Analysis of Vitamin D and Vitamin B12 Status during the First Trimester of Pregnancy in a Tertiary Care Centre

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Vitamin D and vitamin B12 are essential micronutrients with distinct but complementary roles in maternal and fetal health. Vitamin D regulates calcium and phosphate homeostasis, supports fetal skeletal development, and modulates immune function; deficiency during pregnancy has been linked to complications including pre-eclampsia, gestational diabetes, preterm birth and impaired fetal bone mineralization. [1,2] Despite abundant sunlight in many regions of India, multiple studies and reviews have documented a high prevalence of vitamin D insufficiency and deficiency among pregnant women, driven by limited sun exposure, skin pigmentation, cultural clothing practices, urban lifestyles and low dietary intake of vitamin D-rich foods. [3,4,5] Vitamin B12 is a key cofactor in one-carbon metabolism required for DNA synthesis, methylation reactions and neural development. Maternal B12 deficiency is associated with neural tube defects, intrauterine growth restriction and adverse neuro-developmental outcomes in offspring. [6,7] India shows a high burden of maternal B12 deficiency in many cohorts, particularly among vegetarians and low-income populations lacking regular animal-source foods. [8,9] Global and national guidance acknowledges the importance of assessing maternal micronutrient status. The World Health Organization's antenatal care guidance reviews vitamin D supplementation and notes potential benefits for maternal serum status and some pregnancy outcomes while not recommending universal supplementation for all pregnant women without risk stratification.[10] Indian antenatal protocol sand dietary guidelines (ICMR/NIN) emphasize micronutrient support during pregnancy, including calcium with vitamin D in antenatal management where indicated. [11] Given the regional variability and population-specific risk factors, point-prevalence studies of vitamin D and B12 during early pregnancy are valuable to inform screening and supplementation strategies. This study aims to examine the prevalence of vitamin D and vitamin B 12 status during the first trimester among pregnant women attending a tertiary care center in North India, and to explore associations between these two micronutrients and demographic factors.

MATERIALS AND METHODS

A Cross-sectional study performed at Santosh Medical College & Hospital, Ghaziabad over a 12-month period. 55 pregnant women aged 20–40 years in their first trimester who provided informed consent were recruited. Exclusion criteria included chronic liver or kidney disease, cardiovascular disease, active cancer, gestational diabetes mellitus, and hepatitis B infection. Definitions: Vitamin D deficiency: <20 ng/mL; Insufficiency: 21–29 ng/mL; Sufficiency: ≥30 ng/mL. Vitamin B12 categories were used as per the assay reference ranges. Data were entered into a secure database and analyzed using descriptive statistics. Categorical variables were compared using Chi-square tests. A p-value<0.05 was considered statistically significant.

RESULTS

A total of 55 participants were included. Key demographic and biochemical findings are summarized in Tables 1–6 and Figures 1–4.

Table 1: Age distribution of participants (N=55)

Age Group	Frequency	Percent
20-25 years	13	23.63%

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26-30 years	28	50.90%
31-35 years	10	18.18%
36-40 years	4	7.27%

Table 2: Vitamin D status among participants

Vitamin D Status (ng/mL)	Frequency	Percent
Deficient (<20)	19	34.54%
Insufficient (21–29)	21	38.18%
Sufficient (□30)	15	27.27%

Table 3: Vitamin B12 status among participants

Vitamin B12 Status (pg/mL)	Frequency	Percent
Sufficient	51	92.72%
High	4	7.27%

Table 4: Age-wise distribution of Vitamin D categories

Age Group	Deficient	Insufficient	Sufficient
20-25 (n=13)	7 (53.85%)	0 (0.0%)	6 (46.15%)
26-30 (n=28)	8 (28.57%)	14 (50.0%)	6 (21.43%)
31-35 (n=10)	3 (30.0%)	4 (40.0%)	3 (30.0%)
36-40 (n=4)	2 (50.0%)	0 (0.0%)	2 (50.0%)

Table 5: Age-wise distribution of Vitamin B12 categories

Age Group	Sufficient	High
20-25 (n=13)	13 (100.0%)	0 (0.0%)
26-30 (n=28)	28 (100.0%)	0 (0.0%)
31-35 (n=10)	8 (75.0%)	2 (25.0%)
36-40 (n=4)	1 (25.0%)	3 (75.0%)

Table 6: Relationship between Vitamin D and Vitamin B12 categories

Vitamin D Category	Vitamin B12: High	Vitamin B12: Sufficient
Deficient	1 (5.27%)	18 (94.73%)

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Insufficient	1 (33.33%)	2 (66.66%)
Sufficient	3 (8.82%)	31 (91.18%)

