



Assessment of Serum Vitamin B12 and Folate Deficiencies Among Anaemic and Non-Anaemic Postpartum Mothers in North India: A Cross-Sectional Study

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KEYWORDS

Serum Vitamin B12, Serum Folate, Anaemic Postpartum Mothers Non-Anaemic Postpartum Mothers

ABSTRACT:

Background: Postpartum Anemia is a significant public health issue in India. Vitamin B12 and folate deficiencies are prevalent among vegetarian populations and contribute to maternal Anemia and neonatal neural tube defects.

Objective: To assess and compare serum vitamin B12 and folate levels in Anaemic and non-anaemic postpartum mothers.

Methods: A hospital-based cross-sectional study was conducted on 420 postpartum mothers (210 Anaemic, 210 non-anaemic) at UPUMS, Saifai. Serum vitamin B12 and folate levels were measured and analyzed.

Results: Mean serum vitamin B12 and folate levels were significantly lower in Anaemic women compared to non-anaemic ones ($p < 0.05$). A strong association was observed between low serum vitamin levels and clinical symptoms, including fatigue, paresthesia, and pallor.

Conclusion: Deficiencies of vitamin B12 and folate are significantly associated with postpartum Anemia and related symptoms. Routine screening and supplementation should be considered to mitigate complications in mothers and neonates.

Introduction: Anemia during the postpartum period remains a serious health concern, particularly in rural India¹. Despite widespread iron supplementation, Anemia persists, partly due to unaddressed deficiencies in vitamin B12 and folate, especially among vegetarian women^{2,3}. These micronutrients are critical for DNA synthesis, erythropoiesis, and neurological

function^{4,5}. Vitamin B12 deficiency may lead to megaloblastic Anemia, neurological impairments, and increased

Duration: November 2023 – March 2024. homocysteine levels, while folate deficiency is strongly associated with neural tube defects (NTDs)^{6,7,8}. The present study aims to evaluate the



role of these vitamins in the context of postpartum Anemia and its impact on maternal health.

Materials and Methods:

Study Design & Setting: Cross-sectional study conducted at the Department of Biochemistry & Obstetrics Gynaecology, UPUMS, Saifai.

Participants: 420 postpartum mothers (≤ 42 days postpartum), aged 18–40 years. Divided into Anaemic (Hb<11 g/dL) and non-anaemic groups.

Exclusion Criteria: History of cesarean delivery, vitamin supplementation, chronic diseases, medication affecting absorption, and twin pregnancies.

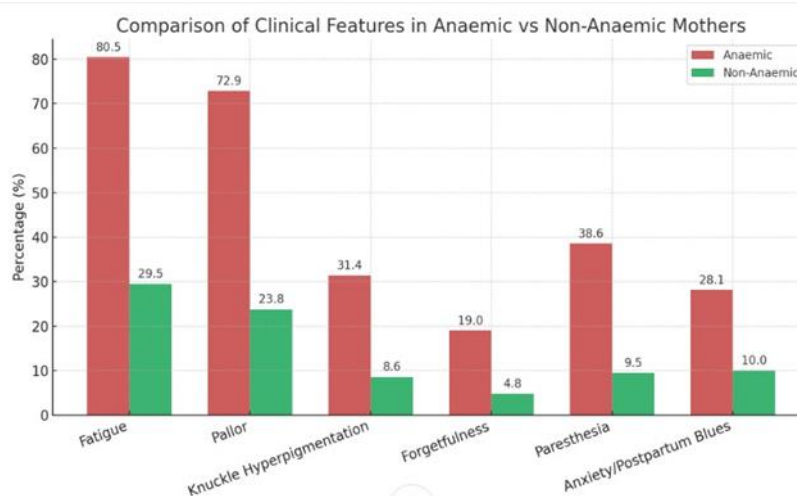
Data Collection & Analysis: Blood samples were analyzed for serum vitamin B12 and folate levels using chemiluminescent immunoassay. SPSS version 25 was used for statistical analysis (Chi-square and t-tests). A p-value <0.05 was considered significant.

Results: A total of 420 postpartum mothers were enrolled in the study, of which 210 were Anaemic and 210 were non-anaemic based on hemoglobin levels (<11 g/dL for Anaemia). The mean age of participants was 26.3 ± 4.2 years. Most women were from lower to middle socioeconomic backgrounds, and a majority followed a vegetarian diet.

