LIFE SCIENCE

Civil Services Examination
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**Health and Diseases**

**Foodborne Diseases**

The term “foodborne disease” is defined as: “A disease, usually either infectious or toxic in nature, caused by agents that enter the body through the ingestion of food.” With the increase in urbanization, industrialization, tourism and mass catering systems, foodborne diseases are on the increase throughout the world. Foodborne diseases may be classified as:

A. Foodborne intoxications

1. Due to naturally occurring toxins in some foods
   (a) Lathyism (beta oxalyl aminoalanine)
   (b) Endemic ascitis (Pyrrolizidine alkaloids).

2. Due to toxins produced by certain bacteria
   (a) Botulism
   (b) Staphylococcus poisons

3. Due to toxins produced by some fungi
   (a) Aflatoxin
   (b) Ergot
   (c) Fusarium toxins

4. Foodborne chemical poisoning
   (a) Heavy metals, e.g., mercury (usually in fish), cadmium (in certain shellfish) and lead (in canned food)
   (b) Oils, petroleum derivatives and solvents (e.g., Tryoresyn phosphate or TCP)
   (c) Migrant chemicals from package materials
   (d) Asbestos
   (e) Pesticide residues (DDT, BHC)

B. Foodborne infections

Group

1. Bacterial diseases Examples of illness Typhoid fever, Paratyphoid fever, Salmonellosis, Staphylococcal intoxication, Cl.perfringens illness, Botulism, B.cereus Food Poisoning, E.coli diarrhoea, Noncholera vibrio illness, V. parahaemolyticus infection, Streptococcal infection, Shigellosis Brucellosis

2. Viral diseases Viral hepatitis, Gastroenteritis

3. Parasites Taeniasis Hydatidosis, Trichinosis, Ascariasis, Amoebiasis, Oxyuriasis

1. Neurolathyism

   - The cause of neurolathyism is a toxin, Beta oxalyl amino alanine (BOAA) which is found in the seeds of the pulse, L.sativus (Khesari dhal).
   - Neurolathyism is a public health problem in certain parts of the country where this pulse is eaten

Lathyism

   - Lathyism is a paralyzing disease of humans and animals.
   - In the humans it is referred to as neurolathyism because it affects the nervous system, and in animals as osteolathyism (odoratism) because the pathological changes occur in the bones resulting in skeletal deformities.
   - Neurolathyism is a crippling disease of the nervous system characterized by gradually developing spastic paralysis of lower limbs, occurring mostly in adults consuming the pulse, Lathyrus sativus in large quantities.
   - The problem Neurolathyism is prevalent in parts of Madhya Pradesh, Uttar Pradesh, Bihar and Orissa.
   - It has also been reported in Maharashtra, West Bengal, Rajasthan, Assam and Gujarat where the pulse is grown.
   - The magnitude of the problem can be assessed from the fact that at one time in Rewa and Satna districts of Madhya Pradesh alone, there were 25,000 and 32,000 cases respectively.
• According to reports, there are no fresh outbreaks of the disease in endemic areas. This is attributed to the shifting trends in agronomical practices in the region.
• Lathyrisim has also been reported to occur in Spain and Algeria where Lathurus is eaten.
• The pulse Lathurus sativus is commonly known as “Khesari dhal”.
• It is known by local names such as Teora dhal, Lak dhal, Batra, Gharas, Matra etc.
• The seeds of lathurus have a characteristic triangular shape and grey colour. When dehusked the pulse looks similar to red gram dhal or bengal gram dhal. Like other pulses, lathurus is a good source of protein, but for its toxin which affects the nerves.
• It is eaten mostly by the poor agricultural labourer because it is relatively cheap.
• Studies have shown that diets containing over 303 of this dhal if taken over a period of 26 months will result in neurolathyrism.

The toxin
• The toxin present in lathurus seeds has been identified as Beta oxaly amino alanine (BOM).
• It has been isolated in crystalline form and is water soluble~ this property has been made use of in removing the toxin from the pulse by soaking it in hot water and rejecting the soak water.
• Studies indicate that there is a blood brain barrier to this toxin. In order to overcome this barrier, the pulse must be eaten in large amounts over a period of time for 2 months or more.

