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Study the levels of some blood parameters among pregnant women with iron deficiency anemia in relation to gestational age

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Abstract---Anemia is the most common female physiological disorder. The study evaluated blood indices in pregnant women with iron deficiency anemia by trimester. This case-control research was conducted in Kirkuk from March 2018 to March 2019. The study included 90 pregnant women (60 with iron deficiency anemia and 30 healthy pregnant without anemia) ages 14-41. Pregnant women were divided into three groups according to the different trimesters of pregnancy. 30 healthy pregnant women without anemia were likewise separated into three groups (The 1st trimester of pregnancy included were 10 pregnant women, the 2nd trimester 10 and 3rd trimester of pregnancy included were 10 pregnant women). Group evaluation includes: History and clinical diagnosis are used to identify pregnant women at risk for iron insufficiency. Iron deficiency is diagnosed through clinical suspicion and laboratory testing. Each subject's blood was drawn for Ferritin immunofluorescence, total serum calcium, Phosphorus, serum Iron, and TIBC biochemistry kits, and CBC count. IDA pregnant women had the lowest mean serum ferritin (11.56 g/l) compared to non-anemic pregnant women (19.46 g/l), P=0.001. The study found that pregnant women with IDA had lower levels of S. iron (10.513.11 g/dl) than non-anemic pregnant women (16.854.23 g/dl), P=0.001. IDA pregnant women had a higher mean serum TIBC (96.55 g/l) than non-anemic pregnant women (65.76 g/l), P=0.001. The study indicated that serum Ferritin and iron decreased dramatically in IDA women in the 1st, 2nd, and 3rd trimesters of pregnancy compared to the control group, whereas TIBC increased significantly. The study also found that IDA pregnant women had higher neutrophil, lymphocyte, and monocyte counts than the control group and lower Hb levels.

Keywords---Iron deficiency, pregnancy, ferritin, TIBC.

Introduction

Anemia is the most frequent derailment of physiology in the world throughout the life of a woman. It is a serious condition in most countries with poor resources countries. Anemia is a major public health problem, causing an unfavorable status in respect to upcoming pregnancy [1]. The hematologic system adapts to make provision for fetal hematopoiesis, ensuring adequate blood supply to the enlarged uterus and its content thereby protecting both mother and fetus against the effects of impaired venous return in both the supine and erect positions in addition to safeguarding against bleeding at delivery[2]. The major hematological changes during pregnancy are physiologic anemia, neutrophilia, mild thrombocytopenia, increased procoagulant factors, and diminished fibrinolysis. Anaemia in pregnancy is defined as a haemoglobin (Hb) of less than 110 g/L in the first and last trimester and less than 105 g/L in the second trimester[3]. Women with anaemia and/or iron deficiency may experience fatigue, reduced energy levels and reduced mental performance.

Severe anaemia is associated with preterm birth, low birth weight, and a small for gestational age fetus. In the postpartum period both anaemia and iron deficiency have been found to be linked to depression, emotional instability, stress and lower cognitive performance tests[4]. The most common causes of anaemia in pregnancy are iron deficiency, folate deficiency vitamin B12 deficiency. Haemolytic diseases, bone marrow suppression, chronic blood loss and underlying malignancies are uncommon and require haematology referral. Iron deficiency is the most globally prevalent nutritional problem reaching an epidemic level in many developing countries[5]. In addition, it is the most common nutritional deficiency encountered in the developed world; up to 50% of cases are the result of insufficient iron intake[6]. Pregnancy is associated with increased iron demand, and therefore, increase the risk of iron deficiency anemia. Up to 52% of pregnant women in the developing world are affected. Lowered iron stores in their newborn baby will increase the risk of subsequent iron deficiency anemia. Prematurity and early weaning off breastfeeding increases the risk further, because of reduced iron stores[7]. The study conducted to evaluate the relation of Blood indices among iron deficiency anemia in pregnant women in relation to trimester of pregnancy.

Patients and Methods

This case-control research was conducted in Kirkuk from March 2018 to March 2019. The study included 90 pregnant women (60 women with iron deficiency anemia, and 30 healthy pregnant without anemia) ranged in age from (14-41 years), pregnant women were divided into three groups according to the different periods of pregnancy, As follows: (The 1st trimester of pregnancy included were 20 pregnant women, the 2nd trimester 20 and 3rd trimester of pregnancy included 20 pregnant women), those women who attended Gynecological and Pediatric Hospital. The study also included 30 healthy pregnant without anemia, which were also divided into three groups according to the different periods of pregnancy (The 1st trimester of pregnancy included were 10 pregnant women, the 2nd trimester 10 and 3rd trimester of pregnancy included were 10 pregnant women).

Inclusion criteria

Pregnant women aged 14-41 years old with and without iron deficiency

Exclusion criteria

- Hereditary anemia
- Inflammation
- Liver and kidney disease
- Malignancy
- Autoimmune diseases.

