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Original Research Article

Maternal Serum Ferritin Levels in Predicting Preterm Labor and Its Clinical Implications

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Abstract: ***Background*:** Preterm labor remains a major contributor to neonatal morbidity and mortality worldwide. Identifying predictive biomarkers such as maternal serum ferritin may enable early detection and improve perinatal outcomes. ***Methods*:** A case-control study was conducted at the Department of Obstetrics & Gynaecology, Dhaka Medical College Hospital, from June 2022 to May 2023. A total of 88 pregnant women were enrolled, including 44 cases with preterm labor and 44 controls with term labor, selected through purposive sampling. Sociodemographic and biochemical parameters were recorded, and serum ferritin levels were compared between the groups. Statistical analysis was performed using SPSS version 25. ***Results*:** The majority of participants in both groups were aged between 18 and 26 years. The mean age was slightly higher in the preterm group (25.59 ± 5.80 years) compared to the term group (24.56 ± 5.41 years), but the difference was not statistically significant ($p = 0.331$). Serum ferritin levels were significantly elevated in the preterm group (89.09 ± 106.07 ng/mL) compared to the term group (32.13 ± 31.40 ng/mL), with a statistically significant difference ($p = 0.004$). Correlation analysis revealed a significant negative association between serum ferritin levels and gestational age ($r = -0.313$, $p < 0.05$), with an R^2 value of 0.139, indicating a modest inverse relationship. ***Conclusion*:** Higher maternal serum ferritin levels are significantly associated with preterm labor and inversely correlated with gestational age. Serum ferritin may serve as a useful biomarker for predicting preterm birth risk, supporting its inclusion in routine antenatal screening protocols.

Keywords: Preterm labor, maternal serum ferritin, pregnancy, biomarker, gestational age.

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INTRODUCTION

Preterm labor, defined as the onset of regular uterine contractions leading to cervical changes before 37 completed weeks of gestation, remains a major global obstetric challenge [1]. It contributes significantly to neonatal morbidity, mortality, and long-term health complications, including neurodevelopmental impairments, respiratory distress syndrome, and intraventricular hemorrhage [2]. According to the World Health Organization (WHO), an estimated 15 million babies are born prematurely each year, and complications of preterm birth are the leading cause of death among children under five years of age [1]. Despite advances in neonatal care, the burden of preterm birth remains high, particularly in low- and middle-income countries, including Bangladesh.

Identifying women at risk of preterm labor early in pregnancy remains difficult due to the multifactorial nature of its etiology [3]. Known risk factors include a history of previous preterm birth, infections, uterine anomalies, multiple pregnancies, cervical insufficiency, and lifestyle or socio-economic factors [4]. However, many cases occur in women with no apparent risk factors, highlighting the need for reliable biomarkers that can assist in predicting the likelihood of preterm labor and guide timely interventions [5].

Recent research has focused on the role of maternal inflammation in the pathophysiology of preterm labor [6]. Ferritin, an iron-storage protein, is not only a marker of iron status but also an acute-phase reactant that increases in response to systemic inflammation. Elevated maternal serum ferritin levels may reflect subclinical infections or inflammatory states that contribute to uterine activation and the initiation of labor [7]. Studies have shown a potential association between high serum ferritin levels and increased risk of spontaneous preterm labor, suggesting that ferritin could serve as a predictive biomarker [8, 9]. However, findings have been inconsistent across populations, and further investigation is needed to establish its clinical utility.

In Bangladesh, where preterm birth significantly impacts neonatal outcomes and healthcare resources, exploring cost-effective and easily accessible predictive tools is essential [10]. Serum ferritin measurement is simple, widely available, and relatively inexpensive, making it a feasible candidate for routine use in obstetric care, particularly in resource-limited settings [11].

