

Class IX – Science (Biology)

Chapter: Why do we fall ill? Chapter Notes

- Health is a state of complete physical , mental and social wellbeing
- Health is considered to be the state of perfect functioning of body and mind.
- Term Disease means Dis – ease i.e. without ease or comfort.
- Disease is the malfunctioning of the organism or a part of it due to infection, inherent weakness or environmental stress that upsets the normal physiological functioning of the organism.
- A disease can be caused by intrinsic or extrinsic factors.
- Intrinsic factors include improper functioning of organs, hormonal imbalance, genetic disorders, allergies etc.
- Extrinsic factors include dietary deficiencies, pollutants, pathogens(disease causing organisms like bacteria and viruses), tobacco, alcohol etc.

Types of Diseases

- Acute diseases
 - The symptoms appear suddenly.
 - These diseases are short term ie the symptoms last for short period of time.
 - Eg. Influenza (Flu) , Common cold.
- Chronic diseases
 - These diseases long term diseases.
 - Their symptoms develop gradually and are long lasting.
 - Eg. TB, Cancer etc
- Congenital diseases
 - These are inborn diseases i.e. present from birth.
 - Most of the diseases are permanent and generally not easily curable.
 - They could be due to genetic abnormality or metabolic disorder.
 - Eg. Down syndrome, Hemophilia, colour blindness, Sickle cell anaemia etc
- Acquired diseases
 - The diseases which a person gets in his or her life time (i.e. after birth) are called acquired diseases.

- Acquired diseases are classified in to two categories

- 1) Communicable diseases (Infectious diseases)
- 2) Non-communicable diseases (Non-infectious diseases)

1) Communicable Diseases

- Communicable diseases are caused by pathogens such as virus, bacteria, protozoan, worms or fungi.
- The organism causing the disease may be transmitted from an infected person to another by means of air, water, food, physical contact or insects (vectors).
- Communicable diseases can be further classified on the basis of the causative agents like Bacterial diseases, Viral diseases, Helminth diseases, Fungal diseases etc.

2) Non-Communicable Diseases

- These are non infectious diseases ie do not spread from an infected person to other healthy person
- These diseases include deficiency diseases, degenerative diseases, cancer etc.

Means of spread of Diseases

- Means of spread of diseases is known as Epidemiology.
- Infectious diseases can spread from an infected person to the healthy by various means.

1) Air-borne diseases

- These diseases spread through air in the form of droplet infection.
- While sneezing or coughing, the droplets released in the air are inhaled by healthy people and the infection spreads.
- Eg. TB, Common cold, Pneumonia etc

2) Water-borne diseases

- These diseases spread through contaminated water.
- The pathogens causing cholera and amoebiasis are found in the fecal matter of infected person, if such infection containing sewage water gets mixed with drinking water, the infection spreads to many healthy people.

3) Sexually transmitted diseases (STDs)

- These diseases spread by sexual contact from infected partner to the healthy.

- These diseases **do not spread** by casual physical contact like hand shake, hugs, eating together or by sports like wrestling.

- Eg. AIDS. Syphilis, Gonorrhoea etc.

4) Vector-borne diseases (Spread of disease through vectors)

- Vectors are intermediate hosts or carriers of pathogens or infections.

- Eg. Female Anopheles mosquito is a vector for malarial parasite, *Plasmodium*.

- Tse-Tse fly is a carrier for the pathogen of African sleeping sickness.

Symptoms or signs of diseases

- Symptoms or signs of diseases can be general or specific.

- General signs include fever, running nose, head ache, body ache, nausea, vomiting, inflammation etc.

- Specific symptoms depend on the organ affected, like in TB the pathogen infects lungs and respiratory tract, so the symptoms are persistent coughing, breathing trouble, blood in sputum due to continuous coughing etc

- In case of jaundice, the affected organ is liver, so the symptoms include accumulation of yellow pigments under the skin which are removed by liver, difficulty in digesting fatty food as liver produces bile which helps in emulsification of fats.

Principle of Treatment of diseases

- There are two ways a disease can be treated.

- 1) By reducing the effect of the disease

- 2) By killing the pathogen.

- The drugs used to bring down fever or to reduce pain are reducing the effect of the disease.

- Antibiotics are used to kill the pathogens like bacteria.

