Iron Deficiency Anaemia in Pregnancy

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ABSTRACT

A clinical study of 82 pregnant women (40 pregnant women without anaemia[control group]and 42 pregnant women with iron deficiency anaemia) attending the child and maternal health care center in Mosul . Each pregnant woman was evaluated clinically and laboratory investigations have been done including haemoglobin, PCV, serum iron ,TIBC and TS%.

The results showed no significant differences between gestational age in pregnant women with iron deficiency anaemia and their control. On the other hand,low level of haemoglobin and PCV were recorded. The reduction increased with advancement in pregnancy in pregnant women with iron deficiency anaemia, especially at the third trimester when it was a significant reduction ($P< 0.001$, $P< 0.01$ respectively).Comparing to the pregnant controls, significant differences between serum iron and TIBC were also noticed between pregnant women with iron deficiency anaemia and pregnant controls ($P< 0.001$). This study also revealed a reduction in the level of serum iron of pregnant women with iron deficiency anaemia at all trimesters, especially the third trimester, ($P< 0.001$), in comparison with similar trimester in the ordinary pregnancies.

الخلاصة

أجريت الدراسة السريرية لـ 82 حامل(40 حامل سليمة غير مصابة باي نوع من انواع فقر الدم و 42 حامل مصابة بفقر دم عوز الحديد) راجعن مراكز رعاية الامومة والطفولة في الموصل . وتم إجـراء التقيـيم السـريري والمختبري لكل امرأة حامل.إذ شملت الفحوصات المختبرية قياس الهيموكلوبين و PCV ومصل دم الحديد و TIBC و نسبة تشبع الترانسفيرين. أوضحت النتائج انه لا يوجد فرق معنوي لتأثير العمر بين الحوامل المصـابات بفقـر دم عوز الحديد والحوامل السليمات، في الجانب الاخر. اظهرت الدراسة انخفاضاً في مسـتوى الهيموكلـوبين و PCV ويزداد هذ الانخفاض بتقدم الحمل عند الحوامل المصابات بفقر دم عوز الحديد وخاصة في المرحلـة الثالثـة حيـث يصبح نقصاً معنوياً ($P< 0.01$, $P< 0.001$ على التوالي) مقارنة مع الحوامل السليمات اللواتي يمـثلن مجموعـة السيطرة. كما لاحظنا وجود فرق معنوي في مستوى مصل دم الحديد و TIBC بين الحوامل المصابات بفقر دم عوز الحديد والحوامل السليمات عند مستوى احتمالية ($P< 0.001$)، كما اظهرت الدراسةانخفاضاً في مستوى مصـل دم الحديد في الحوامل المصابات بفقر عوز الحديد في جميع مراحل الحمل وخاصة في المرحلة الثالثة حيث كان نقصـاً معنوياً ($P< 0.001$) مقارنة مع الحوامل المناظرة في الحمل الطبيعي.

Introduction

Iron deficiency is the most common type of anaemia in pregnancy[1,2]). In pregnant women, iron deficiency increases the risk for preterm delivery and delivering of a low-birthweight baby. The needs of the growing fetus and placenta, as well as the increasing maternal blood volume and red cell mass impose such a demand on maternal iron stores that iron supplementation at daily doses between 18 and 100 mg from 16 weeks gestation onwards could not completely prevent the depletion of maternal iron stores at term[3,4,5]. Mothers given iron supplementation had decreased risk of preterm delivery compared with mothers without supplements[6,7]. Thus the relationship between maternal iron deficiency and preterm birth and fetal growth restrication seem to be well established. Regulation of iron balance occurs mainly in the gastrointestinal tract through absorption when the mechanism is operating normally. A person maintains functional iron and tends to establish iron stores. The capacity of the body to absorb iron from the diet depends on the amount of iron in the body, the rate of red blood cell production, the amount and kind of iron in the diet, and the presence of absorption enhancers and inhibitors in the diet.The percentage of iron absorbed can vary from less than 1% to greater than 50%[4]. The main factor controlling iron absorption is the amount of iron stored in the body. The gastrointestinal tract increases iron absorption when the body's iron stores are low and decreases absorption when stores are sufficient. An increased rate of red blood cell production can also stimulate iron uptake severalfold[8].

