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Obstetrics and Gynecology

Effect of Moderate Iron Deficiency Anemia During Pregnancy on Maternal and Fetal Outcome

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ABSTRACT

Background: The most frequently identified dietary deficiency worldwide is iron deficiency, especially during pregnancy.
Aim of the study: To evaluate the impact of moderate maternal iron deficiency anemia on maternal outcome (atonic postpartum hemorrhage or postpartum infections after delivery), and fetal outcomes (neonatal weight and Apgar score).
Patients and Methods: This study was carried out at El Hussein University Hospital and Om El-Masryeen General Hospital on 100 pregnant females, who were admitted to the labor ward for delivery. They were split into two equal groups after the assessment of hemoglobin levels. The first group included non-anemic pregnant women and the second group included pregnant women with moderate iron-deficiency anemia. After delivery, the maternal outcome was assessed for atonic postpartum hemorrhage or postpartum infections and all newborns were assessed for neonatal weight and Apgar score.
Results: After delivery, the discrepancy in the rate of atonic postpartum hemorrhage, postpartum endometritis, post-cesarean wound infection, and episiotomy wound infection among both groups was statistically insignificant (P value 0.204, 0.307, 0.485, 0.481 respectively). There were positive correlations between maternal parameters (maternal serum hemoglobin, MCV, MCH, serum iron, and serum ferritin) and fetal outcomes (neonatal weight and Apgar score). There were negative correlations between maternal total iron-binding capacity (TIBC) and fetal outcomes (neonatal weight and Apgar score).
Conclusion: Maternal iron deficiency anemia affects both maternal and fetal outcomes.

Keywords: *Iron deficiency anemia; Pregnancy; Maternal outcome & Fetal outcome.*

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INTRODUCTION

In obstetrics and perinatal care, anemia is a common problem. Any hemoglobin level below 11 g/dl, regardless of gestational age, is considered true anemia. The most frequently identified cause of anemia in obstetrics is iron deficiency, which affects between 20 and 80 percent of the world's population, primarily women.[1]

Thousands of women die every year due to pregnancy-related causes, with 99 percent of these deaths occurring in developing countries. The maternal mortality rate due to anemia is 34/100,000 live births.[2]

The demand for iron by the fetus raises the regular iron requirements of the mother by about tenfold during pregnancy. In the first and third trimesters, the requirements are increased from 6 mg to 22 mg per day.[3]

Hypertension, diabetes, placental abruption, chorioamnionitis, blood transfusions, and admission to the intensive care unit were all more common in mothers suffering from anemia. Anemic mothers' babies were more likely to be born prematurely (8.9% vs. 6.5%), but not to have prematurity-related morbidities.[4]

The effects of IDA during pregnancy are frequently severe. In mothers, anemia causes increased tiredness, reduced muscular activity.[5]

In our study, we evaluated the impact of moderate maternal iron deficiency anemia on maternal outcome (atonic postpartum hemorrhage or postpartum infections after delivery), and fetal outcome (neonatal weight and Apgar score).

PATIENTS AND METHODS

From June 2020 to December 2020, a prospective cohort study was conducted at El Hussein University Hospital and Om El-Masryeen General Hospital. One hundred pregnant females who were admitted to the labor ward for delivery were included in the research. The inclusion criteria were that the patient was between the ages of 21 and 35, that the pregnancy lasted more than 37 weeks, and that it was a singleton pregnancy. All patients with a history of medical disorders (chronic hypertension or diabetes mellitus), history of any type of anemia other than iron deficiency anemia, prolonged rupture of membranes (> 18 h), fever or foul-smelling liquor, antepartum hemorrhage, pregnancy-induced hypertension, or gestational diabetes mellitus, and women with risk factors for uterine atony were removed from this research.

The ethics committee of the University confirmed the study methodology, and informed consent was taken from pregnant females in both groups after a full explanation of the study purpose.

The included mothers and their newborns were split into 2 equal groups; the first group included non-anemic pregnant females with a hemoglobin level of 11 g/dl or more and the second group included pregnant females with moderate iron-deficiency anemia who had hemoglobin level ranging from 7 to < 10 g/dl. All mothers underwent a full history taking, as well as a clinical examination and laboratory investigations, which included CBC, serum iron, TIBC, and serum ferritin. Obstetric indications were used to determine the mode of delivery.

