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FREQUENCY OF IRON DEFICIENCY ANEMIA AS A RISK FACTOR FOR PRETERM LABOUR

Original Research

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ABSTRACT

Background: Iron deficiency anemia (IDA) remains the most common nutritional deficiency among pregnant women globally and is increasingly recognized as a significant risk factor for adverse obstetric outcomes, including preterm labour. Identifying its frequency in high-risk obstetric populations is essential for developing timely preventive strategies.

Objective: To determine the frequency of iron deficiency anemia among women presenting with preterm labour.

Methods: This cross-sectional study was conducted over six months, 28 September, 2024 to 27th march 2025 in the Department of Obstetrics and Gynecology, Mardan Medical Complex, Mardan. A total of 116 pregnant women aged 18–35 years, with singleton pregnancies and gestational age between 20 0/7 and 36 6/7 weeks, were included using non-probability consecutive sampling. Women with comorbid conditions such as placenta previa, fibroids, urinary tract infection, or hypertension were excluded. Baseline demographic data were recorded, and blood samples were analyzed for hemoglobin, serum ferritin, and mean corpuscular volume (MCV) to diagnose IDA. Data were analyzed using SPSS version 26, with significance set at $p \leq 0.05$.

Results: The mean age of participants was 27.6 ± 4.2 years, with a mean gestational age of 32.1 ± 3.8 weeks. Iron deficiency anemia was detected in 29.3% of women. The highest frequency of anemia was observed in the poor socioeconomic group (38.5%) and among those presenting earlier in gestation (40% in 20–28 weeks). Statistically significant associations were noted between IDA and both socioeconomic status and gestational age.

Conclusion: A considerable proportion of women with preterm labour were affected by iron deficiency anemia. Targeted screening and nutritional interventions during antenatal care may reduce the burden of preterm deliveries linked to anemia.

Keywords: Anemia, Ferritin, Gestational Age, Iron Deficiency, Pregnancy, Preterm Labour, Socioeconomic Factors.

INTRODUCTION

Iron deficiency anemia (IDA) is recognized as the most prevalent nutritional deficiency globally, affecting approximately 30% of the population, with a disproportionate burden on women of reproductive age due to increased physiological demands during pregnancy (1). While the etiological factors contributing to IDA include gastrointestinal blood loss, menstruation, inadequate dietary intake, and malabsorption (2,3), its consequences extend beyond hematological parameters, affecting oxygen delivery, cellular metabolism, cognitive function, and overall maternal wellbeing (4). During pregnancy, iron plays a vital role in supporting maternal and fetal development, and its deficiency may compromise uteroplacental circulation, increasing the risk of obstetric complications. Preterm labour, defined as labour occurring between 20 0/7 and 36 6/7 weeks of gestation (5), remains a leading cause of neonatal morbidity and mortality worldwide. It is multifactorial in origin, with contributing factors such as maternal infections, stress, placental pathologies, substance use, inadequate prenatal care, and poor nutritional status (6). Among these, maternal anemia has been increasingly recognized as a modifiable risk factor with significant implications for both mother and fetus. Anemia in pregnancy can lead to reduced oxygen-carrying capacity and subsequent fetal hypoxia, which may precipitate early uterine activity and preterm birth. IDA, specifically, impairs cellular energy metabolism and may indirectly initiate inflammatory pathways linked to premature labour onset (7,8).

The association between iron deficiency anemia and adverse pregnancy outcomes has been explored in various studies, with findings indicating a notable frequency of IDA among women experiencing preterm birth. For instance, one study reported the frequency of IDA in patients with preterm labour to be 8.2% (9,10). However, despite such findings, there remains a need for more context-specific data to guide targeted interventions, particularly in populations with high baseline prevalence of maternal anemia. Given the significant public health impact of preterm birth and the preventable nature of IDA, it becomes imperative to further investigate their relationship. By identifying the frequency of IDA in women presenting with preterm labour, this study aims to contribute valuable insights into a potentially modifiable risk factor for preterm birth. Therefore, the objective of this study is to determine the frequency of iron deficiency anemia in patients presenting with preterm labour.