The disease
• The disease affects mainly young men between the age of 15 to 45 years and manifests itself in stages:
  (a) Latent stage: The individual is apparently healthy, but when subjected to physical stress exhibits ungainly gait.
  This stage is considered important from the preventive aspect, since at this stage, if the pulse is withdrawn from the diet, it will result in complete remission of the disease.
  (b) Nostick stage: the patient walks with short jerky steps without the aid of a stick. A large number of patients are found in this stage.
  (c) One stick stage: The patient walks with a crossed gait with a tendency to walk on toes. Muscular stiffness makes it necessary to use a stick to maintain balance.
  (d) Two stick stage: the symptoms are more severe. Due to excessive bending of knees and crossed legs, the patient needs two crutches for support. The gait is slow and clumsy and the patient gets tired easily after walking a short distance.
  (e) Crawler stage: Finally the erect posture becomes impossible as the knee joints cannot support the weight of the body. There is atrophy of the thigh and leg muscles. The patient is reduced to crawling by throwing his weight on his hands.

Interventions
The possible interventions for the prevention and/or control of lathyrisim are:
  (a) Vitamin C prophylaxis: Although this condition is believed to be irreversible, in certain instances the damages could be repaired by the daily administration of ascorbic acid for a week or so.
  (b) Banning the crop: This is an extreme step not feasible for immediate implementation. The Prevention of Food Adulteration Act in India has banned lathurus in all forms whole, split or flour.
  But the ban is not operative where it is needed, viz. Madhya Pradesh, Bihar, Orissa and Gujarat where the pulse is widely grown.
  If however, it is not possible to avoid consuming khesari dhal, it is desirable that the proportion of the dhal should never form more than a quarter of the total amount of cereals and pulses eaten per day.
  (c) Removal of toxin
  1. Steeping method: Since the toxins are water soluble, they can be removed by soaking the pulse in hot water. This method can be practised at home. A large quantity of water is boiled and the pulse is soaked in hot water for 2 hours~ after which the soaked water is drained
off completely. The pulse is washed again with clean water, then drained off and dried in the sun. The pulse is then used for consumption. The drawback with this method is that it entails loss of vitamins and minerals.

(2) Parboiling: An improved method of detoxicating the pulse is “parboiling” as is done in the case of parboiled rice. This technique is suitable for large scale operation. Simple soaking in lime water overnight followed by boiling is credited to destroy the toxin. This treatment also destroys trypsin inhibitors. Lime is easily available as it is used with betel leaves.

(c) Education: The public must be educated on the dangers of consuming this pulse and the need for removing its toxin before consumption.

(d) Genetic approach: Certain strains of lathyrus contain very low levels of toxin (0.1%) The selective propagation and cultivation of such strains may be the most effective way to eradicate lathyris without any drastic change in the food habits of the people.

Low toxin varieties can be obtained from the Indian Agricultural Research Institute, New Delhi.

(e) Socioeconomic changes: In the final analysis, it is only socioeconomic changes or overall development that can root out lathyrism.

2. Aflatoxins

- Aflatoxins are a group of mycotoxins produced by certain fungi, Aspergillus flavus and A. parasiticus.

- These fungi infest food grains such as groundnut, maize, parboiled rice, sorghum, wheat, rice, cotton seed and tapioca under conditions of improper storage, and produce aflatoxins of which B1 and G1 are the most potent hepatotoxins, in addition to being carcinogenic.

- The most important factors affecting the formation of the toxin are moisture and temperature.

- Moisture levels above 16 per cent and temperatures ranging from 11 to 37°C favour toxin formation.

- Aflatoxicosis is quite a public health problem in India.

- The report (1975) of 400 cases of aflatoxin poisoning including 100 deaths from Banswada and Panchmahal districts of Rajasthan and Gujarat respectively highlight the problem in India.

- Control and preventive measures: A crucial factor in the prevention of fungal contamination of foodgrains is to ensure their proper storage after drying. Moisture content should be kept below 10 per cent.

- If the food is contaminated, it must not be consumed.

- It is also essential to educate the local population on the health hazards of consuming contaminated food grains.

3. Ergot

- Unlike Aspergillus, ergot is not a storage fungus, but a field fungus.

- Food grains such as bajra, rye, sorghum, and wheat have a tendency to get infested during the flowering stages by the ergot fungus (C. avicesps purpurea).

- Fungus grows as a blackish mass and the seeds become black and irregular and are harvested along with food grains.