This study aimed to evaluate the association between maternal serum ferritin levels and preterm labor and to determine whether elevated ferritin levels can serve as a reliable predictor. By comparing serum ferritin concentrations in women with preterm and term deliveries, the study seeks to clarify its potential role in identifying high-risk pregnancies and improving perinatal outcomes. The findings may contribute to the development of better screening strategies and clinical decision-making tools, ultimately reducing the burden of preterm birth in the Bangladeshi population and similar settings.

METHODOLOGY & MATERIALS

This case-control study was conducted at the Department of Obstetrics and Gynaecology, Dhaka Medical College Hospital (DMCH), from June 2022 to May 2023. A total of 88 pregnant women were enrolled using purposive sampling, with 44 women in the case group who presented with preterm labor and 44 women in the control group who had term labor. Eligible participants were aged between 18 and 35 years, had singleton pregnancies, and presented with regular uterine contractions along with cervical dilatation and effacement greater than 2 cm. The case group included women with gestational age between 28 and <37 weeks, while the control group consisted of women with gestational age ≥37 weeks. Women with anemia, iron overload, chronic infections, multiple pregnancies, polyhydramnios, diabetes mellitus, preeclampsia, hepatic or renal disease, a history of preterm labor due to incompetent cervix, intrauterine fetal death, or known fetal anomalies were excluded.

Data collection was carried out using a structured questionnaire that included sociodemographic information, medical and obstetric history, and relevant clinical findings. Blood samples were obtained from the antecubital vein under aseptic conditions prior to delivery. Serum ferritin levels were measured using a two-step Chemiluminescent Microparticle Immunoassay (CMIA), which provides accurate and sensitive quantification of ferritin concentrations. All necessary safety precautions, including the use of gloves, lab coats, and protective eyewear, were observed during sample handling.

Statistical analysis was performed using SPSS version 25. Continuous variables were analyzed using the Mann–Whitney U test, and categorical variables were compared using the Chi-square test. The correlation between serum ferritin levels and gestational age was assessed using the Spearman correlation test. A p-value of less than 0.05 was considered statistically significant. Ethical approval for the study was obtained from the Institutional Review Board of Dhaka Medical College Hospital.

Informed written consent was taken from all participants prior to data collection.

RESULTS

Table I: Sociodemographic characteristics of the study participants (n=88)

Characteristics	Pre-term labor (N=44)	Term labor (N=44)	p-value
	Frequency (%)	Frequency (%)	
Age (in years)			
18-26	24 (54.5)	32 (72.7)	0.076^{ns}
27-35	20 (45.5)	12 (27.3)	
Mean±SD	25.59±5.80	24.56±5.41	^{b}0.331^{ns}

Data presented frequency, percentage, and mean ± SD over columns. P-value reached through a chi-square test for categorical variables and ^{b}Mann-Whitney U test, where continuous data was not normally distributed.
s=significant
ns=non-significant

Table-I shows that, age of the preterm pregnancy (25.59±5.80) and term pregnancy (24.56±5.41) was not statistically different (p > 0.05).

Table II: Comparison between preterm and full-term regarding biochemical data (n=88)

Characteristics	Pre-term labor (N=44)	Term labor (N=44)	p-value
	Mean ± SD	Mean ± SD	
Serum Ferritin	89.09±106.07	32.13±31.40	^{b}**0.004**^{s}

Data presented as mean ± SD over columns. P-value reached through ^{b}Mann-Whitney U test, where data was not normally distributed.
s=significant
ns=non-significant

Table-II shows that, serum ferritin was statistically significant between both groups (p < 0.05).

