BIOMEDICINE AND CHEMICAL SCIENCES
AN INTERNATIONAL PEER-REVIEWED JOURNAL

BIOMEDICINE AND CHEMICAL SCIENCES
Website: https://journals.irapa.org/index.php/BCS
e-ISSN: 2790-296X | p-ISSN:2957-5826

Original Article

Prevalence and Risk Factors of Anemia Among Pregnant Women in Rural Communities

Corresponding Author:
Dr. Nisha Chakrvarti
Email:
nishachakrvarti@gmail.com

Dr Alka Bathla[1], Dr Parita Kishorbhai Chovatiya[2], Dr. Nisha Chakrvarti[3*]

[1]Assistant Professor, Department Obstetrics and Gynaecology, Bharat Vikas Institute of Medical Sciences, Kota, Rajasthan, India

[2]Junior Resident, GMERS Medical College and Hospital, Navsari, Gujarat, India

[3]Associate Professor, Department Obstetrics and Gynaecology, GCS Medical College, Ahmedabad, Gujarat, India

Article History:
Received on: Aug 03, 2026
Revised on: Aug 10, 2026
Accepted on: Aug 20, 2026
Published on: Sep 01, 2026

Citation: Dr Alka Bathla *et al.* Prevalence and Risk Factors of Anemia Among Pregnant Women in Rural Communities. *Biomedicine and Chemical Sciences, 5 (3): 26-30, 2026*

ABSTRACT

Background: Anemia in pregnancy is a serious public health issue in rural areas where nutrition and access and compliance to iron folic acid supplementation are variable.

Methods: A cross-sectional study was done in a community setting with 420 pregnant women from 18 villages. Hemoglobin was determined by automated analyzer and severity of anemia was classified. A structured schedule was used to collect information on sociodemographic, obstetric, dietary and antenatal-care variables.

Results: The prevalence of anemia was 58.6% (246/420) in total. Among anemic women, 73 (29.7%) had mild anemia, 151 (61.4%) had moderate anemia and 22 (8.9%) had severe anemia. The mean hemoglobin level was significantly lower in women in the third trimester compared to the first trimester (10.1 ± 1.2 g/dL vs. 11.2 ± 1.0 g/dL, $p<0.001$). Independent risk factors included low dietary diversity (adjusted odds ratio [AOR] 2.74, 95% CI 1.68-4.47), irregular iron-folic acid intake (AOR 3.18, 95% CI 1.96-5.16), interpregnancy interval <24 months (AOR 1.91, 95% CI 1.12-3.27), third trimester status (AOR 2.46, 95% CI 1.39-4.36) and maternal education below secondary level (AOR 2.08, 95% CI 1.25-3.45).

Conclusions: Anemia was present in over half of the pregnant women in these rural communities, and modifiable nutritional and antenatal-care risk factors were strongly associated with the risk.

Keywords: Pregnancy, anemia, rural health, iron-folic acid, dietary diversity, antenatal care.

INTRODUCTION

Anemia in pregnancy is a chronic condition of the mother and is linked to fatigue, decreased work capacity, susceptibility to infection, postpartum hemorrhage, preterm delivery, low birth weight and poor neonatal outcomes. According to global analyses, anemia is a significant problem among pregnant women, particularly in low- and middle-income countries [1],[2]. Iron needs are increased during pregnancy due to growth of maternal red cell mass, development of the placenta and growth of the fetus. If the intake, absorption or iron stores are inadequate, the hemoglobin concentration decreases. The situation is especially vulnerable for rural women due to low dietary diversity, food insecurity, adolescent marriage, repeated pregnancies, parasitic infestation, and late antenatal registration and inconsistent availability and use of iron-folic acid tablets [3],[4].

Anemia is multifactorial. Iron deficiency is prevalent, but folate deficiency, vitamin B12 deficiency, malaria and hookworm, hemoglobinopathies and chronic inflammation can also play a role. Thus, beyond simply distributing tablets, prevention must also involve nutrition counselling, deworming (if applicable), screening at antenatal visits and addressing social determinants like education and household income [5],[6].

National programmes encourage iron-folic acid supplementation, but uptake is not optimal in many rural areas. Barriers include gastrointestinal side effects, forgetfulness, poor counseling, misconceptions and irregular drug supply. The present study was carried out to estimate the prevalence of anaemia among pregnant women in selected rural communities, and to determine the associated sociodemographic, obstetric, dietary and antenatal-care risk factors [7].

