20 Normal distribution curve depends on
a) Mean & sample
b) Mean & median
c) Median & SD
d) Mean & SD

21 In a standard normal curve, the area between one SD on both sides will be
a) 68%
b) 85%
c) 99.7%
d) None of the above

22 In a standard normal curve ± 2SD cover
a) 60%
b) 65%
c) 95%
d) 99%

23 In a standard normal curve ± 3SD covers
a) 99.73%
b) 95.45%
c) 68.27%
d) 25.50%

24 Normal curve is
a) Asymmetrical
b) Symmetrical
c) Linear
d) Curvilinear

25 True about normal curve include all except
a) Bell shaped
b) Total area =1
c) SD = 2
d) Mean = 0

26. If the mean cholesterol value of a group is 230mg% & S.E is 10 the 95% confidence limit of the populations is
a) 220 & 240
b) 210-250
c) 200 & 260
d) 210-240

27 Limit set up on either side of mean in a normal curve is called
a) Normal limit
b) Probability limit
c) Standard limit
d) Confidence limit

28 The probability of a reading falling outside 95% confidence limit is
a) 1 in 20
b) 1 in 15
c) 1 in 40
d) 1 in 30

29. Z is a measure of
a) Median
b) Mode
c) Regression coefficient
d) Standard normal variant

30. Standard error is due to
a) Sampling error
b) Normal distribution of mean
c) Observer errors
d) Variability of the reading.

31. Standard error of mean is calculated from
a) SD of mean
b) SD of observation
c) Mode
d) Geometric mean

32. Significant 'P' value at 95% confidence is below
a) 0.1
b) 0.05
c) 0.01
d) 0.005

33. $\sqrt{PQ/N}$ indicates
a) SE of mean
b) SE of difference is mean
c) SE of proportion
d) SE of difference in proportion

34.Chi-square test, to a table of 4 Rows & 4 columns, the degree of freedom would be
a) 1
b) 4

c) 9
d) 16

35.In order to find out whether there is significant association or not between two variable we calculate
a) Coefficient of correlation
b) Coefficient of regression
c) SD
d) SE

36. If we know the value of one variable in an individual & wish to know the value of another variable, we calculate
a) Coefficient of correlation
b) Coefficient of regression
c) SE of mean
d) Geometric mean

37. Value of coefficient of correlation for the correlation between two variable
a) r<1
b) r>1
c) r between -1 to 1
d) r= 0

38. In a village of 120 Houses, a worker visited 30 houses to collect some information. These 30 houses were visited as house No.4, 8, 12, 16-----120 the type of sample drawn is:
a) Simple random
b) Systematic random
c) Non random
d) Stratified random

39. for testing the statistical significance of the difference in heights of school children among three socio-economic groups, the most appropriate statistical test is:
a) Student's <t' test
b) Chi squared test
c) Paired 't' test
d) One way analysis of variance

40 All of the following are examples cf random sampling method except:
a) Quota sampling
b) Simple random sampling
c) Cluster sampling
d) Stratified sampling

41 The critical ratio of Z score, is application to which type of distribution
a) t
b) Normal
c) Chi-square
d) Binomial

42 Incorrect about normal curve is
a) Mean, Median, mode differ only slightly
b) Infinite values
c) Symmetrical
d) Variance proportion to distance from center

43 The statistical analysis of two Quantitative Data (N=200) is by
a) Paired 't'
b) Z test
c) Unpaired t test
d) X^2 test

44. Height of group of 20 Boys aged 10 years was 140 ± l3cm & 20 girl of same age was 135cm ± 7cm to test the statistical significance of difference in height test applicable is
a) X^2
b) Z
c) t
d) F

45 Continuous quantitative data is depicted by
a) Pie chart
b) Histogram
c) Bar chart
d) Pictogram

46 Which is true of cluster sampling
a) Every 10th cases is chosen for study,
b) Stratification of population done
c) A natural group is taken is sampling unit
d) Involves use of random number

47. The following is an example of nominal scale

a) Age
b) Sex
c) Body weight
d) Social economic status

48. If a value is chosen from a community what is the probability that it will be above the median
a) 9.5
b) 0.5
c) 0.6
d) 1.0

49. The mean B.P of a group of persons was determined and after an interventional trial, the mean BP was estimated again. The test to be applied to determine the significance of intervention is
a) Chi-square
b) Paired t test
c) Correlation coefficient
d) t -test

50. Best method to compare vital statistics of two populations
a) Crude death rate
b) Age Specific death rate
c) Age standardization death rate
d) Multivariate mortality rate

51. Best index to detect deviation is
a) Variation
b) Range
c) Mean deviation
d) Standard deviation

52. Two groups of students, smokers and non smokers are given physical fitness tests, and they are ranked according to how they perform. Rank I means best and rank 2 mean second best. The type of data so collected is:
a) Ordinal scale data
b) Cardinal scale data
c) Nominal scale data
d) Interval scale data

53 Height for weight of boys in a classroom is
a) Correlation
b) Association
c) Proportion
d) Index

54 In a normal curve
a) Mean = SD
b) Mean = median
c) Mean = 2SD
d) Mean variance

55 The weight of each of the 10 babies born in a hospital was 2.5 kg. Considering the distribution was a normal curve, calculate the SD
a) 0
b) 1
c) 2.5
d) 25

56. Sample size, in quant itative data is given by
a) $N= 4\sigma^2 /L^2$
b) $N =4 L^2/6^2$
c) N=PQ/e
d) $N=4PQ/L^2$

57. If the sample size is increased 4 times, precision will:
a) Decrease 4 time
b) Increase 4 time
c) Increase 2 time
d) Decrease 2 time

58 Sample registration system is done once in:
a) 6 months
b) I year
c) 2 years
d) 5 years

59 The cause of deaths in a village is assessed by:
a) Sample registration system
b) Mortality investigation
c) Model registration system
d) Census

60 Best graph for demonstration of

relationship between ages and weight:
a) Bar Diagram
b) Histogram
c) Scatter
d) Line diagram

61. In 11 babies born in hospitals 5 below 2.5 kg, above 2.5 kg are 5. The value of 2.5 is:
a) Median average
b) Mode average
c) Geometrical mean
d) Arithmetic average

62. A number of cases of malaria are collected over 10 years with extreme variation in data; best to calculate average is:
a) Arithmetic mean
b) Mode
c) Geometric mean
d) Median

63. Right-sided skewed deviation causes:
a) Median is more than mean
b) S.D. more than variance
c) "Tail" to the right
d) Mean and mode to be same

64 "Confidence limits" are:
a) Mean ± Standard error
b) Median ± Standard error
c) Mean ± Range
d) Mean ± Standard deviations

65. In a village study, it divides in 5 lines and then at random chooses some group. The type of study is:
a) Simple stratified
b) Simple random
c) Cluster sampling
d) Systemic random

66 Limits of confidence of a hypothesis is determined by:
a) Power factor
b) Level of significance
c) 1-power factor
d) 1-level of significance

67 Cholesterol values are obtained in a group of people after giving some drug. This is a type of:
a) Paired t test
b) Unpaired t-test
c) Fischer's exact test
d) Chi square test

68 In a group of 100 children, the weight of a child is 15 kg. The standard en-or is 1.5 kg. Which one of the following is true:
a) 95% of all children weight between 12 and 18 kg.
b) 95% of the all children. Weight between 13.5 and 16.5 kg
c) 99% of all children weight between 12 and 18 kg
d) 99% of all children weight between 13.5 and 16.5 kg.

69 The following statistic is used to measure the linear association between two characteristics in the same individuals:
a) Coefficient of variation
b) Coefficient of correlation
c) Chi-square
d) Standard error

70 Which of the following tests of significance can be used to compare unrelated variable~ when values are all binary?
a) t-test
b) Chi-square test
c) Proportion test
d) Con-elation test
e) Regression test

71 True about Chi-square test:
a) Expected values
b) Mutually exclusive
c) Mutually non-exclusive
d) Indicates median

72 Regarding paired t-test true is:
a) Blood pressure in a person before and after treatment can be studied
b) Continuous variable in a single sample
c) Different variable in a single sample

d) All of the above

73 Which of the following is a pre-requisite for the Chi-square test to compare?
a) Both samples should be mutually exclusive.
b) Both samples need not be mutually exclusive
c) Normal distribution
d) None of the above

74 In a drug trial one group showed 40% response and the group with the test drug showed 60% response. The two results can be statistically compared for significance by:
a) Chi-square test
b) Paired t-test
c) t-test with different measure
d) Fischer test

75 BP of samples from two communities are best compared by:
a) Paired t-test
b) Student's t test
c) Chi-square test
d) Cohort study

76. The fasting blood levels of glucose for a group of diabetics is found to be normally distributed with a mean of 105 mg per 100 ml of blood and a standard deviation of 10 mg per 100 ml of blood. From this data, it can be inferred that approximately 95% of diabetes will have their fasting blood glucose levels within the limits of:
a) 75 and 135 mgs
b) 85 and 125 mgs
c) 95 and 115 mgs
d) 65 and 145 mgs

77. Mean and standard deviation can be worked out only if data is on:
a) Interval/Ratio Scale
b) Dichotomous scale
c) Nominal scale
d) Ordinal scale

78. The national level system that provides annual national as well as state level reliable estimates of fertility and mortality is called:
a) Civil Registration system
b) Census
c) Adhoc Survey
d) Sample Registration System

79. The age and sex structures of a population may be best described by a
a) Life table
b) Con-elation coefficient
c) Population pyramid
d) Bar chart

80. After applying a statistical test, an investigator gets the 'p' value as 0.0 1 It means that
a) The probability of finding a significant difference is 1%
b) The probability of declaring a significant difference, when there is truly no difference, is 1%
c) The difference is not significant 1% times and significant 99% times
d) The power of the test used is 99%

81 An investigator wants to study the association between maternal intake of iron supplements (Yes or No) and incidence of low birth weight (<2500 or ~ 2500 gms). He collects relevant data from 100 pregnant women as to the status of usage of iron supplements and the status of low birth weight in their newborns. The appropriate statistical test of hypothesis advised in this situation is
a) Paired - t- test
b) Unpaired or independent t-test
c) Analysis of variance
d) Chi-Square test

82. If prevalence of diabetes is 10%, the probability that three people selected at random from the population will have diabetes is:
a) 0.01
b) 0.03
c) 0.001
d) 0.003

83. If each value of a given group of observations is multiplied by 10, the

standard deviation of the resulting observations is:
a) Original std. deviation x 10
b) Original std. Deviation/10
c) Original std. Deviation - 10
d) Original std. Deviation itself

84. If the systolic blood pressure in a population has a mean of 130 mmHg and a median of 140 mmHg. The distribution is said to be:
a) Symmetrical
b) Positively skewed
c) Negatively skewed
d) Either positively or, negatively skewed depending on the standard deviation

85. A researcher found out that students' final year marks correlate with percentage of attendance, Karl Pearson's 'r' = 0.8 and p = 0.001. This would mean that:
a) a student will improve his/her grade by improving attendance
b) 64% of variation in final year marks is accounted for by class attendance.
c) The correlation is too low to be of significance.
d) The correlation is non linear.

86. The standard normal distribution:
a) Is skewed to the left
b) Has mean = 1.0
c) Has standard deviation = 0.0
d) Has variance = 1.0

87. The PEFR of a group of 11 girls follow a normal distribution with mean 300 1/min and standard deviation 20 l/ min:
a) About 95% of the girls have PEFR between 260 and 340 1/min.
b) The girls have healthy lungs.
c) About 5% of girls have PEFR below 260 I/min.
d) All the PEFR must be less than 340 1/min.

88. In India death has to be registered within:
a) 10 days
b) 14 days
c) 7 days
d) 21 days

89. The sample registration system was started to get information on:
a) Death rates from rural areas of the country
b) Morbidity rates for various diseases for the states and country
c) Migration statistics from country
d) Birth and death rates for states and country

90. In a community the correlation between infant mortality rate and socio-economic status is:
a) r = 1 (strong positive correlation)
b) r = -1 (strong negative correlation) .
c) r = -0.8 (moderate negative correlation)
d) r = 2.2 (very strong positive correlation)

91. The events A and B are mutually exclusive, so:
a) Prob (A or B) = Prob (A) + Prob (B)
b) Prob (A and B) = Prob (A). Prob (B)
c) Prob (A) = Prob (B)
d) Prob (A) + Prob (B) = 1

92. Coefficient of correlation between height and weight is 2.6, it signifies that:
a) Relationship is present between two
b) There is no relation between the two
c) Coefficient has been calculated in a wrong way
d) None of the above

93. In respect of type I error in the field of medical statistics, which one of the following is not correct?
a) It is also called alpha error
b) It is often assigned the value of 0.05 in studies
c) It is equal to 1- beta error
d) It is used to determine the sample size

94. The 'P' value of a randomized controlled trial comparing operation A (new procedure) and operation B (gold standard) is 0.04. From this, we conclude that:
a) Type II error is small and we could accept the findings of the study

b) The probability of false negative conclusion that operation A is better than operation B. when in truth it is not, is 4%.
c) The power of the study to detect a difference between operation A & B is 96%
d) The probability of false positive conclusion that operation A is better than operation B, when in truth it is not is 4%. .

95 Total Cholesterol level = a+b (calorie intake) + c (physical activity) + d (body mass index); is an example of:
a) Simple linear regression
b) Simple curvilinear regression
c) Multiple linear regression
d) Multiple logistic regression

96. A cardiologist found a highly significant correlation coefficient (r = 0.90, p = 0.01) between systolic blood pressure values and serum cholesterol values of patients attending his clinic. Which of the following statement is a wrong interpretation of the correlation coefficient observed?
a) Since there is a high correlation, the magnitudes of both the measurements are likely to be close to each other
b) A patient with high level of systolic BP is also likely to have a high level of serum cholesterol.
c) A patient with low level of systolic BP is also likely to have a low level of serum cholesterol.
d) About 80% of the variation in systolic blood pressure among his patients can be explained by their serum cholesterol values and vice versa.

97. For a negatively skewed data mean will be:
a) Less than median
b) More than median
c) Equa1 to median
d) One

98. Chi square value for degree of freedom=1 (2X2 table) is
a) 1.96
b) 2.56
c) 3.84
d) 4.87

99. A large number of HIV physicians across the country were asked to estimate the mean survival time since detection. Surprisingly, there was very little variation among their estimates, but all proved to be consistently pessimistic. Study of actual patients revealed that they lived on an average about one and a half year more than the physicians' estimate. Thus their estimate was:
a) Imprecise
b) Precise and biased
c) Imprecise and unbiased
d) Unbiased

100. Which of the following is not true for biostatistics?
a) It is a science that helps to manage medical uncertainties
b) It provides methods for clinical evaluation of a patient
c) It provides methods for collection and analysis of health data
d) It provides methods to combine probabilities with clinical judgment to help come to a valid medical decision

101. Test of association between two variables is done by:
a) Chi square test
b) Correlation test
c) Regression test
d) None

102. A drug was tested for its efficacy and the following observations were made:

	Diseased	General Pop
Recovery	46	35
No response	14	25

Which of the following tests would you employ to ' establish the usefulness of the drug?
a) Chi square test
b) Likelihood ratio
c) Student t test
d) Probability ratio

103. A correlation coefficient r = 0 indicates

that:
a) There is no linear relationship between the two variables of the sample studied
b) The sample was to small to arrive it any tangible conclusion
c) The relationship is highly significant
d) There is absolutely no relationship between the two variables

104 Median is preferred to arithmetic mean when:
a) Skewed deviation is seen in readings
b) Population is very large
c) Uniform distribution of variable
d) Low variance is seen

105 It we reject the null hypothesis, when it is actually true, it is known as:
a) Power
b) Specificity
c) Sensitivity
d) α error

106. Malaria incidence for the year 2005 for a village is 430, 500. 410, 160, 270, 210, 300, 350, 4000, 430, 480, 540. Which of the following is the best indicator for assessment of malaria incidence in that village by an epidemiologist?
a) Mode
b) Median
c) Arithmetic mean
d) Harmonic mean

107. In a normal distribution with mean 55 and standard deviation 10, the area to the right of 55 within 1 SD is approximately equal to:
a) 0.6
b) 0.3
c) 0.4
d) 0.8

BIOSTATISTICS

1. C
2. C
3. B
4. D
5. B
6. C
7. A
8. A
9. B
10. C
11. B
12. D
13. D
14. C
15. D
16. B
17. B
18. B
19. A
20. D
21. A
22. C
23. A
24. B
25. C
26. B
27. D
28. A
29. D

30. A
31. A
32. B
33. C
34. C
35. A
36. B
37. C
38. B
39. D
40. A
41. B
42. A
43. B
44. C
45. B
46. C
47. B
48. B
49. B
50. C
51. D
52. A
53. A
54. B
55. A
56. A
57. C
58. A
59. A
60. B
61. A
62. D
63. C
64. A
65. B
66. D
67. A
68. A
69. B
70. B
71. B
72. A
73. A
74. A
75. B
76. B
77. A
78. D
79. C
80. B
81. D
82. C
83. A
84. C
85. B
86. D
87. A
88. D
89. D
90. C
91. A
92. C
93. C
94. D
95. C
96. A
97. A
98. D
99. B
100. B
101. B
102. A
103. D
104. A
105. D
106. B
107. B

NATIONAL HEALTH PROGRAMMES

1. National Malaria Control Programme was launched in:
a) 1950
b) 1953
c) 1957
d) 1952

2. In 1953, when National Malaria Control Programme was started, the total incidence of malaria was around:
a) l00 mill.ion
b) 75 million
c) 50 million
d) 25 million

3. National Malaria Control Programme was based on:
a) Indoor spraying of DDT twice year in endemic areas with a spleen rates 10%
b) Active surveillance for cases
c) Radical treatment of subjected malaria cases
d) All of the above

4. Under NMCP, dose of DDT to be sprayed is
a) 0.5/g m^2 once a year
b) 1g/ m^2 twice a year
c) 5g / m^2once a year
d) 1-5g/ m^2 thrice a year

5. National Malaria Eradication Programme was started in
a) 1952
b) 1958
e) 1968
d) 1971

6. Modified Plan of operation under was launched in
a) 1953
b) 1958
c) 1962
d) 1977

7. True about Modified Plan of Operation to control malaria are all *except:*
a) To consolidate previous gain
b) To reduce cost by replacing BHC with DDT
c) Decrease malaria deaths
d) Decrease morbidity due to malaria

8.Modified Plan of operation for malaria is based on:
a) API
b) ABER
c) Infant parasite rate
d) Spleen rate

9.All of the following arc activities in modified plan of operation in areas where API is less than 2 *except:*
a) Active and passive surveillance every fortnight
b) Insecticidal spray with rounds of HCH every 6 weeks
c) Radical treatment of all Cases detected
d) Epidemiological investigations

10.Which of the following is statement is not true about Modified Plan of Operations?
a) Drug distribution centers collect blood slides and distribute Antimalarial tablets
b) Fever treatment depots are **manned b**y voluntary workers
c) Urban malaria scheme was launched in 1971
d) District health officer is responsible for the implementation of programme

11. Active surveillance in malaria is carried out by
a) Village health guide
b) Multipurpose workers
c) Anganwadi workers
d) Local dais

12.Drug distribution center are manned by
a) Panchayat members
b) Village health guides
c) Forest officials
d) All of the above

13.Which of the following agencies is involved in detecting and treating malaria cases in rural endemic areas?
a) Village health guides and multipurpose workers
b) Drug distribution centers
c) Fever treatment depots
d) All of the above

14.Which of the following is true for modified plan of operation?
a) Case detection is a key element of malaria surveillance
b) There is both active and passive surveillance for cases

c) Presumptive treatment was given in all fever cases
d) All of the above

15.Parameter used in epidemiological surveillance of malaria is
a) Annual blood examination rate
b) Annual parasite incidence
c) Slide positively rate
d) All of the above

16.Malaria action plan was launched in:
a) 1977
b) 1980
c) 1954
d) 1995

17.Aim of malaria action plan is
a) Reduction of P'falciparum incidence
b) Management of complicated malaria cases
c) Containment of drug resistant malaria
d) All of the above

18.Enhanced malaria control project was launched in
a) 1978
b) 1984
c) 1994
d) 1997

19.Anti malaria month is observed in
a) April
b) May
c) June
d) July

20.Citation of awareness among masses about malaria and its prevention is objectives of
a) Malaria action plan
b) Anti malaria month
c) Fever treatment depots
d) Modified plan of NMEP

21.Urban malaria scheme started in
a) 1958
b) 1971
c) 1977
d) 1999

22.Insecticide sprayed if API is
a) <1
b) >1
c) >2
d) >5

23.FTD in urban areas located in population of
a) 1000
b) 2000
c) 5000
d) 10000

24.Anti-larval measure if SPR
a) >1
b) >10
c) > 5
d) 10

25.Presumptive chloroquine in high risk area
a) 600mg
b) 1000mg
c) 1500mg
d) 1200mg

26.Dose of primaquine in radical treatment of P.falciparum malaria
a) Not given
b) 45 mg stat
c) 15mg x 5 days
d) 5 mg for 15 days

27. Drugs used in multi drug resistant P. falciparum Under NAMP is:
a) Quinine
b) Halofenotrol
c) Artimisinine
d) Mefloquine

28.Population at risk for filaria in India is:
a) 90 million
b) 360 million
c) 420 million
d) Whole population

29. Most sensitive index of recent transmission of malaria in a community is:
a) Spleen rate
b) Infant parasite rate
c) API

d) SPR

30.Under NAMP for areas with API>2 and vector refractory to DDT, the recommendation is
a) Malathion 3 rounds per year
b) HCH 1 round / year
c) HCH 2 rounds / year
d) HCH 3 rounds / year

31. Under. NAMP, radical treatment of falciparum malaria is given for:
a) 1 day
b) 5 days
c) 7 days
d) 14 days

32.All of the following statements about NAMP are true expect:
a) ABER should be at least 10% of the population under surveillance in a year. .
b) API is based on active and passive surveillance and cases confirmed by blood examinations
c) Annual blood examination rate is calculated from the number of slide examined per 100 cases of fever.
d) SPR provides information on the trend of malaria infection

33. Function of FTD is best denoted by:
a) Diagnosis of cases + spraying
b) Collection of slides + treatment of fever
c) Only treating fever cases
d) Treatment + slide collection T spraying

34.Which of the following is not monitored under NAMP now?
a) ABER
b) Infant parasite rate
c) API
d) SPR

