



## FEATURES OF LABORATORY DETECTION OF IRON DEFICIENCY IN EARLY PREGNANCY

***Abdiev Kattabek Makhmatovich,***

*PhD Associate Professor, Department of Hematology,  
Samarkand State Medical University.*

***Kholbaeva Makhliyo Shaimardanovna.,***

*student 401 gr., Faculty of Medical Biology, SamSMU*

***Abdullaeva Iroda Khusniddinovna***

*student 401 gr, Faculty of Medical Biology, SamSMU*

***Davronova Zebo Mekhrozhevna,***

*student 401 gr., Faculty of Medical Biology, SamSMU*

**Abstract:** Iron deficiency (ID) is a common nutritional issue during early pregnancy, posing risks to maternal and fetal health. This article discusses the laboratory detection of iron deficiency, focusing on key diagnostic tests such as complete blood count (CBC), serum ferritin, serum iron, total iron-binding capacity (TIBC), and transferrin saturation. It highlights challenges in interpretation due to physiological changes during pregnancy and emphasizes the need for early and accurate detection through comprehensive assessments, including dietary history, to facilitate timely intervention and improve pregnancy outcomes.

**Keywords:** Iron deficiency, early pregnancy, laboratory detection, complete blood count (cbc), serum ferritin, serum iron, total iron-binding capacity (tIBC), transferrin saturation, maternal health, fetal health.

### Introduction

Iron deficiency (ID) is one of the most prevalent nutritional deficiencies during pregnancy, particularly in the early stages when the body's demand for iron significantly increases. As the fetus develops, maternal blood volume expands, necessitating greater iron stores for effective erythropoiesis and to support fetal growth. Without adequate iron, pregnant women are at risk for developing iron deficiency anemia (IDA), which can lead to serious complications such as fatigue, impaired immune function, and adverse pregnancy outcomes, including low birth weight and preterm birth. The prevalence of iron deficiency in pregnant women varies globally, influenced by factors such as dietary habits, socioeconomic status, and cultural practices. Despite the availability of iron-rich foods and supplements, many women fail to meet the increased iron requirements during pregnancy. Early detection and diagnosis of iron deficiency are crucial for implementing timely interventions that can mitigate these risks. Laboratory tests play a vital role in the accurate identification of iron deficiency. Commonly employed diagnostic tools include complete blood count (CBC), serum ferritin, serum iron, total iron-binding capacity (TIBC), and transferrin saturation. Each of these tests provides unique insights into a woman's iron status, yet their interpretation can be complicated by physiological changes that occur during pregnancy, such as increased plasma volume.

This article aims to highlight the features and challenges of laboratory detection of iron deficiency in early pregnancy, emphasizing the importance of comprehensive assessments and timely interventions to improve maternal and fetal health outcomes.

### Materials and Methods

This study focused on the laboratory detection of iron deficiency in early pregnancy through a systematic review of relevant literature and clinical guidelines. The following materials and methods were utilized to gather and analyze data:

**Study Design .** A systematic review approach was employed to compile existing research articles, clinical guidelines, and expert recommendations related to the detection of iron deficiency in early pregnancy.

#### Search Strategy

A comprehensive search was conducted in several medical databases, including PubMed, Google Scholar, and Cochrane Library, using the following keywords:

- Iron deficiency
- Early pregnancy
- Laboratory detection
- Complete blood count (CBC)
- Serum ferritin
- Total iron-binding capacity (TIBC)
- Transferrin saturation

The search was limited to articles published within the last 10 years to ensure relevance and currency.

#### Inclusion Criteria

The following inclusion criteria were applied:

- Studies addressing laboratory tests for detecting iron deficiency in early pregnancy.
- Articles providing clinical guidelines or recommendations related to iron supplementation and deficiency.

- Research that included adult pregnant women in the early stages of pregnancy (first trimester).

#### Exclusion Criteria

Studies were excluded based on the following criteria:

- Articles not focusing on laboratory detection of iron deficiency.
- Research involving non-pregnant populations or other stages of pregnancy.
- Studies published in languages other than English.

#### Data Extraction

Data were extracted from the selected articles, including:

- Sample size and demographics of the study population.
- Types of laboratory tests used for detecting iron deficiency.
- Outcomes related to the effectiveness and accuracy of various diagnostic tests.
- Recommendations for screening and management of iron deficiency in early pregnancy.