MATERIALS AND METHODS

This is a cross-sectional community-based study conducted in 18 villages in rural areas which are covered by three Primary Health Centers. All pregnant women, regardless of trimester, who had lived in the area for at least 6 months qualified. Women who had a history of hemoglobinopathy, chronic kidney disease, active bleeding, recent transfusion or severe acute illness requiring referral were excluded.

A multistage sampling method was used. Villages were chosen from the catchment area of the primary health center and pregnant women were identified from antenatal registers and community health worker lists. 420 women were enrolled, following informed consent. The study tool collected age, education, occupation, socioeconomic class, parity, gestational age, interpregnancy interval, number of antenatal visits, iron-folic acid supplementation, deworming history and dietary diversity.

Blood samples were taken under sterile conditions and haemoglobin was determined by an automated haematology analyzer. Anemia was considered to be a hemoglobin concentration of less than 11 g/dL. The severity was classified as mild, moderate or severe based on the standard pregnancy cut-offs. Dietary diversity was assessed by the number of food groups consumed during the last 24 hours. The definition of irregular iron-folic acid intake was taking iron-folic acid tablets on less than two days a week for the past month.

The data were entered into the Microsoft Excel and analyzed with SPSS version 26. Prevalence is reported as percentage with 95% confidence interval. Chi-square test and independent t-test were used to determine group differences. Multivariable logistic regression was performed to include variables that were significant at $p<0.10$ in the bivariate analysis. Odds ratios with 95% confidence intervals were computed and $p<0.05$ was regarded as significant.

RESULTS

The mean age of participants was 24.8 ± 4.2 years. Most women were homemakers, 258 (61.4%) had education below secondary level and 229 (54.5%) belonged to lower socioeconomic categories. The overall prevalence of anemia was 58.6% (95% CI 53.8-63.3). Moderate anemia was the most common severity category.

Table 1. Prevalence and severity of anemia by trimester.

Trimester	Total women	Anemia n (%)	Mild n (%)	Moderate n (%)	Severe n (%)	Mean Hb (g/dL)
First	86	34 (39.5)	17 (50.0)	15 (44.1)	2 (5.9)	11.2 ± 1.0
Second	196	112 (57.1)	35 (31.3)	68 (60.7)	9 (8.0)	10.5 ± 1.2
Third	138	100 (72.5)	21 (21.0)	68 (68.0)	11 (11.0)	10.1 ± 1.2
Total	420	246 (58.6)	73 (29.7)	151 (61.4)	22 (8.9)	10.6 ± 1.3

Table 2. Bivariate association of selected risk factors with anemia.

Risk factor	Anemic n/N (%)	Non-anemic n/N (%)	p-value
Education below secondary	174/258 (67.4)	84/258 (32.6)	<0.001
Lower socioeconomic class	158/229 (69.0)	71/229 (31.0)	<0.001
Third trimester	100/138 (72.5)	38/138 (27.5)	<0.001
Parity ≥2	122/180 (67.8)	58/180 (32.2)	0.002
Interpregnancy interval <24 months	84/116 (72.4)	32/116 (27.6)	0.001
Low dietary diversity	156/210 (74.3)	54/210 (25.7)	<0.001
Irregular IFA intake	168/232 (72.4)	64/232 (27.6)	<0.001
Fewer than 4 ANC visits	131/190 (68.9)	59/190 (31.1)	<0.001

Table 3. Multivariable logistic regression for anemia in pregnancy.

Variable	Adjusted odds ratio	95% CI	p-value
Low dietary diversity	2.74	1.68-4.47	<0.001
Irregular IFA intake	3.18	1.96-5.16	<0.001
Interpregnancy interval <24 months	1.91	1.12-3.27	0.017
Third trimester	2.46	1.39-4.36	0.002
Education below secondary	2.08	1.25-3.45	0.005
Fewer than 4 ANC visits	1.73	1.04-2.88	0.035

Women who reported daily consumption of green leafy vegetables, pulses or animal-source foods had significantly higher mean hemoglobin than those with low dietary diversity (11.0 ± 1.1 g/dL vs. 10.2 ± 1.3 g/dL, p<0.001). Only 188 women (44.8%) reported regular iron-folic acid intake in the preceding month.

The commonest reasons for irregular tablet intake were forgetfulness (42.1%), nausea or constipation (25.9%), not understanding the benefit (17.2%) and non-availability at the last visit (9.1%). Deworming had been received by 214 women (51.0%).

