

Evaluation of serum vitamin D levels in exclusively breastfed babies and their mothers Observational Assessment of Vitamin D Status in Exclusively Breastfed Versus Formula-Fed Infants at Six Months of Age

Dr. DS Ramu*¹, Dr. Madhu Kiran BT², Dr. Vinod M³

¹*Associate professor, BGS Global Institute of Medical sciences & Hospital BGS Health & Education City, Uttarahalli Road, Kengeri Bengaluru-560060

²Assistant professor, BGS Global Institute of Medical sciences & Hospital BGS Health & Education City, Uttarahalli Road, Kengeri Bengaluru-560060

³Associate professor, Global Institute of Medical, sciences & Hospital, BGS Health & Education City, Uttarahalli Road, Kengeri Bengaluru-560060

Corresponding Author

Dr DS Ramu,

Associate Professor, BGS Global Institute Of Medical Sciences & Hospital, BGS Health & Education City, Uttarahalli Road, Kengeri, Bengaluru-560060

[Cite this paper as:](#) Dr. DS Ramu, Dr. Madhu Kiran BT, Dr. Vinod M, (2025) Evaluation of serum vitamin D levels in exclusively breastfed babies and their mothers Observational Assessment of Vitamin D Status in Exclusively Breastfed Versus Formula-Fed Infants at Six Months of Age, *Journal of Neonatal Surgery*, 14 (29s), 807-810

ABSTRACT

Background: Due to its positive impact on child survival, there are international initiatives to promote breastfeeding as the best nourishment for infants up to six months of age. The present study was conducted to study the serum vitamin D levels in exclusively breastfed babies and their mothers.

Materials & Methods: 58 healthy infants born at term who were exclusively breast fed from age group 3-6 months of both genders were selected. A completely automated chemiluminescence immunological test was used to measure the serum vitamin D content. The vitamin D status was categorized as follows- Severe deficiency <5 ng/ml, deficiency <15 ng/ml, insufficiency 15-20 ng/ml, sufficiency 20-100 ng/ml, excess >100 ng/ml and intoxication >150 ng/ml. Nutritional status was assessed using WHO growth charts.

Results: Age group 3-4 months had 6 males and 5 females, 4-5 months had 10 males and 11 females and 5-6 months had 14 males and 12 females. The difference was non-significant ($P > 0.05$). Nutritional status of babies was <3rd percentile in 5 and 3rd-97th percentile in 53 subjects. The difference was significant ($P < 0.05$). Vitamin D levels in 10 babies was 9.1 ng/ml, in 16 babies was 17.3 ng/ml and in 32 babies was 32.4 ng/ml. In 11 mothers was 12.6 ng/ml, in 18 mothers was 17.4 ng/ml and in 29 mothers was 29.7 ng/ml. The difference was non-significant ($P > 0.05$). The mean Vit D levels in babies with age group 3-4 months was 26.4 ng/ml, in 4-5 months was 26.3 ng/ml and in 5-6 months was 24.5 ng/ml. The difference was non-significant ($P > 0.05$).

Conclusion: Breastfeeding may be a contributing factor if the baby does not receive enough sunshine for endogenous vitamin D production and if the mother's vitamin D levels are low, resulting in a decreased amount of vitamin D being transferred to the baby through breast milk.

Keywords: *breastfeeding, Nutrition, vitamin D.*

1. INTRODUCTION

Due to its positive impact on child survival, there are international initiatives to promote breastfeeding as the best nourishment for infants up to six months of age. According to a WHO review of childhood fatalities, one of the most potent shared risk factors is poor breastfeeding. It is projected that increasing the amount of breastfeeding among infants can avoid 1.3 million deaths in 42 high-mortality countries.¹ As a result, exclusive breastfeeding is now more common. The rise in breastfeeding practices linked to the notion that "breast is best" and that breast milk is a baby's ideal nourishment, negating the need for supplements, may result in a reduction in vitamin D (25-OHD) intake from other sources, ultimately leading to

rickets.²

Bone health is maintained in large part by vitamin D. Its function in various bodily systems is becoming more widely acknowledged.³ Vitamin D's immune-modulating properties are especially crucial during infancy, when the immune system is still developing and illness rates and severity are high.⁴ Mothers' vitamin D consumption, skin color, and exposure to sunshine are all related to the amount of vitamin D in breast milk. According to this, infants who are solely breastfed and receive little exposure to sunlight, or who drink unfortified milk, run the danger of being vitamin D deficient by the time they are four to six months old.⁵

Numerous geographical regions, including northern and southern Europe, North America, the Middle East, Asia, and Australasia, have reported significant rates of maternal vitamin D insufficiency in recent years.⁶ There have been a few cases of vitamin D insufficiency in Indian pregnant women, babies' cord blood, and breastfed young children.⁷ The present study was conducted to study the serum vitamin D levels in exclusively breastfed babies and their mothers

