MINERAL

There are 24 numbers of minerals trace element found in the human body. Among them the major minerals are (i) Na+ (ii) Cl- (iii) K+ (iv) Po4(v) Ca+ (vi) Mg+.

Major trace elements: (i) Iron (ii) Copper (iii) Fluorine (iv) Iodine (v) Manganese (vi) Zine & (vii) Molybdenom

Recently identified essential trace elements are (i) Nicked (ii) Tin (iii) Valinium

Heavy metals and contaminants: (i) L-Lead (ii) Mercury (iii) Arsenic (iv)cadmium

**SODIUM** (Na+)

In a person having a body weight of 70 kg the total amount of Na+ - 2700 – 3000 milli equivalent / 100 ml

Distribution of Na+ in human body

 **mg/100ml mEq/liter**

Whole blood 160 70

Plasma 330 143

R.B.C 85 27

Muscle 60mg/100gm 26kg

**RDA. –** (Recommended daily allowance)

 5 – 20 gm/day as salt (Nacl) this depending upon climates

 5 – 8 gm / day need for temporal zone

 10 – 20 gm/ day in tropical countries

**Sources :-** i) Poor source – cereals which is about 4-18 mg/100gm

 ii) Moderate source – Pulses that is about 95mg/100gm

 iii) Rich – Bread, cornflakes Biscuits (More than 100g/100gm)

**Function of Na+ -**

 1. Acid Bose balance regulation

 2. Maintain the osmotic pressure of plasma

 3. Helps in monosaccharide absorption

 4. Muscle relaxation

 5. Impulse transmission

**Absorption and Metabolism:-**

1. It is readily absorbed in E.C.F.
2. It excreted to urine, sweating

**Deficiency –**

1. Acidosis
2. Dehydration
3. Tissue atrophy

**Excess of Na+**

 **i)** Blood pressure causes hypertension

 ii) Edema

**Hypernatramia –** This is the clinical condition when the Na+ level is higher than normal. This is due to –

1. Adrenocortical hormone therapy in crushing’s syndrome
2. Na homeostasis due to aldosteron

**Hyponatramia –** This is the clinical condition when the Na+ level in the body decreases. This is due to –

1. Acidosis
2. Severe vomiting
3. Diarrhea
4. Chronic renal disease
5. Addison’s disease

Subject Source of cat cat intake Retention

 from diet in mg in%

a) Infant 1. Human milk 1.103 -208 1.40% - 70%

 2. Cow milk 2.600-900 2.15%-30%

b) Pre school going 1. Cow milk 1.400-1200 1.18%-25%

 Children (1.5)ys. 2. CoH Po4 2.350-550 2. 18%

c) Early school Cow milk 750 – 1300 21%

going children

(5-10) years.

d) School children Cow milk 259-277 4-15%

 (10-16)

**POTASIUM (K)**

 The total amount in human body is about 2.6 gm/kg body weight.

RDA – 1.5 – 4.5 gm/day

**Sources:**

1. Vegetable
2. Fruits (major source) Banana, pineapple, oranges
3. Milk
4. Meat – beef with liver, chicken
5. Legumes
6. Whole grains

**DISTRIBUTION IN THE BODY**

 mg/100 ml meq/2

Whole blood 200 50

Whole plasma 20 5

Whole cell 440 112

Muscle tissue 250-400mg/100gm

Never tissue 530mg /100gm

**Absorption, Metabolism and excretion**

It is readily absorbed and is the principle cation in the intracellular fluid but also an important constituent in extracellular fluid because it influences the muscle activity, especially for cardiac muscle. High intercellular (k) is essential for several important metabolic functions including protein bio synthesis by ribosome. Kidney is the principle organ for the excretion of K+ which is influence by the changes of acid base balance as well as by the activity of adrenal cortex.

