

JSR IAS ACADEMY

GENERAL SCIENCE

BIOLOGY

Human Diseases

Non communicable diseases

The World Health Organization [WHO] defines health as 'a state of complete physical, mental and social wellbeing and not merely absence of diseases'.

Non-infectious diseases

Degenerative (arthritis, heart attack, stroke).

Obesity

- excess body fat with an abnormal increase in body weight.
- Obesity occurs if intake of calories is more than the expenditure of energy.
- Over weight and obesity are conditions where the body weight is greater than the mean standard weight for age and height of an individual.
- Body mass index (BMI) is an estimate of body fat and health risk.
- $BMI = \text{Weight (kg)} / \text{Height (m}^2\text{)}$

Heart Disease

Cardiovascular disease (CVD)

Coronary heart disease (CHD) is the most common form and is caused by deposition of cholesterol in the blood vessels.

Atherosclerosis

Cardiovascular disease (CVD) leads to atherosclerosis in the large and medium sized arteries that supply the heart muscle with oxygen.

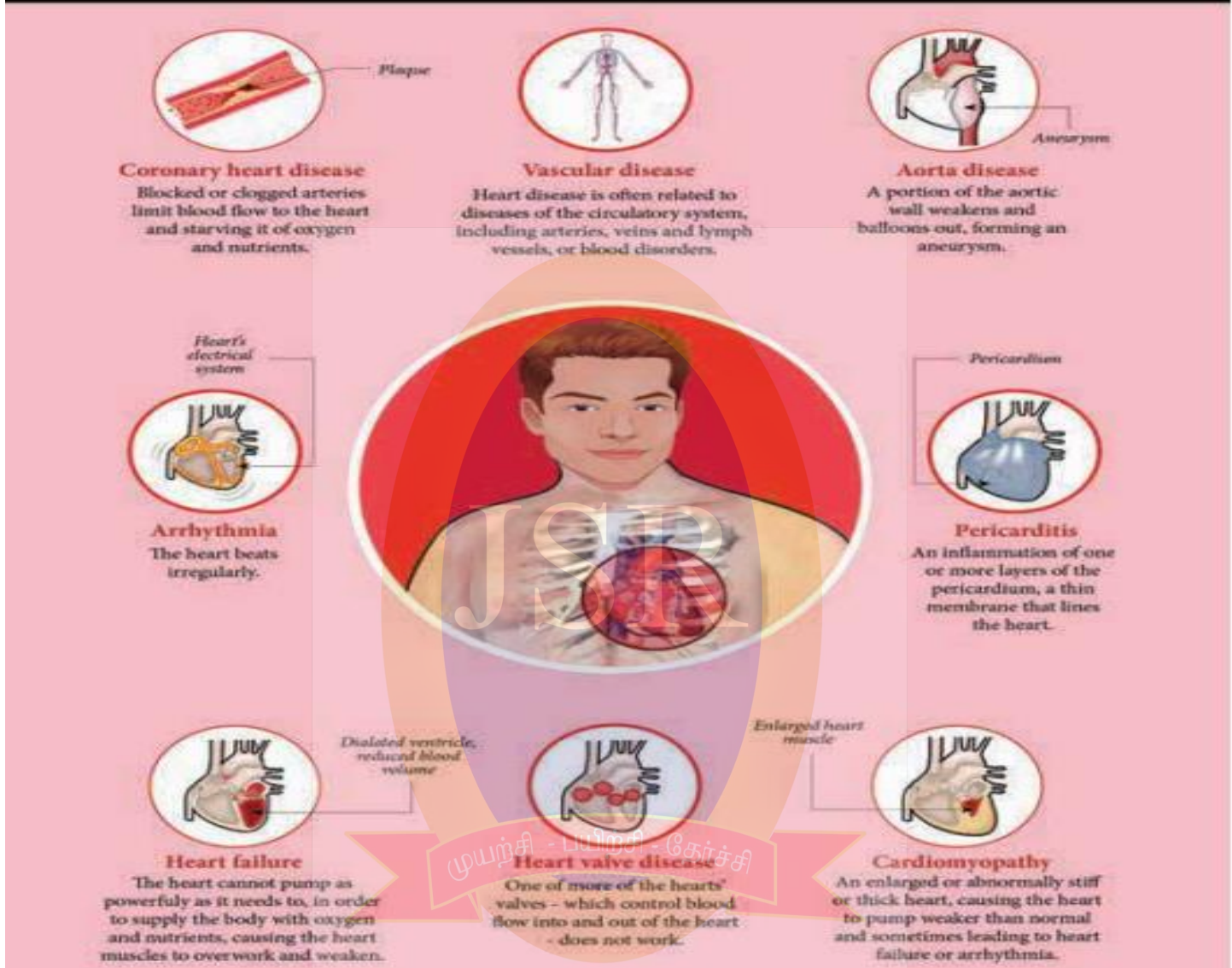
Ischemia

Atherosclerosis leads to sudden ischemia (deficient blood supply to heart muscle) and myocardial infarction (death of the heart muscle tissue).

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Heart disease includes any disorder of the heart, 50% of all heart attacks in Indians occur under 50 years of age and 25% of all heart attacks in Indians occur under 40 years of age.



Desirable level for blood cholesterol should be less than 200 mg/dl for Indians. The risk of coronary heart disease increases slowly as blood cholesterol levels increases from 200 to 300 mg/dl.

DO YOU KNOW? HDL (High Density Lipoprotein) or "good" cholesterol lowers risk of heart disease while LDL (Low Density Lipoprotein) or "bad" cholesterol increases risk of heart disease.

Risk factors:

- Hypercholesterolemia (High blood cholesterol)
- high blood pressure (Hypertension)

Symptoms:

- Shortness of breath,
- headache,
- tiredness,
- dizziness,
- chest pain,
- swelling of leg,
- gastrointestinal disturbances.

Anaemia

- It is caused by eating food with less iron content and can also caused due to feeding some other foods instead of breast milk.
- Severe anemia in children may leads to hookworm infection, chronic diarrhoea and dysentery. In recent