35. Which of the following diseases are not included under NVBDCP?
a) Malaria
b) Japanese Encephalitis
c) Viral encephalitis
d) Dengue

36. Which is the nodal agency implementing NVBDCP
a) NICD
b) Dept. of Social Wc1fare
c) NAMP
d) Central TB Division

37. National Programmes are organized for the following in India *except:*
a) Filariasis
b) Leprosy
c) Small Pox
d) Trachoma

38. Presumptive treatment of malaria in a chloroquine resistant area:
a) Chloroquine + pyrimethamine
b) Sulphalene + pyrimethamine
c) Chloroquir.e + primaquine
d) Sulphalmc 1000 mgs

39. A person wants to visit a malaria endemic area of low level chloroquinc rresistant falciparurn malaria. The best chemoprophylaxis is:
a) Chloroquine
b) Proguanil + chloroquine
c) Suphadoxin + pyrimethamine
d) Mefloquine

40. A malaria survey is conducted in 50 villages having a population of one lakh. Out of 20000 slides examined, 500 turned out to be MP positive. The API *is:*
a) 20%
b) 5%
c) 0.5%
d) 0.4%

41. Classification of endemicity in pre-eradication era was based on:
a) Spleen rate
b) Parasite rate
c) Sporozoite rate
d) Proportional spleen rate

42. Most setback suffered by NMEP occurred during which phase?
a) Preparatory phase

b) Attack phase
c) Consolidation phase
d) Maintenance phase

43. Which of the following is an indicator for operational efficacy?
a) API
b) ABER
c) API
d) SPR

44) The best methods for curbing malaria transmission in areas with API> 5
a) Active surveillance Treatment
b) Mass drug administration
c) Insecticide spraying
d) None of the above

45. Current strategies used in filarial control are all *except:*
a) Spraying
b) Anti larval measures
c) Detection and treatment of eases and carriers
d) IEC - community awareness

46. Identification of filarial cases me done in rural areas by:
a) Anganwad workers
b) Voluntary workers
c) MPWs
d) Social workers

47. Kala azar is endemic in all of the following states except:
a) Tamil Nadu
b) Bihar
c) West Bengal
d) Jharkhand

48. What population is at risk for Kala azar?
a) 90 million
b) 75 million
c) 60 million
d) 25 million

49. kala azar control programme is currently:
a) 50:50 centrally and state sponsored
b) 75:25 centrally and state sponsored
c) Fully state sponosored
d) Fully centrally sponsored

50. All of the following are targets for Kala azar control in tenth plan except:
a) Zero level incidence by 2007
b) Elimination by 2010
c) Zero deaths by 2004/2005
d) 20% reduction in mortality using 2000 as base year

Leprosy

1.The national Leprosy Eradication Programme was launched in:
a) 1955
b) 1980
c) 1982
d) 1983

2.The revised strategy under national leprosy eradcation programme (NLEP) is based on:
a) Multi-drug chemotherapy
b) Early diagnosis
c) Isolation of leprosy patients
d) Slum improvement scheme

3.The aim of multi-drug chemotherapy in NLEP is:
a) Reduction in quantum of infection in the population
b) Reduction is source of infection
c) Breaking the chain of transmission of disease
d) All of the above

4.In NLEP a leprosy control unit is established for a population of:
a) 20-25000
b) 50000
c) 1 lakh
d) 4.5 lakh

5.Under NLEP one Urban Leprosy Centre is established for every:
a) 20-25000
b) 50000
c) 1 lakh
d) 4.5 lakh

6. Medical officer is present in which of the following leprosy centres:
a) Leprosy control unit

b) SET centres
c) Urban Leprosy centre
d) None of the above

7.Present prevalence rate of leprosy 10, 000 population is
a) 57
b) 25.1
c) 2.3
d) 1.4

8. According to WHO Global Alliance for Elimination of Leprosy, leprosy is to be cradicated by:
a) 2000
b) 2002
c) 2005
d) 2010

9. Longest incubation period among the following is of:
a) Malaria
b) Hepatitis
c) Leprosy
d) Filarial

10. The method of choice for screening in setting where prevalence of leprosy is 1 in 1000 is:
a) Contact survey
b) Group survey
c) Mass survey
d) Any of the above

11. In leprosy control programme, indicator of efficiency for early diagnosis of cases is:
a) Disability rate among newly diagnosed
b) Lepromin +ve% among newly diagnosed
c) Ration of pauci/multi bacillary cases
d) All of the above

12. The multi drug regimen under national leprosy eradication programme for treatment of all multi bacillary leprosy eases would include:
a) Clofazamine, thiocetazone and dapsone
b) Clofazamine, rifampicin and dapsone
c) Ethionamide, rifampicin and dapsone
d) Propionanude, rifainpicin and dapsone

13. Strategies in national leprosy control programmes:
a) Early detection of cases
b) Short course multi drug therapy
c) Rehabilitation
d) Chemoprophylaxis with dapsone
e) All of the above

14. SET centre is set up if prevalence of leprosy is:
a) Below 0.1%
b) Less than 5%
c) Above 1%
d) Above 5%

15. Winch of the following is/are used as operational indicators in mitt leprosy activity?
a) Incidence
b) Incidence and prevalence
c) Relapse rate and case detection ratio
d) Incidence and case detection ratio

16. High prevalence zone for leprosy has cases per 1,000 populations as:
a) 1-2
b) 2-5
c) 5-10
d) 10-20

17. Under national leprosy eradication programme, mass surveys an: undertaken when prevalence of leprosy is:
a) 1/1000
b) 3//1000
c) 5/1000
d) 10/1000

Tuberculosis

1.Short tern objective of National Tuberculosis programme is to:

a) Detect maximum number of TB cases
b) Vaccinate newborns and infants with BCG
c) Treat effectively the patients of tuberculosis
d) All of the above

2.Nucleus of the District Tuberculosis Programme (DTP) is:

a) Primary Health Centre

b) District tuberculosis centre
c) Community Health centre
d) All of the above

3.Implementable PHIs under DTP are:
a) Peripheral subcentres
b) Centers having
c) Centres under qualified medical officers
d) None of the above

4.BCG coverage at present is
a) 50%
b) 78%
c) 87%
d) 97%

5.Statement not true about Revised National Tuberculosis Control Programme is
a) Introduced in 1986
b) Supervised short course chemotherapy is instituted lo achieve 85% cure
c) Augmentation of case finding activities
d) To be extended throughout the country in a phased manner

6.Which of the following is not a component of DOTS
a) Appropriate medical treatment
b) Monitoring of disease status
c) Supervision and motivation by qualified health workers
d) To be implanted through DOT agent

7.Sputum +ve new pulmonary TB patient will get treatment under
a) Category I
b) Category II
c) Category III
d) Any category

8.Duration of category II treatment is
a) 6 months
b) 8 months
c) 12 months
d) 4 months

9.Treatment failure refers if a category 1 patient shows sputum +ve after
a) 2 months
b) 3 months
c) 4 months
d) 5 months

10.National tuberculosis programme was started in
a) 1954
b) 1952
c) 1962
d) 1976

11.Long term objective of NTP is
a) Universal BCG coverage
b) Decrease prevalence of infection below 14 years age to less than 1%
c) Decrease incidence of infection below 14 years age to less than 1%
d) Detection and treatment of drug resistant cases

12.The main strategy in National Tuberculosis Control Programme is:
a) To trace contacts
b) To provide free anti tubercular drugs
c) To give BCG vaccination to large population
d) To detect and treat many cases of TB as possible

13.Priniciples of NTCP are following except
a) BCG vaccination
b) Domiciliary chemotheraphy
c) Early case detection
d) Isolation of TB cases

14.At the village level, sputum is collected and fixed by
a) Anganwadi worker
b) Village health guide
c) Health worker male
d) Isolation of TB cases

15. Which of the following is a pepripheral health institution under NTC?
a) District hospital
b) PHC
c) Subcenter
d) Mobile clinic

16. Which of the following is not true about revised NIP?
a) Involvement of NGO's
b) Both active and passive case finding
c) Supervisory teams constituted in rural areas per 3 lakh population
d) Short term chemotherapy provided free of charge

17. Under RNTCP, a new case is one who has never had treatment for TB or has taken anti-TB drugs for less than:
a) 2 weeks
b) 4 weeks
c) 6 weeks
d) 8 weeks

18.False about DOTS is
a) Continuation phase drugs are given in a multi blister pack
b) Medication is to be taken in presence of a health worker
c) Biweekly dosage and DOT on time
d) Improves complicance

19.Goal of national tuberculosis control programme is
a) Eradicate TB
b) Decrease transmission of TB
c) Treat all sputum positive patients
d) Decrease incidence of TB to such an extent that it is no longer a public health problem

20. Main aim of tuberculosis cure is
a) Radiological cure
b) Contract tracing
c) Bacteriological cure
d) Prevent complications

21. Consider the following statements: The Revised National TB Control Programme has a strategy base that reflects in –
I:Accountability of the system
II:Increasing case detection
III:Ensuring DOTS based drugs for every patient
Which of the following statement are correct?
a) I and II
b) II and III
c) III only
d) I, II and III

22. Under the national TB programme, for a PHC to be called PHI-R, requisite is:
a) Microscopy
b) Microscopy + radiology
c) Radiology
d) Specialties of doctors

AIDS

1.National AIDS Control Program was launched in
a) 1987
b) 1991
c) 1992
d) 1994

2.Component of National AIDS Control Program is
a) Establishment of surveillance centers
b) Identification & screening of high risk groups
c) Control of STDs and condom program
d) All of the above

3.Which of the following is not true about National AIDS Control Program?
a) Sentinel surveillance methodology has been adopted
b) Community based screening for prevalence of HIV taken up
c) Early diagnosis and treatment of SID is one of major strategy to control spread of H IV
d) Formulating guidelines for flood banks, blood donors & dialysis units

4.The National AIDS Control Program has the following components excepts
a) Zero surveillance
b) Health education and information
c) Scanning of blood and blood products
d) Banning of sexual contact with foreigners

5.The major emphasis of Govt. of India in National AIDS Control Programme is:
a) Health education

b) Contact tracing
c) Treatment of cases
d) Elimination of high risk population

6.AIDS surveillance is not used in
a) STD clinic
b) ANC clinic
c) Blood Bank
d) Homosexuals

7.For diagnosis of HIV infection in a symptomatic, minimum number of tests required are:
a) 1
b) 2
c) 3
d) 4

8.Transfused blood is routinely tested for all except
a) HIV
b) Malaria
c) Hepatitis A
d) Syphilis

9.Professional blood donation is prohibited from
a) Jan 1, 1998
b) June 1, 1996
c) April 30, 1989
d) Dec, 1, 1992

10.According to national blood donation is blood tested for
a) HIV
b) Hepatitis B
c) Malaria
d) All of the above

Blindness

1.National programme for control of blindness was launched in
a. 1971
b. 1973
c. 1976
d. 1977

2.As per objective of the national programme for control of blindness the present prevalence rate of blindness of 1.1% to be brought down to:
a. 1.0%
b. 0.7%
c. 0.3%
d. 0.1%

3.Annual incidence of cataract induced blindness in India is:
a. 10 million
b. 6 million
c. 2 million
d. 1.6 million

4.Under the national programme for prevention of blindness, vitamin A is to be given to:
a. All children between the ages of 1 to 5 years at 6 monthly intervals
b. Children with history of night blindness
c. Children with severe protein energy malnutrition
d. Children with Bitot's spot

5.SAFE strategy is recommended for the control of?
a. Trachoma
b. Glaucoma
c. Diabetic retinopathy
d. Cataract

6.The most common cause of ocular morbidity in India is:
a. Cataract
b. Conjunctivitis
c. Refractive error
d. Trachoma

7.According to the world health organization the definition to blindness is:
a. Visual activity < 6/60 in the better eye with available correction
b. Visual activity < 3/60 in the better eye with available correction
c. Visual activity > 6/60 in the better eye with available correction
d. Visual activity > 3/60 in the better eye with available correction

8.Under the national programme for control of blindness, who is supposed to conduct the vision screening of school students?

a. School teachers
b. Medical offers of health centers
c. Ophthalmologists
d. Health assistants

9.as per the 1986-89NPCB surveys, what was the prevalence of blindness in India (at visual acuity < 6.60 in better eyes?

a. 1.38%
b. 1.49%
c. 1.75%
d. 1.8%

Cancer

1.Number of new cases of cancer in India per year is

a. 1.5 million
b. 1.2 million
c. 0.7 million
d. 3.3 million

2.National cancer control programme was started in

a. 1960
b. 1967
c. 1975
d. 1987

3.All are activities under national cancer control programme for district projects except

a. Preventive health education
b. Early detection of cancer
c. Pain relief measures
d. Setting up of cobalt therapy units

Miscellaneous

1.National programme for control of blindness was launched during

a) Third five year plan
b) Fifth five year plan
c) Seventh five year plan
d) Eight five year plan

2.According to national water technical mission to define a problem village is all except:

a) Water source more than 1 km away
b) Water source more than 1.6 km away
c) Water depth more than 15 m
d) Water available has excess salinity, iron & fluorides

3.The false statement regarding national water supply & sanitation programme is

a) 47% of rural population has safe water
b) 80% of urban population have safe water
c) Target rural sanitation is 25%
d) Target for safe water coverage by 1990 is 60%

4.Target for coverage for urban sanitation is

a) 25%
b) 50%
c) 80%
d) 110%

5.The drinking water supply & sanitation decade programme was launched in

a) 1976
b) 1981
c) 1985
d) 1990

6.The stipulated norm of safe drinking water per capita per day is

a) 10 litres
b) 25 litres
c) 40 litres
d) 100 litres

7. Minimum needs programme was introduced in ____ five year plan

a) First
b) Third
c) Fifth
d) Seventh

8. All are components of Minimum Needs Programme except

a) Rural Health
b) Rural electrification
c) Rural industries
d) Rural water supply

9. The Objectives of Minimum Needs Programme do not include;
   a) 1 PHC for 30,000 population
   b) Consolidate mid day meal programmes
   c) Integration of health, water & sanitation
   d) Urban slum areas given priority

10. Pulse Polio immunization is done in India in Dec-Jan because of:
   a) Administrative convenience
   b) Easiness of maintaining cold chain
   c) As a tradition
   d) All of the above
   e) None of the above

11. All are true of polio epidemic curve in a community except:
   a) All cases within 7-14 days
   b) Oro-fecal mode of transmission
   c) Herd immunity present
   d) Slow rising slope and decline

12. The most predominant type of polio virus During epidemics is:
   a) Type 1
   b) Type 2
   c) Type 3
   d) Mixture

13. Vaccine associated paralytic polio is due to_ virus on OPV
   a) Type 1
   b) Type 2
   c) Type 3
   d) Mixture

14. True about polio epidemic;
   a) Curve rises and falls rapidly
   b) Transmission via percutaneours route
   c) AU colleges and school is closed to public
   d) All susceptible children should be immunized

15. Acute flaccid paralysis in which group is to be reported:
   a) 0-5 years
   b) 0-10 years
   c) 0- 15 years
   d) 0-3 years

National vector borne disease control programme

1. B
2. B
3. A
4. B
5. B
6. D
7. B
8. A
9. B
10. A
11. B
12. D
13. C
14. D
15. D
16. D
17. D
18. D
19. C
20. B
21. B
22. C
23. B
24. C
25. C
26. B
27. D
28. C
29. B
30. A
31. B
32. C
33. B
34. B
35. C
36. A
37. C
38. B
39. B
40. C
41. A
42. C
43. B
44. B
45. A
46. C
47. A
48. B
49. D
50. D

LEPROSY

1. D
2. A
3. D
4. D
5. B
6. B
7. A
8. C
9. C
10. B
11. B
12. B
13. B
14. E
15. B
16. D
17. D

TUBERCULOSIS

1. D
2. B
3. C
4. C
5. A
6. B
7. A
8. B
9. D
10. C
11. B
12. D
13. D
14. C
15. B
16. B
17. B
18. C
19. D
20. C
21. D
22. B

AIDS

1. A
2. D
3. B
4. D
5. C
6. D
7. C
8. C
9. A
10. D

BLINDNESS

1. C
2. C
3. C
4. A
5. A
6. C
7. B
8. A
9. B

CANCER

1.C
2.C
3.D

MISCELLANEOUS

1.C
2.A
3.D
4.C

5.B
6.C
7.C
8.C
9.D
10. A
11. D
12. A
13. C
14. D
15. C

of the following except:
a) Growth retardation, weight loss, diarrhoea
b) Pyogenic infection,candidiasis, reactivation of tuberculosis
c) Cancrum oris
d) All of the above

6. Which of the following is not a complication of measles?
a) Diarrhoea
b) Pneumonia
c) Otitis media
d) Pancreatitis
e) SSPE

7. The incidence of SSPE following measles IS:
a) 7/1000
b) 1/1000
c) 1/ 11 lakh
d) 7/1 million

8. Vitamin deficiency common in severe measles is
a) Vitamin K
b) Vitamin D
c) Vitamin A
d) Vitamin C

9. Which of *not* true about measles vaccine?
a) Egg culture
b) Freeze dried
c) 0.5ml s/c
d) Reconstituted vaccine should be used within one hour

10. Measles vaccine can be given at 6-8 months of age:
a) In malnourished children
b) If measles outbreak
c) If child is unlikely to return at 9 months of age
d) All of the above

11. Measles vaccination is effective if given

COMMUNICABLE DISEASES-I

1. Most common age of infection for measles
a) <6 months
b) 6 months-3yrs
c) >5yrs
d) > 10yrs

2. Which is *not* true regarding immunity in measles?
a) One attack provides lifelong immunity
b) Infants protected upto 6 months by maternal antibodies
c) Immunity after vaccination is short lasting
d) No age is immune if no previous immunity exists

3. Epidemics of measles are common in India in:
a) October to April
b) January to July
c) July to December
d) Throughout the year

4. Koplik's spot - which is not true?
a) Appear 1-2 days before rash
b) Appear opposite 1st & 2nd upper molar
c) Small bluish white spots
d) Occur in other exanthematous fever also

5. During post- measles states there may be all

within days of exposure to susceptible contacts:
a) 1 day
b) 3 days
c) 7 days
d) 10 days

12. For eradication of measles, immunization coverage should be at least:
a) 60%
b) 85%
c) 95%
d) 100%

13.Improved case management of measles includes-
a) Measles vaccination + immunoglobulin
b) Prophylactic antibiotics + vaccination
c) Care of contacts by vaccination
d) Antibiotics and vit A supplementation

14. What number of doses of measles vaccine is required for immunizing infants in a village of 2500 where the birth rate is 30/1000 midyear population and IMR is 80/1000 LBs assuming a wastage rate of 2?
a) 150 doses
b) 135 doses
c) 138 doses
d) 148 doses

15. All are features of rubella *except*
a) Source of infection is a case
b) No subclinical case
c) No carrier state for post nasally acquired rubella
d) Infants with congenital rubella excrete virus

16. Complication of rubella is all *except*
a) Arthralgia
b) Thrombocytic purpura
c) Myocarditis
d) Congenital malformation

17. The most widely used diagnostic test for rubella is
a) Elisa
b) RIA
c) HAI Test
d) Virus isolation

18. Classical triad of congenital rubella syndrome includes all *except:*
a) PDA
b) Deafness
c) Microcephalus
d) Cataract

19. After which week of gestation, rubella does *not* cause major abnormalities of fetus
a) 8^{th}
b) 12th
c) 16^{th}
d) 20^{th}

20. All are features of RA 27/3 rubella vaccine *except:*
a) Produced in human diploid fibrob!ast
b) Produces high antibody titre
c) Does not prevent subclinical infection with wild virus
d) Immunity is lifelong .

21. Recommended vaccination strategy for rubella is to vaccinate 1^{st}
a) Women 15-39 yrs
b) Infant
c) Adolescent girls
d) Children 1-14yrs

22. Causative agent for mumps is:
a) Arbo virus
b) Rhabdo virus
c) Paramyxo virus
d) Myxo virus

23. Incidence of mumps is highest among:
a) 0-5yrs
b) 5-15yrs
c) 15-95yrs
d) > 25yrs

24. Which of the following statements is all true about mumps?

a) Disease more severe in children
b) Secondary attack rate 86%
c) One attack confer lifelong immunity
d) 30-40% cases are subclinical
e) Period of maximum infectivity is just before and at onset of parotitis

25. Incubation period for mumps is:
a) 18 days
b) 14 days
c) 10 days
d) 5 days

26. Complication of mumps include all *except:*
a) Pneumonia
b) Orchitis
c) Pancreatitis
d) Myocarditis
e) Ovaritis

27. The type of influenza causing pandemics:
a) A
b) B
c) C
d) Any of the above

28. A person after contact with diphtheria case is Schick test -ve throat culture -ve and had received DPT (B) one and half years back. He needs:
a) Passive immunization
b) Active immunization
c) Ab & immunization
d) No *T/T* needed

29. Which of the following is used as an adsorbent in OPT vaccine?
a) Aluminimium phosphate
b) Thiomersal
c) Alumina
d) Zinc sulphate

30.Preservative in diphtheria vaccine is:
a) Aluminum hydroxide
b) Aluminum phosphate
c) Thiomersal
d) Formaline

31. Severe reaction to OPT includes all *except:*
a) Fever upto 39° C .
b) Convulsions
c) Anaphylactic reaction
d) Persistent screaming episode

32. Prophylactic dose of diphtheria Antitoxin is:
a) 3000-5000 unit
b) 500-2000 unit
c) 10,000-30,000 units
d) 40,000 to 100000 units

33. Which is *not* true regarding *B. Pertussis?*
a) Infects only men
b) Sub-clinical cases are source of infection
c) Secondary attack rate 90%
d) No carrier state

34. Which of the following is not true regarding Pertussis?
a) Most infections during paroxysmal stage
b) Affects infants & preschool children
c) Highest mortality in infants < 6months
d) Recovery is followed by immunity pertussis

35. All are true regarding meningococcal meningitis *except:*
a) Cases are important source of infection
b) Case Fatality. rate in treated cases is < 10%
c) Group A & C causes epidemic
d) Predominant in children

36. Average No. of ARI in a child per year:
a) 1-3
b) 3-5
c) 5-8
d) 8-12

37. Broncho pneumonia secondary to influenza is usually caused by:
a) Streptococcus pyogenes
b) Staphylococus pyogenes
c) Klebsiella pneumonia
d) Legionella pneumonia

38. Indications for admission in a one year old child who is suffering from ARI is:
a) Chest in drawing
b) Respiratory rate > 40

c) Cough
d) Fever above 100°F

39. According to WHO definition Tuberculosis control is achieved when TB positivity in age group 0 –
14yrs is less then
a) 20%
b) 10%
c) 50%
d) 1% .