**Metabolic function**

1. It is a buffer constituents
2. For acid – base balance regulation
3. Water balance
4. Transport of co2
5. Membrane transport
6. Neuromuscular irritability

**K+ low/High**

**Hypokalaemia** - When the K+ level in the human body below the normal range.

Causes- i) Decrease Arterial volume

1. Diarrhea
2. Chronic wasting disease with malnutrition
3. Adrenocortical hormones e.g. aldosterone- which increase the excretion of k+.
4. Familial periodic paralysis – Rapid transfer of k from the extracellular to the intracellular space
5. Decrease Na level in distal tubule exchange site.

**Symptomes of Hypokalaemia**

1. Paralysis
2. Muscle weakness
3. Abdominal distention
4. Tachycardia
5. E.C.G change – Flattened T wave, inverted T wave

**Hyper kalaemia**

**Cause:** i) Renal failure

 ii) Addisons disease

 iii) Exces K+ when given intravenously

**Symptoms:** i) Mental confusion

 ii) Depression of cardiac and central nervous system

 iii) Bradicardia

 iv) E.C.G change –Sharp T wave prolonged P-R interval widening of the Q.R.S complex

**COPPER**

**Copper (CU):-**

**R.D.A-** 2-6 mg/day depended on age and certain physiological condition that in pregnancy, during lactation and growing age maximum requirement of copper is needed.

**Total amount in Human body**

It is about 25 gm/.70kg body weight

**Distribution**

 Whole blood 100 µgm/dL

 Serum 100 µgm/dL

**Sources:-**

 Animal – i) Heart ii) Liver iii) kidney iv) Brain

**Metabolic function:-**

1. It help in hemoglobin synthesis
2. Bone development
3. Connective tissue metabolism

**Deficiency:-**

i) Nephritic syndrome

ii) Kwashiorkor

iii) Wilson’s disease – It is cause by abnormality of cu metabolism causes Hepato lenticular degeneration

**Absorption, Metabolism and Excretion**

Dietary Cu+ absorption in the stomach and proximal part of the intestine other (i.e. duodenum). Then it is taken out into the liver and stored in incorporated into ceruloplasmin which is secreted into blood..

**Excretion:**

Excretory pathway through bile.

**Increase Cu+ level:-**

1. Acute Myocardial infarction
2. Leukemia
3. Billiary cirrhosis
4. Thyrotoxicosis
5. Corrective tissue disorder

**Selenium (Se):**

 It is first found Keshan province. It is component of Glutathione peroxides and plays a critical role in the control of oxygen metabolism particularly in catalyzing the brake down of Hydro peroxide (H2O2). This metal is recurred for the growth of human fibroblast and other cells in tissue culture. This metal deficiency first found people of keeshond province in china. This may be due to take of selenium of soil. And the disease is so called ‘keeshond disease’. Disease characterized by Multiple Myocardial Necrosis & Blood and serum selenium contains.

**Clinical symptom -**

1. Severe arrhythmia
2. Sometimes Carcinogenic shock
3. Cardiac enlargement

**Deficiency:**

 It is occur usually in Children in 1-9 years age group, Child bearing women 21-30 years.

**Protection:-**

 Selenium protects animals from a number of carcinogenic and viral agents.

**ZINC(zn+)**

**RDA** – 15-20 mg/day depending on the age and physiological condition eg: pregnancy

Total amount in human body 39mg/70kg body weight

**Distribution in the body:-**

Blood - 800 ugm/dl

Serum - 100u gm/dl

**Source –a) Poor sources** i) White bread I ii) Fats iii) Sugar

 b)) Moderate Source i) Meats (Beef – Pork) ii) Whole grain

 iii) Cereals iv) Legumes v) Rich Source vi) Oyster

**Absorption Metabolism and excretion –**

Absorption mainly takes place in the small intestine. It is decreases by Phosphates, Calcium, copper but in the following factors increase the absorption of zinc (1) amino acids (2) peptide.

Zn exertion principally through Secretion of pancreas and small intestine. 99% of the total zn+ found in the inside the cell and remaining 1% found in the plasma and ECF. Approximately 70% of the total zinc of serum loosely bounds with albumin and other protein.

