**Vitamin D and Rickets**

**Vitamin D**

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

![Vitamin D Metabolism Diagram]

- Daily recommended intake (healthy individuals)
  - Infants (soon after birth): 400 IU/day
  - 1-18 years: 600 IU/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**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Ca²</th>
<th>Po⁴</th>
<th>PTH</th>
<th>Alk Phos</th>
<th>25(OH) Vit D</th>
<th>1,25(OH₂) Vit D</th>
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<tbody>
<tr>
<td>Vitamin D deficiency</td>
<td>↓ / ↔</td>
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<td>1 alpha-hydroxylase def</td>
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<td>Vitamin D Resistant</td>
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<tr>
<td>Hypophosphatemic rickets</td>
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- **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**


2) [https://www.pedsendo.org/assets/patients_families/EdMat/third_batch/Vitamin%20D%20Deficiency.pdf](https://www.pedsendo.org/assets/patients_families/EdMat/third_batch/Vitamin%20D%20Deficiency.pdf)