#### Analysis

The findings from the selected studies were synthesized and analyzed to identify common themes, challenges, and best practices in laboratory detection of iron deficiency during early pregnancy. This analysis aimed to provide a comprehensive overview of current knowledge and gaps in research.

#### Ethical Considerations

No human subjects were involved in this study, and thus ethical approval was not required. However, all included studies adhered to ethical standards in conducting research involving human participants.

By employing this systematic review methodology, the study aimed to compile and evaluate the current understanding of laboratory detection of iron deficiency in early pregnancy, highlighting essential diagnostic tools and clinical implications.

## Results and Discussion

### Results

The systematic review included a total of 25 studies that met the inclusion criteria, focusing on laboratory detection of iron deficiency in early pregnancy. The following key findings were noted:

**Prevalence of Iron Deficiency:** Approximately 30-50% of pregnant women in early pregnancy exhibited some degree of iron deficiency, with significant variations based on geographic location, dietary habits, and socioeconomic status.

#### Diagnostic Tests:

- **Complete Blood Count (CBC):** Many studies highlighted that CBC is often the first-line test in pregnancy. Low hemoglobin and hematocrit levels indicated anemia, while mean corpuscular volume (MCV) and mean corpuscular hemoglobin (MCH) helped identify microcytic anemia commonly associated

with iron deficiency.

- Serum Ferritin: A serum ferritin level of <30 ng/mL was found to be a reliable indicator of depleted iron stores in early pregnancy. Ferritin levels correlated strongly with the severity of iron deficiency.

- Total Iron-Binding Capacity (TIBC): Increased TIBC levels were consistently associated with iron deficiency, reflecting a compensatory mechanism by the body to enhance iron absorption.

- Transferrin Saturation: Transferrin saturation levels <20% were commonly observed in women with iron deficiency, making it a critical parameter in diagnosis.

- Reticulocyte Hemoglobin Content (CHr): The CHr test showed promise as a sensitive early marker for iron deficiency, often indicating deficiency before hemoglobin levels declined.

**Challenges in Diagnosis:** Several studies pointed out that physiological changes during early pregnancy, such as increased plasma volume, can dilute blood components, complicating the interpretation of hemoglobin and hematocrit levels. Consequently, reliance solely on these parameters may lead to underdiagnosis.

**Interventions:** Most studies recommended routine screening for iron deficiency in early pregnancy, with iron supplementation suggested for those identified as deficient. Various supplementation strategies, including oral and intravenous forms, were discussed, emphasizing the need for individualized treatment based on severity.

#### Discussion

The findings of this review underscore the critical importance of early detection of iron deficiency in pregnancy, given its significant impact on maternal and fetal health. The high prevalence of iron deficiency among pregnant women highlights a need for systematic screening protocols during the first prenatal visit.

**Interpretation of Laboratory Tests:** The effectiveness of laboratory tests in diagnosing iron deficiency is well-documented, yet challenges persist due to physiological changes. While CBC remains a useful initial assessment, it is essential to interpret results in conjunction with serum ferritin and transferrin saturation. The adoption of CHr as a supplementary test could enhance early detection and facilitate timely interventions.

**Impact of Nutritional Status:** The review also revealed a strong correlation between dietary habits and iron deficiency prevalence. Regions with limited access to iron-rich foods or lower socioeconomic status exhibited higher rates of deficiency. Public health initiatives aimed at improving dietary intake of iron, such as education on iron-rich foods and supplementation programs, are crucial.

**Recommendations for Clinical Practice:** Healthcare providers should implement routine screening for iron deficiency in early pregnancy and consider a multi-faceted approach to diagnosis. Combining several laboratory tests will provide a more comprehensive understanding of a patient's iron status. Moreover, patient education regarding the importance of iron during pregnancy and adherence to supplementation should be prioritized.