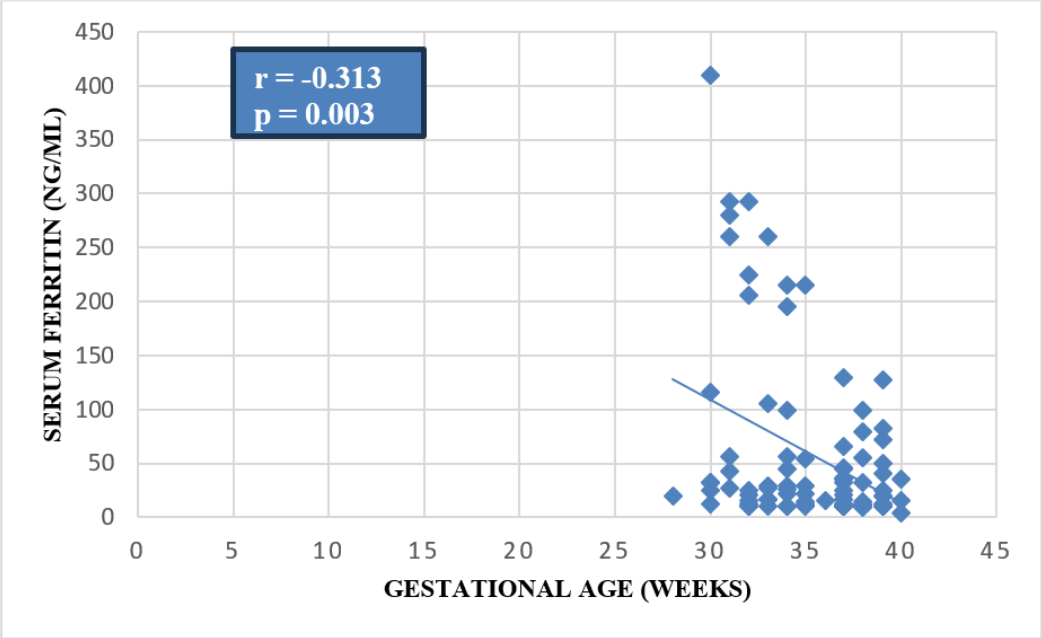

Figure 1: Relationship between serum ferritin levels and gestational age (n=88)
R^2 linear = 0.139

Figure-1 shows that serum ferritin level increases with decreased gestational age; the relationship is negative but weak (r = -0.313) and also statistically significant (p < 0.05).

DISCUSSION

This study aimed to evaluate the association between maternal serum ferritin levels and preterm labor, highlighting its potential as a predictive biomarker. Our findings revealed a significantly

higher serum ferritin concentration in women with preterm labor compared to those with term labor (89.09±106.07 ng/mL vs. 32.13±31.40 ng/mL; p = 0.004). Furthermore, a statistically significant negative correlation was found between serum ferritin levels and gestational age (r = −0.313; p < 0.05), indicating that elevated ferritin levels may be associated with earlier delivery.

These results align with the study by Alrasheed *et al*., who reported significantly higher maternal ferritin levels in women presenting with preterm labor, suggesting its role as an acute phase reactant reflective of subclinical inflammation [12]. Similarly, Omran and Sarsam demonstrated a notable elevation in ferritin levels among preterm labor cases, reinforcing its potential diagnostic value [13].

The mechanism underlying this association may relate to ferritin's dual role: while it serves as an iron storage protein, it is also a marker of inflammation. Elevated serum ferritin can occur in response to maternal inflammatory processes, which are known to contribute to the cascade of events leading to preterm labor [14, 15]. Vogel *et al*., described ferritin as one of several biochemical markers with predictive utility for preterm birth, particularly in cases lacking overt signs of infection [14].

Our findings are supported by Jyothi *et al*., who found that higher ferritin levels could predict preterm delivery in low-risk Indian women, particularly when combined with other biomarkers such as cervical length [16]. This multidimensional approach reflects current trends in perinatal research, emphasizing the importance of combining biochemical and clinical indicators for better predictive accuracy [17].

While the inflammation hypothesis is compelling, it is important to note that elevated ferritin levels may also reflect maternal iron overload or dysregulated iron metabolism, which have been associated with adverse pregnancy outcomes. Liao *et al*., found elevated ferritin in maternal infections and suggested that it could mediate inflammatory responses contributing to adverse fetal outcomes, including preterm birth [18].