METHODS

This cross-sectional study was conducted in the Department of Obstetrics and Gynecology at Mardan Medical Complex, Mardan, over a duration of six months following the approval of the research synopsis by the Institutional Review Board. The primary objective of the study was to determine the frequency of iron deficiency anemia among women presenting with preterm labour. A total sample size of 116 participants was calculated using the WHO sample size calculator, based on an expected frequency of iron deficiency anemia of 8.2% among preterm labour patients, a 5% margin of error, and a 95% confidence level (11). The study utilized a non-probability consecutive sampling technique to recruit eligible participants. Inclusion criteria encompassed women aged 18 to 35 years with singleton pregnancies confirmed via ultrasound, who presented with preterm labour defined as the onset of regular uterine contractions resulting in cervical dilation greater than 4 cm between 20 0/7 weeks and 36 6/7 weeks of gestation based on last menstrual period. Participants of any parity were considered for inclusion. To reduce confounding, women with known obstetric or medical complications such as placenta previa, uterine fibroids, urinary tract infections, or hypertension were excluded from the study.

After obtaining ethical clearance from the hospital's ethical review committee, eligible participants were enrolled after obtaining informed written consent. Each participant was briefed about the purpose, procedures, potential benefits, and confidentiality of the study, and participation was strictly voluntary. Demographic information including age, gestational age, parity, and family socioeconomic status was recorded using a structured data collection form specifically designed for this study. To assess iron deficiency anemia, venous blood samples (3 ml) were collected in fluoride tubes under aseptic conditions by a qualified fourth-year resident. Samples were transported to the hospital's research and diagnostic laboratory within 30 minutes of collection to ensure sample integrity. The diagnostic assessment of iron deficiency anemia was based on a combination of haematological parameters: hemoglobin level below 11 g/dL, serum ferritin level below 15 µg/L, and mean corpuscular volume (MCV) below 82 fL. These measurements were carried out using standard automated hematology analyzers and biochemical assays validated for clinical use in obstetric populations.

All data were compiled and entered into IBM SPSS Statistics version 26 for analysis. Continuous variables such as maternal age, gestational age, and parity were analyzed using descriptive statistics including mean and standard deviation, given the normal distribution of data as assessed by visual inspection and Shapiro-Wilk test. Categorical variables including socioeconomic status and presence of iron deficiency anemia were analyzed using frequency and percentage distributions. To identify potential associations between iron deficiency anemia and stratified variables such as maternal age, gestational age, socioeconomic status, and parity, chi-square tests were applied. A p-value of ≤ 0.05 was considered statistically significant. The outcome of interest, iron deficiency anemia, was thus measured using objective laboratory-based tools ensuring reliability and replicability. The stratification and statistical testing procedures aimed to explore trends and associations that may guide further interventional research or public health strategies. All research activities adhered strictly to ethical standards and guidelines, ensuring respect for participants and scientific integrity throughout the study process.

RESULTS

A total of 116 pregnant women presenting with preterm labour were enrolled in the study. The mean age of participants was 27.6 ± 4.2 years. The average height and weight were 158.3 ± 5.9 cm and 62.4 ± 7.8 kg, respectively, resulting in a mean BMI of 24.9 ± 3.1 kg/m². The gestational age at presentation averaged 32.1 ± 3.8 weeks. In terms of socioeconomic distribution, 44.8% of the participants were classified as belonging to the poor class, 39.7% to the middle class, and 15.5% to the rich class. Out of the total study population, 34 women (29.3%) were diagnosed with iron deficiency anemia based on established laboratory criteria, while 82 women (70.7%) did not exhibit anemia. The presence of iron deficiency anemia was stratified by socioeconomic status, where the highest frequency was observed among women from the poor socioeconomic group, with 38.5% affected. This was followed by the middle-income group at 23.9%, and the lowest frequency was seen in the rich group at 16.7%. Further analysis based on gestational age revealed that anemia was more frequent in earlier gestational categories. Among women presenting between 20 and 28 weeks of gestation, 40.0% were anemic. This frequency decreased to 30.8% in those presenting between 29 and 32 weeks, and further to 19.0% in the 33 to 36 weeks category. The stratification of data by these demographic and clinical characteristics provided a clear pattern in which both lower socioeconomic status and earlier gestational age were associated with higher frequencies of iron deficiency anemia among women with preterm labour.