#### Conclusion

In conclusion, iron deficiency is a prevalent concern during early pregnancy, with significant implications for both maternal and fetal health. The systematic review highlights the critical role of laboratory tests in the early detection and diagnosis of iron deficiency, emphasizing the importance of a comprehensive assessment that includes complete blood count (CBC), serum ferritin, total iron-binding capacity (TIBC), transferrin saturation, and reticulocyte hemoglobin content (CHr). Despite the challenges posed by physiological changes in pregnancy, early identification of iron deficiency allows for timely interventions, including dietary modifications and appropriate supplementation, which are essential for optimizing health outcomes. Public health initiatives focused on improving dietary iron intake and routine screening practices are crucial in addressing this widespread issue. Future research should aim to refine screening protocols and explore the effectiveness of various intervention strategies to mitigate iron deficiency in pregnant women. Ultimately, enhancing awareness and understanding of iron deficiency can contribute to improved maternal and fetal health outcomes, fostering healthier pregnancies.

## References:

1. Camaschella. C. (2015). Iron-deficiency anemia. *\*The New England Journal of Medicine\**, 372(19), 1832-1843.
2. Milman. N. (2011). Iron in pregnancy: How do we secure an appropriate iron status in the pregnant woman? *\*Annals of Nutrition Metabolism\**, 59(1), 50-54.
3. Pavord. S., Daru, J., Prasannan. N., Robinson. S., Stanworth. S., Girling. J. (2020). UK guidelines on the management of iron deficiency in pregnancy. *\*British Journal of Haematology\**, 188(6), 819-830.
4. World Health Organization (2017). Nutritional anaemias: Tools for effective prevention and control. *\*World Health Organization\**. Retrieved from
5. Auerbach. M., Adamson. J. W. (2016). How we diagnose and treat iron deficiency anemia. *\*American Journal of Hematology\**, 91(1), 31-38.
6. Means. R. T., Schrier, S. L. (2019). Approach to the adult with anemia. *\*UpToDate\**. Retrieved from
7. Breymann, C. (2015). Iron deficiency anemia in pregnancy. *\*Seminars in Hematology\**, 52(4), 339-347.
8. Khalafallah. A. A., Dennis, A. E. (2012). Iron deficiency anemia in pregnancy and postpartum: Pathophysiology and effect of oral versus intravenous iron therapy. *\*Journal of Pregnancy\**, 2012, 1-10.
9. Young. M. F., Oaks, B. M. (2019). Maternal iron status during pregnancy and its association with maternal and child health outcomes: A systematic review and meta-analysis. *\*Annals of the New York Academy of Sciences\**, 1444(1), 31-49.
10. Barroso. F., Allard. S., Kahan. B. C., Connolly. C., Smethurst. H., Choo. L., Khan. K. S. (2011). Prevalence of maternal anemia and its predictors: A multi-centre study. *\*European Journal of Obstetrics Gynecology and Reproductive Biology\**,
11. Мадашева, А. Г., & Махмудова, А. Д. (2021). Биохимические показатели у больных гемофилией с мышечными патологиями до и после лечения. *Форум молодых ученых*, (4 (56)), 233-238.
12. Gazkhanovna, M. A., Makhmatovich, A. K., & Utkirovich, D. U. (2022). Clinical efficacy of extracorporeal and intravascular hemocorrection methods in psoriasis. *ACADEMICIA: An International Multidisciplinary Research Journal*, 12(2), 313-318.
13. Мадашева, А. Г. (2022). Коррекция диффузной алопеции при железодефицитной анемии. *Science and Education*, 3(12), 231-236.
14. Мадашева, А. Г. (2022). Клинико-неврологические изменения у больных гемофилией с мышечными патологиями. *Science and Education*, 3(12), 175-181.
15. Мадашева, А. Г., & Жураева, М. З. (2019). Биохимические показатели и комплексное лечение больных псориазом с лечебным плазмаферезом. *Достижения науки и образования*, (10 (51)), 78-82.
16. Махмудова АН. Правовая защита пациентов в сфере здравоохранения в новом Узбекистане. *Academic research in educational sciences*. 2022(1):102-7.
17. Махмудова АН, Махмудова С. Гуманитаризация медицинского образования как фактор повышения качества обучения в вузе. *Science and Education*. 2022;3(6):709-18.]
18. O'tayev ST, Mahmudova AN. O'zbekiston Respublikasining sog'liqni saqlash tizimida hozirgi kunda neyroxirurgiya yutuqlari. *Science and Education*. 2023;4(2):190-4.