

Nutritional rickets

M. Hashemipour

Pediatric Endocrinologist

Isfahan university of medical sciences

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Rickets

- ❖ **Rickets**, a disease of growing bone, occurs in children only before fusion of the epiphyses, and is due to unmineralized matrix at the growth plates .

VITAMIN D DEFICIENCY

- The most common cause of rickets globally
- most commonly occurs in infancy: 3 months - 3 years of age
- Transplacental transport of vit D (25-D) → vit D for the 1st 2 mo



Clinical manifestation of vitamin D deficiency

Clinical Features of Rickets

❖ GENERAL

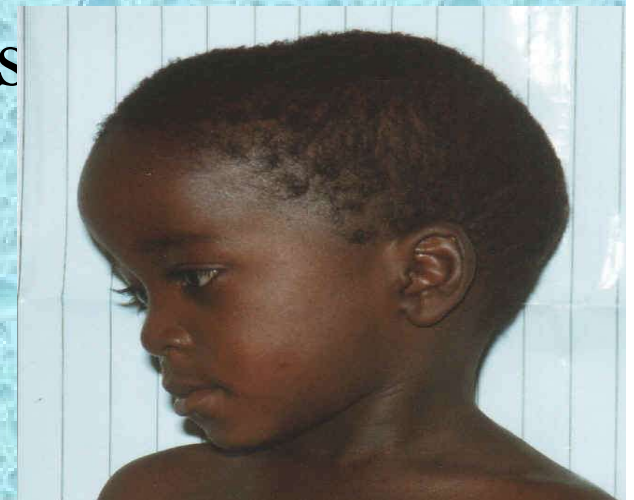
FTT, Listlessness, Protuding abdomen, Muscle weakness (proximal) , Fractures, ↑sweating

❖ HEAD

Craniotabes, Frontal bossing. Delayed fontanelle closure, Delayed dentition caries , Craniosynostosis

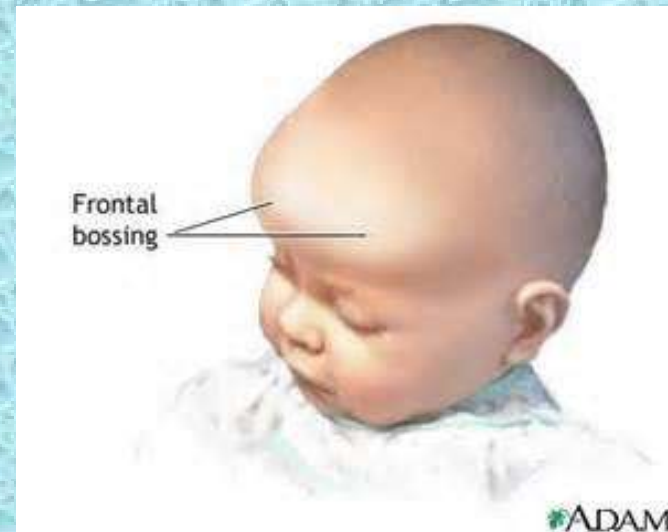
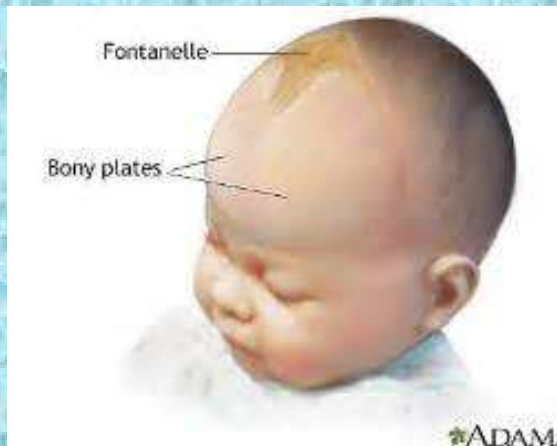
❖ CHEST Rachitic rosary, Harrison groove, Respiratory infections

❖ BACK Scoliosis, Kyphosis, Lordosis



Skeletal findings

- Delay in the closure of the fontanelle
- Parietal and frontal bossing



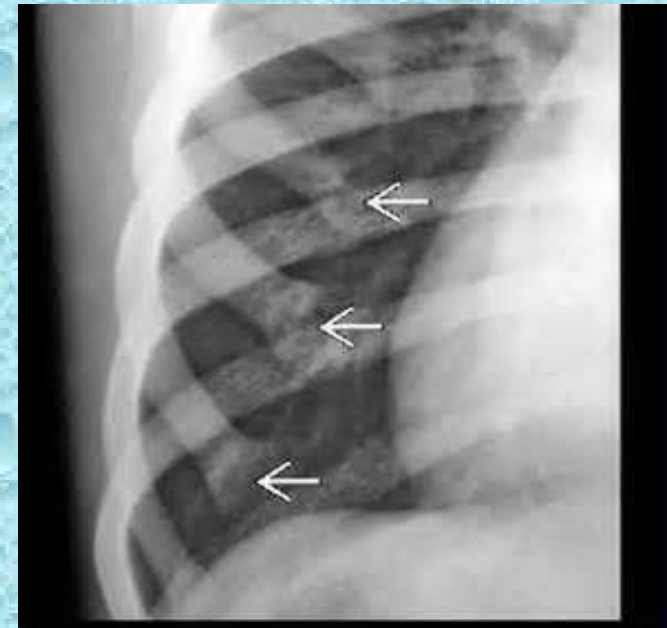
Skeletal findings

- Craniotabes (soft skull bones)