Principle of prevention of diseases

- The basic principles of prevention include

- 1) Personal and public hygiene.

- 2) Availability of proper balanced diet.

- 3) Immunization

• General ways of prevention

- Public hygiene is an important way to prevent diseases.
 - Air-borne diseases can be prevented by avoiding going to crowded places, covering mouth and nose while sneezing and coughing.
 - Water-borne diseases can be prevented by using safe and clean drinking water and by avoiding contaminated and exposed food.
 - Vector-borne diseases can be prevented by maintaining clean surroundings, by avoiding collecting of stagnant water which is the breeding ground for mosquitoes etc.
- **Specific ways of prevention**
- Our immune system works in a very specific manner by producing specific “Antibodies” against specific antigen.
 - Special WBCs called “B” and “T” lymphocytes are responsible for the immunity.
 - These cells when come in contact with a disease causing agent (pathogen or antigen) trigger the formation of antibodies and Memory cells.
 - So when the infection occurs next time, the memory cells of the immune system trigger a more vigorous response against the infection.
 - Immunity can be attained actively as well as passively.
 - Active immunity can be natural ie by getting the disease and artificial by vaccination (injecting killed or weakened pathogens)
 - Passive immunity means taking ready made antibodies (in the form of antiserum)
 - Edward Jenner observed that a milkmaid boy who had suffered with cowpox did not suffer with smallpox during the epidemic.
 - He injected cowpox virus in to people and found that they were resistant to smallpox.
 - This is because the cowpox virus is very similar to smallpox virus and when the cowpox virus enters the body, it triggers the immune response by producing the antibodies and the memory cells.
 - So when the smallpox virus enters the body, the memory cells are ready to destroy them by producing more and more antibodies.
 - A vaccine can be of following types
- a) Killed pathogen eg. Vaccine for Whooping cough

b) Live but weakened pathogen. Eg – BCG vaccine, Polio vaccine.

c) Modified toxins. Eg -Tetanus

d) Isolated antigens Eg – Flu vaccine

e) Genetically engineered antigens. Eg – Hepatitis B vaccine.

Important Communicable Diseases

Malaria

- This insect-borne disease is caused by a parasitic protozoan, *Plasmodium*.
- *Plasmodium* completes its life cycle in two hosts, man and female *Anopheles* mosquito
- It is transmitted from person to person by the bite of the insect vector, the female *Anopheles* mosquito.
- When a mosquito bites an infected person, the protozoa are sucked into the stomach of insect along with the blood and breed there.
- These parasites complete their life-cycle when they enter the red blood corpuscles in man and destroy them.

Symptoms

- High fever, headache, body ache, nausea and shivering are some of the symptoms of malaria.
- Each malarial attack lasts for 6-10 hours and consists of the cold stage (shivering), hot stage (fever) and sweating stage (temperature goes down to normal).

Prevention

- Efforts must be made to prevent mosquitoes from biting and also prevent them from Breeding
- Following are some such methods:
- Use wire mesh on doors and windows to prevent entry of mosquitoes into the house
- Use mosquito repellents to prevent mosquito bites
- Spray kerosene on stagnant water bodies or introduce fishes that feed on mosquito larva into the water bodies, so that the larvae are killed

Example of larvae eating fishes: *Gambusia*, Minnows, Trouts

- Spray insecticides like Malathion, BHC
- Clean tanks and sumps regularly

- Do not allow rain water to collect and stagnate in the garden

Control

- Quinine - which is an extract from the cinchona tree is used to manufacture chloroquine. This drug kills the malarial parasite.

Influenza (flu)

- This is an air borne disease caused by a virus called *Myxovirus influenzae*.
- It spreads through droplet infection.
- The virus attacks the mucous membrane of the nose.

Symptoms

- Running nose, sneezing, coughing, body ache and fever are some of the symptoms of this disease.

Prevention

- Avoid physical contact with patients suffering with flu.

Control

- Being viral there is no known control for influenza.
- Drugs like Rimantidine, Paracetamol (like crocin) are used.
- Rest helps in speedy recovery.

Jaundice (Hepatitis)

- Jaundice is the disease that affects the liver which is caused by viral infection.
- The types of hepatitis are A, B, C, D, E and G.
- Out of all these, Hepatitis B is most dangerous.
- Hepatitis A infection spreads through contaminated food and water.
- Hepatitis B infection spreads through infected blood, contaminated needles, from mother to babies and it is also a STD.

