

VITAMIN D

Calciferol - (Active form)

- It is a steroid hormone (Fat soluble).

- Inactive molecule

Vitamin D₂

(Ergocalciferol)

- Plant sources

Vitamin D₃

(Cholecalciferol)

- Animal and
Sunlight.

Preformed

Adrenaline, hormone

Food from Gut $\rightarrow D_2, D_3 \rightarrow$ Combined with bile salt

Blood mixed with Vitamin D binding proteins

Liver D_2, D_3

25 Hydroxylase

25 Hydroxy ergocalciferol (Ergocalciferol)

25 Hydroxy cholecalciferol (Cholecalciferol)

Kidney 1 α -Hydroxylase

1,25 dihydroxy ergocalciferol (Ergocalciferol)

1,25 dihydroxy cholecalciferol (Calcitriol)

Active form of Vitamin D₃

From Sunlight

UV radiation

$\rightarrow$ 7 Dehydrocholesterol $\rightarrow$ Skin precursor of (cholecalciferol) [photolysis]

Blood $\leftarrow$ Vitamin D₃ cholecalciferol

$\leftarrow$ Previtamin D₃

Source Functions:

- Intestine - Promotes absorption of calcium and phosphorus
- Bone - Mineralization, Resorption of Bone
- Kidney - Reabsorption of calcium from kidney
- Other - Promotes normal growth

Sources:

i) Sunlight $\rightarrow$ Converts 7 dehydrocholesterol into Vitamin D₃

ii) Food $\rightarrow$ Only in Animal food like liver, Egg yolk, butter, cheese, fish

- Fish liver oil its main anal. Human milk has water soluble Vitamin D sulphur.

ii) Fortified foods: Milk, margarine, vanaspathi and infant foods.

Deficiency:

- When there is not enough active Vitamin D, Ca^{2+} , PO_4^{3-} → Inadequately mineralization.
- In children → Rickets → Softening, Impaired growth, Malformation
- In adults → Weakening and softening → Osteomalacia

Causes:

- i) Intestinal malabsorption (Celiac disease or chronic - Disease)
- ii) ↓↓ UV light exposure (Pawdha system)
- iii) Drugs affecting liver and kidney
- iv) liver and kidney disease

Clinical features:

Rickets & Osteomalacia @
Common

- Diffuse Bone and Joint Pain
- Proximal Muscle weakness
- Bone Fragility

- Increased risk for fractures

- Muscle spasm and weakness & numbness

Rickets Specific:

- ① Cranio-talar → Thin soft skull bones
- ② Delayed closure of anterior fontanelles.
- ③ Bow legs - Cremi Varum Knock Knees
- ④ Prominent Frontal bone and protruding abdomen
- ⑤ Rachitic rosary → Thickening of costochondral junction; Harrison Sulcus
- ⑥ Pigeon chest → Sternum projects forwards. (Chest carination)
- ⑦ Immature pelvis → Females causing obstruction during labor
- ⑧ Kyphosis, Scoliosis, Harrison Sulcus

Osteomalacia

- Tri radiate Pelvis
- Kyphoscoliosis
- Pseudofracture (Milkmaid lines and Looser zones)

Lab Investigations

- Vitamin D $\downarrow\downarrow\downarrow$, Calcium $\downarrow\downarrow\downarrow \rightarrow \uparrow\uparrow\uparrow$ PTH
- Increased Serum Alkaline Phosphatase
- $\downarrow\downarrow\downarrow$ Phosphorus

Rickets: X-ray

- ↳ Distal end of radius and ulna shows:
 - Concave (Cupping)
 - Widened (Flaring)
 - Irregular (Fraying)
- Bowing of legs

Osteomalacia:

- Decreased mineral density
- Bands of low mineral density form on the surface of the bone called as Looser zones (Pseudofractures)
- Usually seen in the superior and inferior pubic ramus

Prevention: → Daily Recommendation $\rightarrow 4000$ U under minimal Sun exposure

- Educating parents about sun exposure
- Periodic dosing of vitamin D
- Vitamin D fortified food

- Excessive Vitamin D intake orally can cause nausea, vomiting, anorexia, sleepiness due to hypercalcemia $\rightarrow$ Coma may develop.