

Original Research Article

Maternal awareness regarding vitamin D supplementation and its deficiency among their infants in a tertiary care hospital, Puducherry: a cross-sectional study

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ABSTRACT

Background: Vitamin D deficiency is a common public health problem affecting mothers and infants, even in sun-rich countries like India. Maternal awareness plays a key role in preventing deficiency and its complications in infants. This study aimed to assess maternal awareness regarding vitamin D supplementation and its deficiency among infants, and to determine the association with sociodemographic factors.

Methods: A hospital-based cross-sectional study was conducted among 200 postnatal mothers attending the Paediatrics OPD of a private medical college in Puducherry from September to December 2025. Participants were selected using systematic random sampling. Data were collected using a pre-tested, self-administered questionnaire via an online platform. Descriptive statistics were expressed as frequencies and percentages, and associations were tested using the Chi-square test ($p < 0.05$ considered significant).

Results: Among participants, 78.0% had heard about vitamin D, with doctors as the main information source (74.3%). While 47.0% recognized its role in bone health, 21.0% lacked knowledge of its benefits. Only 39.0% and 23.0% reported vitamin D supplementation during pregnancy and lactation, respectively. However, 89.0% provided supplements to their infants, though only 24.0% did so regularly. Most mothers (87.0%) exposed infants to sunlight. Significant associations were observed between knowledge and age ($p = 0.035$), education ($p < 0.001$), residence ($p < 0.001$), family type ($p = 0.007$), and housing ($p < 0.001$).

Conclusions: Despite moderate awareness, gaps in knowledge and practices persist. Strengthening maternal education and counselling is essential to improve vitamin D supplementation and reduce deficiency among infants.

Keywords: Maternal and infant health, Postnatal mothers, Vitamin D

INTRODUCTION

Vitamin D is an essential micronutrient that plays a critical role in calcium homeostasis, bone mineralization, and overall growth and development in infants. Deficiency of vitamin D during early life can lead to rickets, impaired skeletal development, increased susceptibility to infections, and other long-term health consequences.^{1,2} Despite the availability of abundant sunlight in tropical countries like India, vitamin D

deficiency remains highly prevalent among both mothers and infants, making it a major public health concern.^{3,4}

Maternal vitamin D status is a key determinant of neonatal vitamin D levels, as the fetus is entirely dependent on maternal stores during pregnancy.⁵ Inadequate maternal knowledge regarding vitamin D supplementation, dietary sources, and sunlight exposure contributes significantly to deficiency among infants. Furthermore, exclusively breastfed infants are at increased risk of vitamin D deficiency if they do not

receive appropriate supplementation, as breast milk alone may not provide sufficient amounts of vitamin D.⁶

In India, several socio-cultural and environmental factors such as limited sun exposure, increased indoor lifestyle, skin pigmentation, dietary habits, and lack of awareness contribute to widespread hypovitaminosis D.⁷ Studies conducted in different parts of India have demonstrated a high prevalence of vitamin D deficiency among pregnant women and their infants, highlighting the need for improved awareness and preventive strategies.⁸

Maternal awareness plays a crucial role in ensuring appropriate infant feeding practices and adherence to supplementation guidelines. However, existing literature suggests that knowledge regarding vitamin D supplementation and its importance remains suboptimal among mothers.⁹ Tertiary care hospitals provide an ideal setting to assess maternal awareness and identify gaps in knowledge, as they cater to diverse populations and serve as important centres for health education.

Therefore, this study aimed to assess maternal awareness regarding vitamin D supplementation and its deficiency among their infants in a tertiary care hospital in Puducherry. The findings of this study may help in designing targeted educational interventions to improve maternal knowledge and ultimately reduce the burden of vitamin D deficiency in infants.

METHODS

This hospital-based cross-sectional study was conducted in a private medical college, Sri Lakshmi Narayana Institute of Medical Sciences (SLIMS), Puducherry. The study population comprised postnatal mothers attending the outpatient department (OPD) of the Department of Paediatrics during the study period of two months, from September 2025 to December 2025. Postnatal mothers who attended the OPD and were willing to participate were included in the study, while those who did not provide consent and those with known chronic illnesses such as chronic liver disease, renal disease, or other significant comorbid conditions were excluded.

The sample size was calculated using the standard formula for estimating a proportion in cross-sectional studies: $n = Z^2pq/d^2$, where Z is the standard normal variate at 95% confidence level (1.96), p is the expected prevalence, $q = 1-p$, and d is the allowable error.⁹ Based on previous studies reporting awareness regarding vitamin D supplementation among mothers to be approximately 50% (to obtain maximum sample size in the absence of precise local estimates), with a 95% confidence level and 7% absolute precision, the calculated sample size was approximately 196, which was rounded off to 200 participants.