- Consumption of ergot infested grain leads to ergotism.

- Sporadic outbreaks of ergot poisoning in human population have been reported from time to time in areas where bajra is consumed as a staple.

- The symptoms are acute but rarely fatal and include nausea, repeated vomiting, giddiness and drowsiness extending sometimes for periods upto 24 to 48 hours after the ingestion of ergoty grain.

- In chronic cases, painful cramps in limbs and peripheral gangrene

- However, the long term effects of consuming small amounts of the toxin are not known.

- A disquieting feature is that the recently introduced high yielding varieties of bajra are more susceptible to infestation.

- Ergot infested grains can be easily removed by floating them in 20 per cent salt water.
• They can also be removed by handpicking or air floatation. The upper safe limit for the ergot alkaloids has been estimated to be 0.05 mg per 100 grams of the food material.

4. Epidemic dropsy
• From time to time, outbreaks of “epidemic dropsy” are reported in India.
• The cause of epidemic dropsy was not known until 1926, when Sarkar ascribed it to the contamination of mustard oil with argemone oil.
• Isolated a toxic alkaloid, sanguinarine from argemone oil and found out its chemical formula.
• This toxic substance interferes with the oxidation of pyruvic acid which accumulates in the blood.
• The symptoms of epidemic dropsy consist of sudden, bilateral swelling of legs, often associated with diarrhoea.
• Dyspnea, cardiac failure and death may follow. Some patients may develop glaucoma.
• The disease may occur at all ages except breastfed infants.
• The mortality varies from 550 per cent. The contamination of mustard or other oils with argemone oil may be accidental or deliberate.
• Seeds of Argemone mexicana (prickly poppy) closely resemble mustard seeds. The plant grows wild in India.
• It has prickly leaves and bright yellow flowers.
• Crops of mustard are gathered during March, and during this period, the seeds of argemone also mature and are likely to be harvested along with mustard seeds.
• Sometimes unscrupulous dealers mix argemone oil with mustard or other oils. Argemone oil is orange in colour with an acrid odour.
• The following tests may be applied for the detection of argemone oil:
  1. Nitric acid test: A simple test is to add nitric acid to the sample of oil in a test tube. The tube is shaken and the development of a brown to orange-red colour shows the presence of argemone oil. The nitric acid test is positive only when the level of argemone oil is about 0.25 per cent.
  2. Paper chromatography test: This is the most sensitive test yet devised. It can detect argemone oil up to 0.0001 per cent in all edible oils and fats. The accidental contamination of mustard seeds can be prevented at the source by removing the argemone weeds growing among oilseed crops.
  • Unscrupulous dealers may be dealt with by the strict enforcement of the Prevention of Food Adulteration Act.

5. Endemic ascites
• In Kusmi Block of Sarguja district in Madhya Pradesh, during 1973 and again during 1976, an outbreak of rapidly developing ascites and jaundice was reported among the Nagesia tribals.
• Both the sexes and all the age groups, except infants, were affected.
• The overall mortality was 40 per cent.
• That the local population subsist on the millet Panicum miliare (known locally as Gondhli) which gets contaminated with weed seeds of Crotalaria (locally known as Jhunjhunia).
• On chemical analysis, Jhunjhunia seeds were found to contain pyrrolizidine alkaloids which are hepatotoxins.
• The preventive measures comprise educating the people in the affected areas about the disease, dewatering of the Jhunjhunia plants which grow along with the staple, and simple sieving of the millet at the household level to remove the seeds of Jhunjhunia which are considerably smaller than those of the millet.

6. Fusarium toxins
• Fusarium species of soil fungi are known to contaminate food crops and pose health hazards to livestock and man.
• The problem of fusarium contamination of sorghum is believed to be on the increase.
• Rice is also known to be a good substrate for fusarium.
• Work is now in progress at the National Institute of Nutrition to isolate, and identify the toxic metabolites produced by fusarium incarnatum.
Stem Cells

When cultured, a stem cell has the ability to reproduce specialized cells (such as brain cells) for an indefinite period.

Where do stem cells come from?
1. Stem cells can be isolated from a human embryo in early development. These are obtained with the consent of donor parents at in-vitro clinics.
2. Stem cells can be derived from fetal tissue obtained from terminated pregnancies with donor consent.
3. A normal egg cell has the nucleus removed and the cell is fused with any other body cell. These cells are not as versatile and healthy as ones obtained in the two processes above.