Symptoms of Hepatitis A

- There is loss of appetite.
- Body ache, nausea, vomiting, weakness.
- Eyes and skin turn yellow.

- Urine is dark yellow and stools are light yellow.
- The other symptoms are headache, temperature and pain in the joints.

Prevention

- Use potable water that is chlorinated, boiled, filtered and ozonised
- Prevent infection through physical contact by washing hands thoroughly after handling any article used by the patient
- Hepatitis-B vaccine should be taken to prevent the disease

Control

- Interferon injection are affective to control the disease
- Adequate rest is required for the patient to recover fast
- Sugarcane juice, radish with jaggery are recommended
- Fats should be avoided and protein taken within limits

Rabies (Hydrophobia)

- This is a canine disease which is transmitted to man through the bite of a rabid dog or other rabid mammals such as monkeys, cats or rabbits.
- This is a viral disease caused by a rabies virus, which is present in the saliva of the infected animal.

Symptoms

- The patient develops severe headache, high fever, painful contractions of the throat muscles and chest.
- Patient feels restless, shows excessive salivation and difficulty in swallowing
- Hydrophobia (fear of water) sets in as the virus selectively attacks the brain i.e., the nervous system.
- Damage to the central nervous system causes paralysis and painful death.

Prevention

- Wash the wound with antiseptic soap, and clean water.
- Apply an antiseptic and consult the doctor for anti rabies vaccine
- Pet dogs or cats should be immunized by getting them vaccinated with anti-rabies vaccine
- A rabid dog can be easily identified because it will show excessive salivation and

try to seek isolation after biting.

- To prevent further transmission of the disease the dog should be killed.

Control

- Rabies can be treated by Pasteur's treatment (A course of 14 vaccines was given)
- Advanced treatment- Five anti rabies vaccines are prescribed at an interval 0-3-7-14-30 days of the bite.

AIDS

- AIDS stands for “**Acquired Immuno Deficiency Syndrome**” (as the virus affects the immune system of the body)
- AIDS was first detected in June 1981 in USA.
- The disease is caused by a virus - HIV (Human Immuno Deficiency Virus).
- The HIV attacks the “T” lymphocytes and uses the genetic material to produce more virus particles which are released into the blood to attack more lymphocytes (WBC).
- This leads to destruction of the white blood corpuscles and reduces the body's defense against infections like pneumonia and also some kinds of cancer.
- HIV is transmitted when there is an exchange of body fluids from an infected person to a healthy one.
- The common modes of transmission are:
 - Sexual intercourse
 - Sharing needles to inject drugs
 - Blood transfusion
 - From HIV positive mother to unborn child
 - Razor at the hair dressing saloon

Symptoms

- The incubation period (period between infection and the first appearance of symptoms) is 1-10 years.
- The important symptoms of AIDS are: Swollen lymph nodes
- Low blood platelet count, causing hemorrhage and fever, weight loss and sweating at night
- Severe damage to brain which may lead to loss of memory, ability to speak and think clearly
- Due to the breakdown of the immune system the patient becomes susceptible to other infections

Prevention

- The public must be educated to take the preventive measures against AIDS.
- A disposable or new razor should be used by the hair dresser's
- Blood donors must be screened for HIV before they donate blood.
- Only disposable needles and syringes should be used.
- Contraceptives like Condom must be used and Safe sex must be practiced Control
- No effective vaccine for AIDS has been developed so far.

Tuberculosis (TB)

- The bacterium that causes this disease is Mycobacterium tuberculosis
- It is a rod shaped bacteria spread by air, dust, sputum of infected person or even from animals.
- The bacterium releases a toxin called tuberculin.
- The disease generally affects lung tissue but may spread to any other part of the body like the brain, stomach or intestine.
- TB is completely curable

Symptoms

- The first symptoms observed are persistent coughing and weight loss.
- The patient feels sick and weak.
- There is loss of appetite.
- There is low grade fever which may rise in the afternoon.
- Depending on the affected organ TB can be of different types-

1. Pulmonary T.B.

- The affected organ is lung
- The patient has persistent cough and produces blood containing sputum.
- There is weight loss and a feeling of weakness.
- Pain in the chest and breathlessness may also occur.