Methods

The assessment of the groups includes: clinical assessment: identification of pregnant women at risk of iron deficiency should be based upon history and clinical diagnosis. Diagnosis of iron deficiency: laboratory investigation of iron deficiency should be based on clinical suspicion, including. Serum iron (SI) and total iron binding capacity (TIBC): should be measured on the base of clinically suspicious iron deficiency by using commercial kits [73].

Blood collection

Five ml of venous blood was collected from each subject by using sterile disposable syringe and transferred into two tubes, . Blood samples were placed into two sterile test tubes, in one of them 2.5 ml of blood was put in test tube containing anticoagulant EDTA and used for assessment of complete blood count (CBC) test using Ruby autoanalyzer, the 2nd part was transferred to sterile gell tubes, left to clot at room temperature for 20 minutes , then centrifuged at 3000 rpm for 15 minutes , sera were then removed and added in Eppendorf tubes and stored at -30°C for determination of Ferritin levels by immunofluorescence, total serum calcium, Phosphorus, serum Iron and TIBC by Biochemistry kits.

Results

The study demonstrated that, the lowest mean of serum ferritin was noted in IDA pregnant women (11.56 µg/l) as compared with non anemic pregnant women (19.46 µg/l), P:0.001, Table 1

Table 4.3
Level of serum ferritin in pregnant women (with and without iron deficiency)

Serum Ferritin (µg/l)	Pregnant women		P. value
	IDA	Control group	
Mean±SD	11.56±2.12	19.46±3.22	0.001

The study demonstrated that, the level of S. iron was reduced significantly in pregnant women with IDA (10.51±3.11 µg/dl) as compared with non anemic pregnant women (16.85±4.23 µg/dl), P:0.001, Figure 1

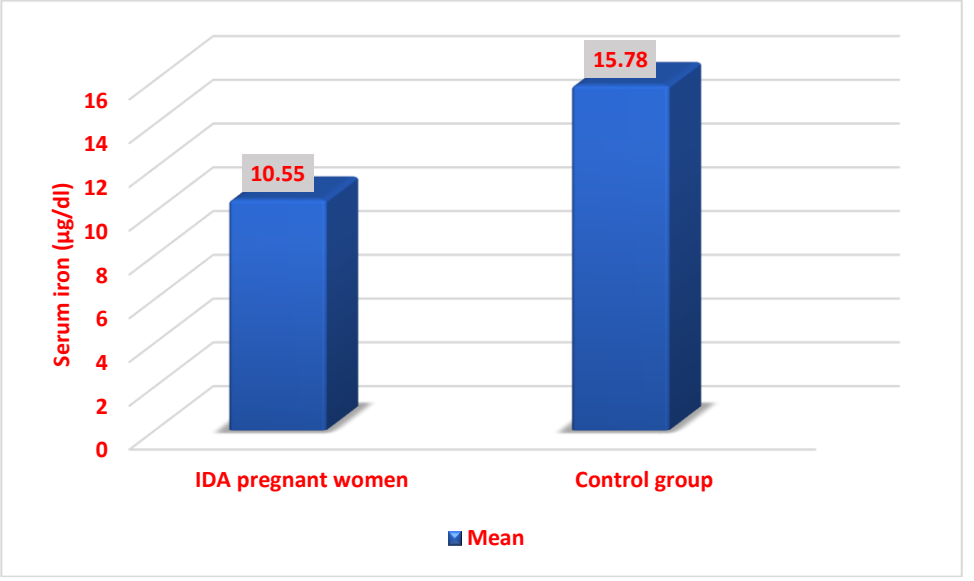

Figure 1. Level of serum iron in IDA pregnant women and the control group

The study demonstrated that, the highest mean of serum TIBC was noted in IDA pregnant women (96.55 µg/l) as compared with non anemic pregnant women (65.76 µg/l), P:0.001, Table 2

Table 2
Level of serum TIBC in pregnant women (with and without iron deficiency)

Serum TIBC (µg/l)	Pregnant women		P. value
	IDA	IDA	
Mean±SD	96.55	65.76	0.001

The study showed non- significant difference in the means of S. calcium and S. Phosphorus between IDA pregnant women and the control group (P>0.05), Table 3

Table 3
Levels of S. calcium and S. Phosphorus in IDA pregnant women and the control group

Sample	Preganat women	No.	Mean	SD	P. value
S. calcium (mg/dl)	IDA	60	10.46	1.18	0.35
	Control	30	10.88	2.28	
S. Phosphorus (mg/dl)	IDA	60	5.22	1.60	0.24
	Control	30	5.32	1.72	

The study showed that, the mean of serum Ferritin reduced significantly in IDA women in the 1st, 2nd and 3rd trimesters of pregnancy as compared with the control group ((P:0.001), Table 4

Table 4
Levels of Ferritin in IDA women and the control group in relation to trimesters of pregnancy

Studied groups		No.	Ferritin (µg/l)	P. value
First trimester	IDA group	20	13.30	0.001
	Control group	10	21.81	
Second trimester	IDA group	20	10.37	0.001
	Control group	10	15.30	
Third Trimester	IDA group	20	10.53	0.001
	Control group	10	15.15	

The study showed that, the mean of serum iron reduced significantly in IDA women in the 1st, 2nd and 3rd trimesters of pregnancy as compared with the control group (P:0.001), Table 5.