All patients with an indication for cesarean section received antibiotic prophylaxis in the form of 1 to 2 grams of third-generation cephalosporin as ceftriaxone. The Cesarean section was performed, and after delivery, 20 units of oxytocin were infused over 30 min.

For patients who delivered vaginally, mediolateral episiotomy was performed only when indicated, and a local anesthetic (e.g. lidocaine) was injected at the site of episiotomy. After the delivery of the fetus, oxytocin was infused over 30 min.

The maternal outcome was assessed for atonic postpartum hemorrhage or postpartum infections after delivery. We estimated blood loss by quantifying the amount of blood loss by collecting blood in graduated volumetric containers. Also, the difference in the weight of surgical swabs was calculated before and after surgery [1 g =1 ml].

Postpartum endometritis was diagnosed by fever (38.3 ℃ or higher on 2 measurements more than 6 h apart), lower abdominal pain and tenderness, tachycardia, uterine tenderness, and purulent lochia. Wound infection typically manifests as redness and induration of the incision within one week after cesarean section. Episiotomy site infection was diagnosed by the presence of perineal pain, wound dehiscence, or purulent wound discharge.

All newborns were assessed for neonatal weight and Apgar score.

Statistical Analysis:

Using the SPSS program statistical computer package version 26, the collected data were structured, tabulated, and statistically analyzed. For quantitative variables, data were summarized using mean, standard deviation, median, maximum and minimum. Using Kolmogorov-Smirnov Z test variables that were normally distributed, compared using independent t test, while the not normally distributed data were compared using Mann-Whitney U test. For qualitative variables, data were described as frequency and percentage and were compared using Chi-square test and Fisher exact test. Spearman correlation was done for quantitative variables. The significance level for interpreting the outcomes of significance tests was set at $p < 0.05$.

RESULTS

In our study, we reviewed 100 pregnant females who were split among 2 groups. The base characteristics of our 2 research groups are illustrated in (Table 1).

There was no remarkable difference between the research groups regarding residence, the frequency of gravidity, and mode of delivery. However, there was a significant difference between the 2 groups regarding the maternal laboratory parameters as shown in (Table 2).

In (Table 3), comparison between the 2 study groups regarding the rate of atonic postpartum hemorrhage, postpartum endometritis, post-cesarean wound infection, and episiotomy wound infection. There were no statistically significant variations among both study groups (P-value 0.204, 0.307, 0.485, 0.481 respectively). However, there were significant differences (P-value <0.01) in fetal outcomes (neonatal weight, APGAR score at first and fifth minutes) between both study groups with higher means of all these parameters in the non-anemic group than the anemic group as shown in (Table 4).

Significant ($P < 0.01$) positive correlations between maternal parameters (maternal serum hemoglobin, MCV, MCH, serum iron, and serum ferritin) and fetal outcomes (neonatal weight, APGAR score at 1st and 5th minute) respectively and separately were found. Significant ($P < 0.01$) negative correlations between maternal total iron-binding capacity and fetal outcomes (neonatal weight, APGAR score at first and fifth minute) are also found in (Table 5).

Groups Distribution / Study		Non-anemic group n.	%	Anemic group n.	%	P-value
Residence	**Urban**	29	58	20	40	0.072
	Rural	21	42	30	60	
Gravidity	**Primigravida**	19	38	15	30	0.398
	Multigravida	31	62	35	70	
Delivery	**Vaginal Delivery**	33	66	34	68	0.832
	Cesarean Section	17	34	16	32	

Table 1: Distribution of Residence, Gravidity and Delivery in both study groups.

Maternal Parameters / Study Groups	Non-anemic group N=50 Mean±S.D.	Anemic group N=50 Mean±S.D.	P-value
Maternal Hemoglobin	11.70±0.45	8.53±0.49	<0.001
Maternal Corpuscular Volume (MCV)	88.21±0.96	76.05±4.19	<0.001
Maternal Corpuscular Hemoglobin (MCH)	29.15±0.69	25.46±1.46	<0.001
Maternal Serum Iron	86.58±11.93	33.91±7.33	<0.001
Maternal Total Iron Binding Capacity (TIBC)	338.266±55.762	535.224±46.629	<0.001
Maternal Serum Ferritin	49.36±15.13	20.37±6.45	<0.001

Table 2: Maternal hematological laboratory parameters in both study groups.