Types of stem cells
- Totipotents: At this point these cells have the ability to become anything from a complete human being to any type of tissue cells.
- Pluripotents: These cells are derived from the inner cell mass of a blastocyst. Pluripotents can reproduce a number of tissue cells but do not have the ability to produce an entire human.
- Multipotents: The more specialized stem cells are found in both adults and children. These stem cells are responsible for replenishing everything from our skin cells to blood cells throughout our lives.

Stem-cell uses
Stem cells are used in human development research (cell decisionmaking and specialization), drug development (drug testing on individual types of cells), and cell therapy (regeneration of damaged tissue with stem cells).

What are Stem Cells?
- Stem cells are a class of undifferentiated cells that are able to differentiate into specialized cell types.
- Commonly, stem cells come from two main sources:
- Embryos formed during the blastocyst phase of embryological development (embryonic stem cells) and
- Adult tissue (adult stem cells).
- Both types are generally characterized by their potency, or potential to differentiate into different cell types (such as skin, muscle, bone, etc.).

Adult stem cells
- Adult or somatic stem cells exist throughout the body after embryonic development and are found inside of different types of tissue.
These stem cells have been found in tissues such as the brain, bone marrow, blood, blood vessels, skeletal muscles, skin, and the liver.

They remain in a quiescent or nondividing state for years until activated by disease or tissue injury.

Adult stem cells can divide or self-renew indefinitely, enabling them to generate a range of cell types from the originating organ or even regenerate the entire original organ.

It is generally thought that adult stem cells are limited in their ability to differentiate based on their tissue of origin, but there is some evidence to suggest that they can differentiate to become other cell types.

**Embryonic stem cells**

Embryonic stem cells are derived from a four or five day old human embryo that is in the blastocyst phase of development.

The embryos are usually extras that have been created in IVF (in vitro fertilization) clinics where several eggs are fertilized in a test tube, but only one is implanted into a woman.

Sexual reproduction begins when a male’s sperm fertilizes a female’s ovum (egg) to form a single cell called a zygote.

The single zygote cell then begins a series of divisions, forming 2, 4, 8, 16 cells, etc. After four to six days before implantation in the uterus this mass of cells is called a blastocyst.

The blastocyst consists of an inner cell mass (embryo blast) and an outer cell mass (trophoblast).

The outer cell mass becomes part of the placenta, and the inner cell mass is the group of cells that will differentiate to become all the structures of an adult organism.

This latter mass is the source of embryonic stem cells totipotent cells (cells with total potential to develop into any cell in the body).

In a normal pregnancy, the blastocyst stage continues until implantation of the embryo in the uterus, at which point the embryo is referred to as a fetus.

This usually occurs by the end of the 10th week of gestation after all major organs of the body have been created.
• However, when extracting embryonic stem cells, the blastocyst stage signals when to isolate stem cells by placing the “inner cell mass” of the blastocyst into a culture dish containing a nutrient rich broth.

• Lacking the necessary stimulation to differentiate, they begin to divide and replicate while maintaining their ability to become any cell type in the human body.

• Eventually, these undifferentiated cells can be stimulated to create specialized cells.

**Stem cell cultures**

**Human embryonic stem cell colony**

• Stem cells are either extracted from adult tissue or from a dividing zygote in a culture dish. Once extracted, scientists place the cells in a controlled culture that prohibits them from further specializing or differentiating but usually allows them to divide and replicate. The process of growing large numbers of embryonic stem cells has been easier than growing large numbers of adult stem cells, but progress is being made for both cell types.

**Stem cell lines**

• Once stem cells have been allowed to divide and propagate in a controlled culture, the collection of healthy, dividing, and undifferentiated cells is called a stem cell line. These stem cell lines are subsequently managed and shared among researchers. Once under control, the stem cells can be stimulated to specialize as directed by a researcher a process known as directed differentiation. Embryonic stem cells are able to differentiate into more cell types than adult stem cells.

**Potency**

• Stem cells are categorized by their potential to differentiate into other types of cells. Embryonic stem cells are the most potent since they must become every type of cell in the body. The full classification includes:

• Totipotent the ability to differentiate into all possible cell types. Examples are the zygote formed at egg fertilization and the first few cells that result from the division of the zygote.

