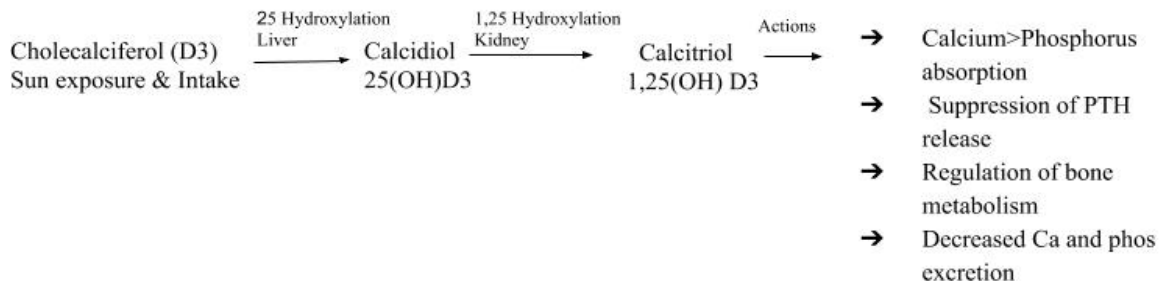


Vitamin D and Rickets

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: CYP34A 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 ₂	Po ₄	PTH	Alk Phos	25(OH) Vit D	1,25(OH ₂) Vit D
Vitamin D deficiency	↓ / ↔	↓ / ↔	↑	↑	↓	↔
1 alpha-hydroxylase def	↓	↓ / ↔	↑	↑	↔	↓
Vitamin D Resistant	↓	↓ / ↔	↑	↑	↔	↑ ↑
Hypophosphatemic rickets	↔	↓↓	↔	↑	↔	↔

- **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.

References and Resources

- 1) Munns CF, Shaw N, Kiely M, et al. Global Consensus Recommendations on Prevention and Management of Nutritional Rickets. J Clin Endocrinol Metab 2016; 101:394.
- 2) https://www.pedsendo.org/assets/patients_families/EdMat/third_batch/Vitamin%20D%20Deficiency.pdf