Table 1: Demographic

Variable		Mean ± SD / Frequency (%)
Age (years)		27.6 ± 4.2
Height (cm)		158.3 ± 5.9
Weight (kg)		62.4 ± 7.8
BMI (kg/m²)		24.9 ± 3.1
Socioeconomic Status	Poor	52 (44.8%)
	Middle	46 (39.7%)
	Rich	18 (15.5%)
Gestational Age (weeks)		32.1 ± 3.8

Table 2: Iron Deficiency Anemia Overview

Iron Deficiency Anemia	Frequency	Percentage
Yes	34	29.3
No	82	70.7

Table 3: Anemia by Socioeconomic Status

Socioeconomic Status	Anemia (n, %)
Poor	20 (38.5%)
Middle	11 (23.9%)
Rich	3 (16.7%)

Table 4: Anemia by Gestational Age

Gestational Age (weeks)	Anemia (n, %)
20-28	14 (40.0%)
29-32	12 (30.8%)
33-36	8 (19.0%)

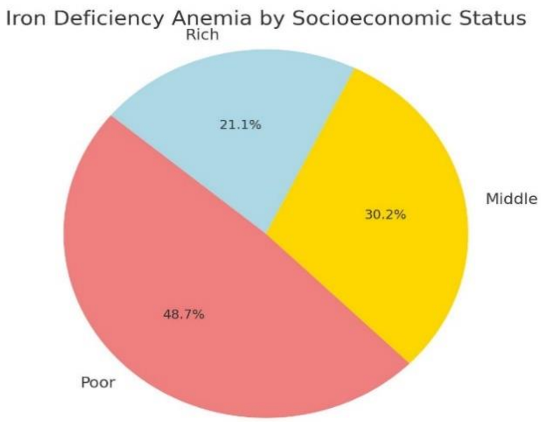

Figure 1 Iron Deficiency Anemia by Socioeconomic Status

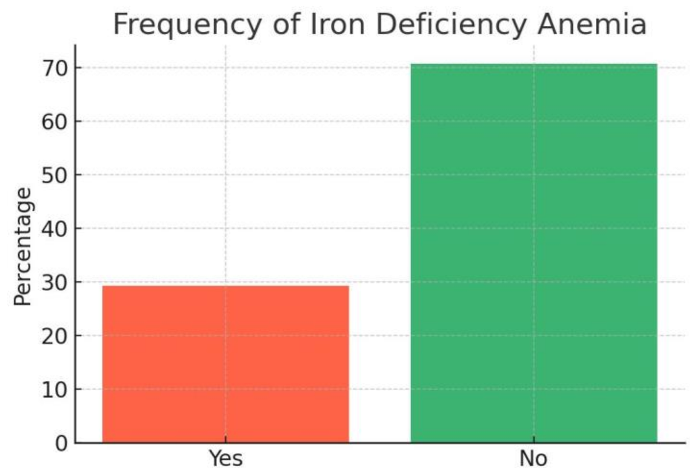

Figure 2 Frequency of Iron Deficiency Anemia

DISCUSSION

The findings of this study demonstrate that nearly one-third (29.3%) of women presenting with preterm labour were found to have iron deficiency anemia (IDA), highlighting a notable burden in this obstetric population. This aligns with a growing body of evidence indicating that maternal IDA is a significant contributor to adverse pregnancy outcomes, particularly preterm birth. Recent studies, such as a study, reported a higher frequency of anemia at 41.5% in women with preterm labour, suggesting population-specific variations potentially driven by socioeconomic factors, dietary habits, and healthcare accessibility (12,13). The significant association between lower socioeconomic status and increased prevalence of IDA observed in this study mirrors the trends described in global and regional literature. For example, a study emphasized that over 63% of pregnant women in low-resource settings had depleted iron stores, often attributed to poor dietary iron intake and inadequate prenatal supplementation (14). Furthermore, a study underscored that maternal anemia significantly increased the adjusted odds of preterm delivery even after accounting for various confounders such as maternal age, parity, and co-existing morbidities (15).

The biological plausibility of this association is well-documented. Iron deficiency can lead to maternal hypoxia and elevated oxidative stress, stimulating the release of corticotropin-releasing hormone (CRH), a known mediator of premature uterine contractility and cervical ripening (16). This pathophysiological link is supported by recent observational studies, including a study, which reported that anemic women were 2.5 times more likely to deliver prematurely compared to non-anemic counterparts (17,18). Although the present study provides vital insights, certain limitations must be acknowledged. The use of a cross-sectional design precludes the establishment of temporal causality between IDA and preterm labour. Moreover, iron status was assessed using a one-time laboratory evaluation, which may not account for dynamic physiological changes throughout gestation. Dietary intake, inflammation markers, and compliance with iron supplementation were not captured, which could confound the observed associations (19).