2. MATERIALS & METHODS

The study was carried out on 58 healthy infants born at term (38- 42weeks) and weighed >2.5kgs at birth and who were exclusively breast fed from age group 3-6months of both genders. All parents gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Using aseptic procedures, 4 milliliters of blood were extracted via venepuncture from both moms and newborns in order to measure serum vitamin D (25 (OH) D). A completely automated chemiluminescence immunological test was used to measure the serum vitamin D content. The vitamin D status was categorized as follows- Severe deficiency <5ng/ml, deficiency <15ng/ml, insufficiency 15-20ng/ml, sufficiency 20-100ng/ml, excess >100ng/ml and intoxication >150ng/ml. Nutritional status was assessed using WHO growth charts. Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

3. RESULTS

Table I Age & Gender wise distribution

Age group (months)	Male	Female	P value
3-4	6	5	0.65
4-5	10	11	
5-6	14	12	

Table I shows that age group 3-4 months had 6 males and 5 females, 4-5 months had 10 males and 11 females and 5-6 months had 14 males and 12 females. The difference was non- significant ($P > 0.05$).

Table II Assessment of nutritional status of babies

Percentile	Number	P value
<3 rd percentile	5	0.01
3 rd - 97 th percentile	53	
Total	58	

Table II shows that nutritional status of babies was <3rd percentile in 5 and 3rd- 97th percentile in 53 subjects. The difference was significant ($P < 0.05$).

Table III Vitamin D concentrations

Vitamin D levels	Babies	Mean	Mothers	Mean	P value
<15 ng/ml	10	9.1	11	12.6	0.08
15-20 ng/ml	16	17.3	18	17.4	

>20 ng/ml	32	32.4	29	29.7	
-----------	----	------	----	------	--

Table III shows that vitamin D levels in 10 babies was 9.1 ng/ml, in 16 babies was 17.3ng/ml and in 32 babies was 32.4 ng/ml. In 11 mothers was 12.6ng/ml, in 18 mothers was 17.4 ng/ml and in 29 mothers was 29.7 ng/ml. The difference was non- significant ($P > 0.05$).

Table IV Age wise distribution of vitamin D level

Age group (months)	Mean Vit D levels (ng/ml)	P value
3-4	26.4	0.84
4-5	26.3	
5-6	24.5	

Table IV shows that the mean Vit D levels in babies with age group 3-4 months was 26.4 ng/ml, in 4-5 months was 26.3 ng/ml and in 5-6 months was 24.5 ng/ml. The difference was non- significant ($P > 0.05$).

4. DISCUSSION

Vitamin D is the essential precursor of 1, 25-hydroxyvitamin D, the steroid hormone required for calcium absorption, bone development and growth in children.⁸ During the first 6-8 weeks of life, the vitamin D status of infants is determined by the vitamin D levels at birth, which depend on the vitamin D status of the mother.⁹ Breast milk concentration of vitamin D is low (<20 IU/l) and is inadequate for the needs of the growing infant. Vitamin D in breast milk relates to mothers' vitamin D intake, skin pigmentation and sunlight exposure.¹⁰ This implies that babies born to mothers with vitamin D deficiency are very likely to develop vitamin D deficiency unless supplemented from outside or adequately exposed to sunlight which is often not practical during early infancy.¹¹ The present study was conducted to study the serum vitamin D levels in exclusively breastfed babies and their mothers.

We found that age group 3-4 months had 6 males and 5 females, 4-5 months had 10 males and 11 females and 5-6 months had 14 males and 12 females. Soumya M et al¹² studied the serum vitamin D levels in exclusively breastfed babies and their mothers in a tertiary care hospital. 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 22.09 ng/ml (± 9.17 ng/ml).

We found that nutritional status of babies was $<3^{\text{rd}}$ percentile in 5 and 3^{rd} - 97^{th} percentile in 53 subjects. We found that Vitamin D levels in 10 babies was 9.1 ng/ml, in 16 babies was 17.3 ng/ml and in 32 babies was 32.4 ng/ml. In 11 mothers was 12.6 ng/ml, in 18 mothers was 17.4 ng/ml and in 29 mothers was 29.7 ng/ml. Jain et al¹³ determined the prevalence of vitamin D deficiency and insufficiency [serum 25 hydroxyvitamin D (25OHD) ≤ 15 ng/ml and 15-20 ng/ml, respectively] among healthy term breastfed 3 month old infants and their mothers, evaluate for clinical and radiological rickets in those infants having 25OHD < 10 ng/ml, and check for seasonal variation and predictors of infants' vitamin D status. Vitamin D deficiency was found in 66.7 per cent of infants and 81.1 per cent of mothers; and insufficiency in an additional 19.8 per cent of infants and 11.6 per cent of mothers. Radiological rickets was present in 30.3 per cent of infants with 25OHD < 10 ng/ml. 25OHD did not show seasonal variation in infants but maternal concentrations were higher in summer [11.3 (2.5 - 31) ng/ml] compared to winter [5.9 (2.5-25) ng/ml, $P=0.003$]. Intake of vitamin supplement, sunlight exposure and mother's 25OHD were predictors of infants' 25OHD levels.