Jahedbozorgan *et al*., compared serum ferritin in women with term and preterm deliveries and found significantly elevated levels in the preterm group, consistent with our findings [19]. Similarly, Cetinkaya et al., observed that elevated acute phase reactants like ferritin, CRP, and IL-6 could indicate a heightened risk of early delivery [20].

The relatively weak but significant negative correlation between serum ferritin and gestational age in our study (r = −0.313) suggests that while ferritin may not fully explain the onset of preterm labor, it contributes to a broader inflammatory and metabolic profile that could predispose women to premature delivery. This is consistent with findings from Menon et al., who concluded that spontaneous preterm birth results from a multifactorial process involving infection, inflammation, stress, and endocrine pathways [21].

Our results also reinforce the idea that maternal iron status plays a crucial role in pregnancy outcomes. Alwan et al., noted that both iron deficiency and iron excess in early pregnancy are linked to adverse outcomes, including preterm birth [17]. Thus, careful monitoring and individualized iron supplementation are essential during antenatal care.

Moreover, Singh *et al*., emphasized the utility of biochemical markers, including ferritin, in early detection and prevention strategies for preterm labor, especially when clinical signs are subtle or absent [22]. This supports the integration of serum ferritin testing into routine antenatal screening protocols, particularly for at-risk populations.

Limitations of the study

Nevertheless, our study has limitations. The cross-sectional design restricts causal inference, and the sample size, though adequate, may limit generalizability. Furthermore, potential confounders such as infections, chronic inflammation, and iron supplementation history were not fully accounted for. Future studies should adopt longitudinal designs with larger, more diverse populations to validate ferritin's predictive role and establish standardized cut-off values.

CONCLUSION

In conclusion, our findings support existing evidence that elevated maternal serum ferritin levels are associated with preterm labor. Ferritin may serve as a simple, non-invasive, and cost-effective biomarker for early identification of women at risk. Its incorporation into antenatal risk assessment models could enhance timely intervention and improve maternal-fetal outcomes.

