

Original Research Article

Prevalence of vitamin D deficiency in exclusively breastfed infants

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ABSTRACT

Background: Vitamin D deficiency in exclusively breast fed infants was increasing in young infants. Many studies were done previously but still the data on vitamin D status of healthy term infants are scanty. Hence the present study was done to determine the prevalence of subclinical vitamin D deficiency among exclusively breast fed babies by estimating the serum levels of relevant parameters.

Methods: The present descriptive study included 40 babies that are exclusively breast fed healthy term babies with birth weight >2.5kg. After collection of complete demographic and antenatal data, serum was collected from all the babies to estimate serum levels of vitamin D (25OH-D3) and calcium, phosphate, and alkaline phosphatase.

Results: Out of 40 babies, vitamin D deficiency was found in 33 (83%) babies. Of them, hypocalcaemia was seen in 13 (39.3%) infants. Raised ALP was noticed in all babies with a mean value of 464.97 IU/L. Phosphorus levels were normal in all babies with a mean value of 6.12 mg/ml. Serum 25 OH vitamin D3 levels were low (mean-10.02 ng/ml) and mean calcium was 8.81 mg/dl.

Conclusions: Prevalence of vitamin D deficiency was found to be high in exclusively breastfed babies with hypocalcemia in 39% of babies and associated seizure in one baby in this study.

Keywords: Breast feeding mothers, Infants, Vitamin D deficiency

INTRODUCTION

Exclusive breast-feeding is recommended up to 6 months of age with all its beneficial effects on child survival.¹ In developing countries, a total of about 1.45 million lives of infants are lost due to inadequate breast feeding. WHO analysis of childhood deaths has listed suboptimal breast-feeding as one of the most powerful shared risk factors and estimated that 1.3 million deaths can be prevented in 42 high mortality countries by increasing the level of breast-feeding amongst infants. The increase in the practice of breast feeding associated with the belief that "breast is best" and that breast milk does not require supplementation because it is a baby's "perfect food"

may lead to decreased 25-hydroxy vitamin D (25-OHD) intake from other sources and thereby causing rickets.¹

Vitamin D is the necessary precursor for 1, 25-hydroxyvitamin D, the steroid hormone required for calcium absorption there by helps in bone development and growth in children.² Vitamin D stores in children depend on the levels of vitamin D stores of the mother. If mother is deficient of vitamin D, former will be the deficient of the same.³ Restricted intake of vitamin D, insufficient exposure to sunlight was found to be the main reasons for vitamin D deficiency in the mother and women with dark skin pigmentation were also at higher risk.⁴

As per the recommendations of FDA, daily required dose of vitamin D was 400 IU.⁵ It has been reported that breast milk from a vitamin D replete mother contains between 20 and 60 IU/l of vitamin D and hence breast milk alone cannot be adequate to meet the sufficient needs of vitamin D for infants.^{5,6} Hence, it is recommended for added vitamin D supplements particularly during pregnancy and lactation. A study from Finland concluded that it is more efficient to supplement infants rather than their mothers to meet their daily requirements; as the reports stated that the levels of 1, 25-hydroxyvitamin D was found to be similar even if the mothers were supplemented with 2000 IU of vitamin D.⁷

The present study was conducted with the aim to determine the prevalence of subclinical vitamin D deficiency among exclusively breast fed babies.

METHODS

This prospective descriptive study was conducted at Institute of Child Health and Hospital for Children in Chennai for a period of one year from November 2010 to December 2011.

Inclusion criteria

- After getting approval from Institutional ethics committee 40 babies that are exclusively breast fed healthy term babies with birth weight >2.5kg were included in the study.

Exclusion criteria

- Babies who are on multivitamin drops were excluded from the study.

After taking written informed consent from the mothers, demographic and antenatal data were recorded. Baby data such as birth weight, present weight, feeding history and multivitamin supplementation were enquired and recorded.

Babies were screened for underlying systemic illness and any clinical evidence of rickets. Details such as sunshine exposure, pigmentation of the baby, residing in urban area with air pollution and living in tall buildings with sunscreen use noted.

Serum levels of vitamin D (25OH-D3) and calcium, phosphate, and alkaline phosphatase were estimated. Vitamin D3 was assayed by CLIA method.

Anthropometric assessment was carried out during the first 24 hours after admission. Clinical examination included assessment of weight for age as per WHO standards, length for age according to Waterlow's classification, and weight for length according to McLaren's classification.