day school going children, especially the girls are affected by anemia.

- The Government of Tamil Nadu provides weekly iron folic tablets to all the girls in the schools of all areas.

The signs of anemia are:

- Pale or transparent skin, The inner surface of eye lids are pale, white fingernails, pale gums, weakness and fatigue.
- In severe cases, face and feet may be swollen, the heartbeat is rapid and with shortness of breath.
- Children and women who eats mud are usually anemic

Treatment and prevention of anemia:

Consuming iron containing food Sources

Food – Moringa leaves, Dates, Liver (Sheep and Chicken), Green, green leafy vegetables like beans, peas, lentils and Greed banana.

Pills - Cod liver oil tablet, Ferrous sulfate.

Cancer

- Cancer is derived from Latin word meaning **crab**.
- The study of cancer is called **Oncology** (Oncos-Tumor).
- Cancer is an abnormal and uncontrolled division of cells

Neoplasm

destroy surrounding tissue forming a tumor or neoplasm (new growth).

Metastasis

The cancerous cells migrate to distant parts of the body and affect new tissues. This process is called metastasis.

The frequent sites of metastasis are

- lungs,
- bones,
- liver,

- skin ,
- brain.

World Cancer Day - 4th February

National Cancer Awareness Day -7th November

Types of Cancers

Cancers are classified on the basis of the tissues from which they are formed.

1. Carcinomas

Carcinomas arise from epithelial and glandular tissues. They include cancers of skin, lung, stomach and brain.

About 85% of the tumours are carcinomas

2. Sarcomas

Sarcomas are occur in the connective and muscular tissue.

They include the cancer of bones, cartilage, tendons, adipose tissue and muscles.

These form 1% of all tumours

3. Leukaemia

Leukaemia are characterized by an increase in the formation of white blood cells in the bone marrow and lymph nodes.

Leukaemia are called blood cancers.

Most common type of cancer which also affect children below 15 years of age.

Types of Tumours

Benign tumours or Non malignant tumours: Remain confined in the organ affected and do not spread to other parts of the body.

Malignant tumours: Mass of proliferating cells which grow very rapidly invading and damaging the surrounding normal tissues.