1. Serum Vitamin B12 and Folate Levels: There was a statistically significant difference in mean serum vitamin B12 and folate levels between Anaemic and non-anaemic postpartum mothers ($p < 0.001$):

Parameter	Anaemic Mothers (n = 210)	Non-Anaemic Mothers (n = 210)	p-value
Serum Vitamin B12 (pg/mL)	169.45 ± 43.87	242.60 ± 51.23	< 0.001
Serum Folate (ng/mL)	4.22 ± 1.18	6.87 ± 2.02	< 0.001

The bar chart below visualizes these findings:



Here's the bar graph comparing clinical features in Anaemic versus non-anaemic postpartum mothers. It visually highlights the higher prevalence of symptoms like fatigue, pallor, and paresthesia among Anaemic women

Clinical Correlation

A higher frequency of clinical symptoms was observed among Anaemic mothers with low vitamin levels:



- **Fatigue:** 80.5% in Anaemic vs 29.5% in non-anaemic ($p < 0.01$)
- **Pallor:** 72.9% vs 23.8% ($p < 0.01$)
- **Knuckle hyperpigmentation:** 31.4% vs 8.6% ($p < 0.01$)
- **Forgetfulness:** 19.0% vs 4.8% ($p < 0.01$)
- **Paresthesia (tingling in legs/feet):** 38.6% vs 9.5% ($p < 0.01$)
- **Anxiety and postpartum blues** were also more common in the Anaemic group.

These signs were significantly associated with reduced levels of serum vitamin B12 and folate.

2. Dietary Correlation

A strong association was found between dietary habits and serum vitamin levels:

- Women who consumed milk, curd (dahi), cheese, and meat ≥ 3 times/week had significantly higher mean serum B12 and folate levels compared to those with low intake.
- Pure vegetarians were disproportionately represented in the Anaemic group (approx. 78%).

3. Sociodemographic Correlation

- **Education level:** Women with higher education had significantly better serum folate and B12 levels ($p < 0.05$).
- **Socioeconomic status:** Higher SES was positively correlated with higher vitamin levels.
- **Parity and age** showed a mild inverse correlation with folate levels.

4. Association with Neonatal Outcomes

- **Low birth weight** (< 2.5 kg) was more common in neonates of Anaemic mothers.
- Neural tube defects were noted in a few cases, all from the Anaemic group with low maternal folate levels, suggesting a potential link.

Discussion: Our findings confirm a high prevalence of vitamin B12 and folate deficiencies among Anaemic postpartum mothers. This aligns with previous reports from Kaushal et al. and Singh et al. showing similar trends in north Indian populations. The high rate of vegetarians in the studied cohort likely contributes to B12 deficiency, as observed in previous Indian studies. Furthermore, the low folate levels emphasize the need for food fortification and targeted supplementation in antenatal and postnatal care.

Conclusion: Vitamin B12 and folate deficiencies are major contributors to postpartum Anemia in North Indian women. Integration of vitamin screening and supplementation into routine maternal care can significantly reduce maternal morbidity and neonatal complications.

Limitations

1. **Cross-Sectional Design:** The study's cross-sectional nature limits the ability to establish causality between vitamin deficiencies and Anemia. Longitudinal follow-up could provide better insight into temporal associations and outcomes.
2. **Hospital-Based Sample:** As the study was conducted in a single tertiary care center (UPUMS, Saifai), the findings may not be generalizable to the broader rural or urban population of India, especially those not accessing institutional healthcare.
3. **Self-Reported Dietary Intake:** Dietary habits were assessed based on self-reporting, which is subject to recall bias and may not accurately reflect actual intake or long-term dietary patterns.
4. **Exclusion of Supplemented Women:** Women already on multivitamins were excluded, which may have led to an overestimation of deficiency prevalence, as these women likely represent a more health-conscious subgroup.
5. **Lack of Functional Biomarkers:** The study did not include markers like methylmalonic acid or homocysteine, which could have provided more precise insights into the functional status of vitamin B12 and folate metabolism.
6. **Unmeasured Confounding Factors:** Variables such as infection status, inflammatory markers, and exact dietary micronutrient quantities were not evaluated, which could influence the observed relationships.

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