Table 5
Levels of serum iron in IDA women and the control group in relation to trimesters of pregnancy

Studied groups		No.	Iron (µg/dl) Mean	P. value
First trimester	IDA group	20	11.67	0.001
	Control group	10	17.78	
Second trimester	IDA group	20	11.65	0.001
	Control group	10	15.76	
Third Trimester	IDA group	20	9.07	0.001
	Control group	10	11.94	

The study showed that, the mean of serum TIBC increased significantly in IDA women in the 1st, 2nd and 3rd trimesters of pregnancy as compared with the control group (P:0.001), Table 6

Table 6
Levels of TIBC in IDA women and the control group in relation to trimesters of pregnancy

Studied groups		No.	TIBC (µg/l) Mean	P. value
First trimester	IDA group	20	82.65	0.001
	Control group	10	56.44	
Second trimester	IDA group	20	98.45	0.001
	Control group	10	60.35	
Third Trimester	IDA group	20	108.55	0.001
	Control group	10	71.36	

The study also showed that the highest mean of neutrophil count, lymphocyte and monocytes were observed among IDA pregnant women as compared with the control group and Hb level was reduced significant among IDA women, Table 7

Table 7
Comparison between studied groups regarding haematological parameters

Lab parameters	IDA	URTI	P. value
Neutrophils (cell/mm^3)	14.27	4.91	0.0001
Lymphocytes (cell/mm^3)	5.94	2.83	0.0001
Monocytes (cell/mm^3)	1.48	0.24	0.001
Hemoglobin (g/dL)	9.36	11.73	0.035
Platelet (/mm^3)	260.6	234.3	0.033

Discussion

The study demonstrated that, S. ferritin and S. iron were reduced in IDA pregnant women as compared with non-anemic pregnant serum TIBC was elevated in IDA pregnant women. Pregnancy induces a number of changes in the normal physiology, either directly or indirectly. Important of these changes are those which alter the hematological parameters. Plasma expansion and hemodilution during pregnancy contribute to majority of these changes. The most frequent hematologic complication during pregnancy is anemia [1-4]. In agreement with our findings, Alwan *et al* [5] found that, the levels of S. Iron and ferritin were significantly lower in IDA than normal group of pregnant women, whereas TIBC was significantly higher in IDA group than normal pregnant women. Similar to the study done in Pakistan, by Raza *et al* [6] who found significant decreased in S. iron and S. ferritin levels particularly in third trimester compared to first trimester and controls.

Næss-Andresen *et al* [2] demonstrated that, the lowest mean of serum ferritin and S. iron was noted in IDA pregnant women as compared with non anemic pregnant women. Additionally, Rasool *et al* [7] revealed that, the patients in the IDA groups had significantly lower levels of serum ferritin, S. iron, high TIBC compared to healthy women. In addition, Rahman *et al* [8] and Tag *et al* [9] showed that, the S. iron and ferritin values were lower than non pregnant while TIBC was elevated , this also agree with Mba *et al* [10], who reported that S. iron and ferritin decreased significantly in women with anemia compared with women without anemia. The study showed that, the mean of serum Ferritin and S. iron reduced significantly in IDA women in the 1st, 2nd and 3rd trimesters of pregnancy as compared with the control while S. TIBC was elevated. In agreement, Mba *et al* [10], who reported that S. iron and ferritin decreased significantly in women with anemia compared with women without anemia in first trimester of pregnancy. Anemia were found more severe in third trimester as compared to second and first trimester female, similar to the report of different studies [11-14].

High anemia in third trimester could be due to increase requirement of fetus [15,16]. Alwan *et al* [2] found that, women in third trimester of pregnancy presented with anemia have high levels of TIBC and lowest mean of S. iron and S. ferritin than 2nd and 1st trimester women and women without anemia. In addition,

Rahman *et al* [8] and Tag *et al* [9] showed that, serum ferritin concentration began to decline clearly between the 12-24 weeks of pregnancy period, because of iron consumption expansion made in the maternal red blood cell mass. Our results agree with Rasool *et al* [7] revealed that, the serum iron in the third trimester was lower than in the second trimester. Similarly other studies found significant decreased in S. iron and S. ferritin levels particularly in third trimester compared to first trimester and controls [17,18]. Otejrs also demonstrated that, the mean of serum Ferritin and S. iron reduced significantly in IDA women in the 1st, 2nd and 3rd trimesters of pregnancy as compared with the control while S. TIBC was elevated [19,20]. In addition, the complication of anemia in the interval pregnancy, includes the weakness in the transfer of oxygen which leads to hypoxia [21]. This could be explained that iron supplements can be reduced to the extent of iron depletion in the third trimester [22].

Conclusions

The lowest mean of S. ferritin, S. iron and vitamin D and the highest mean of TIBC a were noted in IDA pregnant women especially in 3rd trimester of pregnancy.

Recommendations

A prospective study on larger population with greater number of patients to assess the relation of our factors before and in labor

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