A systematic random sampling technique was employed, wherein every 5th eligible postnatal mother was selected

from the Paediatrics OPD register. Data collection was carried out after obtaining informed consent from the participants. Information was collected using a self-administered, pre-tested structured questionnaire distributed through an online platform (Google Forms). The questionnaire included sections on sociodemographic characteristics and specific questions assessing knowledge, awareness, and practices related to vitamin D supplementation and its deficiency in infants.

The collected data were entered into Microsoft Excel 2019 and analyzed using SPSS version 16.0. Quantitative variables were summarized using mean and standard deviation, while qualitative variables were expressed as proportions and percentages. The association between categorical variables was analyzed using the Chi-square test. A p -value of less than 0.05 was considered statistically significant.

RESULTS

Among the 200 participants, the majority were aged 26-35 years (112, 56.0%), followed by <25 years (82, 41.0%) and >35 years (6, 3.0%). Most mothers were literate (178, 89.0%) and unemployed (162, 81.0%). Among infants, 112 (56.0%) were male and 123 (61.5%) were aged <6 months. The majority had a birth weight of 2.5-4.5 kg (157, 78.5%), while 40 (20.0%) weighed <2.5 kg. Regarding current weight, 100 (50.0%) infants weighed 4.5-10 kg and 88 (44.0%) weighed <4.5 kg. Most households had both natural and artificial lighting (140, 70.0%), and adequate ventilation was reported by 188 (94.0%) participants (Table 1).

Out of 200 participants, 156 (78.0%) had heard about vitamin D, while 44 (22.0%) had not. Among those aware ($n=156$), the main source of knowledge was doctors (116, 74.3%), followed by nurses (35, 22.5%), social media (3, 1.9%), and family and friends (2, 1.3%). Regarding knowledge of the benefits of vitamin D, 94 (47.0%) identified its role in bone health, 76 (38.0%) in enhancing immunity, and 10 (5.0%) in promoting healthy pregnancy. Smaller proportions reported prevention of diabetes (16, 8.0%), arthritis (8, 4.0%), obesity (6, 3.0%), hypertension (6, 3.0%), skin health (8, 4.0%), and depression (2, 1.0%). However, 42 (21.0%) participants did not know any benefits. Regarding sources of vitamin D, 126 (63.0%) identified sunlight, while 7 (3.5%) reported food, 3 (1.5%) supplementation, and 60 (30.0%) did not know any source (Table 2).

Among the study participants, 78 (39.0%) reported taking vitamin D supplements during pregnancy, while 122 (61.0%) did not. During lactation, only 46 (23.0%) mothers reported supplement intake, whereas 154 (77.0%) did not. Testing for vitamin D during pregnancy was reported by only 20 (10.0%) participants, while a large majority (180, 90.0%) had not undergone testing. However, most mothers (178, 89.0%) reported giving

vitamin D supplementation to their infants, while 22 (11.0%) did not (Table 3 and Figure 1).

Table 1: Socio-demographic and infant characteristics of study participants (n=200).

Variables	Category	Frequency	Percentage
Age (years)	<25	82	41.0
	26–35	112	56.0
	>35	6	3.0
Educational status	Illiterate	22	11.0
	Literate	178	89.0
Occupation	Employed	38	19.0
	Unemployed	162	81.0
Infant gender	Male	112	56.0
	Female	88	44.0
Infant age	<6 months	123	61.5
	>6 months	77	38.5
Birth weight in kg	<2.5	40	20.0
	2.5–4.5	157	78.5
	>4.5	3	1.5
Current weight in kg	<4.5	88	44.0
	4.5–10	100	50.0
	>10	12	6.0
Lighting source (daytime)	Natural	58	29.0
	Artificial	2	1.0
	Both	140	70.0
Ventilation	Adequate	188	94.0
	Not adequate	12	6.0

Table 2: Mother's knowledge towards vitamin D (n=200).

