VITAMIN D: FROM SOURCE TO DESTINATION

Sun

Ultraviolet light

Provitamin D3 in skin (7-dehydrocholesterol)

Cholecalciferol (vitamin D3)

D3 → 25(OH)D3

Liver

Chylomicrons

Parathyroid hormone

Kidney

25(OH)D3 → 1.25(OH)2D3

Calcitriol (1.25(OH)2D3)
Primary active form of vitamin D

Intestine

Bone

Other tissues

Food sources
Dietary calciferol (ergocalciferol D2, cholecalciferol D3)

Small intestine
Vitamin D is absorbed with fat
Formation of Vitamin D

- **Skin (UV light)**
  - 7-dehydro cholesterol \(\rightarrow\) Vitamin D\(_3\)
  - Ergosterol \(\rightarrow\) Vitamin D\(_2\)

- **Liver**
  - OH-group added
    - 25-Hydroxy vitamin D\(_3\)
    - Storage form of vitamin (~3 months storage in liver)

- **Kidney**
  - OH-group added by 1-hydroxylase
    - 1,25-dihydroxy vitamin D\(_3\)
    - Active form of vitamin D, a “steroid hormone”
  - OH-group added by 24-hydroxylase
    - 24,25-dihydroxy vitamin D\(_3\)
    - Inactive form of vitamin D, ready for excretion
Function

- Increase absorption of calcium from G.I.T
- Increase reabsorption of calcium from renal tubule
- Increase osteoblastic activity in bone
Vitamin D deficiency
Cause of Vitamin D Deficiency

1. Lack of sunshine due to
   - Lack of outdoor activities
   - Lack of ultraviolet light in fall and winter
   - Too much cloud, dust vapour and smoke

2. Improper feeding
   - Inadequate intake of Vitamin D, Calcium & Phosphate

3. Diseases
   - Liver diseases, Renal diseases, Gastrointestinal diseases

4. Drugs
   - Antiepileptic
   - Glucocorticosteroid
• Deficiency of vitamin D leads to:
  - Rickets in small children.
  - Osteomalacia
  - Osteoporosis
Clinical manifestation

- Mental psychiatric symptoms
  - Irritability, sleepless
- Spinal deformities
  - Scoliosis, Kyphosis & Lordosis
- Extremities
  - Bowlegs, knock knee, greenstick fracture
- Rachitic dwarfism
- Muscular system
  - Potbelly, late in standing and walking
  - Delayed Motor development
Clinical manifestation

Advanced stage

Osseous changes:

Head:
Frontal bossing
Box like appearance of skull
Delayed closure of anterior fontanelle

Teeth:
Delayed eruption

Chest:
Rachitic rosary
Harrison’s groove
Pigeon chest,
Funnel-shaped chest
X-ray finding in Rickets

- Late appearance of ossification center
- Widening of the epiphyseal cartilage
- Thinned cortex of the shaft of long bone
Laboratory findings

- Serum Calcium - Decrease
- Serum Phosphorus - Decrease
- Serum 1,25-Vitamin-D - Decrease
- Serum PTH - Increase
- Renal function test
- Liver function test
Diagnosis

- Assessed according to the followings:
  1. History
  2. Physical examination
  3. Laboratory findings
  4. Roentgenographic changes
Treatment

Food and nursing care
Prevention of complications
Special therapy
Vitamin D therapy

A. General method

B. Vitamin D 2000-4000IU/day for 2-4 weeks, then change to preventive dosage (400IU).

C. Single large dose:
   • Vitamin D3 200000-300000IU, I.M.

Calcium supplement
Sources of Vitamin D

- Sunlight is the most important source
- Fish liver oil
- Fish & Sea food (herring & salmon)
- Eggs
- Plants do not contain vitamin D3