Figures

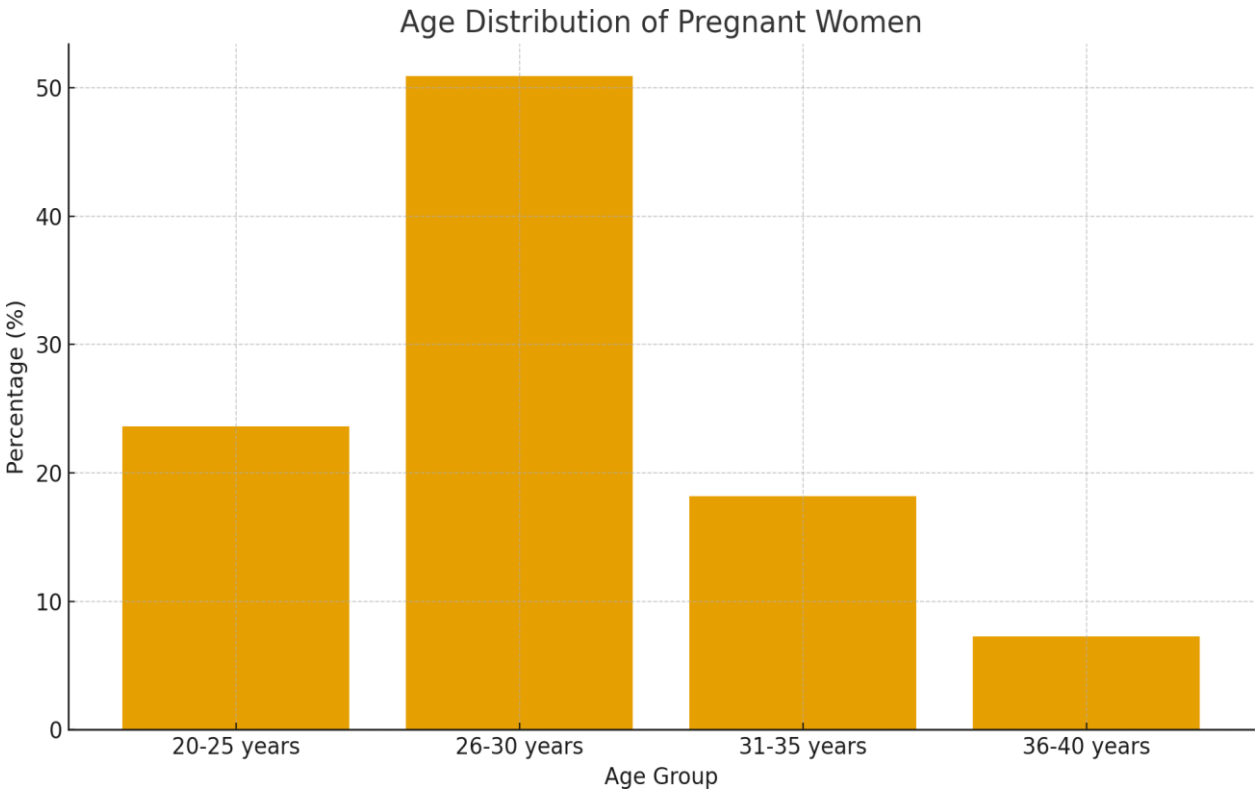

Figure 1: Age distribution of participants.