Variables	Category	Frequency	Percentage
Heard about vitamin D	Yes	156	78.0
	No	44	22.0
Source of knowledge (n=156)	Doctors	116	74.3
	Nurses	35	22.5
	Family and friends	2	1.3
	Social media	3	1.9
Knowledge on benefits of vitamin D*	Bone health	94	47.0
	Enhance immunity	76	38.0
	Healthy pregnancy	10	5.0
	Prevent arthritis	8	4.0
	Prevent diabetes	16	8.0
	Prevent hypertension	6	3.0
	Prevent obesity	6	3.0
	Prevent depression	2	1.0
	Skin health	8	4.0
	Don't know	42	21.0
Source of vitamin D	Sunlight	126	63.0
	Food	7	3.5
	Supplementation	3	1.5
	Don't know	60	30.0

Table 3: Mother's attitude towards vitamin D and its supplementation (n=200).

Variables	Category	Frequency	Percentage
Intake of vitamin D supplements during pregnancy	Yes	78	39.0
	No	122	61.0
Intake of vitamin D supplements during lactation	Yes	46	23.0
	No	154	77.0
Vitamin D test done during pregnancy	Yes	20	10.0
	No	180	90.0
Vitamin D supplementation given to baby	Yes	178	89.0
	No	22	11.0

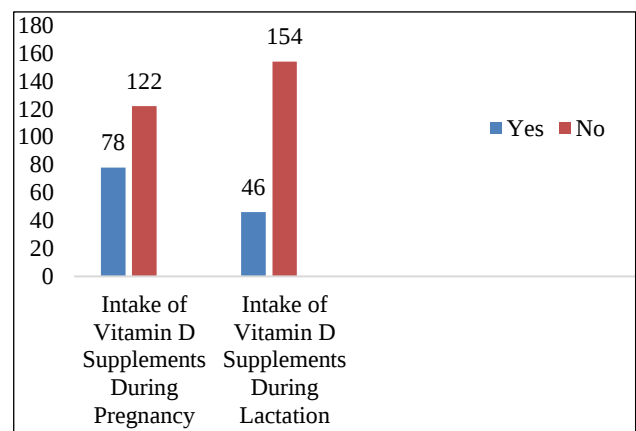


Figure 1: Intake of vitamin D supplements during pregnancy and lactation (n=200)

A total of 178 (89.0%) mothers reported giving vitamin D supplements to their infants, while 22 (11.0%) did not. Regarding regular administration of vitamin D drops, 48 (24.0%) always administered them, 82 (41.0%) sometimes, 43 (21.5%) rarely, and 27 (13.5%) never. Among those who did not give supplements regularly (n=27), the most common reason was reliance on food and sunlight (12, 44.4%), followed by forgetfulness (8, 29.6%), lack of concern (4, 14.8%), and infant illness (3, 11.2%). Most mothers (174, 87.0%) reported exposing their infants to sunlight. The preferred time for sun exposure was before 10 AM (186, 93.0%), followed by 10 AM to 3 PM (12, 6.0%) and after 3 PM (2, 1.0%). Regarding duration, 188 (94.0%) reported 1–5 hours of weekly sun exposure, while 11 (5.5%) reported <1 hour and 1 (0.5%) reported >5 hours. Only 6 (3.0%) infants had undergone vitamin D testing, while 194 (97.0%) had not. Regarding dietary practices, 120 (60.0%) mothers were always concerned about including vitamin D-rich foods in their infant's diet, 68 (34.0%) were sometimes concerned, and 12 (6.0%) were rarely concerned (Table 4).

Among the 200 participants, maternal age showed a statistically significant association with knowledge of

vitamin D ($p=0.035$), with higher good knowledge observed among mothers aged 26-35 years (53/78, 67.9%) compared to <25 years (32/78, 41.0%). Educational status was also significantly associated ($p<0.001$), with literate mothers demonstrating better knowledge (76/78, 97.4%) compared to illiterate mothers (2/78, 2.6%).

Place of residence showed a strong association ($p<0.001$), as urban mothers had higher good knowledge (37/78,

47.4%) compared to rural mothers (41/122, 33.6% with good knowledge vs 105/122, 86.1% with poor knowledge). Similarly, type of housing was significantly associated with knowledge ($p<0.001$), with better knowledge among mothers living in shared housing (40/78, 51.3%) compared to those in separate housing (38/78, 48.7%), while poor knowledge was more common among those in separate housing (98/122, 80.3%) (Table 5).

Table 4: Mother's practice towards vitamin D among their babies (n=200).

