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# Study Iron deficiency anemia (ferritin) in patient women of samawa provenance

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**Abstract**

Iron deficiency anemia is an important public health problem in developing countries; it is estimated that about one-third of the world's population suffers from anemia, iron deficiency anemia during pregnancy, the mechanisms leading to the increase in the disease include decreased oxygen delivery capacity and enzyme dysfunction, and the cause of iron deficiency anemia during pregnancy is a complex combination of increased iron demand, decreased iron intake and chronic blood loss.

**Aim of the study**

- Evaluate iron deficiency in pregnant women from (2) to (8) months.
- To evaluate hemoglobin concentration and packed cell volume in pregnant women from (4) to (6) months.

**Materials and Methods:** This prospective study was conducted in out-of-hospital laboratories and lasted from February 10, 2024 to April 10, 2024. 24 patients were randomly selected in this study, and all pregnant patients were examined within 2 to 8 months. Their ages ranged from 20-45 years, respectively. These pregnant patients with iron deficiency were diagnosed by specialized physicians. Laboratory tests were performed for all pregnant patients and control patients using the best laboratory devices, after drawing blood from the patient and sending it to the laboratory to perform the necessary tests, including complete blood count (CBC) using the Genex device. To measure iron stores (ferritin).

**Results:** The result of this study showed a higher significant difference between the patient and control groups) (the probability value is less than (0.01) in the pregnant patient who has more than four children.

Similarly, the serum ferritin deficiency in pregnant women recorded a high significant value (0.001) in the patient group other than the control group.

Regarding the hemoglobin concentration and packed cell volume in the patient, pregnant women recorded a high significant value (0.001) unlike the control group.

**Conclusion:** In this study, analyses were performed for the patient including serum ferritin and complete blood count, which turned out to be the most sensitive indicator of iron deficiency in the second half of pregnancy from 4 to 6 months).

**Keywords:** Iron deficiency anemia, ferritin, pregnant women, Samawa province

## Introduction

Iron deficiency is the most common nutritional deficiency in the world, both in developing and industrialized countries. Iron deficiency anemia accounts for more than 50% of all cases of anemia. Its impact on physical and mental development and work performance are important public health problems and a frequent cause of consultation in routine medical practice [1].

It can occur at all ages, but its prevalence is higher in women of childbearing age due to iron loss through menstruation; and in children, in whom the amount of iron in food is usually not sufficient to meet demand. A 2019 World Health Organization report estimated that 39.8% of children and 29.9% of non-pregnant women had anemia 2. A 2016 meta-analysis described that 25% of children and 37% of women had iron deficiency anemia [2-4].

Iron deficiency anemia is caused by a negative balance between iron intake and iron needs, so anamnesis is essential. It can be caused by a lack of intake (iron-deficient diet or strict vegetarian diet), absorption problems (inflammatory bowel diseases, bariatric surgery, malabsorption syndrome in intestinal or gastric resection), increased demand (pregnancy, lactation, growth, continued intense exercise) or by increased losses, whether digestive or menstrual, without forgetting regular blood donors (250 mg of iron are lost in each donation) 4 and the use of gastro-lesion drugs such as non-steroidal anti-inflammatory drugs or aspirin [5-7].

Diagnosis of iron deficiency anemia is usually easy to make from a complete blood count which detects hypochromic microcytic hypo/regenerative anemia (normal or decreased reticulocyte count), from the study of iron metabolism which detects low sideremia, ferritin and a transferrin saturation index (TSI) and from the assessment of acute phase reactants. Ferritin is the parameter of choice in the diagnosis of iron deficiency anemia, since it correlates with iron deposits in the body, provided there is no inflammation, because by having as an acute phase reactant it can mask iron deficiency anemia in the course of a chronic disorder [7-9] Once diagnosed, an attempt should be made to identify the cause of the iron deficiency, since this is associated with significant morbidity and mortality and, whenever possible, correct the anemia by means of iron treatment [10, 11] The route of administration, the drug used and the duration of treatment will depend on the severity of the anemia.