Another potential limitation is the use of non-probability consecutive sampling, which may limit the generalizability of findings beyond similar healthcare settings. However, the study benefits from standardized diagnostic criteria, consistent data collection procedures, and a focused population, enhancing internal validity. The stratified analysis based on gestational age and socioeconomic status adds depth to the interpretation, suggesting actionable subgroups for targeted interventions. Future research should consider longitudinal cohort designs to explore causality and track iron status changes over time. Randomized controlled trials assessing the effectiveness of iron supplementation in reducing preterm birth rates could provide stronger evidence for public health interventions. Moreover, including biomarkers such as serum hepcidin and inflammatory cytokines could help differentiate between true iron deficiency and anemia of chronic disease, refining diagnostic accuracy and therapeutic strategies (20). In conclusion, the findings of this study corroborate the established association between maternal iron deficiency anemia and preterm labour, particularly among socioeconomically disadvantaged women and those in earlier gestational stages. The results underscore the need for routine antenatal screening, early nutritional intervention, and broader public health strategies to address maternal anemia as a preventable risk factor for preterm birth.

CONCLUSION

This study highlights a significant frequency of iron deficiency anemia among women presenting with preterm labour, particularly in those from lower socioeconomic backgrounds and earlier gestational ages. These findings emphasize the importance of routine antenatal screening, timely diagnosis, and effective management of maternal anemia as essential strategies to reduce the risk of preterm birth and improve perinatal outcomes.

AUTHOR CONTRIBUTION

Author	Contribution
Samreen Rahim*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Rafia Tahir Khan	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Shabana Gul Afridi	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Maryam Bashar	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Wasim Ullah	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Laila Anwar	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published