• Pluripotent the ability to differentiate into almost all cell types. Examples include embryonic stem cells and cells that are derived from the mesoderm, endoderm, and ectoderm germ layers that are formed in the beginning stages of embryonic stem cell differentiation.

• Multipotent the ability to differentiate into a closely related family of cells. Examples include hematopoietic (adult) stem cells that can become red and white blood cells or platelets.

• Oligopotent the ability to differentiate into a few cells. Examples include (adult) lymphoid or myeloid stem cells.

• Unipotent the ability to only produce cells of their own type, but have the property of self renewal required to be labeled a stem cell. Examples include (adult) muscle stem cells.

• Embryonic stem cells are considered pluripotent instead of totipotent because they do not have the ability to become part of the extraembryonic membranes or the placenta.

**Identification of stem cells**

• Although there is not complete agreement among scientists of how to identify stem cells, most tests are based on making sure that stem cells are undifferentiated and capable of selfrenewal.

• Tests are often conducted in the laboratory to check for these properties.

• One way to identify stem cells in a lab, and the standard procedure for testing bone marrow or hematopoietic stem cell (HSC), is by transplanting one cell to save an individual without HSCs. If the stem cell produces new blood and immune cells, it demonstrates its potency.

• Clonogenic assays (a laboratory procedure) can also be employed in vitro to test whether single cells can differentiate and self renew.

• Researchers may also inspect cells under a microscope to see if they are healthy and undifferentiated or they may examine chromosomes.

• To test whether human embryonic stem cells are pluripotent, scientists allow the cells to differentiate spontaneously in cell culture, manipulate the cells so they will differentiate to form specific cell types, or inject the cells into an immunosuppressed mouse to test for the formation of a teratoma (a benign tumor containing a mixture of differentiated cells).
Uses

Organ and tissue regeneration
- Tissue regeneration is probably the most important possible application of stem cell research.
- Currently, organs must be donated and transplanted, but the demand for organs far exceeds supply.
- Stem cells could potentially be used to grow a particular type of tissue or organ if directed to differentiate in a certain way.
- Stem cells that lie just beneath the skin, for example, have been used to engineer new skin tissue that can be grafted on to burn victims.

Cardiovascular disease treatment

Brain disease treatment
- Additionally, replacement cells and tissues may be used to treat brain disease such as Parkinson’s and Alzheimer’s by replenishing damaged tissue, bringing back the specialized brain cells that keep unneeded muscles from moving.
- Embryonic stem cells have recently been directed to differentiate into these types of cells, and so treatments are promising.

Cell deficiency therapy
- Healthy heart cells developed in a laboratory may one day be transplanted into patients with heart disease, repopulating the heart with healthy tissue.
- Similarly, people with type 1 diabetes may receive pancreatic cells to replace the insulin producing cells that have been lost or destroyed by the patient’s own immune system.
- The only current therapy is a pancreatic transplant, and it is unlikely to occur due to a small supply of pancreases available for transplant.

Blood disease treatments
- Adult hematopoietic stem cells found in blood and bone marrow have been used for years to treat diseases such as leukemia, sickle cell anemia, and other immunodeficiencies.
- These cells are capable of producing all blood cell types, such as red blood cells that carry oxygen to white blood cells that fight disease.
- Difficulties arise in the extraction of these cells through the use of invasive bone marrow transplants.
- However hematopoietic stem cells have also been found in the umbilical cord and placenta. This has led some scientists to call for an umbilical cord blood bank to make these powerful cells more easily obtainable and to decrease the chances of a body’s rejecting therapy.

General scientific discovery
- Scientist photograph Stem cell research is also useful for learning about human development.
- Undifferentiated stem cells eventually differentiate partly because a particular gene is turned on or off.
- Stem cell researchers may help to clarify the role that genes play in determining what genetic traits or mutations we receive.
- Cancer and other birth defects are also affected by abnormal cell division and differentiation.
- New therapies for diseases may be developed if we better understand how these agents attack the human body.
- Another reason why stem cell research is being pursued is to develop new drugs.
- Scientists could measure a drug’s effect on healthy, normal tissue by testing the drug on tissue grown from stem cells rather than testing the drug on human volunteers.