## Materials and Methods

### Study Design

To establish Iron deficiency in women and its association with anemia (ferritin) with different age groups where 24 (patients) were included in this study where data have been collected b from February 10, 2024 to April 10, 2024. Age of patients arranged from 2 to 8 month.

This is a multi-centre, descriptive survey, with closed response options: yes or no answers, or multiple choices, including alternatives usual in clinical practice, using a

### Likert scale where appropriate

The reference population was the entire population served in all community work centers in Iraq. To achieve this goal, a random selection of patients was performed.

### Study Population

The study sample consisted of Iraqi women suffering from ferritin deficiency and anemia for 24 patients through a cross-sectional study.

### Setting

The study was conducted in a hospital or clinical laboratory setting where the according to CBC, Cobas 411 was available for diagnostic and measurement testing.

### Sample (Participants)

This study is part of a larger research program designed to assess the health and nutritional status of Iraqi women due to economic and social changes. The study protocol was approved by the Ethics Committee for Human Studies.

### Sampling Methods

Participants were recruited through convenience sampling. This included patients with anemia and iron deficiency who were willing to give their informed consent. The research team was trained prior to the survey and supervised to ensure that data collection procedures were standardized at all times throughout the period. Across the survey area covered by the from February 10, 2024 to April 10, 2024

### Sample size

This study was a case-control study covering the period from February 10, 2024 to April 10, 2024. The study population was Iraqi women in some hospitals, patients and primary health care centers in Muthanna, Iraq. The samples included 24 participants who met the inclusion criteria and had no exclusion criteria. The study protocol was approved by the Ministry of Health and Environment in Muthanna, Iraq. Permission was also approved by the primary school authority.

### Data Collection

The 24 participants

### Validity of Tools

Note that this paper addresses types of test validity, which determine the accuracy of the actual components of the scale

- Construct validity
- Content validity
- Virtual validity

### Devices and procedures

- Cobas 411
- Suprax X

### Statistical Analysis

The entire collected data set was analyzed using SPSS version 16.0 (SPSS Inc., Chicago, IL, USA) as follows: Frequencies in the distribution were determined and analyzed using the chi-square ($\chi 2$) test to determine whether an association existed between the anemia and level of ferritin. All variables of interest were then analyzed using the Student t-test to assess statistically significant differences between children infected by E. histolytica and their control group. Differences were significant at p 0.05 (95% CI).

### Ethical Considerations

This research adhered strictly to ethical recommendations concerning the written consent of the participating mother, which allows voluntary participation and guarantees confidentiality for withdrawal at any time. The study was then explained to the mothers, and the informed consent form was obtained and signed by all volunteer mothers. This is drawn from the writings about recruiting mothers in rural villages.

## Results

**Table 1:** Distribution of patients according to age,

| Age | | | | | |
|---|---|---|---|---|---|
| Frequency | | | Percent | Valid Percent | Cumulative Percent |
| Valid | 22.00 | 6 | 25.0 | 25.0 | 25.0 |
| | 23.00 | 3 | 12.5 | 12.5 | 37.5 |
| | 25.00 | 2 | 8.3 | 8.3 | 45.8 |
| | 26.00 | 2 | 8.3 | 8.3 | 54.2 |
| | 27.00 | 1 | 4.2 | 4.2 | 58.3 |
| | 28.00 | 1 | 4.2 | 4.2 | 62.5 |
| | 30.00 | 1 | 4.2 | 4.2 | 66.7 |
| | 31.00 | 1 | 4.2 | 4.2 | 70.8 |
| | 32.00 | 2 | 8.3 | 8.3 | 79.2 |
| | 33.00 | 2 | 8.3 | 8.3 | 87.5 |
| | 34.00 | 3 | 12.5 | 12.5 | 100.0 |
| | Total | 24 | 100.0 | 100.0 | |

