

Original Research Article

Study of vitamin D levels in exclusively breastfed term infants in a tertiary care centre

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ABSTRACT

Background: Exclusive breast-feeding is recommended up to 6 months of age with all its beneficial effects on child survival. Several studies have concluded that adequate intake of vitamin D cannot be met with human milk as the sole source of vitamin D. So this study was undertaken to study the serum vitamin D levels in exclusively breastfed babies and their mothers in a tertiary care hospital.

Methods: It was a prospective observational study. A minimum of 100 healthy infants born at term (38-42 weeks) and weighed >2.5kgs at birth and who were exclusively breast fed from age group 3-6 months attending the hospitals attached to J J M M C were selected for study. Approval from the ethical committee of the institution was obtained.

Results: In this study there were totally 43% of males and 57% of females. Among them 14 (14%) of the infants were vitamin D deficient and 19 (19%) infants were vitamin D insufficient. And in 100 mothers studied 25 (25%) mothers were vitamin D deficient and 24 (24%) mothers were insufficient of vitamin D. The mean vitamin D level in infants was 25.72 ng/ml (± 11.31 ng/ml) and in mothers' it was 22.09ng/ml (± 9.17 ng/ml).

Conclusions: Breastfeeding might be one the contributing factors if the infant is not adequately exposed to sunlight for endogenous synthesis of vitamin D and if the mother is deplete in vitamin D levels transferring lower amount of vitamin D to infant through breast milk.

Keywords: Exclusive breastfeeding, Lactating Mother, Vitamin D, Term Infant

INTRODUCTION

There are global efforts to promote breast feeding as optimal nutrition up to 6 months of age because of its beneficial effects on child survival. WHO analysis of childhood deaths has listed suboptimal breast feeding as one of the most powerful shared risk factors and estimated that 1.3million deaths can be prevented in 42-high mortality countries by increasing the level of breastfeeding amongst infants.¹ This has led to resurgence of exclusive breastfeeding. The increase in the practice of breast feeding associated with the belief that "Breast is Best" and breast milk does not require supplementation because it is a baby's perfect food, may lead to decreased

vitamin D (25-OHD) intake from other sources and thereby causing rickets.²

Vitamin D plays an integral part in maintaining bone health. Its role in other body systems is being increasingly recognised.³ The immune modulating effects of vitamin D are particularly important in infancy where infection incidence and severity are high and immune response is incomplete.⁴

Vitamin D in breast milk relates to mothers' vitamin D intake, skin pigmentation and sunlight exposure. This implies that babies who are exclusively breastfed and who gets minimal sunlight exposure or an infant who is

on a nonfortified milk is at risk of developing vitamin D deficiency by 4-6 months of age. A high prevalence of maternal vitamin D deficiency has been reported in recent years from many global regions including northern and southern Europe, North America, the Middle East, Asia and Australasia.⁵ There are a few reports of vitamin D deficiency among pregnant women and cord blood of their newborns and breastfed young infants from India.⁶⁻⁹

So this study was undertaken to study the serum vitamin D levels in exclusively breastfed babies and their mothers in a tertiary care hospital. Aims and objectives of present study were to study the serum vitamin D levels among exclusively breastfed infants aged 3-6 months, to study the serum vitamin D levels among their lactating mothers and to study the correlation between the serum vitamin D levels of exclusively breastfed infants and their mothers.

METHODS

Present study was a prospective observational study. A minimum of 100 healthy infants born at term (38-42 weeks) and weighed >2.5kgs at birth and who were exclusively breast fed from age group 3-6 months attending the hospitals attached to J J M M C were selected for study.

All the patients were explained about the basis of the study and informed consent was obtained. Study was conducted from 1st November 2010 to 1st November 2012.

Inclusion criteria

- All the infants who were born at term.
- Weighing >2.5kgs at birth.
- Infants who were exclusively breastfed.
- In the age group of 3-6 months.
- Healthy infants.

Exclusion criteria

- Infants who were not exclusively breast fed.
- Those who were unwilling to participate in the study.
- Infants who are on calcium and vitamin D supplementation.
- Infants born with congenital malformations.

Each patient was subjected to detailed history taking and examined for Growth assessment of the child including anthropometry and were recorded in the structured proforma.

Babies were considered full term based on a review of history obtained from the mother.

Blood (4ml) was drawn by venepuncture under aseptic precautions for serum vitamin D (25(OH)D) and from both mothers and infants. Serum vitamin D level was

estimated by fully automated chemi luminescent immune assay.

Exclusive breast feeding was defined as no food or liquid other than breast milk, not even water, given to infant from birth by mother, health care provider, or family member/ supporter.¹⁰

Weight was recorded with minimal clothes on an electronic weighing machine with a minimal reading of 5g. Length was measured using an infantometer with minimum reading of 0.1cm with accuracy of ±0.5cm. head circumference and chest circumference was measured using a flexible measuring tape using standard methods. Nutritional status was assessed using WHO growth charts.¹¹

The vitamin D status was categorized as follows¹²

- Severe deficiency <5ng/ml
- Deficiency <15ng/ml
- Insufficiency 15-20ng/ml
- Sufficiency 20-100ng/ml
- Excess >100ng/ml
- Intoxication >150ng/ml.

Statistical analysis

Data analysis was performed using SPSS, trial version 18.0 computer software. Descriptive statistics presented the growth assessment of the participants. The statistical method of two independent student's t-test was used to compare the differences between the vitamin D that were obtained from the surveyed infants after the consent from the parents.

RESULTS

In this study there were totally 43% of males and 57% of females. There was no statistical difference noted related to the sex of the infants.

Table 1: Infant gender distribution.