Stem cell controversy
- The debates surrounding stem cell research primarily are driven by methods concerning embryonic stem cell research.
- It was only in 1998 that researchers from the University of Wisconsin Madison extracted the first human embryonic stem cells that were able to be kept alive in the laboratory.
- The main critique of this research is that it required the destruction of a human blastocyst. That is, a fertilized egg was not given the chance to develop into a fully developed human.

When does life begin?
- The core of this debate similar to debates about abortion, for example centers on the question, “When does life begin?” Many assert that life begins at conception, when the egg is fertilized.
It is often argued that the embryo deserves the same status as any other full grown human.

Therefore, destroying it (removing the blastocyst to extract stem cells) is akin to murder. Others, in contrast, have identified different points in gestational development that mark the beginning of life after the development of certain organs or after a certain time period.

Chimeras
- People also take issue with the creation of chimeras. A chimera is an organism that has both human and animal cells or tissues.
- Often in stem cell research, human cells are inserted into animals (like mice or rats) and allowed to develop.
- This creates the opportunity for researchers to see what happens when stem cells are implanted. Many people, however, object to the creation of an organism that is "part human"

Japanese Encephalitis

What is Japanese Encephalitis?
- Japanese Encephalitis is a viral disease

- It is transmitted by infective bites of female mosquitoes mainly belonging to Culex tritaeniorhynchus, Culex vishnui and Culex pseudovishnui group. However, some other mosquito species also play a role in transmission under specific conditions
- JE virus is primarily zoonotic in its natural cycle and man is an accidental host.
- JE virus is neurotropic and arbovirus and primarily affects central nervous system

Signs and symptoms
- Most JEV infections are mild (fever and headache) or without apparent symptoms, but approximately 1 in 250 infections results in severe clinical illness.
- Severe disease is characterized by rapid onset of high fever, headache, neck stiffness, disorientation, coma, seizures, spastic paralysis and ultimately death. The case fatality rate can be as high as 30% among those with disease symptoms.
- Of those who survive, 20%–30% suffer permanent intellectual, behavioural or neurological problems such as paralysis, recurrent seizures or the inability to speak.
- JE virus infection presents classical symptoms similar to any other virus causing encephalitis.
- Clinically it is difficult to differentiate between JE and other viral encephalitis
- Japanese encephalitis is a vector borne disease.
- Several species of mosquitoes are capable of transmitting JE virus.
- JE is a zoonotic infection. Natural hosts of JE virus include water birds of Ardeidae family (mainly pond herons and cattle egrets). Pigs play an important role in the natural cycle and serve as an amplifier host since they allow manifold virus multiplication without suffering from disease and maintain prolonged viraemia.
- Due to prolonged viraemia, mosquitoes get opportunity to pick up infection from pigs easily.
- Man is a dead end in transmission cycle due to low and short lived viraemia. Mosquitoes do not get infection from JE patient.

**Japanese Encephalitis**
- First discovered and originally restricted to Japan. Now large scale epidemics occur in China, India and other parts of Asia.
- The virus is maintained in nature in a transmission cycle involving mosquitoes, birds and pigs.
- Most human infections are subclinical: the inapparent to clinical cases is 300 : 1.
- In clinical cases, a life-threatening encephalities occurs.
- The disease is usually diagnosed by serology. No specific therapy is available.
• Since Culex has a flight range of 20 km, all local control measures will fail. An effective vaccine is available.

**Treatment of Japanese Encephalitis**

• There is no specific antiviral medicine available against JE virus. The cases are managed symptomatically.

• Clinical management of JE is supportive and in the acute phase is directed at maintaining fluid and electrolyte balance and control of convulsions, if present. Maintenance of airway is crucial.

**Fact File**

<table>
<thead>
<tr>
<th>Japanese encephalitis virus is transmitted from wild birds and pigs of humans through the Culex mosquito.</th>
<th>The disease has no available treatment. Only symptomatic treatment is administered.</th>
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<tbody>
<tr>
<td>The symptoms are fever, headache, nausea and disorientation. Left untreated it can affect the central nervous system, leading to seizures, spastic paralysis and even death</td>
<td>Vaccination is the only way to prevent the disease.</td>
</tr>
</tbody>
</table>

**What are the Prevention and control measures of JE?**

• The preventive measures are directed at reducing the vector density and in taking personal protection against mosquito bites using insecticide treated mosquito nets. The reduction in mosquito breeding requires eco-management, as the role of insecticides is limited.