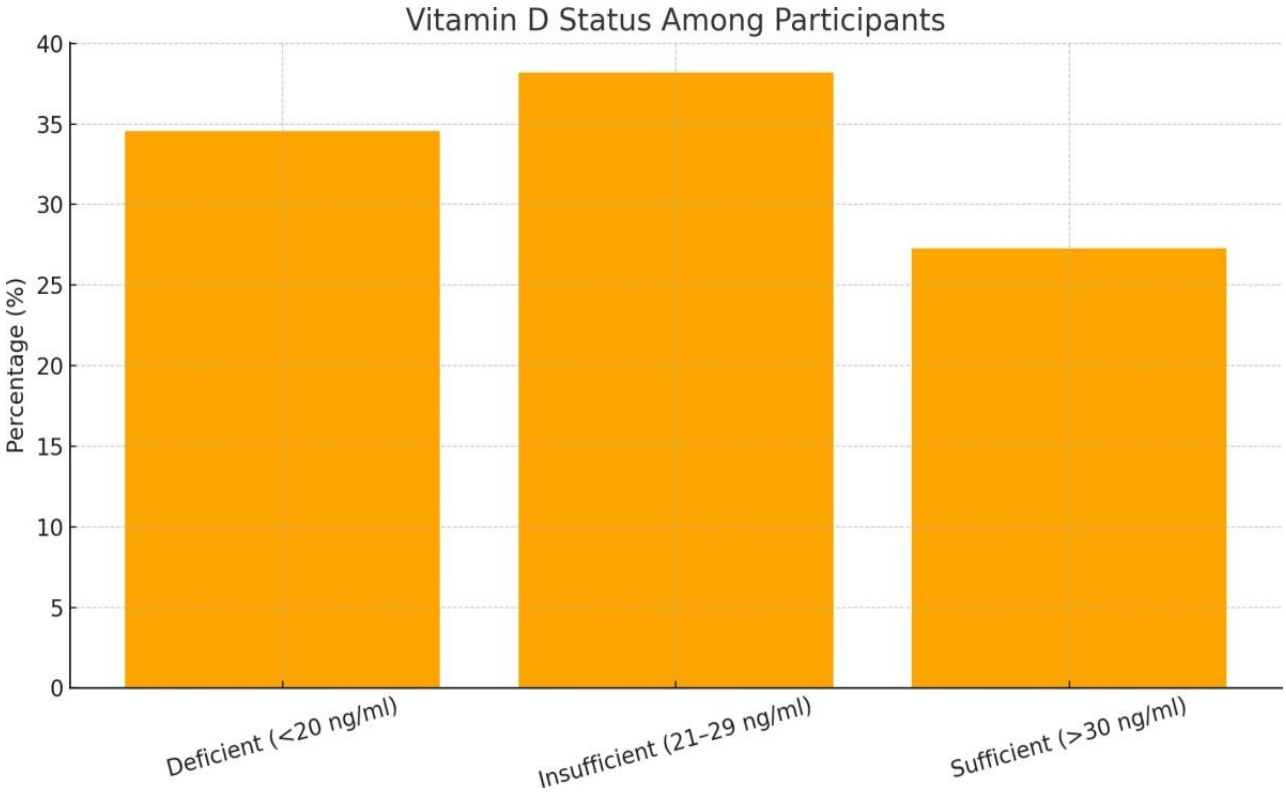

Figure 2: Vitamin D status among participants.

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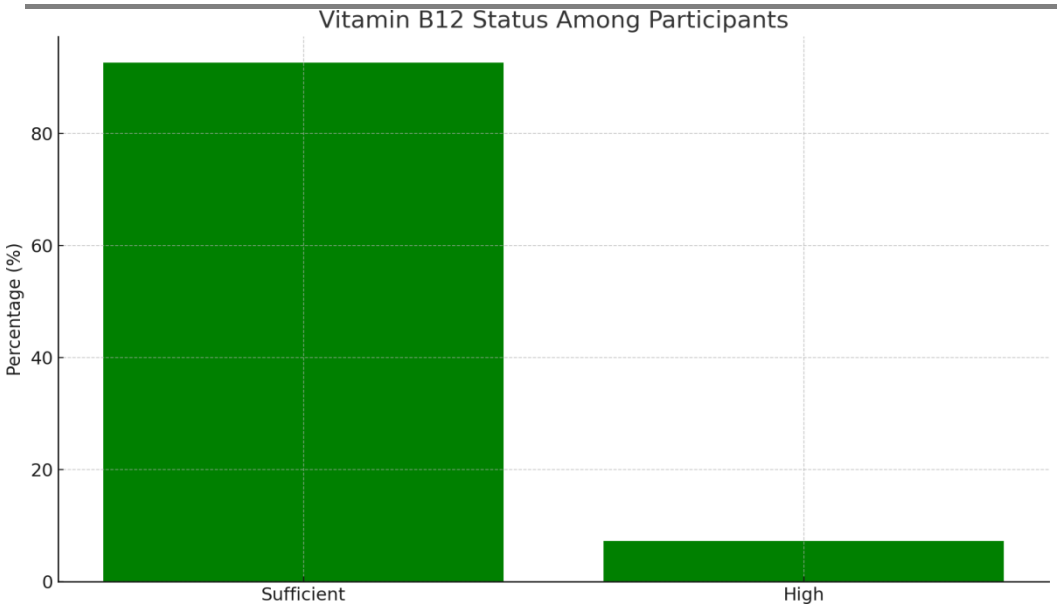

Figure 3: Vitamin B12 status among participants.