Skeletal findings

- Enlargement of the costochondral junction ("rachitic rosary")



Skeletal findings

- Harrison sulcus (muscular pull of the diaphragmatic attachments to the lower ribs)



Skeletal findings

- Enlargement of the wrist and bowing of the distal radius and ulna



Skeletal findings

- Deformities in lower limbs due to rapid growth and weight bearing
- Progressive lateral bowing of the femur and tibia
- Genu valgum, genu varum, windswept deformity, and anterior bowing of legs.



Skeletal findings

Genuvalgus



Genuvarum



Knock knee deformity (genu valgum)



Windswept deformity of rickets



What are the manifestations of vitamin D deficiency during preschool period and adolescence?

- + proximal myopathy manifests with waddling gait, even without any deformity.
- + Chest deformities include pectus carinatum, pectus excavatum



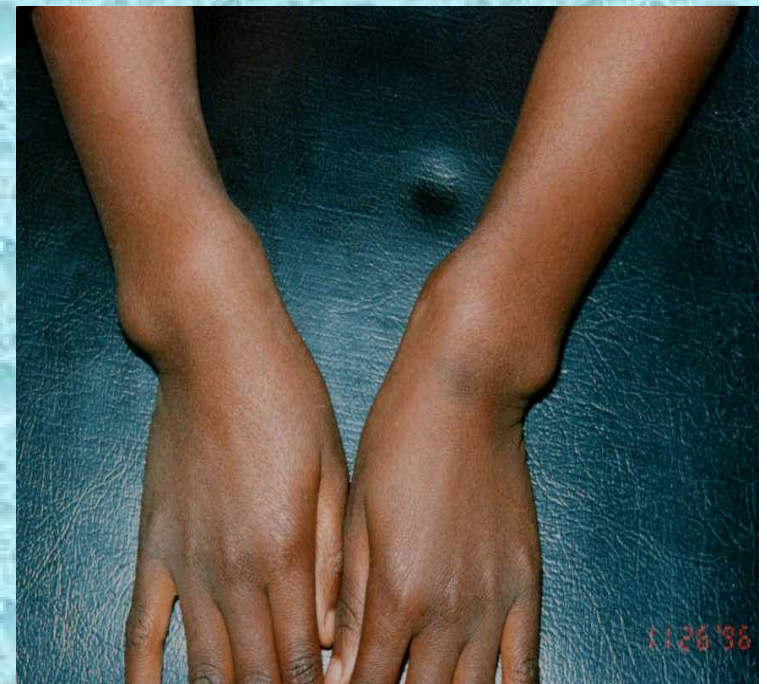
❖ EXTREMITIES

- Enlargement of wrists and ankles
- Windswept deformity
- Valgus or varus deformities
- Leg pain



❖ HYPOCALCEMIC SYMPTOMS

- Tetany
- Seizure
- Stridor



- ❖ The site and type of deformity depend upon the age and the weight-bearing patterns in the limbs.
- ❖ deformities of the forearms → infant
- ❖ toddler → genu varum
- ❖ older child → valgus deformities or a windswept deformity