• JE vaccine is produced in limited quantities at the Central Research Institute, Kasauli.

• Three doses of the vaccine provide immunity lasting a few years. The vaccine is procured directly by the state health authorities.

• Vaccination is not recommended as an outbreak control measure as it takes at least one month after second dose to develop antibodies at protective levels and the outbreaks are usually short lived.

• There is no specific treatment of JE.

• Clinical management is supportive and in the acute phase is directed at maintaining fluid and electrolyte balance and control of convulsions, if present. Maintenance of airway is crucial.

• The state governments have been advised that in the endemic districts, anticipatory preparations should be made for timely availability of medicines, equipment and accessories as well as sufficient number of trained medical, nursing and paramedical personnel.
NON COMMUNICABLE DISEASES (NCDs)

NON COMMUNICABLE DISEASES INCLUDE

- Cardiovascular disease (CVD)
- Diabetes Mellitus (DM)
- Chronic obstructive pulmonary disease (COPD)
- Cancer

RISK FACTORS

- High blood pressure
- Tobacco use
- Physical inactivity
- Alcohol
- Obesity
- Raised blood glucose
- Increased vegetable & fruit intake
- Raised cholesterol

ENCEPHALITIS IN INDIA

Most common cause of viral Encephalitis in infection by the Japanese Encephalitis virus of the Flaviviridae family

Natural reservoirs of this virus: Wild birds and Water birds, such as Herons and Egrets

25% causes do not survive this deadly infection

Health experts say 70 million children are at risk

Transmitted to pigs and humans, through the bite of Culex mosquitoes

JENVAC vaccine developed in 2013

Map showing distribution: Mostly young children died, Over 100 children succumbed to virus, Over 100 people died, Annual outbreaks of Encephalitis with 500-600 people
Malarial Facts
Malaria is a serious disease that is PREVENTABLE and TREATABLE.

97 countries and territories had ongoing malaria transmission in 2015.

3.2 billion people are at risk of malaria worldwide.

A child dies from malaria in Sub-Saharan Africa.

Each year, over 10,000 travellers are reported to become ill with malaria after returning home.

Early Diagnosis and prompt treatment prevent deaths.

MILD / MODERATE
SYMPTOMS
DO NOT IGNORE SYMPTOMS. Go straight to the doctor.

Medical Emergency

FEVER sweating headache muscle aches fatigue shaking (goos, chills) vomiting diarrhoea fatal if not treated

The ‘ABCD’ of Malaria Prevention

AWARENESS
Be Aware of the risk and the symptoms.

BITE PREVENTION
Avoid being bitten by mosquitoes, especially between dusk and dawn.

CHEMOPROPHYLAXIS
If prescribed for you, use Chemoprophylaxis (antimalarial medications) to prevent infection.

DIAGNOSIS
Immediately seek Diagnosis and treatment if a fever develops one week or later after being in a malarial area. (up to one year after departure)

Sources
1. World Health Organization, Malaria Fact Sheet, January 2015
2. World Health Organization, International Travel and Health, January 2015
3. World Health Organization, World Malaria Report 2013

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Malaria

Introduction
Malaria is a potentially life-threatening parasitic disease caused by parasites known as Plasmodium vivax (P.vivax), Plasmodium falciparum (P.falciparum), Plasmodium malariae (P.malariae) and Plasmodium ovale (P.ovale).

It is transmitted by the infective bite of Anopheles mosquito.

Man develops disease after 10 to 14 days of being bitten by an infective mosquito.

There are two types of parasites of human malaria, Plasmodium vivax, P. falciparum, which are commonly reported from India.

Inside the human host, the parasite undergoes a series of changes as part of its complex life cycle. (Plasmodium is a protozoan parasite)
• The parasite completes life cycle in liver cells (preerythrocytic schizogony) and red blood cells (erythrocytic schizogony)
• Infection with P. falciparum is the most deadly form of malaria.

**Symptoms of Malaria**

• Typically, malaria produces fever, headache, vomiting and other fulminate symptoms.
• The parasite infects and destroys red blood cells resulting in easy fatigue ability due to anemia, fits/convulsions and loss of consciousness.
• Parasites are carried by blood to the brain (cerebral malaria) and to other vital organs.
• Malaria in pregnancy poses a substantial risk to the mother, the fetus and the newborn infant. Pregnant women are less capable of coping with and clearing malaria infections, adversely affecting the unborn fetus.