40.Major epidemics of influenza A occurs at interval of:
a) 2-3 yrs
b) 3-5 yrs
c) 4-7 yrs
d) 10-15 yrs

41.All are features of influenza epidemics except
a) Slow rise of cases
b) Increase incidence of respiratory illness
c) Sickness absent in school
d) Increase hospitalization of cases

42.Rapid spread of influenza occurs because of all except:
a) Short incubation period
b) Large no. of sub-clinical cases
c) Presence of cross immunity
d) Short duration of immunity

43.Which of the following is not true about influenza virus?
a) Influenza virus A is subject to frequent antigenic variation
b) Antigenic drift is a gradual antigenic change over a period of time
c) Antigenic shift is due to genetic recombination of virus
d) Major epidemics are due to antigenic drift

44.All of the following is true about influenza except:
a) Antigenic drift is due to point mutation
b) Influenza C virus is antigenically stable
c) Recent epidemics are caused by H1 N1 type
d) Infant & person > 65 yrs are low risk groups

45.the most serious complication of influenza is
a) Myocarditis
b) Pneumonia
c) Encephalitis
d) Pancreatitis

46.Which of the following influenza vaccine can be given as nasal drugs?
a) Killed vaccine
b) Live attenuated vaccine
c) Split virus vaccine
d) Neuraminidase specific vaccine
e) Recombination vaccine

47.Avian flu is considered as a worldwide threat because of
a) It can affect birds
b) It can infect humans
c) It is non curable
d) Case fatality rate is high

48.H N is the most dangerous of all the avian flu viruses
a) It can affect cattle
b) It can infect humans
c) It mutates very fast
d) Birds can be affected in millions

49.Fatality rate for diphtheria in untreated cases is
a) <1%
b) 5%
c) 10%
d) 50%

50.The most common source of infection for diphtheria is:
a) Clinical case
b) Subclinical case
c) Carrier
d) All

51.The major clinical types of diphtheria include all except
a) Anterior nasal
b) Conjunctival

c) Faucial
d) Laryngeal

52.All are true of carrier state in diphtheria except:
a) Incidence 0.1-5%
b) Immunization prevents carrier
c) Chronic carrier persists for a year
d) Nasal carriers are particularly dangerous

53.Infective period of diphtheria is:
a) From 1 wk after exposure to 3 months
b) 14-28 days from onset of disease
c) 4-6 days before onset of symptoms and a week there after
d) None of the above

54.Diphtheria is commonest in age group
a) <1 yrs
b) 1-5 yrs
c) 1-15 yrs
d) 10-15 yrs

55.To prevent epidemic spread of diphtheria herd immunity should be at least:
a) 50%
b) 70%
c) 80%
d) 90%

56.More commonly immunity to diphtheria is acquired through
a) Maternal Ab
b) Immunization with DPT
c) Inapparent infection
d) Acquiring the disease

57.Incubation period of diphtheria is
a) 1-2 days
b) 2-6 days
c) 6-10 days
d) 10-14 days

58.Which of the following is not true about diphtheria?
a) Grayish black membrane on posterior pharynx or tonsil
b) Membrane can be removed easily
c) Minimal mucosal erythema surrounding the membrane
d) Cutaneous diphtheria is common in tropics

59.Schick test gives information about
a) Immunity status
b) Hypersensitivity to diphtheria toxin
c) Presence of antitoxin
d) All of the above

60.Positive schick test denotes
a) Immune to diphtheria
b) Allergy toxin
c) Susceptible to diphtheria
d) Infection by diphtheria

61.Isolation of diphterhia case is done till:
a) Symptoms subside
b) 2 consecutive swabs are –ve
c) Schick test is –ve
d) Ab titre decrease

62.The drug of choice for treatment of diphtheria carrier is:
a) Sulphadiazine
b) Erythromycin
c) Rifampicin
d) Tetracycline

63.Managment of non-immunized close contacts of diphtheria include
a) Erythromycin
b) Diphtheria antitoxin
c) Immunization
d) All of the above

64. Prevalence of disease in tuberculosis can be confirmed by:
a) Mass miniature radiograph
b) Sputum microscopy
c) Sputum culture
d) Tuberculin test

65..Trends of the TB problem in a community including impact of control measures is reflected by:
a) Prevalence of suspect cases
b) Proportional mortality ratio

c) Incidence of new cases
d) All of the above

66..After BCG vaccination individual become mantoux + veafter
a) 2wks
b) 5 wks
c) 8wks
d) 6months

67. According to WHO, multidrug resistance strains is one that is at least resistant to:
a) Rifampicin & streptomycin
b) INH & thiacetazone
c) INH & ethambutol
d) INH & Rifampicin

68. National 1'B Control. Program was started on:
a) 1954
b) 1958
c) 1962
d) 1976

69. Principles of National TB control Program are all *except:*
a) BCG vaccination
b) Domicilliary chemotherapy
c) Early case detection
d) Isolation of TB cases .

70. At the village level, sputum is collected & fixed by:
a) A W workers
b) VHG
c) MPW male
d) MPW female

71. The most accurate technique to measure prevalence rate of polio in a community is:
a) School survey
b) House to house survey of children 510 for lameness
c) Hospital records
d) Serological survey in children> 14yr

72. Most outbreaks of polio in India are due to:
a) Type I virus
b) Type II virus
c) Type III virus
d) All of the above

73. Which of the following is not true about polio
a) Man is the only reservoir
b) Subclinical infections dominant role in spread
c) Females more commonly affected
d) Most vulnerable age is 6 months to 3yrs

74. For every case of polio the estimated No. of subclinical cases is
a) 10
b) 50
c) 500
d) 1000

75. All are true regarding killed Polio vaccine except
a) Produces circulatory Ab
b) Does not requires refrigeration
c) Immunity against re-infection of gut by wild stain
d) Immunity is not rapidly achieved
g) During epidemic may precipitate paralysis

76. Herd immunity level needed to prevent the spread of epidemic is:
a) 56%
b) 66%
c) 86%
d) 100%

77. Vaccine associated paralytic polio is due to which virus in OPV:
a) Type 1
b) Type 2
c) Type 3
d) All

78. OPV all true *except:*
a) Produces both humoral & intestinal immunity
b) Live attenuated vaccine
c) Frequent vaccine failure even after 3 doses
d) Not efficacious in combating epidemics
e) Pulse Polio immunization, intensified

79. Which one of the following is most complication of measles infection in children?
a. Otitis media .
b. Bronchopneumonia
c. Encephalitis
d. Diarrhea

80. In an area *not* covered by measles immunization, the attack rate of measles is
a. 70%
b. 80%
c. 90%
d.100%

81. All of the following statements are true about Congnital Rubella *except:*
a. It is diagnosed when the infant has IgM antibodies at birth
b. It is diagnosed when IgG antibodies persist for more than 6 months
c. Most common congenital defects are deafness, cardiac malformations and cataract
d. Infections after 16 weeks of gestation result in major congenital defects.

82. Which of the following statements is true about BCG vaccination?
a. Distilled water is used as a diluents for BCG vaccine
b. The site for injection should be cleaned thoroughly with spirit
c. Mantoux test becomes positive after, 48 hours of vaccination
d. WHO recommends Danish 1331 strain for vaccine production.

83. Which of the following diseases has incubation period less than one week?
a. Kala azar
b. Tuberculosis
c. Leprosy
d. Influenza
e. Food poisoning,

84. A 5 year old sister of a neonate is suffering from pertusis, which has been documented by isolation and culture of the organism. Most appropriate statement regarding this clinical situation is:
a. If mother has received pertusis vaccine, the neonate is protected
b. Hyperimmune globulins indicated for the neonate
c. Erythromycin prophylaxisis indicated in the neonate
d. DPT vaccine is recommended for the elder child before birth of a child.

85. In a hostel campus, a boy named Xavior developed meningococcal meningitis. 3 days later a boy named Khiroth developed fever and neck rigidity. On examination Xavior was found to be infected with meningococci group Band Khiroth was found to be infected with meningococci group C virus. What is the next step?
a. Prophylactic antibiotics to all contacts of Xavior and Khiroth
b. Vaccination to all students who came in contact with Khiroth
c. Vaccination to all students who came in contact with Xavior
d. Treat both with ceftriaxone

86. Vaccines are available against group..... *Meningococcus:*
a. A
b. B
c .C
d. A and C

87. A patient with sputum positive pulmonary tuberculosis is on A TT for the last 5 months, but the patient is still positive for AFB in the sputum. This case refers to:
a. New case
b. Failure case c Relapse case d Drug defaulter
c. Relapse case
d. Drug defaulter

88. Most common cause of viral Hepatitis in Adult:
a) HEV
b} HDV
c) HBV
d} HAV

89. Hepatitis A - all are true *except/:*

a} Infectious hepatitis faeco oral route
b) Caused by entero virus of picorna virus family
c) Case fatality rate> 1%
d) Numerous subclinical cases

90. Australia antigen is:
a) HB Ag
b) HBc Ag
c) Anti HBc
d) HBe Ag

Communicable disease-I

1. B
2. C
3. A
4. D
5. D
6. D
7. D
8. C

9. A
10. D
11. B
12. C
13. D
14. C
15. B
16. C
17. C
18. C
19. C
20. C
21. A
22. C
23. B
24. A
25. A
26. D
27. A
28. D
29. A
30. C
31. A
32. B
33. B
34. A
35. A
36. C
37. B
38. A
39. D
40. A
41. A
42. C
43. D
44. D
45. B
46. B
47. D
48. C
49. C
50. C
51. B
52. B
53. B
54. B
55. B
56. C
57. B
58. B
59. A,B
60. C
61. B
62. B
63. D
64. B
65. C
66. C
67. D
68. C
69. D
70. C
71. B
72. C
73. C
74. D
75. C
76. B
77. C
78. D
79. D
80. C
81. D
82. D
83. D,E
84. C
85. A
86. D
87. B
88. A
89. C
90. A

COMMUNICABLE DISEASES-II

1. Site of administration of HDCV is
   a) Deltoid
   b) Buttock
   c) Thigh
   d) Any of the above

2. The best method of controlling rabies in the dogs is
   a) Killing of stray dogs
   b) HDCV vaccine
   c) Legislation
   d) Duck embryo vaccines

3. Oral rabies vaccine has been introduced. For immunization of
   a) Humans
   b) Dogs
   c) Foxes
   d) Horses

4; The causative organism of yellow fever belongs to the far.1ily of
   a) Alpha virus
   b) Flavivirus
   c) Reovirus
   d) Poxvirus

5. Jungle yellow fever is primarily a disease of
   a) Man
   b) Dogs
   c) Foxes
   d) Monkeys

6. All are features of yellow fever except
   a) Sub clinical cases present .
   b) Fatality rate > 90%
   c) One attack gives lifelong immunity
   d) Hepatic and renal involvement in severe cases

7. Classical vector of yellow fever is
   a) Aedes
   b) Culex
   c) Anopheles
   d) All of the above

8. In Africa, the vector for yellow fever is
   a) Aedes aegypti
   b) Aedes simpsoni
   c) *Aedes viLiatus*
   d) *Aedes albopictus*

9. Incubation period of yellow fever is
   a) 1 - 2 days
   b) 3 - 10 days
   c) 10 - 20 days
   d) 20 - 25 days

10. The index measuring percentage of houses in an area showing actual bleeding of A. aegypti larvae is
   a) *Aedes aegypti* index
   b) Yellow fever index
   c) Container index
   d) Breteau index

11. The index measuring number of positive containers for 100 houses is
   a) *Ae. aegypti* index
   b) House index
   c) Container index
   d) Breteau index

12. Percentage of water - holding containers that are positive for Ae. aegypti larvae is
   a) Ae. agypti index
   b) House index
   c) Container index
   d) Breteau index

13. Transmission of yellow fever is considered unlikely where the Breteau index is less than
   a) 1
   b) 3
   c) 5
   d) 10

14. The yellow fever vaccine approved for

international use by WHO is
a) 17 D
b) Dakar vaccine
c) Both of disease
d) None of these

15. All are true of 17D yellow fever vaccine except:
a) Live attenuated
b) Chick embryo
c) Freeze dried
d) Thermostable

16. The major disadvantage of Dakar vaccine is that in. some cases it causes
a) Severe headache
b) Anaphylactic shock
c) Angioneurotic edema
d) Post - vaccinal encephalitis

17. Which is correct regarding administration of 17D vaccine
a) 0.5 ml. 1m .
b) 1 ml. m
c) 0.5 ml subcutaneous
d) 1 ml subcutaneous

18. Following yellow vaccine, immunity begins within
a) 1 -2 days
b) 10-12days
c) 2 - 3 weeks
d) 4 weeks

19. The main reason why yellow fever does *not* exist in India is
a) High vaccination coverage
b) Vector is absent
c) Environmental conditions not suitable
d) None of the above

20. All the following arbovirus belong to Group *B f*lavivirus except:
a) Dengue
b) JE
c) KFD
d) Chikungunya

21. Filarial endemicity rate measures the percentage of persons,
a) Showing Mf in their blood.
b) With disease manifestations
c) Any of the above
d) None of the above

22. Percentage of mosquito positive for filarial larvae of any stage is
a) Infection rate
b) Infectivity rate
c) Endemidty rate
d) Mosquito density rate

23. The rate which measures the mosquito positive for stage III larvae is
a) Infection rate
b) Infectivity rate
c) Endemicity rate
d) Mosquito density rate

24. The currently given regimen for Bancroftian filariasis is
a) DEC - 6 mg/ Kg/ day x 21 days
b) DEC - 6 mg/ Kg/ day x 12 days
c) DEC - 100 *mg/* day x 21 days
d) DEC - 100 mg/ day x 12 days

25. For treating Brugian tilariasis the dose of DEC is than that given Bancroftian filarasis
a) Higher
b) Lower
c) Same
d) Any of the above

26. Diethyl carbamazine is very effective in killing
a) Microtilaria
b) Adult filarial worms
c) Infective stage larva
d) All of these

27. Filariasis does not cause explosive epidemic because
a) Parasite does not multiply in vector
b) Larvae do not multiply in host.
c) Of long life cycle
d) All of the above

28.Mass DEC administration has been carried out in India since which year?
a) 2000
b) 2001
c) 2002
d) 2003
e) 2004

29. A classical case of Rabies is characterized by all *except*
a) Variable incubation period
b) Short period of illness
c) Encephalomyelitis always present
d) Fatal only some cases

30. A rabies free area has been defined as one where no case of indigenously acquired rabies has occurred for
a) 1 year
b) 2 years
c) 3 years
d) 5 years

31. All are true of Rabies virus except
a) Bullet shaped virus
b) RNA virus
c) Has four serotypes
d) All serotypes cause rabies

32. The virus recovered from naturally occurring cases is called
a) Natural virus
b) Street virus
c) Fixed virus
d) Free virus

33. All of the following are characteristic features of fixed virus except
a) Long incubation period
b) Reproducible incubation period
c) Does not term negri bodies
d) Does not multiply in extra-ncural tissues

34. The virus used in preparation of anti rabil vaccine is
a) Street virus
b) Fixed virus
c) Both of these
d) None of these

35. In India, urban rabies is maintained by
a) Dogs
b) Cats
c) Rats
d) Mongoose

36. In India, all the following animals are reported to transmit rabies except
a) Dogs
b) Jackal
c) Fox
d) Vampire bats

37. All are features of Rabies in man except
a) Dead and infection
b) Aerosol transmission is quite common
c) Common age group 1 - 24 years
d) All animals are susceptible to rabies

38. The incubation Iperiod rabiesin man depends on
a) Site of bite-. .
b) Severity of bite
c) Number of wound
d) All of the above

39. Generally the incubation period of Rabies tends to be shorter in bites occurring in following sites except
a) Face
b) Neck
c) Arms
d) Legs

40. The only prodromal symptom of Rabies which is considered reasonably specific is
a) Sore throat
b) Fever 3-4 days
c) Headache
d) Pain on tingling at site of bite

41. Specific treatment for rabies is
a) Anti rabies vaccine
b) Anti rabies serum
c) Morphine
d) None of the above

42. Sample vaccine is type of ------ rabies

vaccine
a) Adult sheep brain
b) Suckling mouse brain
c) Duck embryo
d) Cell culture

43. Suckling mouse brain vaccine differs from adult sheep nervous tissue vaccine in that it
a) Is very effective
b) Has consistent potency
c) Requires fewer doses .
d) Is devoid of neuroparalytic efforts

44. BPL inactivated vaccine refers to rabies vaccine
a) Adult animal nervous tissue
b) Suckling mouse brain
c) Duck embryo
d) Cell culture

45. The rabies vaccine not given to person with sensitivity to egg protein is
a) Adult sheep brain vaccine
b) Suckling mouse brain vaccine
c) Duck embryo vaccine (DEV)
d) Cell culture vaccine

46. Which of the following rabies vaccine is not available in India?
a) Sample vaccine
b) Suckling mouse brain vaccine
c) DEV
d) HDCV

47. Advantages of cell culture vaccine includes all except:
a) More potency
b) Less non neural side effects
c) Fewer injections of lower volume
d) All of the above

48. 'Second generation' tissue culture vacclI1c refers to rabies vaccine of
a) Human origin
b) Non human origin
c) Synthetic origin
d) None of the above

49. All the following can be done following of a suspected rabid dog except
a) Flushing wound under running soap
b) Suturing wound within 24 hours
c) Application of Anti rabies serum
d) Applying tincture iodine

50. The action of soap in washing bile wound by a rabid dog is
a) Removal of dirt
b) Kills virus
c) Prevents virus from getting attached to nerve endings
d) Relieves pain

51. Which of the following is no longer recommended for local application in the wound?
a) Alcohol
b) Tincture iodine
c) Povidone iodine
d) Savlon

52. Following an animal bite, the animal has to be observed for at least
a) 2 days
b) 5 days
c) 10 days
d) 20 days

53. The unique feature of rabies except vaccine compared to other vaccines is that
a) Immunity is absolute
b) It is effective even after nerve infection
c) Can be given after exposure to infection
d) Booster doses are not necessary

54. All the following are considered as Class I wounds for rabies management except
a) Lick on healthy skin
b) Consumption of unboiled milk suspected animal
c) Bite on thigh
d) Scratches without oozing of blood

55. Bites on all the following are considered as Class III <u>except:</u>
a) Head
b) Face
c) Fingers
d) Toes

56. Bites from wild animals are classified as
a) Class I
b) Class II
c) Class III
d) Any of the above

57. A lacerated wound in the leg is classified under
a) Class I
b) Class II
c) Class III
d) None of the above

58. Multiple wounds more than_____ in number are classified under class III (sever risk)
a) Two
b) Five
c) Seven
d) Ten

59. Under class I treatment, rabies vaccine is given for
a) 7 days
b) 10 days
c) 14 days
d) 16 days

60. Route of administration of BPL inactivated rabies vaccine is
a) Intramuscular
b) Deep subcutaneous
c) Intra dermal
d) None of the above

61.All are true of extra human hosts for JE virus except:
a) Pigs are major hosts
b) Cattle & buffaloes are mosquito attractants
c) Infected pigs manifest disease
d) Some species of birds are involved

62. The only animal known to manifest JE disease is
a) Pig
b) Cattle
c) Buffalo
d) Horse

63. The most important breeding place for *Culex triataeniorrhynchus* is
a) Overhead ranks
b) Rice fields
c) Shallow ditches
d) Artificial water collections

64. Human live vaccine is available against which species of Brucella?
a) B. mefitensis
b) B. abortus
c) *B. suis*
d) B. canis

65. The activity of which control programme led to indirect decrease in cases of plague in India
a) NMCP
b) NMCP
C)Guinea – Worm eradication programme
d) National water supply sanitation programme

66. The last laboratory – confirmed plague in India occurred in
a) 1955
b) 1966
c) 1977
d) *1988*

67. In India the main reservoir of plague transmission is
a) Rattus rallus
b) Badicotabengalensis
c) Totera indica
d) Mus hoodugu

68. Trachoma is transmitted by following routes *except*
a) Direct contact
b) Venereal transmission
c) Vector borne transmission
d) Corneal transplantation

69. Blanket treatment for trachoma is indicated if the prevalence of disease in children less than 10 years is
a) 1%
b) 5 %

c) 10%
d) 12 %

70. Spores of Clostridum tetani are sterilized by
a) Boiling
b) Cresol- 15%
c) Autoclaving at 120°C for 15 minutes
d) None of the above

71. The reservoir of infection in tetanus is
a) Active case
b) Chronic carrier
c) Convalescent
d) None of the above

72. Immunization of the mother against tetanus provides immunity for the newborn for a period of
a) 4 weeks
b) 3 months
c) 6 months
d) 1 year

73. Neonatal tetanus most often manifests at
a) Birth
b) 48 hours
c) 7th day
d) 14th day

74.Purified tetanus toxoid should be stored at a temperature of
a) -20 degree C
b) 0 degree C
c) 4 degree C
d) Room temperature

75. *The* prophylatic does of human tetanus immunoglobulin is
a) 250 IU
b)1000 IU
c) 2000IU
d) 4000 IU

76. An unimmunized person with a risk of acquiring tetanus should be immunized with
a) Tetanus toxoid
b) Human immunoglobulin
c) Both the above
d) None of the above

77. Following are true of antibiotic prophylaxis in tetanus *except*
a) Benzathine pencillin drug of choice
b) Can be started upto 48 hours after Injury
c) Not effective against spores
d) Cannot replace human immunoglobulin

78. Leprosy is considered as a public health problem if the prevalence is more than.
a) 1 per 1000
b) 5 per 1000
c) 10 per 1000
d) 10 per lakh population

79. Which of the following states has the least prevalence of leprosy in India?
a) Punjab
b) Tamil Nadu
c) Lakshwadeep
d) Sikkim

80. Following are true of *M. leprae* except:
a) Grows slowly in artificial media
b) Intracetlular bacteria
c) Acid fast
d) Affinity for schwann cells

81.A patient with lepromatous leprosy is rendered non infections by treating with dapsone alone for
a) 9 days
b) 90 days
c) 1 year
d) 10 years

