Vitamin D Deficiency in Exclusively Breastfed Infants

Dr.S.Balasubramanianan, MD,DCH,MNAMS, Senior Consultant in Pediatrics
Kanchi Kamakoti CHILDS Trust Hospital,
Chennai -600 034. Tamil Nadu.
Introduction

• **Exclusive breast feeding** - recommended up to 6 months of age with all its beneficial effects on child survival
Increase in breast-feeding rates leads to decreased vitamin D intake from other sources and there by Rickets

Vitamin D in Breast Milk

Breast Milk is deficient in Vitamin K, Vitamin D, and Iron.

Concentrations of vitamin D average only 35 IU/L in African American women and 68 IU/L in white women, far below the daily amount of 200 IU/day recommended for infants by the Food and Nutrition Board of the National Academy of Sciences.
Breast feeding & Vit D Deficiency

• Breast milk contains between 20 and 60 IU/L of vitamin D and hence adequate intake of vitamin D cannot be met with human milk as the sole source of vitamin D in a breast-feeding infant

Requirements of Vitamin D

• 200 IU/day of vitamin D has been recommended for normal infants, children and adolescents beginning in the first 2 months of life


• 200–400 IU/day recommended in pregnancy and lactation
Vit D & Breast Feeding

- Half-life of serum 25(OH)D is 3 wk; therefore, even if neonates do not receive an exogenous supply of vitamin D during the first weeks of life, 25(OH)D concentrations should decrease to values associated with vitamin D deficiency only toward the end of the second month, provided that the maternal vitamin D status is adequate during pregnancy.
Prevalence of Vitamin D Deficiency in Exclusively Breastfed Infants

• Reported to be 82%, 52% & 20% from UAE, Pakistan and China respectively.


• There is paucity of data from India
Risk factors For Vitamin D Deficiency in Exclusively Breastfed Infants

- Low maternal levels of vitamin D
- Indoor confinement during the day
- Living at higher altitudes
- Living in urban areas with tall buildings
- Air pollution
Risk factors
Risk factors

• Use of sunscreen and covering much or all of the body when outside
• Dark Skin
• Low educational level
• No reports of correlation between the number of pregnancies and vit D deficiency
• Preterm, VLBW & ELBW babies
Sunlight & Vit D

Two hours is the required minimum weekly period of exposure to sunlight for infants if only the face is exposed, or 30 minutes if the upper and lower extremities are exposed.

• Effects of sunlight exposure decreases with individuals who have darker skin pigmentation. (Fuller KE, Casparian JM. Vitamin D: balancing cutaneous and systemic considerations. South Med J. 2001; 94:58–64)

Protective measures to reduce skin cancer:

- Avoiding the sun between 10 AM and 4 PM,
- Wearing sun-protective clothing when exposed to the sun
- Using sunscreen with a sun protection factor (SPF) of 15 and
- Avoiding artificial sources of UV light

Risk of Vitamin D Deficiency still heightened by AAP recommendations

- To keep infants < 6 months out of sunlight.

- Children's activities should minimize sunlight exposure by use of protective clothing & sunscreens

Clinical features of Vitamin D Deficiency in Exclusively Breastfed Infants

- Symptomatic or Asymptomatic.

Stage 1: Hypocalcemic symptoms

Stage 2: Skeletal deformities

Stage 3: Worsening of symptoms of 1&2
Manifestations of Vit D Def

• Symptomatic vitamin D deficiency manifests as craniotabes, rickety rosary, swelling of the ends of long bones, frontal bossing of the skull, hypocalcemic seizures or tetany and slow motor development.
• The development of clinical vitamin D deficiency rickets is dependent not only on the severity of the vitamin D deficiency [circulating concentrations of 25(OH)D] but also on the duration of the deficiency, on the rate of the child's growth (which influences calcium demands), and on the dietary calcium content
Hypocalcemia due to vitamin D deficiency in Exclusively Breastfed Infants.

- Indian Pediatr. 2006 Mar;43(3):247-51 Balasubramanian S, Shivbalan S, Kumar PS.