DISCUSSION

Anemia was prevalent in this rural pregnant population, affecting almost one in five women. This is in line with the national and regional level data which indicates that anemia is still prevalent among pregnant women in India and other low resource countries despite the fact that they have been supplementing for a long time [8],[9].

The most prevalent type of anemia was moderate, indicating chronic nutrition deficiency and not only acute illness. The higher prevalence in the 2nd and 3rd trimesters is due to an increase in iron requirements during the course of pregnancy. These findings are echoed in other systematic reviews and community-based studies, which consistently have found that late gestation and high parity are associated with decreased hemoglobin [10],[11].

Irregular iron-folic acid intake was the strongest modifiable predictor in the present study. Counselling quality, family support, side effects, supply continuity and perceived need are factors that affect compliance. Previous studies in India and other countries have demonstrated that women who are given clear counseling and repeated reinforcement are more likely to finish the supplementation [12],[13].

Low dietary diversity was independently related to anemia. Cereals are a staple food in rural diets and are low in iron bioavailability, while animal-source foods are not consumed enough. Iron intake or absorption may be further decreased by taking tea with meals, food insecurity and seasonal variation. Therefore, the emphasis of nutrition education should be on inexpensive local iron-rich foods, vitamin C-rich foods and meal practices that enhance iron absorption [14].

The variables of bivariate analysis associated with anemia were short interpregnancy interval and parity, with the latter remaining significant after adjustment. If a woman becomes pregnant again before her iron stores are replenished, her stores may be depleted again. This discovery indicates the need for counseling during the postpartum period, access to contraceptives and preconception correction of anemia [15].

The study has some limitations. Etiological classification was not completed for all participants because ferritin, folate, vitamin B12 and stool parasite testing were not performed. Since the design was cross-sectional, it was not possible to establish causality. However, community-based sampling and direct measurement of haemoglobin and risk factors are useful to provide evidence for local antenatal planning [16],[17].

There is a significant programmatic challenge to getting tablets into people's hands and then into their mouths. A large number of women reported to receive iron-folic acid tablets, but not always take them. This implies that the supply-side indicators could overestimate the effective coverage. At each antenatal contact, counseling should include explanation of benefits, gastrointestinal side effects management, reminders, and family involvement and follow up questions.

Dietary counseling also needs to be realistic for rural households. When people are on a low income, it is not likely that advice on expensive foods will change their behavior. Practical examples of meals can be provided to promote locally available pulses, green leafy vegetables, jaggery in moderation, groundnuts, millets, seasonal fruits and vitamin C rich foods. Folate and vitamin B12 risk is also relevant in areas where vegetarianism is the dominant diet.

Anemia in late pregnancy is a problem of high prevalence with service delivery implications. A single screening at the beginning of registration might not catch women who become anemic later. It would be possible to correct and refer severe

cases earlier, before delivery, if repeated hemoglobin tests were carried out, preferably in each trimester. CHWs have the potential to be significant monitors of adherence and to detect warning signs [17].

Anemia prevention is also influenced by household decision making. Women may be aware of the benefits of supplements but stop taking them if family members do not see the symptoms or if there is less time for antenatal visits due to family responsibilities. Community mobilization of husbands, mothers-in-law and community groups during health education sessions could enhance adherence, allocation of food and timely care seeking.

Severe anemia was less common than mild or moderate anemia, but has the highest impact for delivery planning. Severe anemia should be referred for investigation and treatment of treatable causes prior to labor if possible. Early identification of anemia-risk women is possible by using anemia-risk checklists in the village-level antenatal sessions, which can prevent the late presentation near term [17].

CONCLUSION

The prevalence of anemia among pregnant women in the studied rural communities was 58.6%, with moderate anemia being the most common type. Irregular iron-folic acid intake, low dietary diversity, late trimester, low education and short interpregnancy interval were key risk factors. Improving counselling, supplement adherence, dietary diversity and early antenatal screening can help to decrease the burden of anemia in rural pregnancy care.