82. Which of the following indicates high prevalence and rapid spreading of leprosy?
a) Prevalence rate of 1 per 1000
b) High ratio of lepromatous leprosy
c) High prevalence in children
d) Presence of disfiguring leprosy

83. Leprosy is transmitted by
a) Droplet infection
b) Contact transmission
c) Via breast milk
d) All of the above

84. The type of leprosy which has been included in the Indian classification and not present in other classifications of leprosy
a) Intermediate type
b) Burnt out leprosy
c) Chronic disfiguring leprosy
d) Pure neuritic type

85. Following types of leprosy bacteriologically negative *except*
a) Intermediate type
b) Tuberculoid type
c) Borderline type
d) Pure neuritic type

86.True statement regarding Trench fever include
a) Limited to central Europe
b) Caused by Rochalimaea Quintana
c) Louse borne
d) All of the above

87. The antibiotics of choice for specific treatment of Rickettsial infection is
a) Tetracycline
b) Penicillin
c) Erythromycin
d) Ampicillin

88.At present, vaccine is available against which rickettsial infection
a) Scrub typhus
b) Murine typhus
c) Indian tick typhus
d) Q fever

89.Human cysticerosis is caused by
a) T. solium
b) *T. Saginata*
c) Both the above
d) None of the above

90. Definitive host for *T. saginala* is
a) Man
b) Cattle
c) Pig
d) None of the above

91.Interrnediate host for T. Solium is
a) Man
b) Cattle
c) Pig
d) None of the above

92. The main host for larval stage of *T. Solium* is
a) Man
b) Cattle
c) Pig
d) None of the above

93. The infective form of Cysticercosis is
a) Adult worm
b) Eggs in contaminated food
c) Cysticerci in undercooked beef
d) None of the above

94.The most dangerous form of cysticercosis is
a) Muscular
b) Ocular
c) Cerebral
d) None of the above

95.ln India. highest prevalence of Hydatid disease are reported in
a) Kerala & Karnataka
b) AP & Tamil Nadu
c) Rajasthan & Gujarat
d) Bihar & W. Bengal

96. The most prevalent from of Leishmaniasis in India is _____ Leishmaniasis
a) Visceral
b) Cutaneous .
c) Muco- cutaneous
d) Post kala azar

97. Which of the leishmaniasis is considered to be a non zoontic infection?
a) Kala azar
b) Cutaneous leishmaniasis
c) Indian leishmaniasis
d) Post kala azar dermal leishmaniasis

98. The proven vector of Leishmaniasis in India is
a) P. argel1lipes
b) P. papatasi

c) *P. Sergel1li*
d) None of the above

99. Post kalaazar dermal Leishmaniasis is caused by
a) L. dvnovani
b) L. brazilensis
c) L. tropica .
d) None of the above

100.All the following are true regarding Leishamanin test *except*
a) Based on skin reaction
b) Induration 5 mm is positive
c) It is species specific
d) Negative during active phase of kala azar

COMMUNICABLE DISEASE II

1. A
2. D
3. C
4. B
5. D
6. B
7. A
8. B
9. B
10. A
11. D
12. C
13. C
14. A
15. D
16. D
17. C
18. B
19. D
20. D
21. C
22. A
23. B
24. B
25. B
26. A
27. D
28. E
29. D
30. B
31. D
32. B
33. A
34. B
35. A

36. D
37. B
38. D
39. D
40. D
41. D
42. A
43. D
44. A
45. C
46. C
47. D
48. B
49. B
50. C

51. C
52. C
53. C
54. C
55. D
56. C
57. C
58. B
59. A
60. B
61. C
62. D
63. B
64. B
65. A
66. C
67. C
68. D
69. B
70. D
71. D
72. C
73. C
74. C
75. A

76. C
77. B
78. A
79. A
80. A
81. B
82. C
83. D
84. D
85. C
86. D
87. A
88. D
89. A
90. A
91. B
92. C
93. C
94. C
95. B
96. A
97. C
98. A
99. A
100. C

NON-COMMUNICABLE DISEASES

1. All are characteristics of chronic disease except:
a) Leave residual disability
b) Are permanent
c) Caused by reversible pathological alteration
d) Require a long period of observation or care

2. A disease is said to be chronic if it has duration of more than:
a) 1 month
b) 2 months
c) 3 months
d) 6 months

3. The major cause of mortality in developed countries is:
a) Acute infections

b) Chronic infections
c) Cardiovascular disease
d) Industrial accidents

4. The increased prevalence of chronic disease in developed countries is because of:
a) Life style pattern
b) Increased life expectancy
c) Changing behavioral pattern
d) All of the above

5. Following are major risk factors for non communicable disease prevalence except:
a) Smoking
b) Stress factors
c) Alcohol abuse
d) Immunodeficiency
e) Failure to obtain preventive health services

6. Following are characteristic features of non-communicable diseases except:
a) Well defined etiological agent
b) Multifactorial causation
c) Long latent period
d) Indefinite onset

7. Which of the following clinical presentation is specific for coronary heart disease?
a) Myocardial infarction
b) Angina pectoris
c) Irregularities of the heart rhythm
d) Sudden death

8. Following indices can be used to measure the burden of coronary heart disease except:
a. Loss of life expectancy
b. CHD incidence and prevalence rate
c) Secondary attack rate
d) Case fatality rate

9. Most cardiac deaths due to myocardial infarction occurs within:
a) I hr
b) 24 hrs
c) I wk
d) 2 wks

10. Project 'MONICA' is concerned with:
a) Monitoring of trends and determinants of cardiovascular diseases
b) Newer methods of diagnosis of CHD
c) Provision of acute coronary care
d) Primordial prevention of CHD

11. Following are true of coronary heart disease pattern in India except:
a) Occurs at young age
b) More common in females
c) Hypertension and diabetes coexist in 40%
d) Smoking is an important etiological f3ctor

12. Which of the following is a modifiable risk factor for CHD:
a) Obesity
b) Sedentary habits
c) Cigarette smoking
d) All of the above

13. All of the following are non-modifiable risk factors for CHD except:
a) Age
b) Sex
c) Family history
d) Diabetes

14. Smoking predisposes to coronary heart disease by:
a) Promoting atherogenesis
b) Adrenergic drive raising BP and myocardial O2 demand
c) Reducing HDL lipoprotein levels
d) All of the above

15. Which one of the following sets of components of cigarette smoke is a causal agent of coronary artery disease?
a) Tar and nicotine
b) Nicotine and carbon monoxide
c) Carbon monoxide and tar
d) Tar nicotine and carbon monoxide

16. Following are true of cigarette smoking and CHD except:
a) Filter cigarettes protective
b) Direct: related to number of cigarettes smoked per day
c) Responsible for CHD deaths in men under 50yrs.

d) Risk declines on cessations of smoking

17. Following are true regarding the relationship between coronary heart disease and hypertension:
a) Hypertension accelerates atherosclerosis
b) Systolic BP is a better predictor of CHD than diastolic BP
c) Mild hypertension also a risk factor
d) All of the above

18. The threshold le\el of serum cholesterol beyond which there is definite increase in CHD risk is:
a) 150mgdL
b) 200 mg dL
c) 220 mg dL
d) 300 mg dL

19. Single most useful test for identifying individuals at high risk of developing CHD is:
a) Blood pressure
b) Serum cholesterol
c) Sedentar life style
d) Age

20. High levels of which of the following are associated with coronary heart disease?
a) HDL
b) LDL
c) VLDL
d) Chylomicrons

21. The cholesterol 'HDL ratio that must be achieved to prevent CHD is less than:
a) 1
b) 2
c) 3.5
d) 4.5

22. The most specific plasma marker for CHD risk is:
a) Serum LDL
b) HDL cholesterol
c) Raised Apolipoprotein-B
d) Serum VLDL

23. Elevated levels of which of the following hormones have been linked to CHD?
a) Testosterone
b) Estrogen
c) Progesterone
d) Thyroxine

24. Following increase the risk for CHD except:
a) Oral contraceptives
b) Alcohol abuse
c) High fibre diet
d) Type A personality
e) Diabetes

25. Following dietary changes are advised to reduce prevalence of coronary heart disease except:
a) Increased complex carbohydrate intake
b) Saturated fat intake less than 10% of total energy intake
c) Salt intake less than 2g/day
d) Reduce fat intake to 20-30% of total energy intake

26. Prevention of emergence of risk factors to prevent cardiovascular diseases is called:
a) Primary prevention
b) Primordial prevention
c) Secondary prevention
d) Specific protection

27. Primordial prevention in coronary heart disease involves
a) Control of blood pressure
b) Preserving traditional life style
c) Screening high risk persons
d) Health check-ups

28. The most effective means of preventing subsequent myocardial infarction is:
a) Anticoagulants
b) Beta blockers
c) Anti-thrombotic drugs
d) Lipid lowering drugs

29. Mild hypertension is defined as a diastolic BP of
a) 80-90 mm Hg
b) 90-95 mm Hg
c) 90-100 mm Hg
d) 95-105 mm Hg

30. The following are WHO recommendations for recording blood pressure except:
a) Record BP in supine position
b) Use one arm consistently
c) Measure thrice at 3mins intervals
d) Record the lowest of 3 readings

31. Most common cause of hypertension is:
a) Essential
b) Renal disease
c) Heart disease
d) Adrenal hyperplasia

32. In India, main cause of death due to hypertension is:
a) Coronary heart disease
b) Congestive heart failure
c) Stroke
d) Renal failure

33. The term 'Tracking' of blood pressure refers to:
a) 24 hr BP monitoring
b) Identifying children at risk of developing hypertension at future dose
c) Pictorial representation of BP
d) BP control with nifedipine

34. Commonest cause of secondary hypertension is:
a) Oral contraceptives
b) Chronic glomerulonephritis
c) Toxemia of pregnancy
d) Adrenal tumors

35. Which one of the following is not true about hypertension?
a) Prevalence more in males
b) Rules of halves applies to hypertension
c) Number of deaths in women due to hypertension exceed those in men
d) Obesity and high alcohol intake are associated with increased risk of hypertension

36. Following are methods for primary prevention of hypertension except:
a) High calorie carbohydrate diet
b) Low salt diet
c) Maintain body mass index less than 25
d) Physical exercise

37. Main somato neurological disorder in stroke is:
a) Paraplegia
b) Hemiplegia
c) Monoplegia
d) Speech disturbances

38. Most common cause of stroke is:
a) Cerebral thrombosis
b) Cerebral embolism
c) Cerebral haemorrhage
d) Subarachnoid haemorrhage

39. Unfavorable prognostic factor for stoke are all except:
a) Old age
b) Hypertension
c) Impairment of consciousness
d) Cranial nerve paresis

40. Main risk factor for cerebral thrombosis IS:
a) Elevated blood lipids
b) Diabetes
c) Hypertension
d) Oral contraceptives

41. Which of the following is not true about 'TIA'
a. Due to micro emboli
b. Tendency to recurrence
c. Neurological deficit of sudden onset
d. Some neurological deficit persists

42. The characteristic features of stroke is:
a) Incidence higher in males
b) Occurs in younger age in India
c) 48% patients die within one year
d) All of the above

43. Which of the following virus has been implicated in the causation of rheumatic fever?
a. Adenovirus
b. Coxsackie virus.
c. Respiratory syncytial virus
d. Rhinovirus

44. Following are true about streptococcal infections responsible for rheumatic fever except:
a. Chronic carrier state exists
b. Can be eradicated with mass antibiotic therapy
c. M type 5 strain most rheumatogenic
d. Little cross immunity exists

45. Following are true of rheumatic heart disease in India except:
a) Occurs in younger age (5-15yrs)
b) Valvular lesions less common
c) Prevalence is 1 per 1000 population
d) 50°-0 of all heart diseases

46. Which one of the following is not true about 'rheumatic heart disease' (RHD)?
a) Rheumatic fever occurs in 10% of streptococcal infection
b) RHD accounts for 35-50% of all cardiac cases in India
c) Mitral stenosis is the most common valvular lesion
d) Affects both sexes equally
e) Rapidly progressive

47. Which of the following is most common manifestation of rheumatic fever?
a) Carditis
b) Chorea
c) Polyarthritis
d) Subcutaneous nodules

48. Following are seen in a patient with acute rheumatic fever in the active stage except:
a) Fever
b) Carditis
c) Subcutaneous nodules
d) Polyarthritis

49. Which of the following lesions of acute rheumatic fever does not lead to permanent damage?
a) Chorea
b) Subcutaneous nodules
c) Polyarthritis
d) All of the above

50. Most common ECG manifestation of rheumatic carditis is:
a) First degree A-V block
b) Sinus tachycardia
c) Right bundle branch block
d) Tall P and T waves

51. All of the following are minor clinical criteria of rheumatic fever except:
a) Fever
b) Arthralgia
c) Previous history of rheumatic fever
d) Pericardial effusion

52. Which of the following is mandatory to diagnose rheumatic fever?
a) Carditis
b) Chorea
c) Polyarthritis
d) Positive ASO antibodies

53. Most common ECG manifestation of rheumatic carditis is:
a) First degree A-V block
b) Sinus tachycardia
c) Right bundle branch block
d) Tall P & T waves

54. Prevention of recurrence of rheumatic fever by giving benzathine penicillin is:
a) Primordial prevention
b) Primary prevention
c) Secondary prevention
d) Tertiary prevention

55. Which one of the fol1owing is true about secondary prevention of rheumatic fever?
a) 1.2 million units of benzathine penicillin given IM in adults every 3 wks
b) Penicillin prophylaxis is continued for at least 5 yrs
c) Penicillin prophylaxis is continued till age of 18 years
d) All of the above

56. All of the following are true about evaluation of prevalence of RHD except:
a) Survey is carried out in individuals 1-8 yrs age

b) Survey is carried out in 6-14 yrs age group at 5 years interval
c) Survey is carried out on samples of schools
d) Recommended sample size is 20000 to 30000 children

57. Cancer arising from mesodermal cells is:
a) Lymphoma
b) Sarcoma
c) Carcinoma
d) Myeloma

58. Incidence of cancer in India is (per 1.00,000):
a) 289
b) 181
c) 80
d) 48

59. Most common cancer among Indian females is of:
a) Cervix
b) Breast
c) Body of uterus
d) Oral cavity

60. Most common site of cancer in India is:
a) Lung
b) Stomach
c) Breast
d) Oropharyngeal

61. Most common site of cancer among females worldwide is:
a) Cervix
b) Breast
c) Lung
d) Oral

62. Most common site of malignancy worldwide, when both sexes are combined, is:
a) Stomach
b) Lung
c) Colon
d) Oral

63. Tobacco is associated with all of the following malignancies except:
a) Oropharyngeal
b) Lung
c) Urinary bladder
d) Liver

64. Alcohol intake is associated with which of the following malignancy?
a) Oesophagus
b) Liver
c) Rectal
d) All of the above

65. Match the following:
1. Epstein-Barr virus a) Kaposi sarcoma
2. Hepatitis B virus b)Burkitt's lymphoma
3. Cytomegalovirus c) Cancer cervix
4. Human papilloma virus d) Hepatocellular carcinoma

66. Malignancy most commonly associated with AIDS is:
a) Non Hodgkin's lymphoma
b) Kaposi sarcoma.
c) Adult T cell leukemia
d) Hepatocellular carcinoma

67. Match the following
1. Epstein-Barr virus a) Carcinoma bladder
2. Schistosomiasis b) Cancer stomach
3. Smoked fish carcinoma c) Nasopharyngeal
4. High fat diet d) Cancer rectum

68. All of the following are precancerous lesions except:
a) Intestinal polyposis
b) Chronic gastritis
c) Chronic cervicitis
d) Cervical erosion

69. Early warning signs ("danger signals") of cancer are all except:
a) Change in wart
b) Persistent change of bowel habits
c) Unexplained fever
d) Persistent cough

70. Following are methods of primary prevention of cancer except:
a) Cancer screening
b) Control of tobacco consumption

c) Treatment of precancerous lesions
d) Immunization against hepatitis B

71. Early detection and treatment at pre invasive or pre-malignant stage is possible in all except:
a) Cancer cervix
b) Breast cancer
c) Oral cancer
d) Lung carcinoma

72. Best possible protection against cancer is:
a) Dietary modification
b) Cancer screening
c) Health education
d) Control of tobacco consumption

73. Cancer screening is possible because of all except:
a. Many cancers preceded by premalignant lesions whose removal is curative
b) Most cancers begin as localized lesions and their removal has high rate of cure
c) 75% cancer sites are easily accessible
d) Most cancers are symptomatic early

74. Use of Pap smear examination in the detection of cervical cancer in women is:
a) Primary level prevention
b) Secondary level prevention
c) Tertiary level prevention
d) Not related to the prevention

75. For effective cancer cervix screening Pap smear should be taken every:
a) 6 months
b) 1 yr
c) 3 yrs
d) 5 yrs

76. The sensitivity of Pap smear in detecting cervical carcinoma is:
a) 99%
b) 90%
c) 80%
d) 60%

77. Most sensitive and specific method of screening for breast cancer is:
a) Breast self examination
b) Examination by physician
c) Mammography
d) Thermography

78. The radiation exposure in mammography is:
a) 0.03 rads
b) 0.5 rads
c) I rad
d) 2 rads

79. Oral cancer is most commonly associated with:
a) Tobacco
b) Alcohol
c) Radiation exposure
d) None of the above

80. Average time interval between precancerous stage and invasive oral cancer IS:
a) 2 yrs
b) 5 yrs
c) 10yrs
d) 15 yrs

81. Reverse smoking is associated with:
a) Carcinoma of tongue
b) Epidermoid carcinoma of hard palate
c) Liver carcinoma
d) Adenocarcinoma lower lip

82. Cancer amenable to primary prevention is:
a) Oral cancer
b) Cancer cervix
c) Carcinoma breast
d) Liver carcinoma

83. Carcinoma cervix is least common in:
a) Israel
b) Iran
c) India
d) Latin America

84. All are risk factors for carcinoma cervix except:
a. Genital warts
b. Multiple sexual partners

c. Early marriage
d. Nulliparity
e. Oral contraceptives high in estrogen

85. The 5-year survival rate for local invasive carcinoma cervix is:
a) 45%
b) 65%
c) 79%
d) 100%

86. Following are risk factors for breast cancer except
a) Low socioeconomic status
b) Positive family history
c) Nulliparity
d) Late menopause
e) Elevated estrogen levels

87. Which of the following component of cigarette smoke predisposes to lung cancer?
a) Nicotine
b) Carbon monoxide
c) Tar
d) Nitrosamine

88. Which of the following is not true regarding 'lung cancer'?
a) Bidis are more carcinogenic than cigarettes
b) Filter cigarettes have low risk
c) Passive smokers are also at increased risk
d) Nicotine contributes to increased risk of cardiovascular disease

89. Which of the following statement about 'stomach cancer' is not true
a) World's second most common cancer
b) Incidence is more in women
c) There is increased incidence of cancer localized to the cardia
d) Better food preservation techniques led to decline of stomach cancer in industrialized countries

90. Prevalence of diabetes mellitus in India is:
a) 0.1-0.2%
b) 1-2%
c) 5-6%
d) 10-12%

91. In impaired glucose tolerance test. 2 hour post prandial capillary glucose is:
a) 100-120
b) 120-180
c) 140-200
d) 160-220

92. Which of the following is not true about diabetes?
a) Obesity is a risk factor in NIDDM
b) Genetic factors play an important role in IDDM
c) The prognosis is worse in young diabetics
d) Obesity produces resistance to action of insulin

93. Which of the following HLA linkage is associated with 100M?
a) $HLA\text{-}DR_4$
b) $HLA\text{-}B_8$
c) $HLA\text{-}DR_3$
d) All of the above

94. Following viruses are implicated in the pathogenesis of diabetes except:
a) Rubella
b) Mumps
c) Coxsackie B
d) Adenovirus

95. Urine examination as a screening test is ineffective because of its:
a) Low specificity
b) Low sensitivity
c) High false positive
d) All of the above

96. The best investigation for epidemiological studies in Diabetes is:
a) Urine analyses
b) Fasting blood sugar
c) Random blood sugar
d) 2 hour post prandial blood sugar

97. Following are high risk groups for diabetes except:
a) Age over 40
b) Family history of diabetes

c) Women who have had baby weighing less than 2.5kg
d) Excess weight gain during pregnancy

98. Glycosylated hemoglobin levels given an indication of diabetic control over previous:
a) 1 week
b) 2-3 weeks
c) 2-3 months
d) 6 months

99. Obesity in males can be defined as a body mass index of more than:
a) 2 standard deviations
b) 10%
c) 25%
d) 30%

100. Following are true of epidemiology of obesity except:
a. Occurs both in developed and underdeveloped countries
b. Can occur at any age
c. Occurs at younger age in women
d. Inverse relationship with socioeconomic status

101. Obesity is defined in epidemiological studies as from median weight for height:
a) + 1 SD
b) + 2 SD
c) + 3 SD
d) None of the above

102. Following are true in obesity except
a) Increased fatty mass
b) Reduced muscle mass
c) Low bone weight
d) Increased total body water

103. Which of the following Quetelet index (body mass index):
a) Weight / $\sqrt{\text{Height}^2}$
b) Weight / $\sqrt{\text{Height}^3}$
c) Height - 100
d) Actual weight / Desirable weight

104. The index which is used as a standard all over the world as reference standard for assessing prevalence of obesity in community is:
a) Body mass index
b) Ponderal index
c) Broca index
d) Corpulence index

105.AII of the following sites are used for measuring skin fold thickness to assess obesity except:
a) Mid-triceps
b) Biceps
c) Subscapular
d) Anterior abdominal wall

106. Body fat can be estimated from measurement of:
a) Total body water
b) Total body potassium
c) Body density
d) All of the above

107. Obesity is a risk factor for all except:
a) Hypertension
b) Varicose veins
c) Gall bladder disease
d) Cancer of breast

108. The essential aspects of a weight reducing diet are all except:
a) Low in fat content
b) Low in proteins
c) Low in simple carbohydrate
d) Increased fibre content

109.Blindness is defined by WHO as a visual acuity of less than:
a) 6/60
b) 3/60
c) 6/1 8
d) 6/6

110. For practical purposes blindness is defined by WHO as inability to count fingers in daylight at a distance of:
a) 50 cm
b) 1 metre
c) 3 metres
d) 6 metres

111.Highest prevalence of blindness is in following Indian states except:
a) Uttar Pradesh
b) Haryana
c) Rajasthan
d) Orissa

112.The most common cause of blindness in India is:
a) Cataract
b) Vitamin A deficiency
c) Trachoma
d) Glaucoma