2. Lymph Gland T.B.

- Swelling of lymph glands

Prevention

- Public awareness of health and hygiene is essential

- BCG (Bacillus-Calmette-Guerin) vaccination which contains weakened

Tuberculosis bacillus is injected into the system to produce antibodies that will fight the disease

- Cows that are milked should be immunized with tuberculin vaccine
- Spitting in public places must be banned

Control

- ATT (Anti-tubercular therapy) should be administered.
- Streptomycin (antibiotic) is an effective drug.

Cholera

- This is water borne disease which is transmitted by flies.
- The infection can occur in a large area especially during flood and other natural calamities.
- The bacterium that causes the disease is Vibrio cholerae.

Symptoms

- There is severe gastro intestinal infection (infection of digestive system) which leads to vomiting, watery motions, reduced urination and dehydration.
- Eyes become sunken and the patient gets muscle cramps.

Prevention

- Immunization with anti cholera vaccine. The immunization lasts for 6 months
- When the disease spreads precautions like boiled water, properly cooked food must be consumed.
- Exposed food should be avoided.
- Proper sanitation and good personal hygiene in the community will prevent the spreading of the disease
- To prevent dehydration ORS (Oral Rehydration Solution) should be given to the infected person to make up for the loss of water and salts.
- ORS can be prepared by mixing - Sodium chloride 3.5 g + sodium bicarbonate 2.5 g,+ Potassium chloride 1.5 g + Glucose 20.0 g + Sucrose 40 gm + Water 1 L.

Control

- Immediate medical help is required to control the disease.

- Tetracycline (antibiotic) is effective in controlling cholera.

Typhoid

- This is the most communicable disease in our country and affects mainly children in the age group 0-15 years.
- Caused by bacterium *Salmonella typhi*, it passes out through the excreta of the infected person.
- Typhoid is spread by houseflies or directly through contaminated food especially milk and eggs.

Symptoms

- Headache and high fever for three to four weeks.
- The temperature reaches its peak in the afternoon
- If care is not taken, relapse(recurrence) is common

Prevention

- Proper sanitation
- Control of flies
- Anti typhoid vaccines.

Control

- Ciproflox is the the most drug used.

Diarrhoea

- Bacteria such as *E.coli*, *Shigella*, some types of protozoa (*Entamoeba*) and viruses cause this disease.
- The most common symptom of Diarrhoea is frequent loose motions accompanied with abdominal pain.

Symptoms

- Frequent loose motion and vomiting leading to dehydration
- If neglected can result in dehydration.
- The patient becomes irritable, eyes look sunken, mouth gets dry.
- There is sudden weight loss,
- Pulse is weak accompanied with deep breathing and convulsions

Prevention

- Eatables should be kept covered to prevent contamination through dust and flies
- Fruits and vegetables should be washed with potassium permanganate, before use
- Water should be boiled before drinking. Filtered water and mineral water are also safe
- Proper sanitation and toilet facilities are essential
- Proper personal hygiene, like washing hands before eating or handling food is important
- Food that is stale or has got rancid should not be consumed
- Public should be educated about community hygiene

Control

- Total bed rest is advised for the patient till the illness is fully controlled
- Sufficient fluids must be taken.
- ORS should be given regularly at short intervals.
- Antimicrobial drugs and anti-diarrhoeal drugs are prescribed by the doctors.
- A good home remedy is to take the pulp of boiled raw banana, turmeric, salt and lime

Polio

- Poliomyelitis or polio is caused by Polio virus (smallest virus).
- The virus enters the body through food and water.
- The virus is excreted out in the faecal matter of the infected person, the virus can enter through faeco-oral route.
- The virus first reaches the intestine and finally to the Nervous system.
- Polio is the disease of nervous system, the virus destroys the motor nerves which are responsible for muscular control
- It affects children between the ages of 3 months to 6 years.

Symptoms

- Early symptoms are sore throat, head ache, muscle pain,.
- Later symptoms are stiffness in the neck region, tingling sensation in the limbs.
- Finally the muscles lose the power and the limb gets thinner and deformed.

Prevention

- Proper hygiene should be maintained.

