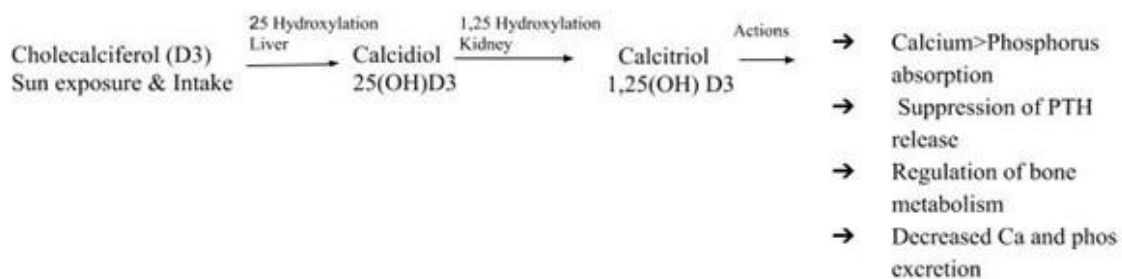


# Vitamin D Deficiency and Rickets:

## Vitamin D

- **Prevalence of deficiency and insufficiency:** 15% of the pediatric population.
- **Vitamin D Physiology**



- **Daily recommended intake(healthy individuals)**
  - Infants (soon after birth): 400 IU/day
  - 1-18 years: 600IU/day
- **Definitions of sufficiency, insufficiency, and deficiency**
  - Vitamin D sufficiency: 20 to 100 ng/mL
  - Vitamin D insufficiency: 12 to 20 ng/mL
  - Vitamin D deficiency: <12 ng/mL
- **Risk factors for deficiency**
  - Nutritional deficiency: maternal Vit D deficiency, a diet deficiency, exclusive breastfeeding
  - Malabsorption: celiac disease, inflammatory bowel disease, cystic fibrosis
  - 25-hydroxylase deficiency: liver disease, genetic disease
  - 1,25-hydroxylase deficiency: renal disease, genetic disease
  - Increased metabolism of Vitamin D-use of anti-seizure meds, steroids
  - Other: CYP3A deficiency, Vitamin D binding protein deficiency, and obesity
- **Clinical manifestations:**
  - Rickets in growing children.

- Severe vitamin D deficiency may lower serum phosphorus levels→ muscle weakness.
- **Evaluation:**
  - 25 hydroxyvitamin D levels in the high-risk population.
- **Treatment of mild vitamin D deficiency-cholecalciferol (D3) or ergocalciferol(D2)**
  - <12 months old – 1000 IU/day for 6 to 12 weeks, followed by maintenance dosing of at least 400 IU/day for 3 to 6 months
  - ≥12 months old – 2000 IU/day for 6 to 12 weeks, followed by maintenance dosing of 600 to 1000 IU/day for 3-6 months

## **Rickets**

**Definition:** it refers to the changes at the growth plate caused by the deficient mineralization of bone before the closure of the growth plates.

1. **Calcipenic rickets:** phosphorus concentration is normal or low, along with elevated PTH levels.
2. **Phosphopenic rickets:** phosphorus level is low with normal PTH concentrations.

- **Evaluation:**
  - Calcium, albumin, phosphorus, 25 hydroxyvitamin D levels, 1-25 dihydroxy vitamin D levels, PTH, spot urinary calcium/creatinine, alkaline phosphatase levels.
  - Radiological: X-ray of wrists.

## **Anticipatory Laboratory Values for different types of Rickets**

Parameters	Ca <sup>2+</sup>	Po <sub>4</sub>	PTH	Alk Phos	25(OH) D	Vit1,25(OH <sub>2</sub> ) Vit D
<b>Vitamin D deficiency</b>	↓/↔	↓/↔	↑	↑	↓	↔
<b>1 alpha-hydroxylase def</b>	↓	↓/↔	↑	↑	↔	↓
<b>Vitamin D Resistant Hypophosphatemic rickets</b>	↔	↓↓	↔	↑	↔	↔

- **Treatment:** It depends on the type of Rickets.
  - Chole/Ergocalciferol-1000-9,000IU/day for Vitamin D deficiency rickets.
  - Add calcium at a dose of 30-75mg/kg/day if hypocalcemia is present.
  - Vitamin D resistant and 1 alpha-hydroxylase rickets are treated with calcitriol.
  - For the treatment of hypophosphatemic rickets, calcitriol(higher dose) is given along with phosphorus supplementation.
  - Monitoring requires monitoring of calcium, phosphorus, alkaline phosphatase, and parathyroid hormone levels in 2-3 weeks.