



SNS COLLEGE OF NURSING

COIMBATORE – 35

MINERALS DEFICIENCIES

INTRODUCTION

More than 50 chemical elements are found in the human body, which are required for growth, repair and regulation of vital body functions. • Minerals can be categorized into 3 groups: 1) Major minerals 2) Trace minerals 3) Trace contaminants without known function: Lead, mercury, barium, boron, and aluminium.

- 1) Major minerals includes calcium, phosphorus, sodium, potassium and magnesium
- 2) Trace elements include iron, iodine, zinc, copper, cobalt, chromium, manganese, molybdenum, selenium, nickel, silicon, vanadium.

CALCIUM:

FUNCTION:

- Bone formation
- Teeth formation: formation of dentin and enamel
- Physiological process:
 - Essential for the clotting of blood as it is required for prothrombin activation
 - Regulate the permeability of the capillary walls and ion transport across the cell membranes.
 - Contraction of the heart and skeletal muscle
 - Regulates the excitability of the nerve fibers.
 - Acts as an activators for enzymes such as rennin and pancreatic lipase.

CALCIUM DEFICIENCY:

Effects in Adults:

- Osteoporosis
- Fractures of brittle bone by minor accidents



Effects in Children:

- Decreased rate of growth
- Loss of Calcium from Bone leading to development of Osteoporosis
- Hyperplasia of parathyroid gland
- Hyper-irritability and tetany leading to death

HypoCalcemia-

- Motor nerves become over susceptible to stimuli

HyperCalcemia-

- Common in 5-8 months children
- May occur because of excess Vit-D
- Symptoms: loss of appetite, Vomiting and wasting
- Treated by diet with low Calcium

TREATMENT:

Giving diet containing 1 -1.5gm calcium along with 400 – 800IC, Vit D.

PHOSPHORUS:

- ✓ Bone and Teeth Formation: formation of dentin and enamel
- ✓ Required for formation of Phospholipids—integral part of cell structure, act as intermediate in fat transport and metabolism
- ✓ Required for carbohydrate metabolism– Glycogen phosphorylation by inorganic phosphorus
- ✓ Required for formation of nucleic acid and nucleoprotein



MAGNESIUM:

DEFICIENCY

It is characterized by Depression, Muscular weakness, vertigo and liability to convulsion, irritability, tetany, hyper-reflexia and occasionally hypo-reflexia.

RISK FACTORS:

- Chronic alcoholics
- liver cirrhosis, PEM
- mal-absorbtion syndrome
- Toxemias of Pregnancy

Treatment:

- Administration of Magnesium salts(100mg MgCl) within 4 hours

SODIUM CHLORIDE

- ✓ Sodium is lost from the body through urine and sweat◇ that passed out in urine is regulated by the kidney but that lost by sweating is not controlled
- ✓ Depletion of NaCl causes muscular cramps.
- ✓ The requirement of sodium chloride depends upon climate, occupation and physical activity.
- ✓ Adult requirement is about 5 gm per day.
- ✓ A strong relationship between hypertension and dietary salt intake has been observed and intake of more than 10 gm of salt per day is considered to have definitive tendency to raise blood pressure

POTASSIUM:

Potassium is vasoactive, increases blood flow and sustains metabolic needs of the tissue.

- Potassium supplements lower blood pressure, although the response is slow.
- High dietary sodium, low dietary potassium have been implicated in the aetiology of hypertension as evidenced by epidemiological clinical studies



- The ideal desirable sodium : potassium ratio in the diet is 1:1 (in mmol).