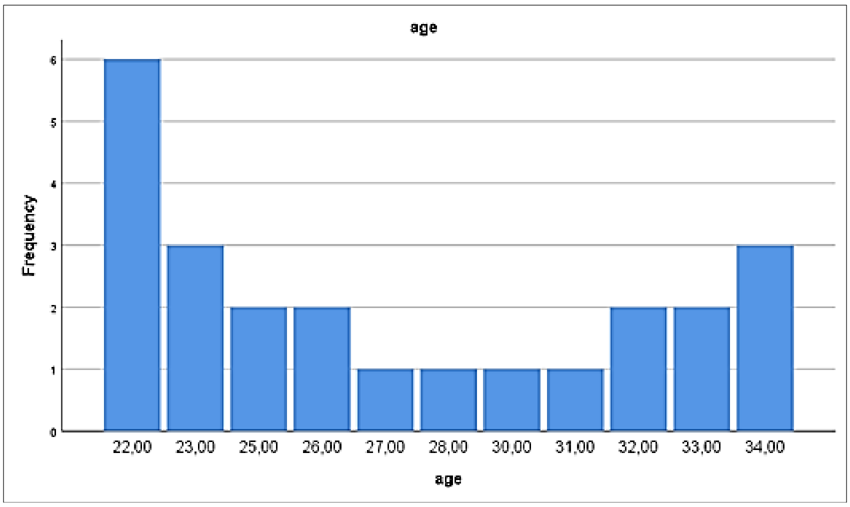


**Fig 1:** Distribution of patient according to age

**Table 2:** Outcomes of patients mean and SD according to age

| | Statistics age | |
|---|---|---|
| **N** | Valid | 24 |
| | Missing | 0 |
| Mean | | 27.1250 |
| Std. Deviation | | 4.67475 |

**Table 3:** Mean and SD of HB, Fe, Month number of pregnancy

| Statistics | | | | |
|---|---|---|---|---|
| **HB** | | | **FE** | **Month number of pregnancy** |
| N | Valid | 24 | 24 | 24 |
| | Missing | 0 | 0 | 0 |
| Mean | | 11.0458 | 29.6708 | 4.5833 |
| Std. Deviation | | 1.61110 | 20.35403 | 1.99819 |

**Table 4:** Assessment outcomes between month number of pregnancy and fe

| Descriptive [a,b,c] | | |
|---|---|---|
| **Month number of pregnancy** | **Fe Mean** | **SD** |
| 2 | 91.4720 | 23.59181 |
| 3 | 26.8000 | 12.1 |
| 4 | 29.4400 | 17.07 |
| 5 | 34.8600 | 28.6 |
| 6 | 36.3667 | 35.6 |
| 7 | 16.6000 | 8.6 |

**Table 5:** Assessment outcomes between month number of pregnancy and Hb

| Descriptives[a,b,c] | | | | |
|---|---|---|---|---|
| | **Month Number of pregnancy** | | **Statistic** | **Std. Error** |
| HB | 2.00 | Mean | 11.4333 | .34801 |
| | | Std. Deviation | .60277 | |
| | 3.00 | Mean | 11.5667 | .43333 |
| | | Std. Deviation | .75056 | |
| | 4.00 | Mean | 11.2400 | .60299 |
| | | Std. Deviation | 1.34833 | |
| | 5.00 | Mean | 11.4600 | .44452 |
| | | Std. Deviation | .99398 | |
| | 6.00 | Mean | 11.4667 | 1.62925 |
| | | Std. Deviation | 2.82194 | |
| | 7.00 | Mean | 11.2000 | 2.20000 |
| | | Std. Deviation | 3.11127 | |