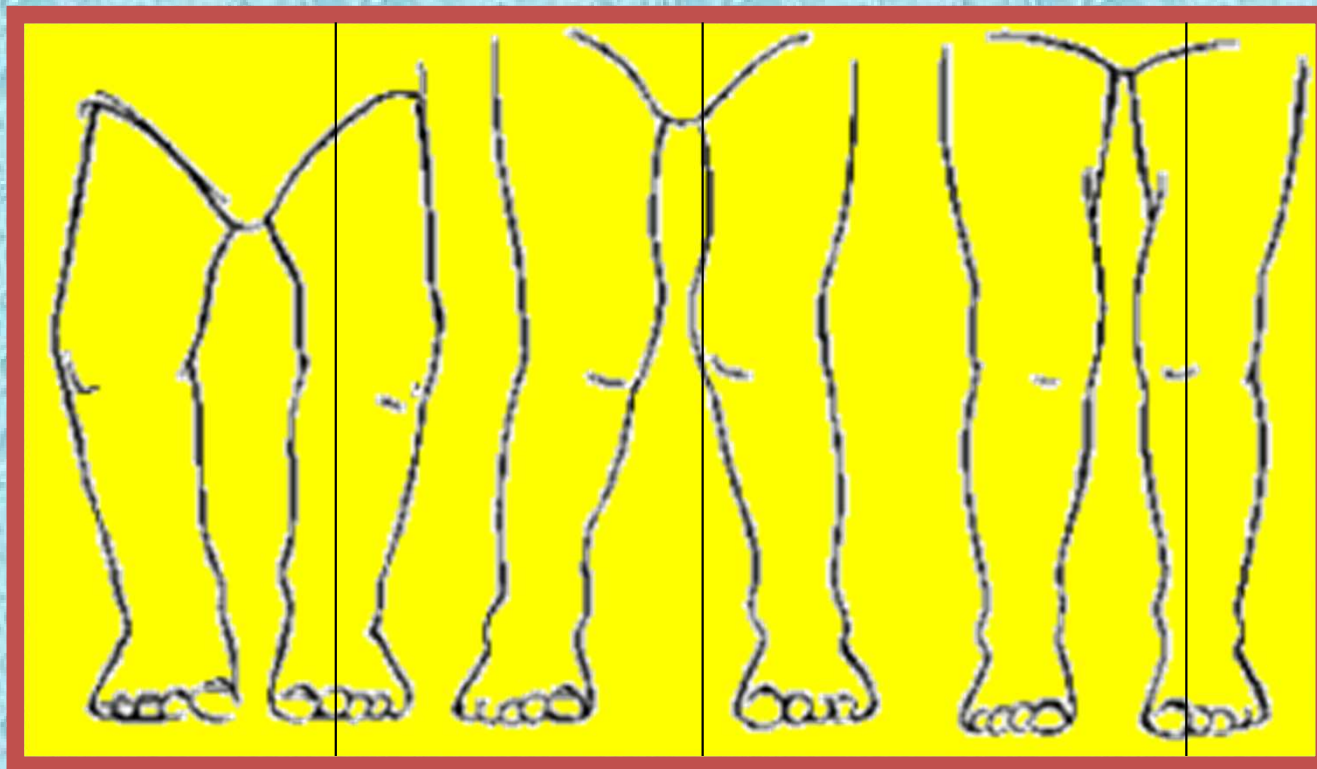


Knock knee deformity (genu valgum)



Windswept deformity of rickets

Normal evolution from bowlegs (age 2) to knock-knees (age 3) to normal valgus (age 4)



Radiology

- ❖ Decreased calcification
- ❖ Fraying, cupping, widening of epiphyseal plate
- ❖ widening of the distal end of the metaphysis
- ❖ coarse trabeculation of the diaphysis
- ❖ delayed appearance of the epiphyseal bone centers, or may be small, osteopenic, and ill-defined



Lab Data

	Ca	P	1,25D	ALP	PTH
Stage I	↓	NL	↑orNL	NL	NL/↑
Stage II	NL	↓	↑	↑	↑
Stage III	↓	↓	↑	↑	↑

How to diagnose vitamin D deficiency?

- To measure $25(\text{OH})\text{D}$

Half-life of $2-3$ weeks

How to diagnose vitamin D deficiency?

- $1,25(\text{OH})_2\text{D}$ is not used to define the vitamin D status because vitamin D deficiency is associated with **normal/high levels of $1,25(\text{OH})_2\text{D}$** as a consequence of secondary hyperparathyroidism.

How was the cutoff for defining vitamin D deficiency derived

25(OH)D level

- <30 ng/ml vitamin D insufficiency
- <20 ng/ml vitamin D deficiency.

Vitamin D treatment

vitamin D₂

Ergocalciferol is available in 5,000 IU capsules for oral administration.

Disadvantages include

- Necessity for hepatic and renal metabolism
- its slow onset
- long duration of action.
- It must be given each day for several weeks before its full effect
- Hypercalcemia, persist for two to three weeks after it is discontinued

vitamin D₂

- Onset of action following oral or IM 1. — 24 hours.
- Therapeutic effect 1. to 14 days
- Maximal effects 4 weeks.
- Duration of action 2 - 6 months

Human milk

- Human breast milk contains approximately ۲۵ IU/L.vitamin D
- So exclusively breast fed infants for a prolonged duration are at risk for the development of severe vitamin D deficiency, unless the mother is supplemented with supraphysiological doses of vitamin D
- ۴۰۰۰–۶۵۰۰ IU/day.

Treatment : vitamin D₂

Age	Stoss therapy	alternative for 3 month
<3 mo	Not advise	1000 IU/day
3 < age < 12 mo	50000 IU orally/IM	1000 – 5000 IU/day
1-12 yr	150000 IU orally/IM	5000 – 10000 IU/day
>12	300000 IU orally/IM	

Calcium supplementation

- In addition to vitamin D supplementation,
- **۳۰-۷۵ mg/Kg/day of elemental calcium** in three divided doses to prevent hungry bone syndrome in children with rickets for ۲-۴ weeks

Thanks for your attention