113. Cataract is responsible for % of blindness in India:
a) 20%
b) 63%
c) 75%
d) 81 %

114. The most frequent cause of blindness in developed countries are all except:
a) Trachoma
b) Glaucoma
c) Diabetes
d) Cataract

115.Common causes of blindness in children below 6 years of age are all except
a) Vitamin A deficiency
b) Trachoma
c) Glaucoma
d) Bacterial conjunctivitis

116. The goal of National Programme for control of Blindness in India is to reduce blindness in the country to less than... ... by 2010 AD:
a) 5%
b) 1%
c) 0.5%
d) 0.3%

117. Secondary eye care is provided through all of the following except:
a) District health centre
b) Primary health centre
c) Mobile eye clinic
d) Multipurpose worker

118. The goal of WHO is to eliminate % of avoidable blindness in the world by 2020 AD:
a) 100%
b) 50%
c) 75%
d) 90%

119. The term 'killed' in road traffic accidence indicates death of an individual within days of trauma:
a) 2 days
b) 7 days
c) 14 days
d) 30 days

120. Following measures help to reduce morbidity of road traffic accidents except:
a) Seat belts
b) Safety
c) Goggles helmets
d) Leather clothing

121. The legal limit to define alcohol intoxication while driving is:
a) 50mg/100ml
b) 80 mg/100ml
c) 100 mg/100ml
d) 150 mg/100ml

122. Which one of the following statements about influence of smoking on risk of coronary heart disease is not true?
a) Influence of smoking is independent of other risk factors for CHD
b) Influence of smoking is only additive to other risk factors for CHD
c) Influence of smoking is synergistic to other risk factors for CHD
d) Influence of smoking is directly related to number of cigarettes smoked per day

123. The cancer which is least amenable to screening is:
a) Lung
b) Breast
c) Cervix

d) Oral cavity

Non-communicable diseases

1. C
2. C
3. C
4. D
5. D

6. A
7. A
8. C
9. A
10. A
11. B
12. D
13. D
14. D
15. B
16. A
17. D
18. C
19. A
20. B
21. C
22. C
23. B
24. C
25. C
26. B
27. B
28. B
29. A
30. A
31. A
32. C
33. B
34. A
35. A
36. A
37. B
38. A
39. D
40. C
41. D
42. D
43. B
44. B
45. B
46. A
47. C
48. C
49. D
50. A
51. D
52. D
53. A
54. C
55. D
56. A
57. B
58. C
59. A
60. D
61. B
62. B
63. D
64. D
65. 1:B, 2:D, 3:A, 4:C
66. B
67. 1:C, 2:A, 3:B, 4:D
68. D
69. C
70. A
71. D
72. B
73. D
74. B
75. C
76. C
77. C
78. B
79. A
80. D
81. B
82. A
83. A
84. D
85. C
86. A
87. C
88. B
89. B
90. B
91. C
92. B
93. D
94. D
95. B
96. D
97. C
98. C
99. D
100. C
101. B
102. D
103. A
104. A
105. D
106. D
107. B
108. B
109. B
110. B
111. B
112. A
113. B
114. A
115. C
116. D
117. D
118. B
119. D
120. D
121. B
122. B
123. A

DEMOGRAPHY

1. Demographic process include study of all except:
a) Fertility
b) Mortality
c) Social mobility
d) Morbidity

2. Early expanding stage in Demographic cycle is characterized by:
a) Declining B.R, declining D.R
b) Low B.R, declining D.R
c) High D.R, high B.R
d) Unchanged B.R, decline D.R

3. In what stage of demographic cycle is India today?
a) Low stationary
b) High stationary
c) Early expanding
d) Late expanding

4. Correct sequence of Demographic cycle is
1. Low stationary 2. Early expanding
3. Late expanding 4. High stationary
a) 1,2,3,4 b) 4,2,3,1
c) 3,2,1,4 d) 2,3, 1,4

5. If annual growth rate of population is 2 % than it will be double in:
a) 35yrs
b) 28yrs
c) 23yrs
d) 47yrs

6. Growth pattern of a population having annual growth rate of 1.5 to 2% is:
a) Explosive growth
b) Very rapid
c) Moderate
d) Slow growth

7. Present growth rate of India is:
a) 3% (Current 1.49)
b) 2.42 %
c) 1.93%
d) 0.53%

8. Age & Sex composition of population can be best demonstrated by:
a) Bar chart
b) Age pyramid
c) Pictogram
d) Histogram

9. According to 2011 census sex ratio i.e. no. of females per 1000 males is:
a) 940
b) 933
c) 927
d) 104

10. The state in India with sex ratio in favor of females is:
a) Andhra Pradesh
b) Kerala
c) Punjab
d) U.P

11. Density of population in India is: (2001)
a) 216
b) 236
c) 294
d) 324

12 Magnitude of completed family size can be obtained from:
a) Pregnancy rate
b) General Marital fertility rate
c) GRR
d) Total fertility rate (TFR)

13 For calculating literacy rate the age group includes
a) 5yrs & above
b) 7yrs & above
c) 10yrs & above
d) 18yrs & above

14. According to 2001 census the literacy rate is:
a) 34.4%
b) 43.5%
c) 52.1%
d) 65.4%

15. Goals by 2000 for life expectancy was:
a) 60yrs
b) 70yrs
c) 64yrs
d) 68yrs

16. In defining general fertility rate, the denominator is
a) Mid years population of women
b) Women population 15yrs above
c) Women population in child bearing age
d) Population of married women

17. Average no. of daughter a new born girl will bear during her life time assuming fixed age specific fertility & mortality rates is
a) GRR
b) NRR
c) TFR
d) Total marital F.R

18. According to revised National Health Policy NRR of I to be achieved by:
a) 2001
b) 2010
c) 2004
d) 2000

19. If GFR is 125 then birth rate will be
a) 45
b) 18
c) 36
d) 25

20. The No. of children in 0-4yrs of age per 1000 women of child bearing age is defined as:
a) GFR
b) TFR
c) GRR
d) Child women ratio

21. Eligible couples means:
a) A couple having two living children
b) A couple having birth to 2 children
c) A couple with wife 15 to 45 age
d) A couple who is ready for sterilization

22 Eligible couples per 1000 population in India IS:
a) 50-70
b) 100-120
c) 150-180
d) 200-250

23 The expected growth rate by 2000 AD was:
a) 0.8
b) 1.2
c) 2.0
d) 2.3

24 In India children below 15yrs age constitute:
a) 22% population
b) 30%
c) 36%
d) 50%

25 If an eligible couple on an average has 3 children than the birth rate will be:
a) 18/1000
b) 22/1000
c) 25/1000
d) 28/1 000

26 Sum of total age specific fertility rate X class interval
a) TFR
b) GFR
c) NRR
d) GRR

27. If total fertility rate is 6, GRR would be (considering M: F ratio is one)
a) 5
b) 6

c) 3
d) 2

28 The number of condoms needed for protection for l yr is:
a) 50
b) 72
c) 200
d) 175

29 Most cost effective methods of contraception is:
a) Condom
b) Tubectomy
c) Vasectomy
d) Copper – T

30 Population above 60 yrs age in India is:
a) 2.2%
b) 3.4%
c) 6.8%
d) 10%

31 Rural population in India is:
a) 90.5%
b) 82.4%
c) 71.6%
d) 60.7%

32. Female literacy is lowest in:
a) Kerala
b) Bihar
c) MP
d) Delhi

33 Current infant mortality rate in India is
a) 30/1000 live birth
b) 52
c) 63
d) 65

34 State with maximum infant mortality rate is
a) Bihar
b) Punjab
c) Orissa
d) U.P

35 Mean marriage age for girls & boys in India is
a) 18&21yrs
b) 19.5 & 24yrs
c) 22 & 28yrs
d) 24 & 30yrs

36. Goals by 2010 AD include
a) IMR< 30
b) MMR < 100/lakh births
c) Institutional delivers 80%
d) All

37. IMR in Kerala is:
a) 70/1000 live births
b) 45/1000 live births
c) 30/1000 live births
d) 13/1000 live births

38. Kuppuswami scale include all criteria for socioeconomic scale except:
a) Income/capita
b) Living space /capita
c) Occupation of head
d) Education of Head of the family

39. % of people below poverty line in India:
a) 14%
b) 22%
c) 26%
d) 72%

40. Indian population in 2001 census was:
a) 889 million
b)' 684 million
c) 992 million
d) 1028 million

41. Demographic goal of NRR=1 can be achieved only if CPR exceeds:
a) 30%
b) 60%
c) 50%
d) 90%

42. In a village with 180 eligible couples Family Planning data ot contraceptive methods is Sterilization - 11, IUD users -10. Oral pills users -10, Condom users -29
Effective CPR in the village is:

a) 60%
b) 30%
c) 25%
d) 10%

43. Population density is maximum in:
a) Tamil Nadu
b) Delhi
c) U.P
d) Bihar

44. The most sensitive indicator of family planning achievement is:
a) Age specific fertility rate
b) Birth rate
c) Growth rate
d) NRR

45 Annual growth rate is:
a) Crude birth rate + crude D.R. x 100
b) Crude birth rate - crude D.R. x 100
c) Crude birth rate - crude death rate
d) None of the above

46. Denominator in birth rate is
a) Mid year population
b) Total number of deaths
c) Woman of child bearing age group
d) Total number of eligible couples

47. Denominator of mate mal mortality rate is
a) Per 1000 deaths ..
b) Per 1000 live births
c) Per 1000 mother deaths
d) Per 1000 deaths of children

48. To calculate infant mortality rate you take mortality of which of the following age group
a) Less than 7 days
b) Less than 28 days
c). Less than I - 4 days
d) Less than I year

49. Which was not a goal for Health for all by 2000 A.D?
a) Crude birth rate - 21
b) NRR -1
c) Complete family size - 4
d) CPR-60

50. Which of the following is not true about Kerala?
a) Per capita income is Rs. 2600 per month
b) B.R. is 22/1000
c) Life expectancy at birth: 66.5 year
d) Female literacy rate: 88%

51. Among the following one of the states/Uts have favorable sex ration for females in India.
a) Tamil Nadu
b) Andhra Pradesh
c) Chandigarh
d) Pondicherry

52.General fertility rate is a better measure of fertility than crude birth rate because the denominator includes:
a) 15 -45 years of age
b) Mid year population
c) Total women population
d) Married women population

53. All of the following attribute to high fertility in India except:
a) ↑ per capita income
b) Universality of marriage
c) Lower age at marriage
d) Low level of literacy

54. For calculating dependency ratio – numerator is expressed as:
a) Population -1- 15 years and ↑ 60 years
b) Population -1- 10 years and ↑ 65 years
c) Population -I- 10 years and ↑ 65 years
d) Population -I- 15 years and ↑ 65 years

55. Stable population is one which has:
a) No growth of population
b) Constant rate of growth of population
c) Fluctuating rate of growth of population
d) None of the above

56. If the CBR of a sub-center having a population of 5,000 is 30 / 1000 pop. and IMR is 80 / 1000 LBs. then population of infants will be:
a) 149
b) 138

c) 128
d) 118

Family Planning

1. Family Planning refers to practice to:
a) Avoid unwanted births
b) Bring about wanted birth
c) Regulate interval between pregnancies
d) All of the above

2. Most common method of contraception for CPR used in India is:
a) IUDs
b) Condom
c) Oral pills
d) Sterilization

3. Assertion (A) - Couple protection rate is to be achieved as 60% by 2000AD. Reason (R) - Net reproduction rate is to be achieved is 1.5: .
a) A and R true, R explains A
b) A and R true, R does not explain A
c) A True, R false
d) A false, R true

4. The number of condoms needed for protection for one year is:
a) 72
b) 144
c) 288
d) 266

5. Failure to remove diaphragm from vagina for extended period can cause:
a) Trichomoniasis
b) Candidiasis
c) Vaginal tear
d) Toxic shock syndrome

6. 'Today' contraceptive which has been recently introduced contains:
a) Prostaglandin F2n
b) Norethisterone
c) Nonoxynol-9
d) Copper releasing mesh

7. Commonly used material in foam spermicides is:
a. Citric acid
b. Surface active agent
c. Progesterone
d. Copper

8. The IUD device was first pioneered by:
a) Oppenheimer
b) Ota
c) Gräfenberg
d) Ishihama

9. Multi load device refers to:
a) First generation IUCD
b) Second generation IUCD
c) Oral contraceptive pills
d) Barrier contraceptives

10. Multi load device contains:
a) Zinc
b) Copper
c) Progesterone
d) Silver

11. The special feature of Nova T is that it
a) Is effective for 10 years
b) Has silver core
c) Has more copper
d) Has two plastic arms

12. Which of the following is not true about copper - T
a) Low expulsion rate
b) Lower incidence of side effects
c) Increased contraceptive effectiveness
d) Not effective as post coital contraceptive

13. III generation IUCD has:
a) Progesterone
b) Copper
c) Estrogen
d) Silver

14 Progestasert is
a) Type of suppository
b) Type of IUCD
c) An oral contraceptive pill
d) Subcutaneous implant

15 IUCD acts by:
a) Altering biochemical composition of cervical

mucus
b) Preventing fertilization by causing changes in endometrium
c) Affect sperm motility capacitation and survival
d) All of the above .

16. The present failure rate of IUD (per HWY) is:
a) Less than I
b) 3-5
c) 5-10
d) 20

17 Which of the following IUD has minimum failure rate?
a) Progestasert
b) Cu-7
c) Nova T
d) Multiload 375

18 Absolute contraindication for IUDs are all except:
a) Pelvic inflammatory disease
b) Previous ectopic pregnancy
c) Suspected pregnancy
d) Previous history of thromboembolism

19. The most appropriate time of IUD insertion is:
a) During or within 10 days of menstruation
b) About the midst of the cycle
c) Just before menstruation
d) At any time of menstrual cycle

20. The commonest side effect on women fitted with IUD is:
a) Low backache
b) Increased vaginal bleeding
c) Pelvic infection
d) Uterine perforation

21 All are complication of IUD except:
a) Increased vaginal bleeding
b) Pelvic inflammatory disease
c) Ectopic pregnancy
d) Suppression of Lactation

22 IUD insertion is not recommended in all except:
a) Immediately after second trimester abortion
b) Nulliparous women'
c) Women having multiple partners
d) 6-8 weeks after delivery

23. At PHC level, a women who complains of spotting following IUCD insertion. Should be advised:
a) Analgesic and observation
b) Antibiotics and observation
c) Iron supplements and observation.
d) Removal of IUCD.

24 Incidence of bleeding after IUD insertion is minimum with:
a) Lippes" loop
b) Cu-T
c) Levonorgestrel releasing IUD
d) Multiload device

25. IUCD with maximum incidence of ectopic pregnancy:
a) Lippes' loop
b) Cu- T
c) Multiload
d) Progestasert

26. Which of the following is not true about IUD?
a) Expulsion of device occurs during first few weeks following insertion
b) Increased risk of teratogenesis
c) Uterine perforations are more likely if inserted between 48 hrs and 6 weeks postpartum
d) Rate of ectopic pregnancy is higher among users of hormone containing devices.

27. Which one of the following sets of hormone are present in Mala D?
a) Levonorgestrel 0.15 mg and ethinyl estradiol 0.03 mg.
b) Norethisterone acetate 1.0 mg and ethinyl oestradiol 0.03 mg
c) L-norgestrel 0.3 mg and ethinyl oestradiol 0.03 mg
d) Desorgestrel 0.15 mg and ethinyl oestradol 0.03 mg.

28. The oral contraceptive containing only progesterone is:
a) Mini pill
b) Combined pill
c) Tri-phasic pill
d) Sequential pill

29. Regarding progesterone only pill all are true except:
a) It is as effective as combined pill
b) Acts on cervical mucus
c) Progesterone dose is low
d) Pill is taken daily without any gap.

30. Yuzpe method is a type of:
a) Post coital hormone contraception
b) Male contraceptive method
c) Post coital IUCD contraception
d) Mini lap sterilization

31. Which of the following is best post-coital oral contraceptive?
a) Sequential pill
b) Progestogen only pill
c) Combined pill
d) Oestrogen only pill

32. The dosage of combined oral pills for post coital contraception is:
a) 1 pill immediately followed another pills 6 hrs later
b) 2 pills immediately followed by another 2 pills 6 hrs later
c) 4 pills immediately followed by another 4 pills 12 hrs later
d) 2 pills immediately followed by another 2 pills at 12 and 24 hrs later respectively

33. Which of the following is being tried as the male pill?
a) Norethisterone
b) Gossypol
c) Quinestrol
d) DMP A

34. Mechanism of action of combined oral pills is:
a) Preventive the release of ovum from ovary by inhibiting gonadotropin secretion from pituitary
b) Preventing the implantation
c) Increasing the viscosity of cervical mucus
d) Preventing the fertilization of ovum

35. Mechanism of action of progesterone only pill is
a) Antispermatozoic
b) Prevents ovulation
c) Makes the cervical mucus viscid
d) Alters tubal mobility

36. The effectiveness of the oral contraceptives is reduced by
a) Rifampicin
b) Phenobarbital
c) Ampicillin
d) All of the above

37. Estrogen component of oral contraceptive causes all except:
a) Myocardial infarction
b) Venous thrombo-embolism
c) Decreased quantity of breast milk
d) Increased blood sugar
e) Breast tenderness

38. Complications or oral contraceptives are all except:
a) Weight gain
b) Cholestatic jaundice
c) Hypertension
d) Diabetes mellitus

39. Which of the following is not true about oral contraceptives?
a) Progestogen component cause decrease in high density lipoprotein
b) Risk of ectopic pregnancy is more in progestogen only pill
c) Progestogen only pill users have greater decline in milk volume
d) There is increased risk of cervical cancer with increased duration of use of oral contraceptives

40. Best hormonal oral contraceptive for a breast feeding woman is:
a) Combined pill
b) Mini pill

c) Triphasic pill .
d) Sequential pill

41. Besides pregnancy the oral contraceptive protect against all except:
a) Fibroadenoma breast
b) Iron deficiency anemia
c) Ovarian cancer
d) Hepatocellular adenoma
e) Pelvic inflammatory disease

42. Increased incidence of ectopic pregnancy is associated with all except:
a) IUD
b) Combined oral pills,
c) Menstrual regulation
d) Safe period method

43. All are contraindications to oral pills except:
a) Ca breast
b) Liver disease
c) Migraine
d) Cardiac abnormalities

44. If a woman was taking oral contraceptive pill, then which of the following investigation would be related to the long term consumption of steroidal contraceptives:
1. Liver functions test
2. Cervical pap smear
3. Wet smear of vaginal secretions for monilial infection
4. Endometrial biopsy Select the correct answers using the codes given below:
a. 2, 3 & 4
b. 1, 3 & 4
c. 1, 2 & 4
d. 1, 2 & 3

45. The best method of contraception for a newly married young woman with epilepsy is
a) Condom
b) Oral
c) IUCD
d) Mini pill

46. Which of the following is not true about 'depot formulations'?
a) Depo- medroxy progesterone acetate (DMPA) is useful as depot injectable contraceptive
b) DMP A is useful in postpartum period to space pregnancy as sit does not affect lactation
c) Useful in multipara over 35 years who have already completed their family
d) Single injection gives protection for I year from pregnancy

47. Consider the following statements:
1. Depot provera is:
2. 17 a-hydroxy progesterone caproate
3. Depot medroxy progesterone acetate
4. Given intramuscularly 3 monthly
5. Safe for lactating mothers
6. Of these statements correct are:
(1) 2
(2) 1, 2 & 3
(3) 1 & 3
(4) 2,3 & 4

48. Norplant contains:
a) Norethisterone
b) Norgestrel
c) Levonorgestrel
d) Ethinyl estradiol

49. Which of the following contraceptive methods protects from pregnancy for longest duration?
a) Vaginal ring
b) Norplant
c) DMPA
d) Progestasert

50. All are true of Menstrual Regulation except:
a) Aspiration of uterine contents is done within 6 -14 days of missed period
b) Uses prostaglandin
c) Done before confirmation of pregnancy
d) Relatively simply method

51. All are early complication of abortion except:
a) Sepsis
b) Hemorrhagic chock
c) Thrombo-embolism

d) Infertility

52. Medical Termination of Pregnancy Act 1971 allows termination of pregnancy only upto:
a) 6 of gestation
b) 12 of gestation
c) 20 weeks of gestation
d) 24 weeks of gestation

53. The MTP act 1971 defines the following:
a) Who should perform termination of pregnancy
b) Where it should be done
c) When it should be done
d) All of the above

54. Opinion from two doctors is necessary for MTP if pregnancy is beyond:
a) 12 weeks
b) 20 weeks
c) 28 weeks
d) 36 weeks

55. By safe period (rhythm method) the sexual intercourse should be avoided from ------ day of menstrual cycle:
a) 14th-18th
b) 10th - 20th
c) 8th - 22nd
d) 11th - 18th

56. Complication due to use of rhythm method as a contraception could be:
1. Ectopic pregnancies
2. Amenorrhea
3. Embryonic abnormalities
4. Hydramnios
Select the correct answer from the code given below:
a. 1,2 & 3
b. 1,2 & 4
c. 1 & 3
d. 2 & 4

57. The rise of basal body temperature at the time of ovulation is due to:
a) Estrogen
b) Progesterone
c) ACTH
d) Thyroxin

58. Billing's methods refers to:
a) Monitoring basal body
b) Cervical mucus method
c) Sympt thermic method
d) Rhythm method

59. Sympt thermic method combines all of the following for identifying the fertile period except:
a) Basal body temperature method
b) Cervical mucus method
c) Calender method
d) Coitus interruptus

60. Most cost effective family planning method is:
a) Vasectomy
b) Tubectomy
c) Copper T
d) Oral pills

61. All are guidelines for sterilization except';
a) Motivated couples must have 2 living children at the time of operation
b) Age of wife should be 20-45 years
c) Age of husband should be 25-50 years
d) The spouse should not have been sterilized earlier
e) Consent of spouse necessary

62. All are true about 'vasectomy' except:
a) Most common cause of failure is spontaneous recanalization
b) Early complication include scrotal hematoma and local infection
c) The person is not sterile until 30 ejaculations have taken place
d) Can be performed under local anesthesia

63. In a Laparoscopic sterilization camp, 40 women were taken up for sterilization. Some women were declared 'unfit.' The cause of "unfit" was
a) Hb below 8 gm%
b) Irregular periods
c) Thick abdominal wall

d) All of the above

64. Regarding evolution of contraceptive methods Pearl index refers to:
a) Failure rate per 100 women years of exposure
b) Total accidental pregnancies
c) Total months of exposure
d) No of OCP cycles used

65. Characteristic of an ideal candidate for Copper T insertion include all of the following except:
a) Has borne at least one child
b) Is willing to check IUD tail
c) Has a history of ectopic pregnancy
d) Has normal menstrual periods

66. On prescription of oral pills to the user, the health worker will ask about the following except:
a) Number of live children
b) Calf tenderness
c) Headache
d) Swelling of the feet.