- **Pulmonary embolism** is a blood clot that occurs in the lungs.
- **Bronchitis** is an inflammation of the lining of your bronchial tubes.
- **Asthma** is a condition in which airways narrow and swell and produce extra mucus.
- **Lung cancer** -The number one cause of cancer deaths. Smoking is the risk factor for lung cancer.
- **Pneumonia** is an inflammatory condition of the lung affecting primarily the small air sacs known as alveoli.
- **Pulmonary edema** is a fluid accumulation in the tissue and air spaces of the lungs.
- **Emphysema** A lung condition that causes shortness of breath due to widening of alveoli.
- **Atelectasis** is a collapse of a lung or lobe of a lung develops when alveoli within the lung become deflated.
- **Tuberculosis** is an infectious disease caused due to *Mycobacterium tuberculae*.
- **Pleurisy** is a condition in which the pleura becomes inflamed.

Carcinogenic Agents

Cancer causing agents are called carcinogens.

Physical Irritant:

- Heavy smoking causes lung cancer
- Betel and tobacco chewing causes oral cancer.
- Excessive exposure to sunlight may cause skin cancer.

Chemical agents:

Nicotine, caffeine, products of combustion of coal and oil, pesticides, asbestos, nickel, certain dyes and artificial sweeteners induce cancer.

Radiations:

Ionizing radiations like X-rays, gamma- rays, radioactive substances

nonionising radiations like UV rays cause DNA damage leading to cancer.

Biological agents:

Cancer causing viruses are called oncogenic viruses.

Treatment of Cancer

Surgery:

Tumours are removed by surgery to prevent further spread of cancer cells.

Radiation therapy:

Tumour cells are irradiated by lethal doses of radiation while protecting the surrounding normal cells.

Chemotherapy:

It involves administration of anticancerous drugs which prevent cell division and are used to kill cancer cells.

Immunotherapy:

Biological response modifiers like interferons are used to activate the immune system and help in destroying the tumors.

AIDS (Acquired Immunodeficiency Syndrome)

- 1984 Luc Montagnier and Robert Gallo discovered HIV (Human Immuno Deficiency Virus).
- AIDS is a severe viral disease and caused by Human Immunodeficiency Virus (HIV).
- HIV is a retro virus with glycoprotein envelope and the genetic material – RNA.
- HIV causes profound Immune suppression in humans.
- It is due to the depletion of one type of WBC, which is involved in the formation of antibodies called CD4 plus T-helper cells (lymphocytes).
- They attack the lymphocytes and the affected individual is prone to infectious diseases.

Transmission of HIV

AIDS virus has been found in

- urine,
- tears,
- saliva,
- breast milk
- vaginal secretions.

It spreads through contact of body fluids or blood.

HIV is transmitted generally by

- (i) Sexual contact with infected person
- (ii) Use of contaminated needles or syringes especially in case of intravenous drug abusers
- (iii) By transfusion of contaminated / infected blood or blood products
- (iv) From infected mother to her child through placenta.

Symptoms:

- Infected individuals become immunodeficient.
- Swelling of lymph nodes, damage to brain, loss of memory, lack of appetite and weight loss, fever, chronic diarrhoea, cough, lethargy, pharyngitis, nausea and headache.

Diagnosis:

The presence of HIV virus can be confirmed by **Western Blot** analysis or **Enzyme Linked Immunosorbent Assay (ELISA)**

Treatment:

Anti-retroviral drugs and immunostimulative therapy can prolong the life of the infected person.

Many people are ignorant about AIDS and it has been said that – “don’t” die of ignorance”. In our country NACO (National AIDS Control Organization) and other NGO’S (Non- Governmental Organizations) are educating people about AIDS. Every year December 1st is observed as the “World AIDS Day”.



Dr. Suniti Solomon, pioneered HIV research and treatment in India. She set up the first voluntary testing and counselling centre and an AIDS Research group in Chennai during 80's. Her team was the first to document evidence of HIV infection in India in 1985 (First Indian AIDS patient in Chennai).

Refractive errors of eye**Myopia (near sightedness):**

- The affected person can see the nearby objects but not the distant objects.
- This condition may result due to an elongated eyeball or thickened lens; so that the image of distant object is formed in front of the yellow spot.
- This error can be corrected using concave lens that diverge the entering light rays and focuses it on the retina.

Hypermetropia (long sightedness):

- The affected person can see only the distant objects clearly but not the objects nearby.
- This condition results due to a shortened eyeball and thin lens; so the image of closest object is converged behind the retina.
- This defect can be overcome by using convex lens that converge the entering light rays on the retina.