Variables	Category	Frequency	Percentage
Vitamin D supplements given to baby	Yes	178	89.0
	No	22	11.0
Giving vitamin D drops regularly	Always	48	24.0
	Sometimes	82	41.0
	Rarely	43	21.5
	Never	27	13.5
	Forgetfulness	8	29.6
Reasons for not giving regularly (n=27)	Not concerned	4	14.8
	Depend on food and sunlight	12	44.4
	Baby's illness	3	11.2
Exposure of baby to sunlight	Yes	174	87.0
	No	26	13.0
Best time for sun exposure	Before 10 AM	186	93.0
	10 AM-3 PM	12	6.0
	After 3 PM	2	1.0
Average weekly sun exposure	<1 hour	11	5.5
	1-5 hours	188	94.0
	>5 hours	1	0.5
Vitamin D testing for baby	Yes	6	3.0
	No	194	97.0
Concern about vitamin D in baby's diet	Always	120	60.0
	Sometimes	68	34.0
	Rarely	12	6.0
	Never	0	0.0

Table 5: Association of demographic profile with mother's knowledge on vitamin D (n=200).

Variables	Category	Good knowledge (n=78)	Poor knowledge (n=122)	P value
Age (years)	<25	32	50	0.035*
	26-35	53	59	
	>35	2	4	
Educational status	Illiterate	2	20	<0.001*
	Literate	76	102	
Place of residence	Urban	37	17	<0.001*
	Rural	41	105	
Type of housing	Separated	38	98	<0.001*
	Sharing	40	24	

*P value >0.05 are significant

DISCUSSION

The present study assessed maternal knowledge, attitude, and practices regarding vitamin D supplementation among infants in a tertiary care setting in Puducherry.

Despite abundant sunlight, notable gaps in knowledge and practices persist, indicating an ongoing public health concern.

Most mothers belonged to the 26-35 years age group (56.0%), where younger reproductive-age mothers showed higher awareness due to better healthcare access. Although a considerable proportion were degree literates (89.0%), knowledge gaps remained, suggesting that formal education alone does not ensure adequate awareness of micronutrient supplementation. Similar observations have been reported by Marwaha et al and Al-Qudah et al where awareness of vitamin D was often restricted to broad notions of bone health, lacking sufficient understanding of insufficiency prevention and supplementation strategies.^{10,11}

A majority (78.0%) had heard about vitamin D, comparable to findings from similar settings. However, detailed knowledge was limited; while 47.0% recognized its role in bone health and 38.0% in immunity, only a few were aware of other benefits, and 21.0% had no knowledge at all. Doctors were the main source of information (74.3%), highlighting their key role in health education.

Maternal supplementation during pregnancy (39.0%) and lactation (23.0%) was low, consistent with previous reports of poor adherence. Only 10.0% underwent vitamin D testing during pregnancy, reflecting low screening practices. In contrast, most mothers (89.0%) provided supplements to their infants, indicating better adherence to pediatric recommendations. Similarly, Harinarayan et al observed that vitamin D is predominantly understood to be obtained primarily from exposure to sunlight.¹² Also, Aparna et al found that the curative and preventive benefits of sunshine exposure may lead to the presumption that natural sunlight alone is adequate to avert insufficiency.¹³

Although 89.0% reported giving supplements, only 24.0% did so regularly. This gap between knowledge and practice, also noted in other studies, may be due to forgetfulness and misconceptions about sunlight and diet being sufficient sources. While 87.0% of infants were exposed to sunlight, mainly in the early morning, factors such as skin pigmentation and duration may limit its effectiveness. Al Marzooqi et al noted a similar observation compared to our study findings.¹⁴

Significant associations were observed between knowledge and maternal age, education, residence, family type, and housing conditions. Higher education ($p < 0.001$) and urban residence ($p < 0.001$) were linked to better knowledge, consistent with previous studies.^{15,16} Overall, despite moderate awareness, gaps in knowledge and consistent practices remain. Strengthening antenatal and postnatal counselling, along with targeted community-based education, is essential to improve vitamin D supplementation practices and reduce deficiency among infants.

CONCLUSION

The present study revealed moderate maternal awareness of vitamin D among mothers visiting a tertiary care hospital in Puducherry; however, significant deficiencies remained in knowledge concerning dietary sources, maternal supplementation, and adherence to infant prophylactic measures. Despite very positive rates of baby supplementation, routine administration was erratic, and maternal supplementation throughout pregnancy and lactation was insufficient. Maternal literacy, urban dwelling, and advantageous housing conditions were substantially correlated with enhanced knowledge levels. These findings underscore the imperative for fortified healthcare-provider-led counselling, augmented antenatal and pediatric nutritional education, and focused community-level interventions to enhance compliance with vitamin D supplementation guidelines and mitigate the incidence of preventable vitamin D deficiency in infants.

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