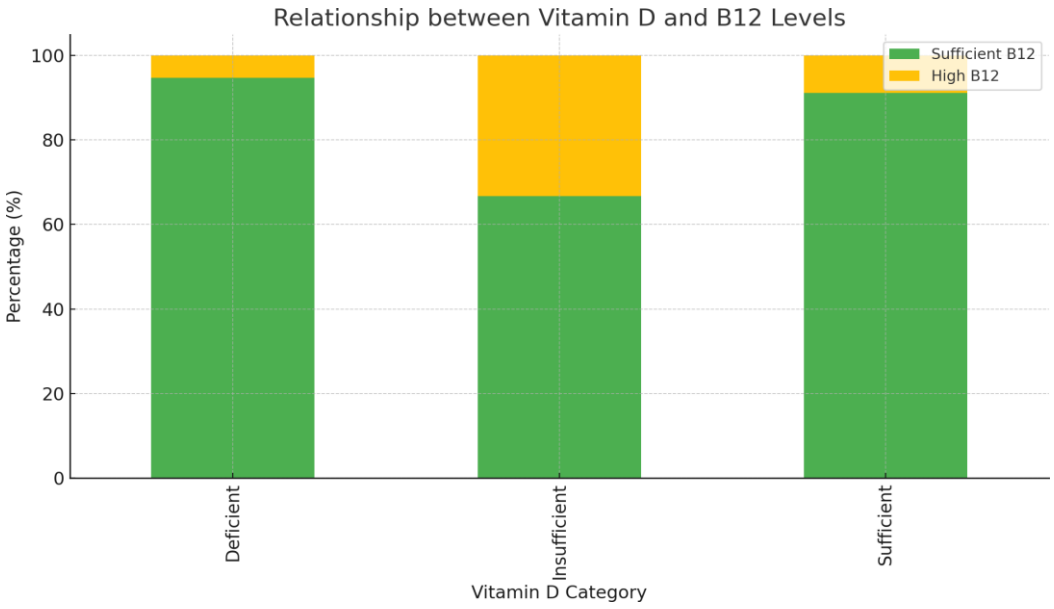

Figure 4: Relationship between Vitamin D and Vitamin B12 categories.

DISCUSSION

This study demonstrates a substantial burden of vitamin D deficiency and insufficiency among pregnant women in their first trimester at a tertiary care center in North India, with 34.54% deficient and 38.18% insufficient. These findings are consistent with pooled estimates and regional studies reporting high prevalence of vitamin D deficiency among pregnant cohorts in South Asia and India. [4,12] Risk factors in our setting likely include reduced sun exposure, cultural clothing, and limited dietary vitamin D intake. Conversely, vitamin B12 levels in this cohort were largely sufficient, which may reflect dietary heterogeneity with in the sampled population though other Indian cohorts often report higher B12 deficiency rates, particularly in vegetarian subgroups. [8] No statistically significant association between vitamin D and B12 status was observed ($p>0.05$), suggesting distinct etiologies and determinants for deficiency in this cohort. Given the potential implications of maternal micronutrient insufficiency on perinatal outcomes, these results support targeted screening during early pregnancy for vitamin D, and selective evaluation of B12 where dietary risk is present. Interventions might include antenatal counseling, dietary diversification, and supplementation guided by national recommendations and clinical risk profiles.

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CONCLUSION

The present study highlights a high prevalence of vitamin D deficiency in the first trimester among pregnant women attending a tertiary care center in North India, while vitamin B12 levels were predominantly sufficient. Routine screening for vitamin D and context specific supplementation strategies may improve maternal and fetal outcomes. Larger, longitudinal studies are needed to assess the temporal changes and causal links between maternal micronutrient status and pregnancy outcomes.

REFERENCES

1. Holick MF. Vitamin D deficiency. N Engl J Med. 2007;357(3):266–281.
2. Mithal A, Wahl DA, Bonjour JP, et al. Global vitamin D status and determinants of hypovitaminosis D. Osteoporos Int. 2009;20(11):1807–1820.
3. Jeyakumar A, et al. Pooled estimate of vitamin D deficiency among pregnant women. J Health Popul Nutr. 2021.
4. Abdelmageed RM, et al. Prospective cohort study of vitamin D deficiency in pregnancy. 2024.
5. World Health Organization. Nutritionalinterventionsupdate: vitamin Dsupplements duringpregnancy.WHO.29July2020.(WHO guidancereview)
6. Behere RV,Yajnik CS.Maternal VitaminB12 status during pregnancy and its long-term effects. FrontEndocrinol.2021.
7. FinkelsteinJ L,et al.Maternal vitamin 12 deficiency and perinatal outcomes. PLoSOne. 2021.
8. Barney AM, et al. Prevalence of Vitamin B12 deficiency in pregnancy in India. 2020.
9. ICMR/NIN. Antenatal Management guidelines. Indian Council of Medical Research. (Antenatal protocol PDF)
10. National Institute of Nutrition, ICMR. Dietary Guidelines for Indians, 2024.
11. Rogne T, et al. Associations of maternal vitaminB12 withpretermbirthandlowbirthweight: systematicreview.AmJEpidemiol.2017.
12. Nindrea RD, etal. Prevalence of vitamin D deficiency among pregnant women in SE Asia. 2024. Vitamin B12 status in women of reproductive age. 2021.