We found that the mean Vit D levels in babies with age group 3-4 months was 26.4 ng/ml, in 4-5 months was 26.3 ng/ml and in 5-6 months was 24.5 ng/ml. Seth A et al¹⁴ evaluated the vitamin D status of lactating mothers and their breastfed infants. The mean serum 25(OH)D values in lactating mothers was 27.2 $\pm$ 14.6 nmol/l (10.9 $\pm$ 5.8 ng/ml), while that of their infants was 28.9 $\pm$ 20.8 nmol/l (11.6 $\pm$ 8.3 ng/ml). Serum 25(OH)D levels < 25 nmol/l (10 ng/ml) were found in 47.8% of the mothers and 43.2% of the infants. Among these, elevated PTH levels (> 54 pg/ml) were seen in 59.3% of the mothers and 69.6% of the infants. A highly significant negative correlation was found between serum 25(OH)D and PTH in mothers ($r = -0.480$, $p = 0.01$) and their infants ($r = -0.431$, $p = 0.01$). A strong positive correlation was seen of 25(OH)D levels in mother-infant pairs ($r = 0.324$, $p = 0.001$).

The shortcoming of the study is small sample size.

5. CONCLUSION

Authors found that breastfeeding may be a contributing factor if the baby does not receive enough sunshine for endogenous vitamin D production and if the mother's vitamin D levels are low, resulting in a decreased amount of vitamin D being transferred to the baby through breast milk.

REFERENCES

- [1] Balasubramanian S, Ganesh R. Vitamin D deficiency in exclusively breast-fed infants. *Indian J Med Res.* 2008;127:250-5.
- [2] Holick MF. Vitamin D deficiency. *N Engl J Med.* 2007;357:266-81.
- [3] Doug B, John M. Vitamin D deficiency is common among otherwise healthy Alaskan children. *Bulletin.* 2003;318(2):39-40.
- [4] Hollis BW, Wagner CL. Assessment of dietary vitamin D requirements during pregnancy and lactation. *Am J Clin Nutr.* 2004;79:717-26.
- [5] Prentice A. Vitamin D deficiency: a global perspective. *Nutr Rev.* 2008;66:S153-64.
- [6] Sachan A, Gupta R, Das V, Agarwal A, Awasthi PK, Bhatia V. High prevalence of vitamin D deficiency among pregnant women and their newborns in northern India. *Am J Clin Nutr.* 2005;81:1060-4.
- [7] Goswami R, Gupta N, Goswami D, Marwaha RK, Tandon N, Kochupillai N. Prevalence and significance of low 25-hydroxyvitamin D concentrations in healthy subjects in Delhi. *Am J Clin Nutr.* 2000;72:472-5.
- [8] Bhalala U, Desai M, Parekh P, Mokal R, Chheda B. Subclinical hypovitaminosis D among exclusively breastfed young infants. *Indian Pediatr.* 2007;44:897-901.
- [9] Balasubramanian S, Shivbalan S, Kumar PS. Hypocalcemia due to vitamin D deficiency in exclusively breastfed infants. *Indian Pediatr.* 2006;43:247-51.
- [10] Sachan A, Gupta R, Das V, Agarwal A, Awasthi PK, Bhatia V. High prevalence of vitamin D deficiency among pregnant women and their newborns in northern India. *Am J Clin Nutr.* 2005;81:1060-4.
- [11] Gordon CM, Feldman HA, Sinclair L, Williams AL, Kleinman PK, Perez-Rossello J, et al. Prevalence of vitamin D deficiency among healthy infants and toddlers. *Arch Pediatr Adolesc Med.* 2008;162:505-12.
- [12] Soumya M. Study of vitamin D levels in exclusively breastfed term infants in a tertiary care centre. *Int J Contemp Pediatr* 2018;5:71-4.
- [13] Jain V, Gupta N, Kalaivani M, Jain A, Sinha A, Agarwal R. Vitamin D deficiency in healthy breastfed term infants at 3 months & their mothers in India: seasonal variation & determinants. *Indian Journal of Medical Research.* 2011 Mar 1;133(3):267-73.
- [14] Seth A, Marwaha RK, Singla B, Aneja S, Mehrotra P, Sastry A, et al. Vitamin D nutritional status of exclusively breastfed infants and their mothers. *J Pediatr Endocrinol Metab.* 2009;22:241-6.

..