67. "Persona" is a
a) Contraceptive advice device
b) Device for detecting safe periods
c) A female condom
d) Brand name of Multi load ML-280

68. The major side effect of DMPA contraceptive are all except:
a) Change in quantity and quality of breast milk
b) Weight gain
c) Irregular bleeding
d) Increase incidence of RT is

69. All of the following are used in the natonal program except:
a) CuT200B
b) Cu T 380 Ag
c) ML-250
d) Cu T 200 C

70. Best method of contraception - 24 hours post coital is:
a) Suction evacuation
b) Oral pill
c) MR
d) IUD insertion

71. Post coital contraception can be used upto 5 days is:
a) High estrogen
b) Cu T
c) High progesterone
d) Combined

72. Rates per 1000 women years of all types of neoplasia is lowest amongst contraceptive users who use:
a) Progesterone only pill
b) Oral pill
c) IUD with Copper
d) IUD with progesterone

73. The major work of one of the following organization is running MCH clinics:
a) Central Social Welfare Board
b) State Social Welfare Board
c) Indian Council for Child Welfare
d) All India Women's council

74. In camps, Sterilization done in luteal phase is characterized by:
a) Ligation failure
b) Motivation not so good
c) More complications
d) Costly

75. Scope of family planning services include all of the following except:
a) Screening for Ca Cx
b) Providing services for unmarried mothers
c) Screening for HIV infection
d) Providing adoption services

DEMOGRAPHY
1. D
2. D
3. D
4. B
5. A
6. B
7. C
8. B
9. A
10. B
11. D
12. D
13. B
14. D
15. C
16. C
17. B
18. B
19. D
20. D
21. C
22. C
23. B
24. C
25. C
26. A
27. C
28. B
29. C
30. C
31. C
32. B
33. C
34. C
35. B
36. D
37. D
38. B
39. C
40. D
41. B
42. C
43. B
44. A
45. B
46. A
47. B
48. D
49. C
50. A
51. D
52. A
53. A
54. D
55. B
56. B

FAMILY PLANNING
1. D
2. D
3. C
4. A
5. D
6. C
7. B
8. B
9. B
10. B
11. B
12. D
13. A
14. B
15. D
16. A
17. D
18. D
19. A
20. B
21. D
22. D
23. C
24. C
25. D
26. B
27. A
28. A
29. A
30. A
31. C
32. C
33. B

34. A
35. C
36. D
37. D
38. D
39. C
40. B
41. D
42. C
43. C
44. D
45. A
46. D
47. D
48. C
49. B
50. B
51. D
52. C
53. D
54. A
55. C
56. C
57. B
58. B
59. D
60. A
61. C
62. A
63. D
64. A
65. C
66. A
67. B
68. C
69. C
70. B
71. B
72. B
73. B
74. A
75. C

a. Brucellosis
b. Staphylococcal food poisoning toxin
c. Shigella shigae
.d. Diphtheria

3. Methylene blue test in milk is done to detect
a. Adequacy of pasteurization
b. Starch content
c. Activity of bacteria
d. Fat content above

4. Trace elements
a. Arf present in nature in small quantities
b. Are those minerals required by the body in micro quantities.
c. Should be used as dietary supplements
d. Causes mainly the deficiency disease in man

5. Current nutritional status is best assessed by
a. Weight for age
b. Height for age
c. Weight for height
d. Anthropometry

6. Human milk in contrast to cow's milk has all of the following except
a. More lactose
b. Less fat
c. More iron
d. Less protein

7. Colostrum in comparison to milk contains all except
a. Vitamin A
b. More fats

NUTRITION

1. The richest source of niacin is
a. Egg
b. Milk
c. Liver
d. Meat

2. Infections or toxic agents destroyed by pasteurization of milk include all except

c. More proteins
d. Antibodies

8. In infants, fed on goat milk, anaemia is because of deficiency of
a. Vitamin E
b. Vitamin B6
c. B12
d. Folic acid

9. Index of severity of malnutrition is
a. Weight for height
b. Height for age
c. Weight for age
d. None

10. Essential diagnostic criteria of Kwashiorkor
a. Growth retardation, Oedema, Psychomotor retarding
b. Hair, change, Oedema, Psychomotor retarding
c. Hair changes, growth & Psychomotor retarding
d. Oedema, skin changes and Psychomotor retard ing

11. In nutritional surveys anthropometric measurements include
a. Arm circumference
b. Height and weight
c. Skin fold thickness
d. a+b
e. a+b+c

12. A child prolonged breast fed needs supplement of
a. Vitamin A
b. Vitamin B
c. Calcium
d. Vitamin C

13. Milling of cereals removes the following except
a. Thiamine
b. Riboflavin
c. Folate
d. Dietary fibre

14. Germination increases all except
a. Thiamine
b. Riboflavin
c. Niacin
d. Ascorbic acid

15. Cardiac arrhythmias & renal failure may occur with excess intake of
a. Vitamin A
b. Vitamin D
c. Calcium Fluoride
d. Vitamin E

16. The feature of Hypervitaminosis A is
a. Pseudotumor cerebei
b. Alopecia
c. Anorexia
d. All

17. The biological value of proteins in soyabean is
a. 40%
b. 50%
c. 58%
d. 64%

18. Which of the following is rich in linoleic acid
a. Linseed oil
b. Groundnut oil
c. Sunflower oil
d. Soyabean oil

19. Iodized oil used in preventing Goitre is
a. Croton oil
b. Castor oil
c. Almond oil
d. Poppy - seed oil

20. 1 ml of iodized oil gives protection for about
a. 6 months
b. 1 year
c. 4 years
d. 10 years

21. All are food fortification except
a. Addition of colour to saccharin
b. Addition of Vit A to food stuff
c. Addition of extra nutrients to food stuff

d. Iodization of salt

22. For assessing the ability of protein utilization the best index is
a. Urea
b. Uric acid
c. Blood ammonia
d. Urinary nitrogen content

23. Lysine is not present in:
a. Wheat
b. Rice
c. Bengal gram
d. Red gram dal

24. Which cooking oil has the highest amount of essential fatty acids?
a. Groundnut oil
b. Coconut oil
c. Sunflower oil
d. Castor oil

25. Which of the following is rich in linolenic acid?
a. Linseed oil
b. Groundnut oil
c. Sunflower oil
d. Soyabean oil

26. The highest percentage of essential fatty acid is found in:
a. Butter fat (ghee)
b. Sunflower seed oil
c. Corn oil
d. Groundnut oil

27. In comparison to animal fat, vegetable fat IS:
a. More stable
b. More saturated
c. More atherogenic
d. Doesn't contain fat soluble vitamins

28. Essential fatty acids are lowest in:
a. Fish liver oil
b. Sunflower oil
c. Vegetable oil
d. Coconut oil

29. Highest vitamin A content is seen in:
a. Lemon
b. Green leafy vegetables
c. Tomato
d. Ragi

30. Which among the following is the most potent vitamin A?
a. Carotene
b. Vitamin AI
c. Vitamin A2
d. Beta carotene

31. Prevalence of vitamin A deficiency in community is assessed as:
a. Bitot's spot - 0.5%
b. Decreased serum retinol levels 0.05%
c. Corneal ulcer - 0.0 1%
d. Night blindness - 10%

32. Earliest feature of vitamin A deficiency IS:
a. Conjunctival xerosis
b. Nyctalopia
c. Bitot's spots
d. Keratomalacia

33. Vitamin A requirement for a child between 6 - 12 months is:
a. 100 micrograms
b. 250 micrograms
c. 350 micrograms
d. 450 micrograms

34. The proportion of children in the age group of 0 - 6 years, who are the beneficiaries of ICDS in the population, is about:
a. 6%
b. 13%
c. 20%
d. 27%

35. Dose of vitamin A given as prophylaxis:
a. 66,0001U
b. 10,000 IU
c. 1.60,000 IU
d. 2,00,000 IU

36. Vitamin D is synthesized by the body by the action of ultraviolet radiation of the sun on:

a. Calciferol
b. Cholecalciferol
c. 7 -dehydrocholesterol
d. Ergosterol

37. Vitamin D is least present in:
a. Milk
b. Fish fat
c. Cod liver oil
d. Egg

38. The daily requirement of vitamin E in an adult is related to intake of:
a. Essential amino acids
b. Total proteins
c. Essential fatty acids
d. Total fats

39. Vitamin E is absent in:
a. Wheat germ oil
b. Vegetable oil
c. Milk
d. Egg yolk

40. Daily requirement of vitamin D in pregnancy and lactation is:
a. 2.5 micrograms
b. 5 micrograms
c. 10 micrograms
d. 20 micrograms

41. Which among the following is a rich source of niacin?
a. Raw rice
b. Par boiled rice
c. Ground nut
d. Milk

42. In which of the following states is pellagra prevalent?
a. Kerala
b. Andhra Pradesh
c. West Bengal
d. Bihar

43. Vitamin BI2 is not found in:
a. Milk
b. Soya bean
c. Meat
d. Fish

44. The highest quantities of vitamin C is found in:
a. Orange
b. Lemon
c. Indian gooseberry
d. Grapes

45. Calcium requirements in the first 6 months of lactation is:
a. 400 mg/day
b. 600 mg/day
c. 550 mg/day
d. 1000 mg/day

46. Level of iodination of salt is:
a. 1 in 200
b. 1 in 20,000
c. 1 in 30,000
d. 1 in 40,000

47. Iodine deficiency is associated with all except:
a. High infant mortality
b. Still births
c. Mental retardation
d. Cataract

48. Pulses and cereals are given together in a balanced diet because of:
a. Pulses lack lysine and cereals
b. Pulses are rich in methionine and cereals lack methionine
c. Pulses lack methionine and cereals lack lysine
d. Pulses have essential amino acids and cereals have non essential amino acids

49. True about NPU is all except:
a. NPU of Indian diet is 50 – 80 %
b. Cow's milk has NPU of 81 %
c. NPU is amount of weight gained per amount of proteins consumed
d. Egg has maximum NPU

50. All are indicators in the assessment of a nutritional program except:
a. Weight and height of pre-school child
b. Prevalence of low birth weigh' less than 2.5

kg in community
c. Nutrition assessment of a pre-school child
d. Prevalence of pregnant mothers having HB < 11.5 g% in 3 d trimester.

17. D
18. C
19. D
20. C
21. A
22. D
23. A
24. C
25. A
26. B
27. D
28. D
29. B
30. B
31. A
32. A
33. C
34. B
35. D
36. C
37. A
38. C
39. C
40. C
41. A
42. B
43. B
44. C
45. D
46. D
47. D
48. C
49. C
50. D

NUTRITION

1. B
2. B
3. C
4. B
5. C
6. C
7. B
8. D
9. C
10. A
11. E
12. D
13. C
14. A
15. B
16. D

MCH INCLUDING RCH PROGRAM

1. Janani Suraksha Yojana caters to
a) Teen age pregnancy
b) Pregnancy in Urban areas
c) Pregnancy in BPL population
d) Any pregnancy

2. RCH - II is different from RCH - I in that:
a. Decentralized withdrawn
b) More t1exibility at state and district level
c) RTI services have been added
d) Adolescent health has been added

3. How much amount can a ASHA worker spend to take a mother from rural area to nearest FRU?
a) Rs 100
b) Rs 200
c) Rs 400
d) Rs 600

4. One of the medium term objectives of RCH - II is:
a) Replacement level of fertility
b) Population stabilization
c) Meet the unmet needs of contraception
d) Provision of integrated services for EAG group states

5. What is Vande Mataram Scheme?
a) A scheme for private STI services
b) A scheme for pediatric services
c) A scheme for adolescent health
d) A scheme for private safe motherhood

6. All of the following are true about basic emergency obstetric care (EmOC) except:
a) Safe blood transfusion services
b) Administration of parenteral anti convulsants
c) Manual removal of retained products
d) Assisted vaginal delivery

7. Medical abortion in RCH-II - the correct regimen is
a) Manual Vacuum Aspiration
b) Menstrual regulation

c) Mifepristone alone
d) Mifepristone + Misoprostol

8. In India women in child-bearing (15 - 44 years) age group constitute. ...% of the population:
a) 10
b) 15
c) 19
d) 25

9. Children under IS years of age constitute.. % of population in India:
a) 10
b) 17
c) 22
d) 36

10. In prenatal period, embryo is between:
a) 0 - 2 weeks
b) 0 - 9 weeks
c) 2 -9 weeks
d) 12 - 24 weeks

11. Under five mortality rate at present (2003) is:
a) 122
b) 87
c) 142
d) 99

12. Minimum number of antenatal visits required for registration during pregnancy is:
a) Two
b) Three
c) Five
d) Six

13. Which of the following is not an important antenatal investigation? :
a) Hb estimation
b) Urine analysis
c) VDRL
d) X - ray abdomen

14. The following are high risk antenatal cases except:
a) Elderly primi
b) Third multi gravida
c) Preeclampsia
d) Malpresentation
e) Twin pregnancy

15. Average weight gain by a normal healthy woman during pregnancy is:
a) 8 Kg
b) 10 Kg
c) 12 Kg
d) 14 Kg

16. Average birth weight in women who smoke during pregnancy is less at term than among non smokers:
a) 170 g
b) 500 g
c) 670 g
d) No effect on birth weight

17. Alcoholism in pregnant women is associated with:
a) Intrauterine growth retardation
b) Developmental delay
c) Increased risk of spontaneous abortion
d) All of the above

18. All are complications of anaemia in pregnant mother except
a) Premature birth
b) Puerperal sepsis
c) Post partum haemorrhage
d) Erythroblastosis foetalis

19. Under RCH programme, iron and folic acid tablets to be given daily to mother has:
a) 60 mg iron + 500 mcg folic acid
b) 100 mg iron + 500 mcg folic acid
c) 60 mg iron + 100 mcg folic acid
d) 120 mg iron + 100 mcg folic acid

20. Which of the following is not true about tetanus immunization during pregnancy
a) If mother is not immunized earlier, 2 doses of tetanus toxoid
should be given
b) The minimum interval between 2 doses should be 8 weeks
c) Second dose preferably should be given one

month before the expected date of delivery
d) If pregnant woman is immunized 2 years back, then only one dose of tetanus toxoid is sufficient

21. A lady comes late in third trimester of pregnancy. True about vaccination for tetanus toxoid is:
a) Give one dose now and another after I month of delivery
b) Give 2 dose in next pregnancy
c) Give I dose only
d) Forget about vaccination

22. Congenital. Syphilitic associated with:
a) Still birth
b) Perinatal death
c) Mental retardation
d) All of the above

23. Infection of foetus is most likely to occur if primary or secondary syphilis occurs:
a) Before 2nd month of pregnancy
b) Before 4th month of pregnancy
c) After 6th month of pregnancy
d) After 8th month of pregnancy

24. Major defects associated with congenital rubella are all except:
a) Cataract
b) Congenital heart disease
c) Deafness
d) Microcephaly

25. Risk of malformation due to congenital rubella
a) 5% upto 10th week of pregnancy
b) 10% upto 10th week l1f pregnancy
c) 15% upto 20th week of pregnancy
d) 20% up to 20th week of pregnancy

26. Contraception to be maintained for after rubella vaccination for possible risk of fetal infection:
a) 2 weeks
b) 4 weeks
c) 8 weeks
d) 16 weeks

27. Which of the following is not included in '5 cleans' in conduct of delivery:
a) Clean hands
b) Clean perineum
c) Clean cutting and care of cord
d) Clean surface for delivery

28. Average milk secretion per day in Indian women is:
a) 200 - 300 ml
b) 400 - 600 ml
c) 800-1000ml
d) None of the above

29. Contraceptive of choice during first 6 months following delivery is:
a) Oral contraceptive
b) Conventional contraceptive
c) DMPA
d) No need because of lactational amenorrhea

30. Neonatal period extends up to:
a) One week of the life
b) Four weeks of life
c) Six months of life
d) One year of life

31. In India, infants comprise total population:
a) 1. 56
b) 2.92
c) 5.61
d) 9. 22

32. Which of the following is not true about neonatal deaths:
a) 50 - 60% of all infant deaths occur in first month of life
b) 25 - 30% of all infant deaths occur in first week of birth
c) Risk of death is greatest during first 48 hours after birth
d) All of the above

33. Breast feeding should be started of birth:
a) Within I hour
b) 2 hours
c) 24 hours
d) 72 hours

34. All are true about colostrums except:
a) Rich in proteins and minerals
b) Rich in anti infective factors
c) Secreted for 3 -6 days
d) Rich in fats

35. Neonatal tetanus can be best prevented by giving:
a) Toxoid to the mother
b) Toxoid to the neonate
c) Antibiotics
d) Anti tetanus immunoglobulins

36. Which of the following is not true about HBV positive mother:
a) Risk of transmission is 90% when mother has HBe antigen
b) Transmission occurs through blood and breast milk
c) Newborn can be infected during perinatal period and infancy
d) Perinatal transmission can be prevented by sero prophylaxis combined with vaccination

37. The following are indicators for identifying 'at risk' babies except:
a) Twins
b) Weight between 70 and 80% of the references
c) Deaths of more than two siblings during the first two years of life
d) Single parent

38. Which of the following infant is not at risk
a) Failure to gain weight during 2 successive months
b) Spacing if less than 2 years
c) 3rd birth order
d) Working mother

39. According to Health for All by 2000, the target is to reduce incidence of LB W to below:
a) 20%
b) 15%
c) 10%
d) 5%

40. Mean birth weight in India is:
a) 2.1 t02.4 Kg
b) 2.7 to 2.9 Kg
c) 2.5 to 3.5 Kg
d) 3 to 3.5 Kg

41. Low birth weight child is due to all except:
a) Maternal malnutrition
b) Infections
c) Unregulated fertility
d) Previous caesarian section

42. Single most important factor determining survival chances of newborn child is:
a) Low birth weight
b) Birth order
c) Multiple gestation
d) Intrauterine infection

43. Exclusive breast feeding is sufficient for after birth:
a) 1 month
b) 3 months
c) 4 - 5 months
d) 9 - 10 months

44. The energy value of human milk per 100 ml is:
a. 60 Kcal
b. 70 Kcal
c. 80 Kcal
d. 100 Kcal

45. Which one of the following is not true about growth and development of Indian children?
a) Baby doubles birth weight by 5 months of age
b) Chest circumference overtakes head circumference by 9th month
c) During first year body length increase by 50%
d) Birth weight gets quadrupled by end of 2nd years

46. Average weight gain per year after second year and until adolescence is:
a) 2. 75 Kg
b) 3. 75 Kg
c) 2 Kg

d) 5 Kg

47. Average gain in height per year after age of 5 years until puberty is:
a) 9 cm
b) 8 cm
c) 7 cm
d) 6 cm

48. 'Road to health' chart indicates that a child is:
a) Free from disease
b) Growing normally
c) Completely immunized
d) Mentally stable

49. Which is not true about growth chart used in India?
a) Top most curve corresponds to 50th percentile of WHO reference standards
b) Second curve corresponds to 80% of that standard
c) There are 3 reference curves
d) Children with normal weight fall between two top line
e) The lower curves indicates degree of malnutrition

50. Preschool children constitute about ___ of general population:
a) 5%
b) 12 %
c) 20 %
d) 24 %

51. Most common cause of preventable childhood blindness is:
a) Galactosemia
b) Vitamin A deficiency
c) Cretinism
d) Birth asphyxia

52. Aims and objectives of 'under live clinic' are all except .
a) Care in illness
b) Immunization
c) Growth monitoring
d) Non formal education for preschool children
e) Nutritional surveillance

53. The border of the symbol for under five clinic that touches all other areas represent:
a) Health education
b) Family planning
c) Immunization
d) Adequate nutrition

54. What is the most peripheral unit where MCH and FP services are provided in rural India by the trained personnel?
a) Vil1age level
b) Sub centre
c) PHC
d) District

55. Statement not true about CSSM programme is:
a) Launched in August 1992
b) Package of services for health of children and mothers
c) Aims decreasing morbidity and mortality which are preventable by cost effective interventions
d) Activities are guided by Child Development Project Officer

56. Consider the following statements about. 'Baby Friendly Hospitals':
1. Initiate breast feeding within 4 hours following caesarean delivery
2. Exclusive breast feeding till 4 – 6 months of age 3. Breast feeding 4 hourly 4. No advertisement or promotional material for infant feeding should be allowed in the facility
Select the correct answer from codes given below:
A. Only 4 is correct
B. 1 and 2 are correct
C. 1,2 and 4 are correct
D. All are correct

57. All the following deaths are classified as maternal death except:
a) During abortion
b) During labour
c) During 3rd month of lactation
d) During 1st 42 days following delivery

58. In maternal mortality rate, denominator is:
a) 1000 live births.
b) 1000 births weighing over 1000 g
c) 1000 pregnancies
d) 1000 population

59, Maternal mortality ratio in India is estimated to be:
a) 0.5 / 1000 live births
b) 1.1 / 1000 live births
c) 3.4/ 1000 live births
d) 10 / 1000 live births

60. Most common cause of maternal mortality is:
a) Infection
b) Malnutrition
c) Toxaemia of pregnancy
d) Hemorrhage

61. All of the following are leading causes of maternal mortality in India except:
a) Congenital heart disease
b) Toxaemia of pregnancy
c) Hemorrhage
d) Sepsis

62. A village with a population of 10,000 has a birth rate of 36/ 1000 population. In one year have been 5 maternal deaths. The maternal mortality rate in this village is:
a) 0.5
b) 5
c) 13.8
d) 14.5

63. All of the following arc associated with increased risk of maternal mortality except:
a) High parity
b) Early age of marriage
c) Age < 20 years
d) Age < 30 years
e) Short birth interval

64. The denominator in still birth rate is:
a) Total live births
b) Total live births and abortions
c) Total live births weighing over 1000 g at birth
d) Total live births and still births weighing over 1000 g at birth