- Proper disposal of sewage.
- OPV (oral Polio Vaccine) must be given to children.
- OPV contains killed or weakened virus.
- As per National Immunization Schedule, a dose of polio drops is given orally to the child at 1 ½ , 2 ½ and 3 ½ months age and finally a booster dose is given at the age of 1 ½ years.
- Pulse Polio Program is a largest single day public health project.
- Pulse polio program is an attempt to eradicate polio from our country.

Important Non-communicable Diseases

- Under this category are diseases which do not spread from an infectious person to a healthy person.
- These are non-infectious diseases e.g., diabetes, arthritis, heart disease and cancer.
- Many non-communicable diseases are caused by nutritional deficiency.

Nutritional Disorders

- For the normal growth of the body, well balanced diet is required.
- A balanced diet has nutrients in the right proportion for proper growth and development of both body and mind.
- Some diet deficiency diseases are

1. Protein Energy Malnutrition (PEM)

- Protein energy malnutrition leads to two types of diseases.

a) Marasmus (b) Kwashiorkor

a) Marasmus

- This is due to protein deficiency.
- The causal factor may be due to early replacement of mother's milk by other foods of low protein and calorific value.

Symptoms

- As the stored fats and tissue proteins are used up for the production of energy, the infant develops a shriveled look
- Ribs become prominent and limbs become very thin as the fat layer beneath the skin disappears

- Physical and mental growth retardation.
- Severe diarrhoea and other digestive disorders

Prevention / Control

- A protein rich diet such as a combination of wheat, gram, peanut, soyabean and jaggery or a diet with animal protein like mutton, chicken and fish, will help the patient to return back to health.

b) Kwashiorkor

- Caused due to protein deficiency.
- Children between 1-3 years of age must consume 1g protein/kg body weight.

Symptoms

- Growth is stunted, appetite is poor
- Stomach gets distended (bulging)
- The eyes are bulging
- The patient develops match stick legs (legs become thin, long and curved)
- Skin may become dark and start peeling off and hair may become dull and loose its luster

Prevention / Control

- By including food rich in protein into the diet, the disease can be cured.
- Gram, peanut, soyabean, milk, eggs and jaggery are good sources of protein, which must be included in the diet

2. Anaemia

- Iron deficiency causes Anaemia.
- Iron is required by the body to form the respiratory pigment haemoglobin present in the red blood cells in our body.
- The main function of haemoglobin is to transport oxygen.

Symptoms

- Patients suffering from anaemia become pale, lose appetite and feel weak and exhausted.

Prevention / Control

- The diet should be supplemented with liver, egg, molasses, cereal, pulses, leafy vegetables, brinjal, apple, banana, and guava which are rich in iron. .

3. Goitre

- Iodine deficiency leads to this disease.
- Iodine is essential for the body in very small quantities for the preparation of thyroid hormone, Thyroxine.

Symptoms

- Iodine deficiency causes abnormal enlargement of the thyroid gland (situated in the neck region).
- In childhood, iodine deficiency causes reduced thyroid functioning which results in retarded physical and mental growth.

Prevention / Control

- The government has made it mandatory to iodize the salt (Iodized salt) consumed by the public.
- Sea food is a good source of Iodine

4. Vitamin Deficiency

- Vitamins are organic compounds which are taken along with food in small quantities.
- They are essential for life as they are responsible for certain metabolic activities in the body.
- Vitamins are of two kinds: Water Soluble and Fat soluble
- **Xerophthalmia** - This disease is caused by vitamin A deficiency.
- **Rickets** - This disease is caused by vitamin D deficiency. Vitamin D is synthesized naturally in the presence of sunlight.
- **Beri – Beri** - Vitamin B1 deficiency causes this disease. This water soluble vitamin is also called Thiamine or anti beri beri or antineuritic factor. Beri beri is common in areas where polished rice is the major food item.
- **Pellagra** - This disease is caused by the deficiency of vitamin B5. The vitamin is also referred to as Niacin or Nicotinic acid or Pellagra preventing factor. Pellagra is prevalent in areas where maize is the staple food. Maize inhibits the absorption of vitamin B5 into the system and thus, this deficiency leads on to Beri Beri.
- **Scurvy- Vitamin C** (ascorbic acid) deficiency causes Scurvy.