**Deficiency:-**

1. High % of miscarriage
2. Birth effect
	1. Joint toes of finger
	2. Hydrocephalous due to zinc deficiency
3. Low birth weight
4. Mongolism
5. Intelligence and Behaviors changes clearing 3rd trimester of pregnancy a)Small size of brain bDecreased learning capacity

**Deficiency symptoms in Adults:-**

1. Diarrhea
2. Mental apathy
3. Anemia
4. Loss of hair
5. Dermatitis found around the mouth .

**Functions: -**

1. It help in poor wound healing
2. It increase hight and weight in same time
3. Increase inteligency

**Biological function:-**

1. Nucleic acid and protein synthesis
2. Alcohol metabolism

**Zinc decease in –**

1. A.M.I – Acute myocardial infraction
2. Nephritic syndrome
3. Cirrhosis of liver
4. Trauma, Burn often may on surgery
5. Hemolytic Anemia.

**CALCIUM (Ca+)**

Total amount of human body contain 22 gm/kg body wt.

99% Ca remains in the bones, 1% Ca remains in the soft tissue.

**Requirement:-**

At birth 27.5gm

According to need

During pregnancy and lactation supplementary: 400 mg/day.

Average requirement is 1000 – 1200 gm for an adult

RDA: - 8 gm/day

**Sources:**

1. Milk
2. Milk product
3. Bones , Fish and meat bones

**Factors responsible for Ca+ Absorption**

i) Vit D– 1, 25 (OH)2 D3 lack of active from of Vit D. ii) Phosphate

iii) Reaction of intestinal contents

iv) Increase absorption of fat and fatty acid.

**Function:-**

i) Essential for formation of bones

ii) Ca+ regulates the permeability of cell wall.

iii) It influences neurotrasmition.

iv) Ca+ regulate contraction of heart muscle

v) Helps in blood clotting

**Reabsorption of act in Human:-**

i) Excretion: Excreted to urine, sweat, faces

iv) Reabsorption: In the renal tubules due to the presence of aldosteron.

Subject Source of ca+ ca+ intake Retention

 From diet in mg in%

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Going children

(5-10) years.

d) School children Cow milk 259-277 4-15%

 (10-16y)

**Deficiency Disorder of Ca+**

1. Rickets in children

2. Oesteomalacia – due to of minerals deficiency

3. Oesteoporosis – It is the metabolic disorder which leads to renal function

4. Tatany – Due to extreme low level ca+ in serum

MAGNESIOM:

Total amount of in human body = 5gm/kg body wt.

Body weight is 50kg then 50x5 = 25.5 gm/kg body wt.

RDA = 350mg

Source: -

1. Chlorophil
2. Lagumes
3. Nut – ex-battle nut, coconut, grown nut
4. Whole grains

**ABSORPTION OF MAGNESIUM**

i) It is well absorption in human body

2) It competes with Ca+ for transport

**METIBOLIC FUNCTION:-**

1. It acts as a cofactor.
2. It is an important constituent bones and teeth.
3. It causes neuromuscular irritability

**DEFICIENCY:**

1. Muscular tremor and weakness
2. Chorliform movement / chore

 iii) Vaso dialatation

 iv) Vertigo

 v) Depression

 vi) Hyper irritability

vii) Mental confusion

**PHOSPHORUS:** Po4

Total amount in human body contain 12gm/kg body wt.

A person having 50kg body wt. 50x12 = 600gm

It comprises 22% total mineral content of the body-

It is found in the extracellular fluid and serum level 3-4 mg/dl

**RDA: 0.8gm/day**

**Source:** i) Milk product ii) Milk iii) Egg yolk iv) Meat v) Fish

 vi) Lagume vii) Whole grain’s

**ABSORPTION:**

1. Infant: Almost 85% absorption

ii) Children: 60-70% absorpted {0-28 days Neonatus)

 {28-1 years infant) From mixed diet.

**METABOTIC FUNCTION\**

1. It is the essential component of nucleic acid
2. It is important for glucose utilization
3. It is constituent of buffer
4. It is constituent of NAD, FAD, ATP etc.
5. It is intermediate of nucleo protein, phospholipids, and phosphoprotein.

**DIFICIENCY:-**

i) Renal impairment

ii) Cardice Arythmia

iv) Oesteomalacia