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REFERENCES

1. World Health Organization. Preterm birth. 2023. Retrieved from https://www.who.int/news-room/fact-sheets/detail/preterm-birth
2. Blencowe H, Cousens S, Oestergaard MZ, Chou D, Moller AB, Narwal R, Adler A, Garcia CV, Rohde S, Say L, Lawn JE. National, regional, and worldwide estimates of preterm birth rates in the year 2010 with time trends since 1990 for selected countries: a systematic analysis and implications. The lancet. 2012 Jun 9;379(9832):2162-72.
3. Goldenberg RL, Culhane JF, Iams JD, Romero R. Epidemiology and causes of preterm birth. The lancet. 2008 Jan 5;371(9606):75-84.
4. Scholl TO. Iron status during pregnancy: setting the stage for mother and infant2–3. The American journal of clinical nutrition. 2005 May 1;81(5):1218S-22S.
5. Marshall I, Mehta R, Petrova A. Vitamin D in the maternal–fetal–neonatal interface: clinical implications and requirements for supplementation. The Journal of Maternal-Fetal & Neonatal Medicine. 2013 May 1;26(7):633-8.
6. Hood KK, Peterson CM, Rohan JM, Drotar D. Association between adherence and glycemic control in pediatric type 1 diabetes: a meta-analysis. Pediatrics. 2009 Dec 1;124(6):e1171-9.
7. Weintraub AY, Sheiner E, Mazor M, Levy A, Tevet A, Paamoni O, Wiznitzer A. Maternal serum ferritin concentration in patients with preterm labor and intact membranes. The Journal of Maternal-Fetal & Neonatal Medicine. 2005 Sep 1;18(3):163-6.
8. Saha CK, Jain V, Gupta I, Varma N. Serum ferritin level as a marker of preterm labor. International Journal of Gynecology & Obstetrics. 2000 Nov;71(2):107-11.
9. Movahedi M, Saiedi M, Gharipour M, Aghadavoudi O. Diagnostic performance and discriminative value of the serum ferritin level for predicting preterm labor. Journal of research in medical sciences: the official journal of Isfahan University of Medical Sciences. 2012 Feb;17(2):164.
10. Abdel-Malek K, El-Halwagi MA, Hammad BE, Azmy O, Helal O, Eid M, Abdel-Rasheed M. Role of maternal serum ferritin in prediction of preterm labour. Journal of Obstetrics and Gynaecology. 2018 Feb 17;38(2):222-5.
11. Rahman SM, Siraj MS, Islam MR, Rahman A, Ekström EC. Association between maternal plasma ferritin level and infants' size at birth: a prospective cohort study in rural Bangladesh. Global Health Action. 2021 Jan 1;14(1):1870421.
12. Alrasheed NA, Ibrahim SK, Asad NM. Maternal Serum Ferritin Concentration in Patient with Preterm Labor and Intact Membranes. European Journal of Medical and Health Research. 2025 Mar 24;3(2):136-42.
13. Omran AA, Sarsam SD. Serum ferritin level as a marker of preterm labor. International Journal of Clinical Obstetrics and Gynaecology 2021; 5 (3): 90.;93.
14. Vogel I, Thorsen P, Curry A, Sandager P, Uldbjerg N. Biomarkers for the prediction of preterm delivery. Acta obstetricia et gynecologica Scandinavica. 2005 Jan 1;84(6):516-25.
15. Goffinet F, Maillard F, Fulla Y, Cabrol D. Biochemical markers (without markers of infection) of the risk of preterm delivery: Implications for clinical practice. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2001 Jan 1;94(1):59-68.
16. Jyothi L, Datta M, Mitra D, Biswas J, Maitra A, Kar K. Prediction of Preterm Delivery among Low-risk Indian Pregnant Women: Discriminatory Power of Cervical Length, Serum Ferritin, and Serum Alpha-fetoprotein. International Journal of Applied and Basic Medical Research. 2023 Oct 1;13(4):198-203.
17. Alwan NA, Cade JE, McArdle HJ, Greenwood DC, Hayes HE, Simpson NA. Maternal iron status in early pregnancy and birth outcomes: insights from the Baby's Vascular health and Iron in Pregnancy study. British Journal of Nutrition. 2015 Jun;113(12):1985-92.
18. Liao X, Xiu X, Xu G, Wu L, Fang Z, Huang H. Alteration of Maternal Serum Ferritin in Pregnancy and Maternal-fetal Infections: A retrospective cohort study. Pakistan Journal of Medical Sciences. 2024 Aug;40(7):1485.
19. Jahedbozorgan T, Yaghmaei M, Naserieh M. Comparison of serum ferritin levels in pregnant women with preterm and term deliveries. Immunopathologia Persa. 2020 May 9;6(2):e25-.
20. Cetinkaya S, Ozaksit G, Biberoglu EH, Oskovi A, Kirbas A. The value of acute phase reactants in predicting preterm delivery. The Journal of Maternal-Fetal & Neonatal Medicine. 2017 Dec 17;30(24):3004-8.
21. Menon R, Torloni MR, Voltolini C, Torricelli M, Merialdi M, Betrán AP, Widmer M, Allen T, Davydova I, Khodjaeva Z, Thorsen P. Biomarkers of spontaneous preterm birth: an overview of the literature in the last four decades. Reproductive sciences. 2011 Nov;18:1046-70.
22. Singh S, Dey M, Singh S, Sasidharan S. Biochemical Markers as Predictor of Preterm Labor-and Their Clinical Relevance-the Current Status. Gynecology Obstetrics & Reproductive Medicine. 2022 Dec 15;28(3):282-9.