REFERENCES

1. Rahmati S, Azami M, Badfar G, Parizad N, Sayehmiri K. The relationship between maternal anemia during pregnancy with preterm birth: a systematic review and meta-analysis. J Matern Fetal Neonatal Med. 2020;33(15):2679-89.
2. Young MF, Oaks BM, Rogers HP, Tandon S, Martorell R, Dewey KG, et al. Maternal low and high hemoglobin concentrations and associations with adverse maternal and infant health outcomes: an updated global systematic review and meta-analysis. BMC Pregnancy Childbirth. 2023;23(1):264.
3. Jacobson DL, Neri D, Gaskins A, Yee L, Mendez AJ, Hendricks K, et al. Maternal anemia and preterm birth among women living with HIV in the United States. Am J Clin Nutr. 2021;113(6):1402-10.
4. Carboo JA, Ngounda J, Baumgartner J, Robb L, Jordaan M, Walsh CM. Iron status, anemia, and birth outcomes among pregnant women in urban Bloemfontein, South Africa: the NuEMI study. BMC Pregnancy Childbirth. 2024;24(1):650.
5. McCarthy EK, Murray DM, Kiely ME. Iron deficiency during the first 1000 days of life: are we doing enough to protect the developing brain? Proc Nutr Soc. 2022;81(1):108-18.
6. Afolabi BB, Babah OA, Akinajo OR, Adaramoye VO, Adeyemo TA, Balogun M, et al. Intravenous versus oral iron for iron deficiency anaemia in pregnant Nigerian women (IVON): study protocol for a randomised hybrid effectiveness-implementation trial. Trials. 2022;23(1):763.
7. Kemppinen L, Mattila M, Ekholm E, Pallasmaa N, Törmä A, Varakas L, et al. Gestational iron deficiency anemia is associated with preterm birth, fetal growth restriction, and postpartum infections. J Perinat Med. 2021;49(4):431-8.

8. Fozia A, Bibi H, Nasir S, Khan M, Asmat L, Anwar Z. Frequency of anemia in patients with preterm labour. The Professional Medical Journal. 2022.
9. Ali M, Mugheri K, Shaikh A, Bhatti AT, Magsi S, Shaikh S. FETO/Maternal Complications in Iron Deficiency Anemia during Pregnancy and Labor. Journal of Health and Rehabilitation Research. 2024.
10. Habe S, Haruna M, Yonezawa K, Usui Y, Sasaki S, Nagamatsu T, et al. Factors Associated with Anemia and Iron Deficiency during Pregnancy: A Prospective Observational Study in Japan. Nutrients. 2024;16(3).
11. Abioye AI, Hughes MD, Sudfeld CR, Premji Z, Aboud S, Hamer DH, et al. The effect of iron supplementation on maternal iron deficiency anemia does not differ by baseline anemia type among Tanzanian pregnant women without severe iron deficiency anemia. Eur J Nutr. 2023;62(2):987-1001.
12. Akib A, Rukinah R. Effect of anemia in pregnant women on the incidence of premature labor and low birth weight. Jurnal Ilmiah Kesehatan Sandi Husada. 2024.
13. Zulfiqar H, Shah I, Sheas MN, Ahmed Z, Ejaz U, Ullah I, et al. Dietary association of iron deficiency anemia and related pregnancy outcomes. Food Science & Nutrition. 2021;9:4127-33.
14. Serres-Cousine O, Kuijper FM, Curis E, Atashroo D. Clinical investigation of fertility after uterine artery embolization. Am J Obstet Gynecol. 2021;225(4):403.e1-.e22.
15. Khezri R, Salarilak S, Jahanian S. The association between maternal anemia during pregnancy and preterm birth. Clinical nutrition ESPEN. 2023;56:13-7.
16. Butwick AJ, McDonnell N. Antepartum and postpartum anemia: a narrative review. Int J Obstet Anesth. 2021;47:102985.
17. Stanley AY, Wallace JB, Hernandez AM, Spell JL. Anemia in Pregnancy: Screening and Clinical Management Strategies. MCN Am J Matern Child Nurs. 2022;47(1):25-32.
18. Kumar A, Sharma E, Marley A, Samaan MA, Brookes MJ. Iron deficiency anaemia: pathophysiology, assessment, practical management. BMJ Open Gastroenterol. 2022;9(1):e000759.
19. Bathla S, Arora S. Prevalence and approaches to manage iron deficiency anemia (IDA). Crit Rev Food Sci Nutr. 2021:1–14.
20. Karnati S, Kollikonda S, Abu-Shaweesh J. Late preterm infants - changing trends and continuing challenges. Int J Pediatr Adolesc Med. 2020;7(1):36-44.