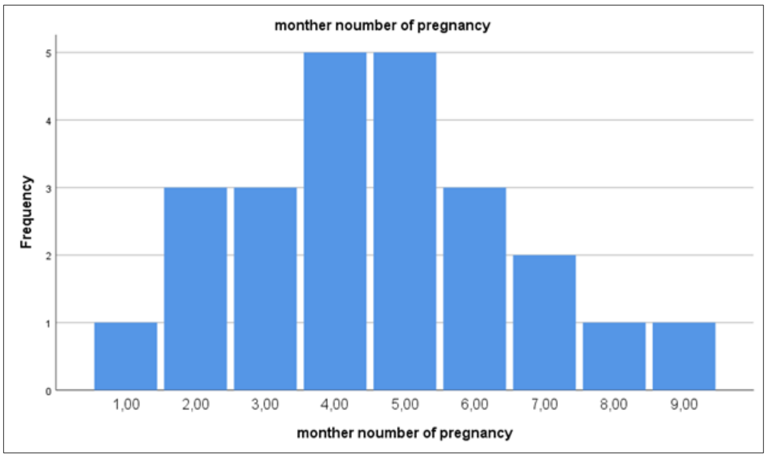


**Fig 2:** Distribution of patients according to Month number of pregnancy

## Discussion

Iron deficiency anemia (IDA) is one of the most common diseases in the world, and the direct correlation of iron deficiency anemia with socio-economic factors allows us to assess the scale of the problem as an "epidemic public health crisis" [12]. In the world, about 700 million people suffer from IDA, and in Russia, IDA is detected in 6-30% of the population [2, 3]. Anemia in pregnant women in more than 90% of cases is iron deficiency, while the frequency of IDA detection depends on the level of socio-economic development of the region. The incidence of IDA in pregnant women worldwide ranges from 5.4% in developed countries to more than 80% in developing countries [13, 14, 15, 16].

## Pathogenesis

Anemia is a clinical and laboratory syndrome characterized by a decrease in the level of hemoglobin, red blood cells and hematocrit per unit volume of blood. The increase in circulating blood volume by 40-45%, mainly due to the volume of circulating plasma, is accompanied during pregnancy by a gradual decrease in hemoglobin and hematocrit, which is considered physiological anemia of pregnant women. A decrease in hemoglobin below 110 g / l in the first trimester and especially in the third trimester and below 105 g / l in the second trimester (fifth percentile) should be considered pathological, and is caused not only by blood thinning during pregnancy, but also by iron deficiency [17]. According to the WHO criteria, anemia in pregnant women should be considered a hemoglobin level below 110 g / l and a hematocrit below 33% in developing countries, the minimum hemoglobin level is considered 100 g / l [9, 10]. IDA is a hypochromic microcytic anemia that develops as a result of an absolute decrease in iron reserves in the body. In a singleton pregnancy, the need for iron is about 1000 mg, of which 300 mg is needed for the growth of the fetus and placenta, 500 mg for increased synthesis of maternal hemoglobin, and 200 mg is redistributed between the digestive tract, urinary tract and skin. This amount - 1000 mg - significantly exceeds the iron reserves of women, so without the use of iron supplements anemia develops. With an increase in blood volume in the second trimester of pregnancy, iron deficiency is manifested by a significant decrease in hemoglobin. In the third trimester of pregnancy, iron consumption for the needs of the fetus increases, while the amount of iron transferred to the fetus usually remains normal in case of maternal anemia [18].