Presbyopia:

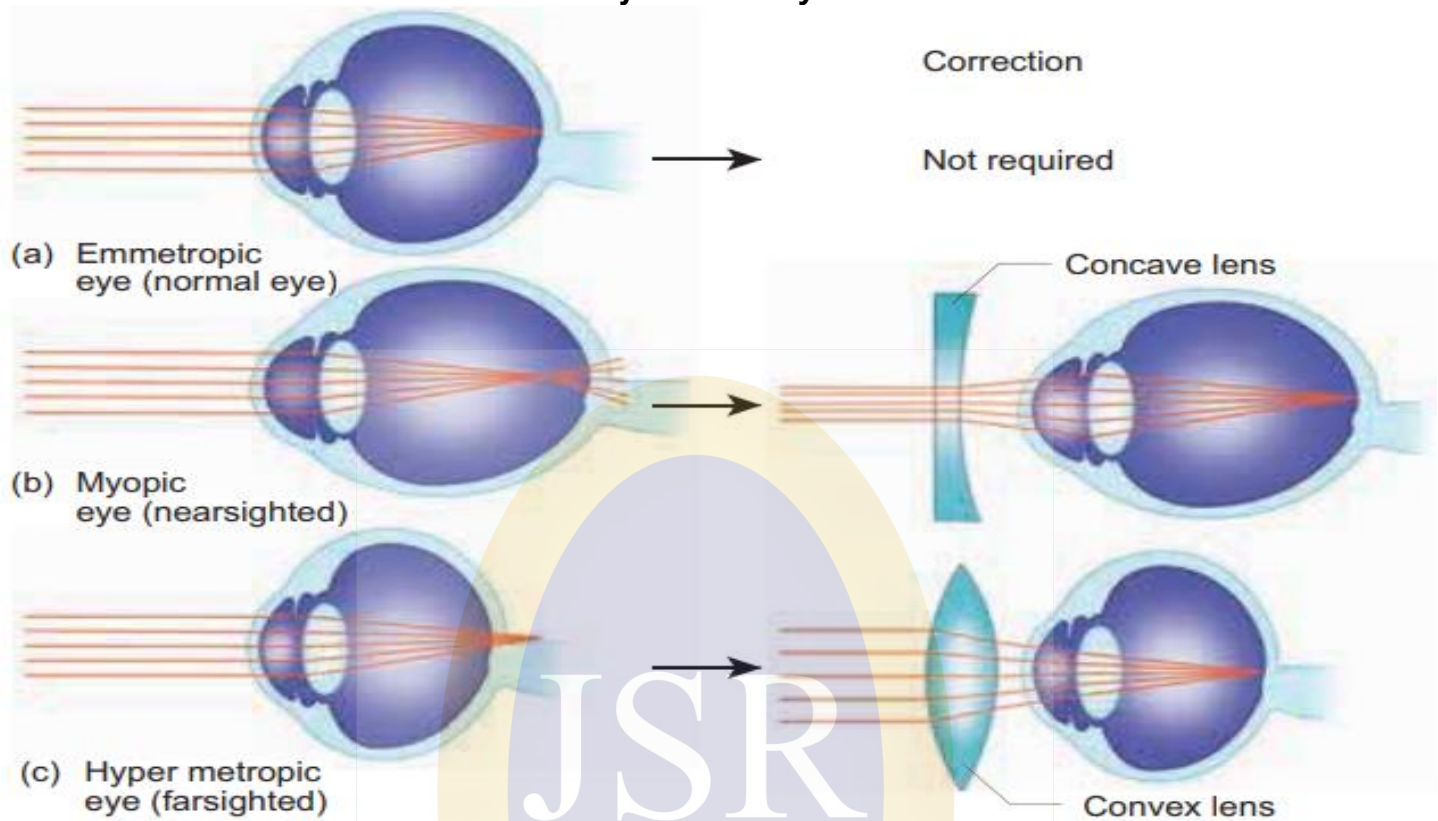
- Due to aging, the lens loses elasticity and the power of accommodation.
- Convex lenses are used to correct this defect.

Astigmatism

- Astigmatism is due to the rough (irregular) curvature of cornea or lens.
- Cylindrical glasses are used to correct this error

Cataract:

Due to the changes in nature of protein, the lens becomes opaque. It can be corrected by surgical procedures.



