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Vitamin D Levels in Exclusively Breastfed Babies and their Mothers.

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ABSTRACT

Background: Increasing prevalence of vitamin D deficiency in pregnant and lactating women (84.3%) is responsible for low vitamin D levels in exclusively breastfed newborns and infants. Objectives: To measure the serum vitamin D, calcium, phosphorus and alkaline phosphatase level in exclusively breastfed infants and their mothers. To correlate maternal serum vitamin D and calcium levels with that of infants. Method: This was a cohort study conducted in Pediatric outpatient department and well baby clinic of a tertiary teaching hospital from Jan 2007 - Dec 2008. The serum vitamin D, calcium, phosphorus and alkaline phosphates levels were estimated in 30 dyads of mother and baby by standard techniques. Result: Twenty six percent of mothers and 60% of infants had low serum 25(OH) D levels. Conclusion: study found very high prevalence of hypovitaminosis D in both mother & infant.

KEYWORDS: Vitamin D, exclusive breastfeeding, infants

Introduction:

Prevalence of vitamin D deficiency continues to remain as public health problem and it is very distressing to note that it is equally prevalent even in sunny countries including India. (1,2,3) All age groups show variable status of vitamin D deficiency including pregnant women, newborns, infants and children. High prevalence of vitamin D deficiency in pregnant and lactating women (84.3%) is responsible for low vitamin D levels in newborns and infants. (4) Vitamin D deficiency does exist in exclusively breastfed infants (5) & hypocalcaemic seizures have been observed in them. (6) Placentally transferred vitamin D is adequate only till 8 weeks of age. Breast milk contains only about 20 – 60 IU/L of vitamin D while RDA of vitamin D for infants is 200-400 IU/ day. (7) In order to find out the prevalence of vitamin D deficiency in mother and infants attending this tertiary care centre, we decided to perform this study.

Subjects and methods:

It was a prospective cross sectional study, carried out in pediatric outpatient department and well baby clinic of a tertiary teaching hospital, during Jan 2007 -Dec 2008. Sample size was 30 dyads. Institutional ethical committee approval & informed consent were obtained. Exclusively breastfed full term healthy babies of birth weight of = 2.5 kg & age between 2 to 4 months were included in the study. While infants with co-morbid conditions, infants on formula feeds / top feeds and calcium, vitamin D supplementation, low birth weight and preterm Infants were excluded from the study. Healthy mothers of age between 20 to 35 years, weighing more than 45 kg with normal pregnancy and normal delivery were included in the study. Mothers with any chronic medical, surgical diseases OR obstetric illnesses were excluded from the study. Detailed maternal and infant history and other relevant details were recorded in a pre-designed questionnaire. All the mothers were receiving calcium lactate 500mg three time's day, as a part of their postnatal care. Serum calcium, phosphorus and alkaline phosphatase were estimated by standard biochemical techniques with adequate control. Serum vitamin D levels were done by fully automated electro chemiluminescence system, Raush (U S).The levels for serum calcium, serum phosphorus and alkaline phosphatase as mentioned over the kits were used as norms for mothers. As specific norms are not available for infants, value most commonly mentioned in the literature was used (Reference range s. calcium 8.8 to 10.8 mg%, s. phosphorus 3.8 to 6.5 mg%, s. alkaline phosphatase 145 to 420 IU/L (8, 9, 10) Serum vitamin D levels <15ng/ml were considered 'deficient' while levels between 15-20ng/ml were considered 'insufficient' for both mother and infant. (11) Statistical analysis was done using statistical package for social sciences15.0 for window evaluation version. The results were compared and analyzed using percent distribution, bivariate analysis using Chi square test. Correlation was determined using Pearson's correlation coefficient.

Result:

There were total 30 mother infant pairs. Out of thirty, 17 mothers were between 20-25 years of age. Twenty five mothers were primipara. The average levels of serum calcium, phosphorus, alkaline phosphatase & 25(OH) D levels in mothers and infants are depicted in (table-1).

Average values of calcium, phosphorus, alkaline phophatase & 25(OH) D levels in mothers and infants.