RESULTS

As shown in Table 1, majority of the babies were between 1 to 2 months followed by 40% in the age group between 2 to 4 months while 15% belonged to 4 to 6 months. Out of 40 babies 28 were males and 12 were females. Babies with dark skin pigmentation, degree of vitamin D deficiency was high. Levels of alkaline phosphatase was elevated (Mean-464.97 IU/L) in all of them. Phosphate level found to be normal in all babies. Serum 25 OH vitamin D3 levels were low (Mean 10.02 ng/ml) and mean calcium was 8.81 mg/dl. Nutritional status of children in terms of weight for age, length for age and weight for length were found to be normal denoting all babies were well nourished.

Table 1: Clinical and biochemical characteristics of study population (n=40).

| Infant characteristics | N (%) |
|-----------------------------------|---------------|
| Males | 28 (70) |
| Females | 12 (30) |
| Age (in months) | |
| 1-2 | 18 (45) |
| 2-4 | 16 (40) |
| 4-6 | 6 (15) |
| Sunlight exposure | |
| Babies with dark skin | 11 (27.5) |
| Babies with fair skin | 29 (72.5) |
| Vit D3 25 OH (ng/ml) ^a | 10.02±8.34 |
| Calcium (mg/dl) ^a | 8.81±1.95 |
| Phosphorus (mg/ml) ^a | 6.12±0.68 |
| ALP (IU/l) ^a | 464.97±116.00 |

^aData presented as median (IQR), otherwise mean±SD.

As shown in Table 2, 33 (83%) out of 40 babies were found to be vitamin D deficient and 17% were vitamin D sufficient. Out of 33 babies with hypovitaminosis D, severe deficiency was seen in 35% cases, deficiency in 45% cases and insufficiency in 3% cases. Among 33 babies with vitamin D deficiency 13 were found to be hypocalcemic. Remaining 20 babies were normocalcemic. One baby with hypocalcemia due to vitamin D deficiency presented with refractory seizures and all other babies were had only asymptomatic hypocalcemia. Serum phosphate level was found to be normal in all cases. Alkaline phosphatase level was raised in all 33 cases. Seizures was noticed only in one case of hypovitaminosis D.

Table 2: Prevalence of vitamin D deficiency and its biochemical markers in infants (n=33).

| Parameter | N (%) |
|-------------------|-----------|
| Severe deficiency | 35 |
| Deficiency | 45 |
| Insufficiency | 3 |
| Hypocalcemic | 13 (39.3) |
| Raised ALP | 33 (100) |

Radiological features of rickets like fraying of ends of long bones in X-ray of both knees and wrist were noticed in 3 babies although clinical features of rickets were absent in all babies.

DISCUSSION

In present study 83% of exclusively breast fed babies are vitamin D deficient similar to report by Atiqet al.⁹ A male preponderance was noticed in present study, the reason for which is not clear. In present study all exclusively breast fed babies with hypocalcemia and vitamin D deficiency had inadequate exposure to sunlight as reported by Kutluket al.¹⁰

Since vitamin D is principally derived from the action of sunlight on exposed skin, inadequate exposure to sunlight, leads to vitamin D which must be made up from dietary sources. In exclusive breast fed babies as the content of breast milk vitamin D is low, so vitamin D deficiency was aggravated.¹⁰ Deficiency must be present for many months before clinical rickets becomes obvious.¹⁰ In present study, all babies with vitamin D deficiency as evidenced by low levels of 25 OH vitamin D3 but clinical features of rickets were absent in all of them.

Babies on exclusive breast feeding with vitamin D deficiency may have normal levels of calcium or low level of calcium depends upon the stage of deficiency.¹¹ In present study serum calcium levels are lower than normal in 13 babies. In present study raised ALP levels was noticed in all babies. This was similar to the findings of Jain et al.¹¹ Rickets and hypocalcemic seizures due to vitamin D deficiency in exclusively breastfed young infants have been recently reported from southern India.^{12,13} In present study one baby with hypocalcemia due to vitamin D deficiency presented with seizures. All other babies with deficiency of vitamin D were asymptomatic.

CONCLUSION

In conclusion, the present study found vitamin D deficiency in 83% of study population. Only one baby was presented with seizure. Elevated ALP was found in all babies. Hypocalcaemia was noticed in 39.3% babies. Still larger studies need to be conducted nationwide with more population to confirm the study findings and to detect subclinical hypovitaminosis D in exclusive breastfed babies. There is also need for implementation of the national recommendations on vitamin D supplementation to exclusive breastfed babies to prevent associated co-morbidities of vitamin D deficiency.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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