Gender	No. of babies
Males	43 (43%)
Females	57 (57%)
Total	100 (100%)

In this study, infants aged 3-4 months were 21, 4-5 months were 33 and 5-6 months were 46.

Table 2: Infants age distribution.

Age (months)	Number of infants
3-4	21 (21%)
4-5	33 (33%)
5-6	46 (46%)
Total	100 (100%)

Table 3: Nutritional status as per WHO charts.

Percentile	No. of babies
<3 rd percentile	8 (8%)
3 rd - 97 th percentile	92 (92%)
Total	100 (100%)

Nutritional status of the children studied noted that 8% of infants were malnourished as indicated by their percentile

<3rd percentile and remaining 92% of them were well nourished who were between 3rd-97th percentile.

In the present study 14 (14%) of the infants were vitamin D deficient and 19 (19%) infants were vitamin D insufficient. Among 100 mothers studied 25 mothers were vitamin D deficient and 24 mothers were insufficient of vitamin D.

Table 4: Vitamin D concentrations in the mother-infant pair.

Vitamin D levels	Babies			Mothers		
	No. of cases	Mean	SD	No. of cases	Mean	SD
<15 ng/ml	14	9.95	3.83	25	12.07	1.92
15-20 ng/ml	19	17.36	1.62	24	17.25	1.37
Above 20ng/ml	67	31.39	9.10	51	29.13	7.20
Total	100	25.72	11.31	100	22.01	9.17
X ² = 5.8, P=0.054, NS						

Table 5: Infants age and vitamin D levels.

Age (months)	Mean Vit D levels (ng/ml)
3-4	26.83
4-5	26.87
5-6	24.39

The mean vitamin D levels below 15 ng/ml in infants and mothers were 9.95 ng/ml (± 3.83 ng/ml) and 12.07 ng/ml (± 1.92 ng/ml) respectively. Similarly Vitamin D levels in infants and mothers at 15-20ng/ml was 17.36 (± 1.62 ng/ml) ng/ml and 17.25 ng/ml (± 1.37 ng/ml), and above 20 ng/ml it was 31.39 ng/ml (± 9.10 ng/ml) and 39.13 ng/ml (± 7.20 ng/ml) respectively. In total, the mean vitamin D level in infants was 25.72 ng/ml (± 11.31 ng/ml) and in mother it was 22.09 ng/ml (± 9.17 ng/ml). The vitamin D levels of the infant and their lactating mothers were comparable ($\chi^2=5.8$, $p=0.054$, not significant).

Among 100 infants studied, 26.83 ng/ml is the mean vitamin D level of infants aged 3-4 months, 26.87ng/ml and 24.39 ng/ml are the mean vitamin D levels in infants aged 4-5 months and 5-6 months respectively. There is no association between the age of infant and serum vitamin D levels. Also there was no statistical difference between the age of the infant and vitamin D levels in the present study.

DISCUSSION

In our study we have included exclusively breastfed infants between 3-6 months of age and their mothers. Male and female distribution was 43% and 57% respectively. About 65% of mothers were vegetarians and

the remaining was on mixed diet. Among the study population 25% of the mothers were vitamin D deficient and 24% were vitamin D insufficient and in remaining 51% mothers it was in normal range. The vitamin D status of the infants studied showed 14% was deficient and 19% were insufficient and 67% infants had normal Vitamin D levels. Our study shows a low percentage of vitamin D deficient mother and infant pairs when compared to other studies conducted in India.

Jain et al had reported 66.7% of infants and 81.1% of mothers were Vitamin D deficient and 19.8% of infants and 11.6% of mothers were insufficient. This study was conducted at AIIMS New Dehli.¹³

Jagzape T et al in their study reported that 93.3% of the babies had vitamin D deficiency and the mean vitamin D level was 8.871 ± 4.78 ng/ml which was very high when compared to present study.¹⁴

Breast feeding and vitamin D levels

All infants were exclusively breastfed in present study. Infants who are breastfed but do not receive supplemental vitamin D or adequate sunlight exposure are at increased risk of developing vitamin D deficiency. Human milk typically contains a vitamin D concentration of 15-50 IU/L or less. Thus, the recommended adequate intake of vitamin D cannot be met with human milk as the sole source of vitamin D for the breastfeeding infant.

In Alaska, the contribution of breastfeeding to vitamin D deficiency has likely increased in recent years with an increase in the proportion of women who breast feed longer than 6 months from 28% of infants during 1990 to 50% during 2000.¹⁵

The recent breastfeeding promotion may have led to the belief that the exclusive breastfed infant is in need of no further supplements. But recent studies suggest that all babies need to be supplemented with vitamin D.

Correlation between maternal and infant vitamin D level

There was a positive correlation between the vitamin D levels of the lactating mothers and their infants which can be substantiated as breast milk contains less concentration of vitamin D. In a similar study conducted by Seth A et al showed a high prevalence of vitamin D deficiency in lactating newborns and their exclusively breast fed babies.⁹

Limitation of present study was very small sample size. Further studies are needed recruiting a larger number of babies and their mothers with different inclusion and exclusion criteria.

CONCLUSION

As we all know breast feeding is immunologically better, species specific and protects the infants from many diseases, exclusive breastfeeding is not the sole cause for developing rickets in exclusively breastfed infants. It is reflected by Growth of most of the infants which were in normal limits with respect to their age and sex according to WHO growth standards. It might be one the contributing factors if the infant is not adequately exposed to sunlight for endogenous synthesis of vitamin D and if the mother is deplete in vitamin D levels transferring lower amount of vitamin D to infant through breast milk. So it is wise to supplement all the breastfed infants and their lactating mothers to supplement with vitamin D and advise them for adequate sunlight exposure.

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Conflict of interest: None declared

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

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