Frequency N=30	Serum calcium (mg/dl)	Serum phosphorus (mg/dl)	Serum ALP (IU/L)	Serum 25 (OH) D(ng /ml)
mothers	8.28±0.92	3.58±0.8	426±143.5	21.73±13.8
Infants	8.45±0.88	3.97±0.86	472.0±237.52	23.81±14.42

Twenty two mothers had low serum calcium levels. Eight mothers had 'deficient' while sixteen mothers had 'insufficient' serum 25(OH) D levels. In infants mean age, weight and length were 3.0months±30days, 4.6kg ± 1.2kg & 59.5cm ±6cm respectively. Male: female ratio was 1:1.5. Twenty three infants had low serum calcium levels. Eighteen infants had 'deficient'& 03 infants and 'insufficient' serum 25(OH) D levels. On correlation of mother-infant 25(OH) D levels (Table-2)

Table-2 Correlation between serum 25(OH) D levels of mothers and infants .

25(OH) D levels in mothers (ng/ml)	25(OH) D levels in Infants (ng/ml)		
	<15	15-20	20-50
<15 (08)	07*	01	00
15-20 (16)	08	02	06
20-50 (06)	03	00	03

we found that eight mothers and 07 infants had deficient 25(OH) D levels (p=<0.05), while 11 infants in addition had deficient 25(OH) D levels.

Discussion:

Exclusive breast feeding is increasingly practiced in our country. Reports of subclinical vitamin D deficiency in exclusively breast fed infants are appearing in abundance in medical literature. Vitamin D deficiency appears much before occurrence of clinical features of rickets, which is extreme form of vitamin D deficiency (12), Diagnosing this pre-rachitic subclinical vitamin D deficiency is very important for non skeletal health benefits.

Average serum calcium level and 25(OH) D levels of mothers were low in our study. Mean serum calcium and 25(OH) D levels of mothers in

another Indian study done by Bhalala & Desai et al (13) were 8.59 ± 0.55 mg/dl and 22.99 ± 10.93 ng/ml respectively which were comparable to our study. While study

done by N Agarwal (5) showed mean serum 25(OH) D level of mothers as 8.89 ± 5.97ng/ml which was lower as compare to our study and study done by Bhalala & Desai et al. (Table-3)

Table-3 Comparison with other studies.

	Our study	Desai et al	N. Agarwal	Balasubramanian.
Mean 25(OH) D level in infants(ng/ml) (Mean s. calcium levels mg/dl)	23.81 ±14.42 (8.45 ± 0.87)	18.19 ±9.74 (10.13±0.78)	11.55 ± 7.17	3.86 ± 2.07 (6.71± 0.72)
Mean 25(OH) D levels in mothers(ng/ml) (Mean S.calcium levels mg/dl)	21.735±13.8 (8.28 ±0.92)	22 ±10.93 (8.59±0.55)	8.89 ± 5.97	NA

There are number of reports in literature on high prevalence of 25(OH) D deficiency in pregnant and lactating women (1, 4, 5, 13) Mean serum calcium and serum 25(OH) D levels in infants were comparable with study done by Bhalala & Desai et al (13). But as compare to our study, mean 25(OH) D levels were lower in the study done by N Agarwal(5) Mean levels in study done at Tamil Nadu by Balasubramaniam et al(6) was very low because the subjects included were symptomatic. Sixty percent of infants enrolled in our study had deficient & 10% had insufficient 25(OH) D levels. Where as in the study conducted by Bhalala & Desai et al 50% of infants were having deficient 25(OH) D levels. Among the mothers 26.6% had deficient 25(OH) D levels which was lower as compared to other Indian study by Bhalala & Desai et al (13) & N Agarwal et al(5) this was 48.5% & 70% respectively.(table-4)

Table-4 Percentage of babies and mothers with deficient 25 (OH) D, comparisons with other studies.

	Our study	Bhalala & Desai et al	N. Agarwal et al
% of infants with deficient 25(OH) D level (ng/ml)	60%	50%	55.6%
% of mothers with deficient 25(OH) D level (ng/ml)	26.6%	48.57%	70%

The limitations in our study were small sample size and inability to perform serum iPTH levels due to economic constraints. X – Ray wrist was not done as the babies did not have any clinical signs of rickets.

Conclusion:

In conclusion, both mother and infant pair in our study showed hypocalcaemia and vitamin D deficiency.

Vitamin D and calcium deficiencies in pregnancy can adversely affect fetal growth and limit fetal bone Mass. Babies will be born with congenital rickets, resulting to poor skeletal growth and its complications. Adequate vitamin D supplementation to pregnant and lactating mothers and to exclusively breastfed Infants will help in achieving normal bone health and will also lower the risk of future cancers, autoimmune and cardiovascular diseases. Large randomized control trials are required in this context to Make vitamin D supplementation as public health policy.

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