- 13 infants most in Upper Middle Class
- All presented with Seizures
- All Born Term & Unsupplemented
- All mothers had poor Sunlight Exposure & were Biochemically Vit D Deficient
Hypocalcemia due to Vitamin D deficiency in Exclusively Breastfed Infants.

(Balasubramaniam et al. Indian Pediatr. 2006)

• The youngest was 2 months age and the oldest being 6 months with signs of rickets (rachitic rosary and craniotabes) observed in only one of these 13 infants and radiological features in only 2 of them.
Myelofibrosis and vitamin D deficient rickets--a rare association.

Balasubramanian S, Varadharajan R, Ganesh R, Shivbalan S.
Indian Pediatr. 2005 May;42(5):482-4

- An exclusively Breast Fed Infant Succumbed to myelofibrosis due to Vit D Deficiency
- Vit D inhibits proliferation of Megakaryocytes
- Promotes maturation of Macrophages & Monocytes which inhibit degradation of Collagen
- Sec Hyperparathyroidism leads to myelofibrosis
Vitamin D deficiency rickets in breast-fed infants presenting with Hypocalcaemic Seizures.


- Prophylactic vitamin D 400 IU administered to infants up to 2 years and 800 IU to women in pregnancy and during lactation is recommended to prevent vitamin D deficiency.
Diagnosis

The classical radiological features of rickets include generalised osteopenia, widening of the growth plates, and cupping of metaphyseal regions of long bones (Mughal et al. BMJ. 1999)
Biochemical

• **Mild vitamin D deficiency**: Serum 25-OHD concentration of 25–50 nmol/L. Serum levels over 50 nmol/L prevent secondary hyperparathyroidism and elevated alkaline phosphatase levels.

• **Moderate vitamin D deficiency**: Serum 25-OHD concentration of 12.5–25 nmol/L. The incidence of hypocalcaemia and rickets increases with moderate deficiency.

• **Severe vitamin D deficiency**: Serum 25-OHD concentration less than 12.5 nmol/L. Vitamin D concentrations less than 12.5 nmol/L are seen in over 70% of children with rickets and over 90% of children with hypocalcaemia.
Treatment

• It involves oral or intramuscular administration of the total treatment dose of vitamin D 600 000 IU either as a single dose or as oral vitamin D3 at a dose of 2000-6000 IU producing radiologic clearing in 2-4 weeks

Treatment of Vitamin D Deficiency Megadose or Daily Dose?

Treatment with either of the two different regimens increases the bone mineral intensities with similar efficacy

Prevention of Vit D Def in Eclusively Breast fed Infants

• No Indian guidelines for vitamin D suplementation

• No evidence of vitamin D deficiency in vitamin D unsupplemented exclusively breast fed infants

(Greer FR, Marshall S. Bone mineral content, serum vitamin D metabolite concentrations, and ultraviolet B light exposure in infants fed human milk with and without vitamin D2 supplements. J Pediatr 1989;114: 204- 212)
Options for Prevention

• Supplementation to Pregnant & Lactating Women
• Supplementation to Infants
• Increased Exposure to Sunlight
Maternal-infant vitamin D relationships during breast-feeding. Rothberg AD, Pettifor JM, Cohen DF, Sonnendecker EW, Ross FP.

- Well-nourished, white nursing mothers were given a placebo, 500 IU vitamin D/day or 1,000 IU vitamin D/day; their infants were not given supplemental vitamin D. A control group of infants who had received 400 IU vitamin D/day had even higher concentrations of 25-hydroxyvitamin D, suggesting that infant supplementation with vitamin D is more efficacious than maternal supplementation.
A decline in the number of pediatricians who recommend Vit D supplementation for breastfed infants might be another contributing factor for resurgence of Rickets.
Aggravating the situation is the possible resistance to vitamin D supplementation from the mothers themselves and from breastfeeding support groups, as it is perceived that vitamin D supplementation detracts from the message that breast milk is a complete food that requires no further supplementation.
Summary

Vitamin D Deficiency in Exclusively Breastfed Infants not confined to Developed Countries

Symptomatic Vit D Deficiency in them - is it unrecognised or underreported?
Summary

• Supplementation of Vit D to all exclusively breast fed infants—need of the hour

• Promoting Exposure to sunlight by Change of Lifestyles needed
Thank You