65. Perinatal mortality includes:
a) Stillbirths
b) Neonatal deaths
c) Stillbirths and early neonatal deaths
d) Stillbirths and neonatal deaths

66. Foetal deaths within 7 days of birth reflect:
a) Infant mortality rate
b) Perinatal mortality rate
c) Crude death rate
d) Net reproduction rate

67. Perinatal period is:
a) 27 weeks onwards of pregnancy
b) 20 - 32 weeks of pregnancy
c) 27 weeks onwards of pregnancy and I week postnatal period
d) 27 weeks onwards of pregnancy and 4 weeks postnatal period

68. Which of the following rates includes stillbirths in numerator?
a) Infant mortality rate
b) Neonatal mortality rate
c) Post neonatal mortality
d) Perinatal mortality rate

69. Criteria for late foetal death to calculate perinatal mortality includes:
a) Birth weight - 1000 gm
b) Gestational age 28 weeks
c) Crown-heel length 35 cm
d) All of the above

70. Perinatal mortality includes all except:
a) Late foetal deaths
b) Deaths during labor
c) Early neonatal deaths
d) Deaths up to 4 weeks

71. The most sensitive indicator of obstetrics and gynecology service is:
a) Infant mortality rate
b) Perinatal mortality rate
c) Crude deaths rate
d) Net reproduction rate

72. Weight of foetus delivered at 28 weeks of

gestation is around:
a) 1000 gm
b) 1500 gm
c) 800 gm
d) 2000 gm

73. Perinatal mortality in India by 2000 AD was around:
a) 40 -45
b) 60-65
c) 20-25
d) 30-35

74. Commonest cause of perinatal mortality is
a) Low birth weight
b) Congenital malformations
c) Respiratory infection
d) GIT infections

75. Numerator for neonatal mortality is:
a) All infant deaths up to 28 days
b) All infants less than or equal to 7 days
c) All infants under one year
d) All infant deaths between 28 days to one year

76. Deaths occurring within 4 weeks of birth are called:
a) Neonatal mortality
b) Perinatal mortality
c) Postnatal mortality
d) Infant mortality

77. The denominator for neonatal mortality rate is
a. Mid year population
b. Number of neonates in the area
c. Number of live births in year
d. Number of life births and stillbirths in year

78. Most common cause of neonatal mortality is:
a) Low birth weight
b) Hemolytic disease of newborn
c) Birth anoxia
d) Congenital anomalies

79. Consider the following cause of neonatal mortality:
1. Congenital anomalies
2. Birth injury
3. Convulsion
4. Hypothermia
5. Asphyxia
6. Sepsis
The three most important causes of early neonatal mortality would include:
A. 4,5 and 6
B. 1,2 and 5
C. 3, 4 and 6
D. 1, 3 and 5

80. The numerator for calculating post neonatal mortality rate is:
a) Total deaths of infants from 0 – 1 year age
b) Total deaths of infants from 0 – 1 month age
c) Total deaths of infants from 0- 7 days age
d) Total deaths of infants from 28th day to 1 year age

81. Most common cause of post neonatal mortality is:
a) Infection
b) Malnutrition
c) Birth injury
d) Congenital anomalies

82. Most sensitive indicator of health and level of living of people in a community is:
a) Maternal mortality rate
b) Infant mortality rate
c) Neonatal mortality rate
d) Perinatal mortality rate

83. Infant mortality rate is expressed as:
a) Rate per 100 live births
b) Rate per 1000 live births
c) Rate per 1000 the births weighing 1000 g at birth
d) Per I lac population

84. In India, infant mortality rate is highest in which state:
a) UP
b) Rajasthan
c) Orissa
d) Bihar

85. Infant mortality rate in India is per 1000

live births:
a) 70
b) 74
c) 64
d) 96

86. Most of deaths among infants occur:
a) During neonatal period
b) During weaning
c) During 6 - 12th moth
d) None of the above

87. Which of the following statement is true about Kerala state:
a) Lowest infant mortality male
b) Lowest birth rate
c) Highest female literacy rate
d) All of the above

88. Infant mortality is mainly due to:
a) Combined infection malnutrition
b) Congenital anomalies
c) Haemolytic disease of newborn
d) Birth asphyxia

89. % of infant deaths attributed to neonatal deaths are:
a) 25%
b) 50%
c) 70%
d) 80%

90. Single most important determinant of infant mortality is:
a) Birth weight
b) Age of mother
c) Birth order
d) Birth interval

91. The following may be related to infant mortality
1. Higher infant mortality is found among first birth as compared to 2nd and 3rd birth order
2. Larger the time interval between births, higher the risk of infant deaths
3. Bigger the family size more is risk of infant deaths
4. Higher the risk of infant deaths if delivered by indigenous dais Select the correct answer from the code given below:
A. 1,2 and 3
B. 2, 3 and 4
C. 1, 2 and 4
D. 1,3and4

92. All of the following are associated with high infant mortality except:
a) Birth order above 3
b) Multiple births
c) Low fertility
d) Mother age if below 20 and above 30

93. The number of doses of measles required assuming a wastage of 50% to immunize the target population in a village with a population 5,000, birth rate 301 1,000 and IMR of 100/1000 live births is:
a) 200
b) 250
c) 270
d) 320

94. The number of doses of IT required for I year to immunize all the pregnant women in a population of 1000 with birth rate 301 3000 is:
a) 30
b) 60
c) 90
d) 120

95. Child death rate includes deaths occurring in children:
a) 0 to 5 years
b) I to 5 years
c) I to 4 years
d) Up to 12 years

96. The denominator in under 5 mortality rate is:
a) Total number of children aged 1 - 5 years at the middle of the year
b) Number of live births in the same year
c) Total live + still births weighing over 1000 g at birth
d) None of the above

97. Child survival rate per 1000 live births is calculated by subtracting from 1000:

a) Infant mortality
b) Under 5 mortality
c) 1 - 4 years mortality
d) Post-neonatal mortality

98. The school health committee came into vogue in:
a) 1946
b) 1948
c) 1950
d) 1960

99. The key person for health education in schools is:
a) Health officer incharge of PHC
b) Health assistant
c) Public health nurse
d) School teacher

100.ln profound mental retardation IQ is:
a) 35 -49
b) 50-70
c) 20 - 34
d) Below 20

101.A 13-year-old with no father, runs from school and caught in a theft should be kept in
a) Foster home
b) Prison
c) Orphanage
d) Remand home

102.All are components of ICDS except:
a) Supplementary nutrition
b) Immunization
c) Nutrition and health education for women
d) Care and treatment of sick children

103. Administrative unit of ICDS project in rural areas is:
a) Primary health centre
b) Community development block
c) Zila parishad
d) All of the above

104.Grass root worker in ICDS scheme is:
a) Midwife
b) Angnanwadi worker
c) Lady health worker
d) Child development officer

105.Anganwadi centres are a part of:
a) ICDS scheme
b) Mid - day meal programme
c) School health programme
d) PHC

106.Non formal preschool education is a component of:
a) Supplementary feeding
b) ICDS scheme
c) School health programme
d) ESI scheme

107. Percentage of population above 60 years of age is
a) 4.5%
b) 6.5%
c) 8.5%
d) 3.8%

108.All are principle causes of illness in aged in India except:
a) Cataract
b) Arthritis
c) Bronchitis
d) Hypertension
e) Anemia

109.Infant mortality does not include:
a) Early neonatal mortality
b) Perinatal mortality
c) Post neonatal mortality
d) Late neonatal mortality

110. "Road to health card" upper line is:
a) 3rd percentile
b) 50th percentile
c) 80th percentile
d) 97th percentile

111.Second degree of under nutrition means:
a) Weight below 50~'0 of Harvard standard
b) Weight below 60~0 of Harvard standard
c) Weight between 60° and 81 % of Harvard standard
d) Weight between 60% and 71% of Harvard standard

112. Which country in the world was the first to introduce School Health Program?
a) France
b) Russia
c) USA
d) India

113. With reference to school health, which one of the following statements is not correct?
a) Per capita space for students in class room should not be less than 10 square feet
b) Desks should be plus type
c) Classroom should have sufficient natural light preferably from the left
d) There should be one urinal for 60 students and one latrine for 100 students

114. When an abandoned child is legally accepted by the couple, it is called as:
a) Remand home placement and foster home placement
b) Remand home placement and Borstal placement
c) Adoption and foster home placement
d) Adoption and remand home placement

MCH
1. C
2. B
3. D
4. A
5. D
6. A
7. D
8. C
9. D
10. C
11. D
12. B
13. D
14. B
15. C
16. A
17. D
18. D
19. B
20. B
21. A
22. D
23. C
24. D
25. D
26. C
27. B
28. B
29. B
30. B

31. B
32. D
33. A
34. D
35. A
36. B
37. B
38. C
39. C
40. B
41. D
42. A
43. C
44. B
45. B
46. C
47. D
48. B
49. C
50. B
51. B
52. D
53. A
54. B
55. D
56. C
57. C
58. A
59. C
60. D
61. A
62. C
63. B
64. D
65. C
66. B
67. C
68. C
69. D
70. D
71. B
72. A
73. D
74. A
75. A
76. A
77. C
78. A
79. B
80. D
81. A
82. B
83. B
84. C
85. B
86. A
87. D
88. A
89. B
90. A
91. D
92. C
93. C
94. B
95. C
96. B
97. B
98. D
99. D
100. D
101. D
102. D
103. B
104. B
105. A
106. B
107. B
108. E
109. B
110. B
111. D
112. D
113. B
114. C

Environment & hospital waste management

1.Ortho Toluidine test determines

a. Free chlorine
b. Combinaed chlorine
c. Chlorine demand
d. Both free and combined chlorine

2.Free chlorine is estimated by

a. Orthotoluidine test
b. OT arsenite test
c. Both the above

d. None of the above

3.Who standard for viral quality is fixed at plaque forming unit per liter
a. 1
b. 2
c. 3
d. 5

4.Recommended standard for bacterial water quality in small community supplies is
a. No coliform
b. No E coli in 100 ml
c. Coliform less than 10/100 ml
d. Coliform less than 1/100 ml

5.Highest desirable level of chloride in water is
a. 5 mg/lit
b. 75 mg/lit
c. 100 mg/lit
d. 200 mg/lit

6.Hihest desirable level of chloride in water is
a. 1 mEq/lit
b. 2 mEq/lit
c. 3 mEq/lit
d. 4 mEq/lit

7.Acceptable limit of gross alpha activity is
a. 10 pCi/1
b. 2 pCi/1
c. 3 pCi/1
d. 4 pCi/1

8.Acceptable limit of gross beta activity is
a. 10 pCi/1
b. 20 pCi/1
c. 30 pCi/1
d. 40 pCi/1

9.Nitrates in excess of --- may cause infantile methaemoglobinaemia
a. 15 mg/l
b. 25 mg/l
c. 35 mg/l
d. 45 mg/l

10.All of the following provide evidence of faecal pollution except
a. Faecal streptococci
b. Coliform
c. CI. tetani
d. Enterpathogenic virus

11.The least toxic organochlorine compound is
a. DDT
b. HCH
c. Dichlorovos
d. Pyrethrum

12.All of the following codenticides are considered to dangerous for use except
a. Phosphours
b. Zinc phosphate
c. Thallium sulfate
d. Arsenic trioxide

13.Fumigat used anti-rat campaigns in India is
a. Calcium cyanide
b. Carbon disulphide
c. Methyl bromide
d. Sulphur dioxide

14.Per captia allowance of water per day is recommended at
a. 70-80 lit
b. 80-120 lit
c. 120-150 lit
d. 150-200 lit

15.Which is true of rainwater
a. Hard
b. High mineral content
c. Erodes lead pipes
d. Has pathogenic agents

16.Disadvantages of deep well water are all except?
a. Much hard
b. Required pumping
c. High mineral content
d. Grossly contaminated

17.Guinea worm disease is more prevalent in areas with
a. Step well
b. Dug well
c. Artesian well

d. No covering

18.A sanitary well should be located at least- feet from source of contamination
a. 15
b. 25
c. 50
d. 75

19.All are features of sanitary well **except**
a. Parapet
b. Drain
c. Platform around the well
d. No covering

20.All of the following cause permanent hardness **expect**
a. Magnesium chloride
b. Magnesium sulphate
c. Magnesium nitrate
d. Magnesium bicarbonate

21.Level of hardness in soft water is – mEq/liter
a. Less than 1
b. 1-3
c. 3-60
d. Over 6

22.Permutit process removes
a. Temporary hardness
b. Permanent hardness
c. A + B
d. None of the above

23.Sodium permutit contains all **except**
a. Sodium
b. Chloride
c. Aluminum
d. Silica

24.The method which softens water to zero hardness is
a. Boiling
b. Clark's method
c. Addition of sodium carbonate
d. Base of exchange process

25.The most harmful radiation is
a. X-rays
b. Beta particles
c. Alpha particles
d. Gamma rays

26.Which of the following is deep penetrating radiation?
a. Alpha
b. Beta
c. Gamma rays
d. Photons

27.Which types of latrine use the device trap
a. Water seal
b. Dug hole
c. Chemical closet
d. Trench

28.A good trap should have effective seal of
a. 2.5 cm
b. 5 cm
c. 7.5 cm
d. 10 cm

29.The amount of sewage flowing in a system in 24 hours is called
a. Sewage rate
b. Dry weather flow
c. RCA index
d. Sludge

30.All the indicators of air pollution **except**
a. Soiling index
b. Mc Ardle index
c. Suspended particles count
d. SO2 concentration

31.CO2 content of air is measured by
a. Pettenkopfler's test
b. Horrock's test
c. Lamotte air sampler
d. None of the above

32.The best method for supplying water to a community is
a. Boling
b. Ozonization
c. Chlorination
d. $KmnO_4$

33.Sewage is said to be strong if biological oxygen demand is more than
a. 50 ppm
b. 100 ppm
c. 200 ppm
d. 300 ppm

34.The best method of purifying turbid water is
a. Using activated charcoal
b. Rapid sand filtration
c. Ozonization
d. Alum precipitation

35.Copper sulphate is utilized in water purification to decrease
a. Turbidity
b. Inorganic iron
c. Odor producing algae
d. Bactieral count

36.Leading soruce of air pollution is
a. Industry
b. Power plants
c. Transport vehcicle
d. Crop spraying

37.Digestion, air dyring, vaccum filtration and heat drying are associated with
a. Air pollution control
b. Water purification
c. Milk processing
d. Sludge treatment

38.Teh action of chlorine in disinfection of water depends on
a. Time
b. Temperature
c. pH
d. all of the above

39.The upper limit of pH above which clorine is not reliable as disinfection is
a. 7.5
b. 4.5
c. 6
d. 8

40.Which of the following **does not** indicate water pollution by faces
a. Ammonia
b. Nitrates
c. Nitrites
d. Chlorides

41.Coliforms are chosen as indicator of faecal pollution by faeces
a. Constant presence in faeces
b. Easily cultured
c. Survive longer than pathogens
d. All of the above

42.The disinfecting action of chlorine is mainly due to ---:
a. Chloride
b. Hypochlorous acid
c. Hypochlorite ion
d. Hydrogen

43.The recommended amount of free residual chlorine at end of 30 min is
a. 0.5 mg/ lit
b. 0.08 mg/ lit
c. 0.1 mg/ lit
d. 0.2 mg/ lit

44.Controlled tipping is a method of disposal of
a. Refuse
b. Sewage
c. Sullage
d. Dead bodies

45.Strength of sewage is expressed in terms of
a. E.coli count
b. Biochemical oxygen demand
c. Amount of nitrates
d. Suspended solides

46. Drinking water us best made free if Cyclops by
a. Filtration
b. Boiling
c. Chlorination
d. Ozonation

47.All are features of septic tank **except**
a. Ideal retention period – 48 hrs
b. Minimum capacity – 500 gallons
c. Aerobic oxidation takes place outside

d. Sludge is solids setting down

48.In a inosquito, the period between a blood meal until eggs are laid is called
a. Serial interval
b. Generation time
c. Extrinsic incubation period
d. Gonotrophic cycle

49.Gonotrophic cycle in tropical areas is about
a. 6 hrs.
b. 24 hrs.
c. 36 hrs.
d. 48 hrs.

50.Larva of ---- mosquitoes floats horizontally in water
a. Anopheles
b. Culex
c. Aedes
d. Mansonia

51.All of the following larvae possess siphon **except**
a. Anopheles
b. Culex
c. Aedes
d. Mansonia

52.The genus of mosquitoes which breed in fresh water tank is
a. Anopheles
b. Culex
c. Aedes
d. Mansonia

53.Mosquitoes which breed in dirty water collection are
a. Anopheles
b. Culex
c. Aedes
d. Mansonia

54.The optimum period of storage of river water is
a. 2-3 days
b. 7-10 days
c. 10-14 days
d. 2-3 weeks

55.The ideal contact period for chlorination is recommended to
a. 15 min
b. 30 min
c. 1 hour
d. 2 hour

56.Chlorination of water kills
a. Bactiera
b. Spores
c. Protozoal cysts
d. Helminthic ova

57.Horrock's apparatus estimates
a. Free chlorine
b. Combined chlorine
c. A + B
d. Chlorine demand

58.The unit measuring amount of radioactive energy absorbed per gram of tissue
a. Rontgen
b. Rad
c. Rem
d. Gray

59.100% fatality occurs with exposure to --- Rontgens
a. 100-200
b. 400-500
c. 600-700
d. 800-900

60.The maximum permissible dose of radiation should not exceed
a. rad/ yr
b. rad/ month
c. 5 rad / year
d. 10 rad / year

61.For good ventilation, the door and windows should have – the floor area
a. ¼
b. ¼
c. 2/5
d. ¾

62.The minimum per captia cubic space is fixed at

a. 100 c. ft
b. 500 c. ft
c. 100 c. ft
d. 1500 c. ft

63.The accepted standard for floor space for 1 person is
a. 50-70 sq. ft
b. 70-90 sq. ft
c. 90-100 sq. ft
d. 100 sq. ft

64.Waste water containing solid and liquid excreta is
a. Refuse
b. Garbage
c. Sullage
d. Sewage

65.the most satisfactory methods of refuse disposal where land is available is
a. Dumping
b. Controlled tipping
c. Composting
d. Incineration

66.Auger is required in which type of latrine
a. Bore hole
b. Dug well
c. Trench
d. Water seal

67.The depth of a dug well latrine is usually about
a. 5 ft
b. 7-10 ft
c. 10-12 ft
d. 20 ft

68.Mosquitoes which breed in artificial accumulation of water in and around houses are
a. Anopheles
b. Culex
c. Aedes
d. Mansonia

69.all are features of culex mosquitoes **except**
a. Can fly long distances
b. Highly antrophilic
c. Peak biting time – noon
d. Preferred biting site – leg

70.Which of the following is referred to as tiger mosquitoes?
a. Anopheles
b. Culex
c. Aedes
d. Mansonia

71.Which is **not true** of aedes aegypti
a. Females are fearless biters
b. Bite chiefly during day
c. Do not fly long distances
d. Not found in India

72.Under international health regulations, aedes aegypti index is kept at
a. 100
b. < 1
c. 3
d. 0

73.All of the following mosquito borne diseases are found in India **except**
a. Dengue
b. Chikungunya
c. Yellow fever
d. West Nile fever

74.Soruce reduction in mosquito control comprises of
a. Minor engineering methods
b. Genetic engineering techniques
c. Personal protection against bites
d. Space sprays

75.Mecahnism of action of mosquito larvicidal oil is
a. Stomach poison
b. Contact poison
c. Cuts off O_2 supply
d. Prevents adult from laying eggs

76.The best method for arthropod control involves
a. Environmental measures
b. Chemical
c. Biological control
d. Genetic control

77.Mosquiroes whose eggs are found attached to aquatic plants are
a. Anopheles
b. Culex
c. Aedes
d. Mansonia

78.Eggs of --- mosquitoes are cigar shaped
a. Anopheles
b. Culex
c. Aedes
d. Mansonia

79.Hard tick is involved in the transmission of all the following **except**
a. Tick typhus
b. Tularaemia
c. Viral tick fever
d. Q fever

80.Whcih of the following is transmitted by soft tick
a. Relapsing fever
b. Trench fever
c. Scrub typhus
d. Undulant fever

81.Trench fever is transmitted by
a. Flea
b. Louse
c. Tick
d. Mosquito

82.Rickettsial pox is transmitted by
a. Flea
b. Mite
c. Tick
d. Mosquito

83.Endemic typhus is transmitted by
a. Flea
b. Mite
c. Tick
d. Mosquito

84.Epidemic typhus is transmitted by
a. Flea
b. Mite
c. Tick
d. Mosquito

85.KFD is transmitted by
a. Flea
b. Mite
c. Tick
d. Mosquito

86.Which of the following is an efficient sarcopticide
a. 25% of Benzyl benzoate
b. 0.5 – 1% HCH
c. 55 tetmosal
d. All of the above

87.Teh average life of Cyclops is
a. 1 week
b. 1 month
c. 3 months
d. 1 year

88.The most satisfactory and permanent method of Cyclops control is
a. Regular chlorination
b. Abate – 1 mg/lit
c. Provision of sanitary wells
d. Provision of piped water supply

89.Which of the following stomach poison?
a. Pyrethrum
b. Paris green
c. DDT
d. Sulphur dioxide

90.Technical DDT contains
a. 50% para para isomer
b. 70-80% para para isomer
c. 50% para para isomer
d. 70-80% para para isomer

91.Residual action of DDT may last as long as
a. 1 month
b. 6 months
c. 12 months
d. 18 months

92.Of the following insecticides, which is considered as environment pollutant?

a. DDT
b. HCH
c. Malathion
d. Abate

93.Techical – HCH contains
a. 13-16% gamma isomer
b. 25% gamma isomer
c. 60-65% gamma isomer
d. 99% gamma isomer

94.Lindane is composed of
a. 13-16% gamma isomer
b. 25% gamma isomer
c. 60-65% gamma isomer
d. 99% gamma isomer

95.The organophosphours compound with least toxicity is
a. Abate
b. Malathion
c. Dizinon
d. Fenthion

96.Teh insecticide extensively used in India to control A stephensii on wells is
a. Abate
b. Malathion
c. Diazion
d. Fenthion

97.The insecticide which can be combined with solid substances likely wax is
a. Diazinon
b. Fenthion
c. Dichlorovous
d. Pyrethrum

98.Paris green kills mainly ------ larvae
a. Anopheles
b. Culex
c. Aedes
d. Mansonia