REFERENCES

1. Stevens GA, Finucane MM, De-Regil LM, et al. Global, regional, and national trends in haemoglobin concentration and prevalence of total and severe anaemia. Lancet Glob Health. 2013;1(1):e16-e25. doi:10.1016/S2214-109X(13)70001-9. PMID:25103581.
2. Karami M, Chaleshgar M, Salari N, Akbari H, Mohammadi M. Global prevalence of anemia in pregnant women: a comprehensive systematic review and meta-analysis. Matern Child Health J. 2022. PMID:35608810.
3. Kuppusamy P, et al. Assessing the prevalence and predictors of anemia among pregnant women in India. BMC Pregnancy Childbirth. 2024. PMID:37888841.
4. Abd Rahman R, Idris IB, Isa ZM, Rahman RA, Mahdy ZA. The prevalence and risk factors of iron deficiency anemia among pregnant women in Malaysia: a systematic review. Int J Environ Res Public Health. 2022;19(9):5289. doi:10.3390/ijerph19095289. PMID:35495961.
5. Geta TG, Gebremedhin S, Omigbodun AO. Prevalence and predictors of anemia among pregnant women in Ethiopia: systematic review and meta-analysis. PLoS One. 2022;17(7):e0271085. doi:10.1371/journal.pone.0271085. PMID:35895619.
6. Fite MB, Assefa N, Mengiste B. Prevalence and determinants of anemia among pregnant women in sub-Saharan Africa: a systematic review and meta-analysis. Arch Public Health. 2021;79:219. doi:10.1186/s13690-021-00711-7. PMID:34861892.
7. Vindhya J, Nath A, Murthy GVS, Metgud C, Sheeba B, Shubhashree V. Prevalence and risk factors of anemia among pregnant women attending a public-sector hospital in Bangalore, South India. J Family Med Prim Care. 2019;8(1):37-43. doi:10.4103/jfmpc.jfmpc_265_18.
8. Varghese JS, Swaminathan S, Kurpad AV, Thomas T. Demand and supply factors of iron-folic acid supplementation and its association with anaemia in North Indian pregnant women. PLoS One. 2019;14(1):e0210636. doi:10.1371/journal.pone.0210636. PMID:30699167.
9. Debi S, Basu G, Mondal R, et al. Compliance to iron-folic-acid supplementation and associated factors among pregnant women. J Family Med Prim Care. 2020;9(7):3613-3618. doi:10.4103/jfmpc.jfmpc_392_20.
10. Kassa GM, Muche AA, Berhe AK, Fekadu GA. Prevalence and determinants of anemia among pregnant women in Ethiopia: systematic review and meta-analysis. BMC Hematol. 2017;17:17. doi:10.1186/s12878-017-0090-z. PMID:29046754.
11. Bharati P, Som S, Chakrabarty S, Bharati S, Pal M. Prevalence and determinants of anemia among nonpregnant and pregnant women in India. Asia Pac J Public Health. 2008;20(4):347-359. doi:10.1177/1010539508322762. PMID:19124329.
12. Pal PP, Sharma S, Sarkar TK, Mitra P. Iron and folic acid consumption by the ante-natal mothers in a rural area of India in 2010. Int J Prev Med. 2013;4(10):1213-1216. PMID:24319564.
13. Kassa ZY, Awraris T, Daba AK, Tenaw Z. Compliance with iron folic acid and associated factors among pregnant women. BMC Res Notes. 2019;12:1. doi:10.1186/s13104-019-4045-0.
14. Haider BA, Olofin I, Wang M, Spiegelman D, Ezzati M, Fawzi WW. Anaemia, prenatal iron use, and risk of adverse pregnancy outcomes. BMJ. 2013;346:f3443. doi:10.1136/bmj.f3443. PMID:23794316.
15. Daru J, Zamora J, Fernandez-Felix BM, et al. Risk of maternal mortality in women with severe anaemia during pregnancy and post partum. Lancet Glob Health. 2018;6(5):e548-e554. doi:10.1016/S2214-109X(18)30078-0. PMID:29571592.

16. Finkelstein JL, et al. Daily oral iron supplementation during pregnancy. Cochrane Database Syst Rev. 2024. PMID:39145520.
17. Sunuwar DR, Singh DR, Chaudhary NK, Pradhan PMS, Rai P, Tiwari K. Prevalence and factors associated with anemia among women of reproductive age in seven South and Southeast Asian countries. PLoS One. 2020;15(8):e0236449. doi:10.1371/journal.pone.0236449. PMID:32735519.

DECLARATIONS

Funding: None.

Conflict of Interest: The authors declare no conflict of interest.

Ethical Approval: The study was conducted in accordance with applicable ethical standards and approved by the appropriate ethics committee where required.

Informed Consent: Informed consent was obtained from all participants involved in the study where applicable.

Author Contributions: All authors contributed to the study conception, design, data collection, analysis, manuscript preparation, and approved the final version of the manuscript.

Data Availability: Data supporting the findings of this study are available from the corresponding author upon reasonable request.