There are three stages of iron deficiency: pre-latent, latent and manifest (Table 1). Pre- latent iron deficiency is characterized by a decrease in reserve iron without a decrease in iron consumption for the formation of red blood cells. Latent iron deficiency (LID) is observed when iron stores in the depot are depleted and is accompanied by a deficiency of transporting iron, but without signs of anemia; Manifest iron deficiency (IDA), or IDA, is manifested by symptoms of anemia [19]. MDF in pregnant women is divided into two clinical types: MDF in pregnant women without chronic inflammation and MDF in pregnant women with chronic inflammation. Diseases accompanied by inflammation in pregnant women with the clinical variant “MID in pregnant women with chronic inflammation” include: kidney disease; infectious diseases and respiratory infections; genitourinary infections (chlamydia, trichomoniasis, ureaplasmosis, bacterial vaginosis and vaginal candidiasis); viral infections (herpes simplex virus, cytomegalovirus, HIV, hepatitis A, B, C); autoimmune diseases; malignant tumors, etc. With MID in pregnant women without chronic inflammation, disorders are detected in all boxes of iron metabolism, with MID in pregnant women with chronic inflammation - in all boxes except the reserve. In the first stage of MID in pregnant women with chronic inflammation, disorders of the functional and regulatory funds are determined, in the absence of disorders of the transport fund; in the second stage, the transport fund is also impaired [20]. The development of IDA in pregnant women is promoted by: iron deficiency due to its consumption for the growth of the fetus and placenta; an increase in the mass of circulating red blood cells, which increases the need for iron; low dietary iron intake with a lack of animal protein, as well as raw vegetables and fruits; - deficiency of vitamins necessary for the absorption of iron (vitamin C, B12 ., folic acid, etc.); early toxicosis, violation of the flow and absorption of iron and other trace elements in the gastrointestinal tract; other complications of pregnancy (preeclampsia, cholestatic liver disease) that disrupt the synthesis of transport proteins and the deposition of ferritin and hemosiderin; high parity and short gestational age; multiple pregnancy; lactation; chronic infectious diseases; parasitic infections (malaria, hookworm, schistosomiasis), environmental factors that disrupt the absorption of iron Diagnosis of IDA is based on clinical and hematological signs and includes determination of hemoglobin, hematocrit, red blood cell indices, and a comprehensive examination of a peripheral blood smear.

Determination of serum iron and ferritin levels. Classic morphological signs of IDA - hypochromia and microcytosis - are less pronounced in pregnant women than in non-pregnant women. Serum ferritin levels usually decrease slightly during pregnancy [24], but may be elevated in inflammatory anemia, which often complicates the diagnosis [12]. Low ferritin levels reflect depletion of iron stores. According to the Russian Federal Guidelines, a sign of IDA is a ferritin level of less than 20 μg / l [12], according to the American Society of Obstetricians and Gynecologists - less than 10-15 μg / l [21]. In pregnant women with IDA, serum iron concentration decreases, serum total iron binding capacity increases, latent iron binding capacity increases, and transferrin iron saturation coefficient decreases [22]. Transferrin iron saturation coefficient <16% confirms the iron deficiency nature of anemia in pregnant women with serum ferritin <20 μg/L (see Table 1). Serum iron content is higher in the first trimester of pregnancy than in later stages, which is associated with positive iron balance due to menopause and decreased iron requirements in early pregnancy. Serum iron level rises on day 2-4 after starting treatment with iron-containing drugs, then decreases. In IDA, the number of transferrin receptors increases. Serum erythropoietin levels also increase, reaching their peak at the beginning of the third trimester, which corresponds to the maximum production of red blood cells [23]. The normal level of erythropoietin in the blood, regardless of age and sex, is 5-30 IU/L.

Iron deficiency anemia is the most common type of anemia in the world and for this reason, both iron deficiency and iron deficiency anemia are a global health problem and a frequent reason for consultation in medical practice.

## Conclusion

According to global statistics, anemia affects about 30% of people worldwide, primarily as a result of iron (Fe) deficiency. For this reason, the WHO has designated anemia as a global public health issue. This is the only deficiency condition that is highly frequent in both developed and developing nations. Although it can appear at any stage of life, the most crucial times are early childhood, adolescence, and pregnancy since these are the times when iron needs rise due to fast growth and development cycles, and anemia can result from an iron deficit throughout these developmental stages. Since iron deficiency is the most common micronutrient shortage worldwide, reducing anemia is one of the Who is goals in order to eradicate all types of malnutrition. Therefore, sufficient iron (Fe) availability is necessary for both general health and human growth. Thus, iron (Fe) level measurement is crucial for diagnosing anemia, and the clinical laboratory is one of the most crucial resources a doctor may utilize to determine the etiology of anemia. Therefore, in order to improve its contribution to the diagnosis and monitoring of iron deficiency, the clinical laboratory has added new biomarkers to its repertoire in recent years. The measurement of ferritin (a protein that stores iron) in blood is one of the most accurate laboratory methods to determine iron deficiency in the body.

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