Deficiency of proteins

Kwashiorkar:

- It is a condition of severe protein deficiency.
- It affects children between 1-5 years of age, whose diet mainly consists of carbohydrates but lack in proteins.

Marasmus:

- It usually affects infants below the age of one year when the diet is poor in carbohydrates, fats and proteins.



Kwashiorkar



Marasmus

Figure 21.1 Malnutrition

Protein Diseases	Symptoms
Kwashiorkar	Stunted growth, Swelling of face and limbs, Diarrhoea.
Marasmus	Skinny appearance, Slow body growth.



Leucoderma is a non - communicable diseases caused by partial or total loss of pigmentation in the skin. (**melanin pigment**). This condition affects any age, gender and ethnicity. There is no cure. It does not spread by touching, sharing food and sitting together.

Minerals	Sources	Functions	Deficiency disorders
Macronutrients			
Calcium	Dairy products, beans, cabbage, eggs, fish	Constituent of bones and enamel of teeth, clotting of blood and controls muscle contraction.	Bone deformities, poor skeletal growth, osteoporosis in adults.
Sodium	Common salt	Maintains fluid balance and involved in neurotransmission.	Muscular cramps, nerve impulses do not get transmitted.
Potassium	Banana, sweet potato, nuts, whole grains, citrus fruits	Regulates nerve and muscle activity.	Muscular fatigue, nerve impulses do not get transmitted.
Micronutrients			
Iron	Spinach, dates, greens, broccoli, whole cereals, nuts, fish, liver	Important component of haemoglobin.	Anaemia
Iodine	Milk, Seafood, Iodised salt	Formation of thyroid hormones.	Goitre

Deficiency of Hormones

Diabetes mellitus

- Diabetes mellitus is a chronic metabolic disorder.
- In Greek (Diabetes – running through; mellitus-sweet).
- It is characterized by increased blood glucose level due to insufficient, deficient or failure of insulin secretion.
- This is the most common pancreatic endocrine disorder.

Normal Glucose Values in blood

- Normal glucose value: 70 – 100 mg/dL
- Random blood sugar: 80 – 120 mg/dL
- Fasting blood sugar: 70 – 110 mg/dL
- Post – prandial blood sugar: 70 – 140mg/dL

Type-1 Insulin Dependent Diabetes Mellitus (IDDM)

- IDDM accounts for 10 to 20% of the known diabetics.
- The condition also occurs in children (juvenile onset diabetes) and young adults
- This is caused by the destruction of β -cells of the pancreas.

hyperglycemia

It is characterized by abnormally elevated blood glucose levels (hyperglycemia) resulting from inadequate insulin secretion.

Causes:

- Genetic inheritance
- environmental factors (infections due to virus, acute stress)

Type-2 Non-Insulin Dependent Diabetes Mellitus (NIDDM)

- This is also called as adult onset diabetes and accounting for 80 to 90% of the diabetic population.
- Insulin production by the pancreas is normal but its action is impaired.
- It does not allow the movement of glucose into cells.

Causes:

- increasing age (affecting middle aged and older people),
- obesity,
- sedentary life style,
- overeating and physically inactive.

Symptoms:

- Increased blood glucose level (Hyperglycemia)
- Increased urine output (Polyuria) leading to dehydration
- Loss of water leads to thirst (Polydipsia) resulting in increased fluid intake
- Excessive glucose excreted in urine (Glycosuria)
- Excess hunger (Polyphagia) due to loss of glucose in urine.
- Fatigue and loss of weight

Factors	Type-1 Insulin dependent diabetes mellitus (IDDM)	Type-2 Non-insulin dependent diabetes mellitus (NIDDM)
Prevalence	10-20%	80-90%
Age of onset	Juvenile onset (< 20 years)	Maturity onset (>30 years)
Body weight	Normal or Underweight	Obese
Defect	Insulin deficiency due to destruction of β -cells	Target cells do respond to insulin
Treatment	Insulin administration is necessary	Can be controlled by diet, exercise and medicine



According to WHO recommendation, if the fasting blood glucose is greater than 140 mg/dl or the random blood glucose is greater than 200 mg /ml on more than two occasions, diagnosis for confirming diabetes is essential.

One in every 8 individuals in India is a diabetic. The revised WHO estimates for the year 2025 is 57.2 million diabetics in India. The average age for the onset of diabetes is 40 years, while it is 55 years in other countries. World Health Organization projects that diabetes will be 7th leading cause of death by the year 2030.