IRON:

IRON ABSORPTION:

- ✓ Iron ingested is converted to Ferrous (absorbable) form by the help of reducing substances.
- ✓ Absorption takes place from Duodenum and upper jejunum.
- ✓ Absorption affected by: • Whether it is Haeme Fe or Non haem
- ✓ Presence of Vit-C– Increases Fe absorption
- ✓ Phytate, Oxalates– reduces Fe absorption

IRON DEFICIENCY ANEMIA:

- ✓ Characterized by low oxygen carrying power and low Hb content in blood(5-9gm/100ml blood).
- ✓ Women of Child bearing age– CLINICAL FEATURE- Fatigue, lassitude, pallor skin, giddiness.
- ✓ Weaned infant and young children– there is tendency of children below 3 to eat mud

TREATMENT:

- Anemic women: Ferrous tablet (0.2g x3 times a day.
- Children below 12 months: 0.2g ferrous ammonium citrate+glycerin x3times.
- 1-5 yr children: 0.4-0.9g ferrous ammonium citrate x3times

IODINE

FUNCTION:

- Constituents of T3 and T4
 - Required for growth and development
 - Stimulates enzymes synthesis, oxygen consumption and basal metabolic rate and thereby affect the heart rate, respiratory rate, mobilization, and metabolism of carbohydrates, lipogenesis.



IODINE DISORDER:

- Excess iodine cause Thyrotoxicosis, it may result from prophylaxis
- Jod Basedow- iodine induced thyrotoxicosis affecting mainly elderly who lived most of their life in iodine deficient area and who have had goiter for long duration

IODINE DEFICIENCY:

- Simple Goiter(25gm \diamond >200-500gm).
- Myxoedema– Progressive destruction of epithelial elements by overgrowth of non-cellular component and formation of cyst and large colloid spaces – reducing gland efficiency.
- Endemic Cretinism and Deaf –Mutism

FLOURINE

- Required for mineralization of bones and enamel formation
- Fluorine is often called a two-edged sword.
- Excess- dental and skeletal fluorosis.
- Deficiency- Dental caries

COPPER:

- Required for bone development, Elastin formation, cytochrome oxidase function, Iron absorption, tyrosinase (melanin formation).
- Deficiency-Cardiac Hypertrophy, Aortic Aneurysm, Cerebral Demyelination, Ataxia, impaired bone formation.
- Excess absorption: >50% (normal:2-5%) \diamond Wilson Disease.
- Copper is deposited in brain, descendent membrane of eyes (Kayser-Feisher ring) , liver, kidney and damaged them.
- Cu requirement for adults: 2.0 mg per day.

ZINC :

- ✓ Zinc deficiency has been reported to result in growth failure and sexual infantilism in adolescents, and in loss of taste and delayed wound healing.



- ✓ There are also reports of low circulating zinc levels in clinical disorders such as liver disease, pernicious anaemia, thalassaemia and myocardial infarction.

ZINC DEFICIENCY:

CAUSES:

- lack of intake of animal food.
- high dietary phytate content
- inadequate food intake.
- increased faecal losses during diarrhoea.

Zinc supplementation in combination with oral rehydration therapy has been shown to significantly reduce the duration and severity of acute and persistent diarrhoea

- Acrodermatitis enteropathies (AE).
- Loss of taste Acuity(hypogeusia).
- Retardation of growth and Genital development

ZINC EXCESS:

High Zn intake interferes with utilization and retention of Cu and thus cause anemia

OTHER TRACE MINERALS:

Cobalt:

- a part of the vitamin B12 molecule.
- No evidence of its deficiency.
- Recently cobalt deficiency and cobalt iodine ratio in the soil have shown to produce goiter in humans.

Selenium:

- The first report that selenium deficiency may occur in man appeared in 1961, and a similar report in 1967.
- Deficiency: protein-energy malnutrition



Molybdenum:

- Excess absorption of molybdenum has been shown to produce bony deformities.
- On the other hand, deficiency of molybdenum is associated with mouth and oesophageal cancer.

Chromium:

- Total body content of chromium is small, less than 6 mg.
- Role in relation to carbohydrate and insulin function

CONCLUSION:

The minerals form only a small portion of the total body weight. They form only 7% of the composition of human body. Many of these are widely distributed in foods so that a well balanced diet will supply them in sufficient quantities.

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