Maternal outcome / Study Groups		Non-anemic group n. %	Anemic group n. %	P-value
Atonic postpartum hemorrhage	yes	1 2%	5 10%	0.204
	no	49 98%	45 90%	
Postpartum endometritis	yes	1 2.0%	3 6.0%	0.307
	no	49 98%	47 94.0%	
Postcesarean wound infection	yes	0 0.0%	1 6.3%	0.485
	no	17 100.0%	15 93.7%	
Episiotomy wound infection	yes	0 0.0%	1 4.0%	0.481
	no	27 100.0%	24 96.0%	

Table 3: The maternal outcome differences between both study groups.

Study Groups Fetal outcome	Non-anemic group N=50 Mean±S.D.	Anemic group N=50 Mean±S.D.	P-value
Neonatal Weight(Grams)	3375±187	2676±239	<0.001
APGAR Score at 1st min.	8±1	6±1	<0.001
APGAR Score at 5th min	9±1	8±1	<0.001

Table 4: The fetal outcome differences between both study groups.

Maternal parameters / Fetal parameters		Hemoglobin	MCV	MCH	Serum Iron	Serum Ferritin	TIBC
Weight	**R**	0.768	0.815	0.767	0.78	0.741	-0.724
	P value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
APGAR 1st min.	**R**	0.64	0.56	0.562	0.636	0.619	-0.516
	P value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
APGAR 5th min.	**R**	0.535	0.431	0.441	0.452	0.454	-0.409
	P value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Table 5: Spearman's Correlations between maternal laboratory parameters and the fetal outcome criteria.

DISCUSSION

Throughout this study, we evaluated the impact of moderate maternal iron deficiency anemia on maternal outcome (atonic postpartum hemorrhage and postpartum infections after delivery), and fetal outcome (neonatal weight and Apgar score).

After delivery, the rate of atonic postpartum hemorrhage, postpartum endometritis, post-cesarean wound infection, and episiotomy wound infection was higher among the anemic group than the non-anemic group, however, no statistically relevant differences between the two groups could be found.

PPH risk has been related to anemia levels in a few older studies, with mixed results. Only a few studies have found a link between extreme anemia and atonic postpartum hemorrhage, which causes most cases of PPH. A cross-sectional study was conducted in which postpartum hemorrhage occurred. 39.6% of cases had severed atonic postpartum hemorrhage that necessitated immediate hysterectomy, while 60.37% of cases responded to conservative measures. Most women, who underwent hysterectomy 80.75%, had Hb levels of 7, compared to 12.5% of nonhysterectomized patients. There was a strong association between low hemoglobin levels and blood loss. As a result, this research backs up the correlation between anemia and PPH, and it also provides evidence for the link between extreme anemia and immediate hysterectomy.[6]

Another study discovered a link between PPH occurrence and prior medical history, anemia, and previous PPH.[7] According to one study, women who had wound dehiscence after a cesarean section had a high rate of anemia, and as a result of the underlying anemia, they were more vulnerable to infection.[8]

A case-control study looked at the risk factors for surgical site infection after cesarean section and discovered that only 2.4 percent of women got it. Mild anemia, moderate anemia, more than five vaginal examinations, and the onset of labour were all associated with surgical site infection.[9]

Our study also showed significant positive correlations between maternal parameters (maternal serum hemoglobin, MCV, MCH, serum iron and serum ferritin), and fetal outcomes (neonatal weight, APGAR score at 1st and 5th minute). Also, it showed significant negative correlations between maternal total iron binding capacity, and fatal outcomes (neonatal weight, APGAR score at 1st minute and 5th minute). So, the severity of maternal iron deficiency anemia has a significant correlation with fetal outcome. A retrospective cohort study found that moderate-to-severe anemia (hemoglobin levels less than 100 g/l) was correlated with preterm birth compared to pre-pregnancy hemoglobin levels of 120–149 g/l. Preterm birth, LBW, and SGA risks differed depending on anemia severity and a high hemoglobin concentration (150 g/l) was not linked to poor birth outcomes.[10]

A correlation between maternal anemia and prematurity, as well as low birth weight babies has been discovered in several studies. [11]

CONCLUSION

Maternal iron deficiency anemia affected both maternal outcome (atonic postpartum hemorrhage and postpartum infections after delivery), and fetal outcome (neonatal weight, APGAR score at first and fifth minutes). So, early detection and management of maternal iron deficiency anemia throughout antenatal follow up is critical to minimize maternal and fetal complications.

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