99.Disadvantages of Organo chlorine compounds include
a. Long residual effect
b. Water contamination
c. Increased risk of resistance
d. All of the above

100.Bactiera which has been tried as larvicides are
a. Bacillus sphaericus
b. Bacillus thuringiensis
c. Both the above
d. None of the above

101.the most extensively used insecticide for ultra low volume spraying is
a. DDT
b. Pyrethrum
c. Malathion
d. Lindane

102.Source of pyrethrum extract is
a. Pyrethrum flower
b. Synthetic pyrethroids
c. Larvivorous fish
d. None of the above

103.Concentration of abate for effective larvicidal action is
a. 0.1 ppm
b. 0.5 ppm
c. 1 ppm
d. 2 ppm

104.Diseases transmitted by sand fly include
a. Kalazar
b. Sandfly fever
c. Oriental sore
d. All of the above

105.Lice are vectors of the following diseases **except**
a. Epidemic typhus
b. Relapsing fever
c. KFD
d. Trench fever

106.Treatment of choice for pediculosis at present is
a. DDT
b. HCH
c. Malathion
d. Carbaryl

107.Xenopsylla cheopis is otherwise called
a. Rat flea

b. Sand flea
c. Black fly
d. Sand fly

108.Rate flea is involved in transmission of
a. Plague
b. Typhus
c. Both of the above
d. None of the above

109.Average number of fleas of all species per rodent is
a. General flea index
b. Specific flea index
c. Incidence of flea species
d. Rodent infestation rate

110.The importance of flea indices is that they indicate
a. Imminent plague outbreak
b. Present of rodents
c. Severity of plague epidemics
d. Potential explosiveness should outbreak occur

111.Major mode of transmission of plague by rat flea is
a. Vomit drop
b. Bite of blocked fleas
c. Mechanical transmission
d. Through faces

112.Which of the following is an efficient flea repellant
a. Dimethyl phthalate
b. Diethyl toluamide
c. Ethyl hexanediol
d. Indalone

113.Vectors of chagas disease are
a. Tsetse fly
b. Reovid bug
c. Soft sick
d. Sand flea

114.Following are properties of slow sand filter **except**
a. Occupies large areas
b. Pre-treatment of raw water by coagulation is not required
c. Purification is by biological process
d. Cleaning is by backwashing

115.Which of the following is used to destroy algae in water
a. Copper sulphate
b. Potassium permanganate
c. Hypochlorite
d. Bleaching power

116.Noise pollution presents clinically as all **except**
a. Increased urinary output
b. Decrease sexual activity
c. Deafness
d. Insomnia

117.Which statement is not true about chlorination of well
a. Chlorine demand has to be estimated
b. Volume of water has to be determined
c. Bleaching power solution has to be added immediately
d. A contact period of 1 hour is allowed

118.For disinfecting large bodies of water, the most efficient and cost-effective method of applying chlorine is
a. Bleaching powder
b. Chloramines
c. Chlorine gas
d. Perchloron

119.Corrected effective temperature is labeled as comfortable if it is (in °F)
a. Between 70 and 76
b. Between 77 and 80
c. Between 81 and 82
d. Above 83

120.Quality standards proposed by the Indian central pollution control board are based on limits of concentration of
a. SO_2 and SPM concentration
b. SO, SPM and oxides of nitrogen
c. SPM, SO2, oxides of nitrogen and oxidants
d. SPM, SO2, oxides of nitrogen and carbon monoxide

121.Genetic control of mosquitoes can be done by

a. Nuclear distortion
b. Gene mutation
c. Cytoplasmic incompatibility
d. Chromosomal aberrations

122.Which one of the following is contact organophosphorus insecticide?

a. BHC
b. Abate
c. Pyrethrum
d. Paris green

123.The classification of hazardous hospital wastes have been done in how many categories

a. 6
b. 8
c. 12
d. 10

124.Shapres can be disposed off in the following method

a. Deep burial
b. Incineration / burning
c. Mutilation / shredding
d. Recycling

E & H W M

1. D
2. C
3. B
4. A
5. D
6. C
7. C
8. C
9. D
10. C
11. A
12. B
13. A
14. D
15. C
16. D
17. A
18. C
19. D
20. D
21. A
22. C
23. B
24. D
25. C
26. C
27. A
28. A
29. B
30. B
31. A
32. C
33. D
34. D
35. BC
36. C
37. D
38. D
39. D
40. D
41. D

42. B
43. A
44. A
45. B
46. A
47. A
48. D
49. D
50. A
51. A
52. A
53. B
54. C
55. C
56. A
57. D
58. B
59. C
60. C
61. C
62. B
63. B
64. D
65. B
66. A
67. C
68. C
69. C
70. C
71. D
72. B
73. C
74. A
75. C
76. A
77. D
78. C
79. D
80. A
81. B
82. B
83. A
84. D
85. C
86. D
87. C
88. D
89. B
90. D
91. D
92. A
93. A
94. D
95. B
96. A
97. C
98. A
99. D
100. C
101. C
102. A
103. C
104. D
105. C
106. C
107. A
108. C
109. A
110. D
111. B
112. B
113. C
114. D
115. A
116. A
117. C
118. A
119. B
120. C
121. C
122. B
123. D
124. D

OCCUPATIONAL HEALTH

1. What does 'Ergonomics' mean?
a Economics for the poor
b fitting the worker to the job
c fitting the job to the worker
d Salary structure of the worker

2. The commonest physical health hazard in most industries is:

a Heat
b Noise
c Humidity
d Ionizing radiation

3. Conjunctivitis and keratitis (reversible) is caused due to the exposure to:
a Heat
b Vibration
c Ultraviolet radiation
d Ionizing radiation

4. Genetic changes may occur due to the exposure to:
a Heat
b Noise
c Ionizing radiation
d Ultraviolet radiation

5. The international Commission of Radiological protection has set the maximum permissible level of occupational exposure at per year to the whole body:
a 5 rem
b 10 rem
c 50 rem
d 100 rem

6. Occupational hazard related to cold are all except:
a Chilblains
b Erythrocyanosis
c frostbite
d Caisson's disease

7. Which one of the following is NOT the direct effect of heat exposure in an industry:
a Heat exhaustion
b Heat stroke
c Erythrocyanosis
d Bums

8. Pneumoconiosis is caused by all but one of the following type of dust:
a Inorganic dust
b Organic dust
c Soluble dust
d Insoluble dust

9. Size of respirable dust is below:
a 0.1 micron
b 1 micron
c 5 microns
d 10 microns

10. All of the following are inorganic dusts except:
a Silica
b Cotton
c Coal
d Asbestos

11. Which of the following disease may be encountered as occupational hazard:
a Leptospirosis
b Brucellosis
c Anthrax
d All of the above

12 Match the following:
I. Anthracosis A. Sugar cane
2. Siderosis B. Cotton
3. Bagassosis C. Coal dust
4. Bysinosis D. Iron
a. 1:c, 2: d, 3:a, 4:d
b. 1 :c, 2:d, 3:a, 4:b
c. 1:c, 2:d, 3:b, 4:a
d. 1 :d, 2:b, 3:c, 4:a

13. All the following are pneumoconiosis except:
a Siderosis
b Bagassosis
c farmer's lung
d Psittacosis

14 Pneumoconiosis is caused by all except:
a Coal dust
b Silica
c Chromium
d Asbestos

15. Once pneumoconiosis occurs there is no cure for it:
(True/ False)

16. Incidence of pneumoconiosis depends on:
a Size of particle

b Duration of exposure
c Chemical composition
d Concentration of dust in air
e All of the above

17. One of the following pneumoconiotic disease occurs in gold mines:
a Anthracosis
b Silicosis
c Bagassosis
d.None of the above

18. Tuberculosis occurs commonly in which of the following pneumoconiosis:
a Silicosis
b Anthracosis
c Bagassosis
d Asbestosis

19. Which is true regarding silicosis:
a. First reported in India form Kolar gold mines, Kamataka
b. X-ray chest shows "Snow-storm" appearance
c. Silicotics are prone to silico tuberculosis
d. All of the above

20. All are features of silico - tuberculosis except:
a. High sputum AFB +ve
b. Children of such cases do not get disease
c. Impairment of total lung capacity
d. Nodular fibrosis

21 Best control measure available to combat silicosis is:
a. Rigorous dust control measures
b. Periodic X-ray chest
c. Preplacement examination
d. Adequate personal hygiene

22.Which type of worker in cotton industry is commonly affected in byssinosis:
a. Growers
b. Spinners
c. Weavers
d. Dyers

22 Byssinosis is seen in:
a Cement factories
b Textile industries
c Iron factories
d Grain fields

23 Thermoactinomyces saccharin is associated with:
a Byssinosis
b Bagassosis
c Anthracosis
d Farmer's lung

24 Prevention of bagassosis includes spraying the bagasse with:
a 1 % acetic acid
b 2% acetic acid
c I % propionic acid
d 2% propionic acid

25. Which of the following types of asbestos is associated with mesothelioma of pleura?
a Chrysotile
b Amosite
c Crocidolite
d Anthrophylite

26. Asbestosis is associated with all except:
a Cancer of gastrointestinal tract
b Cancer of lungs
c Mesothelioma of pleura
d Cancer of urinary bladder

27 X-ray chest shows 'ground glass appearance' in lower two-thirds of lung in:
a Anthracosis
b Silicosis
c Asbestosis
d Farmer's lung

28. Farmer's lung results from exposure to:
a Sugarcane dust
b Cotton fibre dust
c Grain dust
d Tobacco

29. Micropolyspora faeni is the main cause for:
a Byssinosis
b Bagassosis
c Anthracosis
d Farmer's lung

30. Lead is the most used metal commonly in the industries because of:
a Low boiling point
b Anticorrosive
c Least toxic
d Easily mixes with other metals

31. Clinical symptoms are present when blood lead level is more than:
a 25 μg/ 100 ml
b 50 μg/ 100 ml
c 75 μg/ 100 ml
d 100 μg/ 100 ml

32 Least toxic lead compound among the following is:
a Lead arsenate
b Lead oxide
c Lead carbonate
d Lead sulphide

33 Lead poisoning in industries commonly occurs by:
a. Inhalation
b. Ingestion
c. Skin absorption
d Conjunctival route

34 Toxic effects of inorganic lead exposure includes all except:
a Abdominal colic
b Blue line on gums
c Wrist drop
d Mental confusion
e Stippling of RBC

35 Useful screening test for lead is measurement of:
a Coproporphyrin in urine
b Amino levulinic acid in urine
c Lead in blood
d Lead in urine

36 All of the following are notifiable under Factories act except:
a Silicosis
b Anthracosis
c Bagassosis
d Lead poisoning

37 Most common occupational cancer seen is:
a Bladder
b Lung
c Skin
d Leukemia

38 The substances associated with lung cancer include all except:
a Asbestos
b Nickel
c Coal tar
d Silica

39 The cancer seen in aniline industry workers is:
a Skin cancer
b Lung cancer
c CA bladder
d CA rectum

40 All of the following are bladder carcinogens except:
a Beta naphthylamine
b Benzidine
c Auramine
d Benzol

41 All are characteristics of occupational cancer except:
a. Appearing after prolonged exposure
b. Age incidence is earlier than that for cancer in general
c. Cessation of exposure arrests development of cancer
d. Localization of tumor for anyone occupation is fairy constant

42 Sickness absenteeism is a useful index to assess:
a State of health of workers
b Worker management relationship
c Working environment
d Sincerity of workers

43 Minimum area in cubic feet recommended for a work is:

a 100
b 250
c 500
d 600

44 Pre-placement examination for industrial workers means:
a Examination of workers at the time of employment
b Examination of workers everyday before going to job
c Examination of workers periodically while on job
d None of the above

45 All of the following form part of occupational health history except:
a History of previous occupation
b Exposure to dust
c Childhood immunization
d Safety measures employed in industry

46 Which of the following is undesirable condition for a lead industry?
a Anemia
b Peptic ulcer
c Nephritis
d All of the above

47 Of the following exposure which requires daily examination of workers
a Lead
b Arsenic
c Dichromate
d Radium

48 The rationale behind notification of occupational diseases is to:
a Initiate measures for protection of workers
b Initiate measures for prevention
c Investigate working condition
d All of the above

49 Phossy jaw is caused by occupational exposure to:
a Asbestos
b Phosphorus
c Mercury
d Lead

50 The Indian Factories Act of 1948 was latest amended in:
a 1984
b 1975
c 1987
d 1989

51 Factories Act, 1976 defines factory as an establishment employing
a 10 or more workers where power is used
b 30 or more workers where power is not used
c 20 or more workers where power is used
d Only skilled workers

52 Factories Act applies to whole of India except:
a Andhra Pradesh
b Jammu and Kashmir
c Sikkim
d Rajasthan

53 'Safety officers' have to be appointed in factories where number of workers is more than:
a 500
b 1000
c 2000
d 5000

54 Factories Act recommends provision of crèche if number of women workers exceeds:
a 10
b 30
c 60
d 100

55 Which of the following are provided under the 'Indian Factories Act':
1. Disablement benefit
2. Appointment of certifying surgeons
3. Rebate under income tax on contribution to factories act account
4. Prohibition of employment of children below the age of 14 years Select the correct answer using the codes given below:
a 1 and 3
b 2 and 4
c 1, 2 and 3

d all of the above

56 Under factories Act (1976) employment of children is prohibited below age of
a 12 years
b 14 years
c 15 years
d 16 years

57. Maximum permitted working hours per week per worker under Factories Act is:
a 40
b 44
c 48
d 56

58. Total working hours per week per worker including overtime should not exceed:
a 40
b 48
c 60
d 72

59. Number of working hours per day per worker in a factory should not exceed:
a 7
b 8
c 9
d 10

60. Under Factories Act (1976) notifiable disease include all except
a Byssinosis
b Asbestosis
c Sarcoidosis
d Occupational dermatitis

61. The ESI Act came into being in:
a 1948
b 1952
c 1962
d 1975

62. The ESI Act of 1948 was amended in:
a 1954 and 1965
b 1964 and 1975
c 1974 and 1979
d 1975 and 1984 and 1989

63. The provisions of ESI Act 1975 do not extend to:
a Hotel and restaurants
b Cinemas and theatres
c Newspaper establishment
d Sugar factories

64. The ESI Act covers employees earning up to:
a Rs. 15000/ month
b Rs. 5000/ month
c Rs. 6500/ month
d Rs. 7500/ month

65 SI Corporation works under:
a Ministry of Labour
b Ministry of Health
c As autonomous body
d Respective State Government

66 Financial contributions for ESI comes /Tom:
a Grant form Central and State Government
b Employers
c Employees
d All of the above

67 The employer's contribution to ESIC is
a 1.5% of the wages
b 4.75% of the wages
c 8% of the wages
d 12% of the wages

68 The benefits available under the ESI Act is/ are:
a Medical benefit
b Maternity benefit
c Dependent benefit
d All of the above

69 Under ESI, service dispensaries are established in areas where employees family unit is more than:
a 500
b 750
c 1000
d 2000

70 Under which benefit, the ESI beneficiary gets the O.P.D. care?

a Medical benefit
b Sickness benefit
c Dependent's benefit
d All of the above

71 Restricted medical care in ESIC means:
a Only O.P.D. services
b O.P.D. services as well as hospitalization
c Only laboratory facilities are not provided
d O.P.D., hospitalization and laboratory services

72 'Expanded medical care' under medical benefit of ESI means all except:
a Out-patient care
b Hospitalization
c Immunization services
d Family planning services

73 Under ESI, sickness benefit is payable for a maximum period of _____/ year
a 25 days
b 56 days
c 91 days
d 124 days

74 Extend sickness benefit is payable for
a 91 days
b 124 days
c 309 days
d Two year

75 Extended sickness benefit under ESI Act. Is available for all except:
a Tuberculosis
b Leprosy
c Diabetes mellitus
d Ankylosing spondylitis

76 Which is not true a feature of sickness benefit under ESI Act:
a. Periodical cash payment
b. Full daily wages given as cash
c. Person receiving the benefit should receive treatment provided under the act
d. 50"/0 of average daily wages given as cash

77 What is the doctor population ratio under ESI scheme?
a. 1:1324
b. 1 :2349
c. 1:2148
d. 1:585

78 Which of the following statement is not true for ESIC?
a. Funeral benefit @Rs2500
b. Dentures, spectacles & hearing aid provided free to incapacitated due to employment injury
c. Disablement benefit @80% of wages
d. Maternity benefit for' 2 weeks for confinement.

79 Which of the following is not a benefit to the employer in ESIC?
a. No responsibility for the employees health
b. Exemption from applicability of Workmen's Compensation Act. 1923
c. Healthy work force
d. Rebate under Income tax act.

80 Pneumoconiosis is caused by all except:
a. Silica
b. Coal dust
c. SO_2
d. Tobacco

81 Asbestosis causes all except:
a. Mesothelioma
b. Calcified pleural plaque
c. Pneumoconiosis
d. Farmer's lung

26. D
27. C
28. C
29. D
30. A,B,D
31. C
32. D
33. A
34. D
35. A
36. C
37. C
38. D
39. C
40. D

Occupation Health

1. C
2. A
3. C
4. C
5. A
6. D
7. C
8. C
9. C
10. B
11. D
12. B
13. D
14. C
15. TRUE
16. E
17. B
18. A
19. D
20. A
21. A
22. B
23. B
24. D
25. C
41. C
42. A
43. C
44. A
45. C
46. D
47. C
48. D
49. B
50. C
51. A
52. B
53. B
54. B
55. B
56. B

57. C
58. C
59. C
60. C
61. A
62. D
63. A
64. A
65. A
66. D
67. B
68. D
69. C
70. A
71. A
72. ALL CORRECT
73. C
74. D
75. B
76. B
77. D
78. C
79. A
80. C
81. D

Health care of the community

1.Under the MCH program, the female multipurpose worker perform, the following duties **except:**

a. Makes at least three antenatal visits
b. Distributes packets of iron and vit B_{12}
c. Gives 2 doses of TT
d. Makes at least one post natal visit

2.one of the following is not a voluntary health agency

a. Family planning association of India
b. Indian council of child welfare
c. Ford foundation
d. Rockfeller foundation

3.activites of TB association of India include all **except**

a. Organizing a TB seal campaign every year to raise funds
b. Training of doctors, health visitors & social workers
c. Promotion of health education
d. None of the above

4.Functions of dai are all **except**

a. TT injection
b. Delivery
c. Health education
d. Registration

5.Unicef provides all **except**

a. Child immunization
b. Child health education
c. Immunization
d. Family planning

6.in the sub-centres vaccine is;

a. Stored for one month
b. Not stored at all
c. Stored for one week
d. Stored in deep freezers
e. Stored in refrigerators

7.The first thing to do in studying community health work is

a. Talk with medical officers
b. Start directly
c. Talk with the public
d. Use records only

8.ROME scheme was recommended by

a. Chaddah committee
b. Kartar singh committee
c. Srivastava committee

d. Mudaliar committee

9.Who theme health care begins at home was given in the year
a. 1977
b. 1979
c. 1963
d. 1987

10.All of the following are functions of a PHC **except**
a. Reporting of births and deaths
b. Providing supplementary nutrition to children under 5 years of age
c. Training of dais and VHGs
d. Health education

11.Elemetns of primary health care include all of the following **except**
a. Adequate supply of safe water and basic sanitation
b. Provision of essential drugs
c. Sound referral system
d. Health

12.Primary health care includes all of the following **except**
a. Immunization services
b. Family planning services
c. Specialized services
d. Health education

13.sub center in a hilly area should cater to a population of
a. 1000
b. 2000
c. 3000
d. 5000

14.PHC can be differentiated from the dispensary by
a. Provides integrated health services
b. Provides essential care
c. Headed by a medical officer
d. Located in rural areas

15.Anganwadi workers are under
a. Ministry of health and family welfare
b. Ministry of labour
c. Ministry of human resource development
d. PHC

16.All are grass root level workers except
a. Anganwadi workers
b. Traditional birth attendants
c. Village health guides
d. Health assistant

17.What is the current level of beds per 10000 population in India?
a. 1.7
b. 2.3
c. 0.7
d. 0.4

18.a community health center
a. Is controlled by the panchayat
b. Covers a population of 1.2 lacs
c. Has specialist in ophthalmology
d. Is responsible for training of community health volunteers

19.The suggested norm of doctor to population is
a. 1 per 5000
b. 1 per 2500
c. 1 per 3500
d. 1 per 4500

20. Community health guide performs all the functions except
a. Collects bloods slides from fever cases
b. Provides ORS packets
c. Treats minor ailments
d. Immunizes children

21.Which of the following sets of village level workers bridge the gap between the government agencies and people in the health care delivery?
a. Male and female health workers
b. Village health guides and trained dais
c. Male health supervisor and female health supervisor
d. Anganwadi workers and village agricultural workers

22.No smoking day is observed on
a. 7th April
b. 31st May
c. 23rd May
d. 21st January

23.Health universities were set up under directions of which committee?
a. Bhore committee
b. Bajaj committee
c. Krishnan committee
d. Srivastava committee

24.A female multipurpose workers does not do
a. Distribute condoms
b. Malaria surveillance
c. Birth & death statistics
d. Immunization of mothers

25.The growth monitoring of a child at anganwadi is meant for
a. Detection of healthy babies
b. Diagnosis of growth retardation
c. Providing appropriate nutritional supplement
d. Estimation of nutritional problem

26.In urban areas, type B health posts cater to a population of
a. >5000
b. 5000-10000
c. 10000-20000
d. >20000

27.IPP stands for
a. International population parameters
b. Integrated project for peace and development
c. Indian population project
d. Intergovernmental panel on prevention of disease

28.In the report health care in India the road ahead by confederation of Indian industry and Mckinsey, the study sites India has – beds per 1000 population
a. 1.2
b. 1.3
c. 1.5
d. 2.1

29.The only company in India that provides exclusive health insurance cover only
a. Universal insurance company
b. Star insurance
c. Reliance insurance
d. Allianz insurance

30.Community health centers have all of the following except
a. Medical specialist
b. Lab technicians
c. Ophthalmologist
d. Gynaecologist

Health care of the community

1. C
2. B
3. D

4. A
5. D
6. B
7. C
8. C
9. A
10. B
11. C
12. C
13. C
14. A
15. C
16. D
17. C
18. B
19. C
20. C
21. A
22. B
23. B
24. B
25. B
26. B
27. C
28. C
29. B
30. C