Flax seeds containing insoluble fibre, Guavas, Tomatoes and Spinach are foods which help reduce blood sugar levels.

Thyroid Dysfunction

When the thyroid gland fails to secrete the normal level of hormones, the condition is called thyroid dysfunction.

Hypothyroidism

It is caused due to the decreased secretion of the thyroid hormones. The abnormal conditions are simple

- goitre,
- cretinism and
- myxoedema.

Goitre

- It is caused due to the inadequate supply of iodine in our diet.
- This is commonly prevalent in Himalayan regions due to low level of iodine content in the soil.
- It leads to the enlargement of thyroid gland which protrudes as a marked swelling in the neck and is called as goitre.

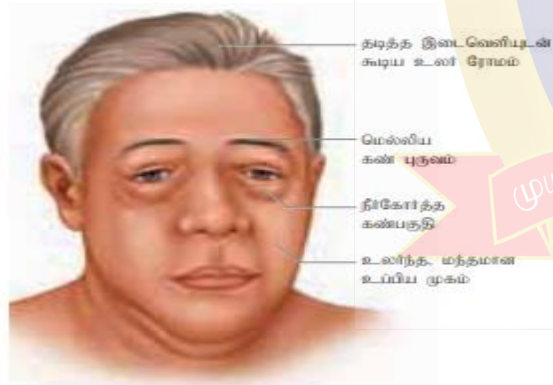


Cretinism

- It is caused due to decreased secretion of the thyroid hormones in children.
- The conditions are stunted growth, mental defect, lack of skeletal development and deformed bones.

**Myxoedema**

- It is caused by deficiency of thyroid hormones in adults.
- They are mentally sluggish, increase in body weight, puffiness of the face and hand, oedematous appearance.

**Hyperthyroidism**

- It is caused due to the excess secretion of the thyroid hormones which leads to Grave's disease.
- The symptoms are protrusion of the eyeballs (**Exophthalmia**), increased metabolic rate, high body temperature, profuse sweating, loss of body weight and nervousness.

**Growth hormone (GH) Dysfunction****Dwarfism:**

- It is caused by decreased secretion of growth hormone in children.
- The characteristic features are stunted growth, delayed skeletal formation and mental disability.

Gigantism:

Oversecretion of growth hormone leads to gigantism in children. It is characterised by overgrowth of all body tissues and organs. Individuals attain abnormal increase in height.

Acromegaly:

Excess secretion of growth hormone in adults may lead to abnormal enlargement of head, face, hands and feet.

**Vasopressin or Antidiuretic hormone (ADH) Dysfunction****Diabetes insipidus.**

Deficiency of ADH reduces reabsorption of water and causes an increase in urine output (polyuria). This deficiency disorder is called Diabetes insipidus.

Parathyroid Dysfunction**Tetany**

Muscle spasm known as Tetany (sustained contraction of muscles in face, larynx, hands and feet).

Tetany is caused due to the hyposecretion of parathyroid hormone (PTH).

Due to hyposecretion of PTH serum calcium level decreases (Hypocalcemia), as a result serum phosphate level increases. Calcium and phosphate excretion level decreases.

Generalized convulsion, locking of jaws increased heart beat rate, increased body temperature, muscular spasm are the major symptoms of tetany.

Addison's disease

- Addison's disease is caused due to hyposecretion of glucocorticoids and mineralocorticoids from the adrenal cortex.
- Muscular weakness, low BP., loss of appetite, vomiting, hyper pigmentation of skin, low metabolic rate, subnormal temperature, reduced blood volume, weight loss are the symptoms that occur in Addison's disease.
- Reduced aldosterone secretion increases urinary excretion of Na Cl. and water and decreases potassium excretion leading to dehydration.



Human skin can synthesize Vitamin D when exposed to sunlight (especially early morning). When the sun rays falls on the skin dehydro cholesterol is converted into Vitamin D. Hence, Vitamin D is called as **Sunshine vitamin**. Vitamin D improves bone strength by helping body to absorb calcium.

Mineral	Deficiency Disease
Calcium	Rickets.
Phosphorus	Osteomalatia
Iodine	Cretinism (in Child) Goitre (in adult)
Iron	Anaemia

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