**Symptoms of Severe and Complicated Malaria**

• The priority requirement is the early recognition of signs and symptoms of severe malaria that should lead to prompt emergency care of patient. The signs and symptoms that can be used are nonspecific and may be due to any severe febrile disease, which may be severe malaria, other severe febrile disease or concomitant malaria and severe bacterial infection.
• Breathing difficulties
• Severe anaemia
• Generalized convulsions/fits
• Inability to drink/vomiting
• Dark and/or limited production of urine
• Patients with prostration and/or breathing difficulties should, if at all possible, be treated with parenteral antimalarials and antibiotics. Oral treatment should be substituted as soon as reliably possible. Frequent monitoring of laboratory parameters is essential blood sugar, blood urine, fluid balance, associated infection, etc. Drugs that increase gastrointestinal bleeding should be avoided.

**Life cycle of Malaria Parasite in Man and Mosquito**

**Vectors of Malaria**

• There are many vectors of malaria
• Anopheles culicifacies is the main vector of malaria
• It is a small to medium sized mosquito with Culex like sitting posture

1. **Feeding habits**
   - It is a zoophilic species
   - When high densities build up relatively large numbers feed on men

2. **Resting habits**
   - Rests during daytime in human dwellings and cattle sheds

3. **Breeding places**
   - Breeds in rainwater pools and puddles, borrow pits, river bed pools, irrigation channels, seepages, rice fields, wells, pond margins, sluggish streams with sandy margins.
   - Extensive breeding is generally encountered following monsoon rains.

4. **Biting time**
   - Biting time of each vector species is determined by its generic character, but can be readily influenced by environmental conditions.
   - Most of the vectors, including Anopheles culicifacies, start biting soon after dusk. Therefore, biting starts much earlier in winter than in summer but the peak time varies from species to species.
Malaria Control Strategies

1. Early case Detection and Prompt Treatment (EDPT)
   - EDPT is the main strategy of malaria control. Radical treatment is necessary for all the cases of malaria to prevent transmission of malaria.
   - Chloroquine is the main antimalarial drug for uncomplicated malaria.
   - Drug Distribution Centres (DDCs) and Fever Treatment Depots (FTDs) have been established in the rural areas for providing easy access to antimalarial drugs to the community.
   - Alternative drugs for chloroquine resistant malaria are recommended as per the drug policy of malaria.

2. Vector Control
   (i) Chemical Control
       Use of Indoor Residual Spray (IRS) with insecticides recommended under the programme
       Use of chemical larvicides like Abate in potable water
       Aerosol space spray during day time
       Malathion fogging during outbreaks
   (ii) Biological Control
       Use of larvivorous fish in ornamental tanks, fountains etc.
       Use of biocides.
   (iii) Personal Prophylactic Measures that individuals/communities can take up
       Use of mosquito repellent creams, liquids, coils, mats etc.
       Screening of the houses with wire mesh
       Use of bednets treated with insecticide
       Wearing clothes that cover maximum surface area of the body

4. Community Participation
   - Sensitizing and involving the community for detection of Anopheles breeding places and their elimination
• NGO schemes involving them in programme strategies
• Collaboration with CII/ASSOCHAM/FICCI

5. Environmental Management & Source Reduction Methods
• Source reduction i.e. filling of the breeding places
• Proper covering of stored water
• Channelization of breeding source

6. Monitoring and Evaluation of the programme
• Monthly Computerized Management Information System (CMIS)
• Field visits by state by State National Programme Officers
• Field visits by Malaria Research Centres and other ICMR Institutes
• Feedback to states on field observations for correction actions.

Dengue

What is Dengue?
• Dengue is a viral disease
• It is transmitted by the infective bite of Aedes Aegypti mosquito
• Man develops disease after 56 days of being bitten by an infective mosquito
• It occurs in two forms: Dengue Fever and Dengue Haemorrhagic Fever (DHF)
• Dengue Fever is a severe, flu-like illness
• Dengue Haemorrhagic Fever (DHF) is a more severe form of disease, which may cause death
• Person suspected of having dengue fever or DHF must see a doctor at once

Signs & Symptoms of Dengue Fever
• Abrupt onset of high fever
• Severe frontal headache

Life cycle of Malaria