Materials and Methods

A clinical study of 82 pregnants(40 pregnant without anaemia [control group] and 42 pregnant with iron deficiency anaemia) attending the child and maternal health care center in Mosul.was conducted. A control group,consisting of 40 healthy pregnants at various stages of pregnancy were used.They were split into three trimesters.These women had no adverse medical history. The studied group consisted of 42 anaemic pregnants.These were also split into three trimesters comparable to those of the control group.

The assessment of the two groups includes:

* clinical assessment: identification of pregnant women at risk of iron deficiency should be based upon history and clinical diagnosis.
* Dignosis 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(BioMerieux).The normal range of serum iron = 13-32 µmol/l, TIBC=45-70µmol/l. Percent transferrin saturation (TS%) is calculated values below 16% are diagnostic of iron deficiency.

Hb and PCV: can suggest iron deficiency . it is not the diagnostic test of choice, but is required to assess the severity of anaemia the normal range of Hb= 135±15 g/1, PCV=0.45±0.051 l/l. The statistical methods used to analyse the data include mean, standard deviation, minimum and maximum, while Z-test was used to compare between total control and total patients at $p<0.05$ and $p<0.001$, and T-test was used to compare between subgroup of control and subgroup of patients at $p<0.05$, $p<0.01$ and $p<0.001$.

Results and Discussion

Iron deficiency anaemia is common especially in women. One in five women and half of all pregnant women are iron deficienct. The cause of iron deficiency

anaemia could be a lack of iron in diet, inadequate absorption of iron, or some from of blood loss, such as from menstruation or slow internal bleeding. Iron deficiency can also occur with pregnancy. It can develop at any age[9,10].

The routine blood tests done at the antenatal clinic is to check whether haemoglobin levels and PCV are satisfactory or not. Pregnancy with iron deficiency anaemia both haemoglobin and PCV level are dropped due to more fluid retention and haemodilution. When the levels of haemodilution PCV droped to a very low levels the pregnant will need iron tablets suppliment[11]. And after receiving iron tablets if haemoglobin level rise 10-20 g/1 in 2-4 weeks this will supports the diagnosis of iron deficiency[12,13]. The results in this study showed a significant difference between Hb and PCV in pregnant women with iron deficiency anaemia group and pregnant control group (Table1).

Serum iron concentration is a measure of the total amount of iron in the serum and is often provided with results from other routine tests evaluted by automated, laboratory chemistry panels. Many factors can affect the results of this test. For example, the concentration of serum iron increases after each meal, infections and inflammations can decrease the concentration[4]. The day-to-day variation of serum iron concentration within individuals is greater than that for Hb concentration and PCV[14]. TIBC is a measure of the iron-binding capacity within the serum and reflects the availability of iron-binding sites on transferrin. Thus, TIBC increases when serum iron concentration (and stored iron) is low and decrease when serum iron concentration (and stored iron) is high[4], and this corresbonding with the study, and the results showed a significant difference between serum iron and TIBC in pregnant with iron deficiency anaemia group and pregnant control group as seen in Table 1.

Table 1: comparison of age, Hb, PCV, SI, TIBC and TS% between pregnant control group and pregnant with iron deficiency anaemia group.

Variables	Pregnant control No.=40	Pregnant with iron deficiency anaemia No.=42
	Mean ± SD	Mean ± SD
Age (year)	26.52 ± 5.77	26.74 ± 5.45
Hb. (g/1)	135.0 ±15.00	108.7 ± 16.9**
PCV(l/l)	0.45±0.05	0.336 ± 0.051*
SI (µ mol/1)	20.91 ± 4.98	8.78 ± 2.88**
TIBC (µ mol/1)	56.09 ± 6.12	78.53 ± 23.76**
TS%	37.3	11.2

*Significant differences P< 0.05
** Significant differences P< 0.001

Haemoglobin in the 1st, 2nd and 3rd trimesters of pregnant with iron deficiency anaemia group are significantly lower than in pregnant control group (P<0.001). And PCV in the 2nd and 3rd trimesters of pregnants with iron deficiency anaemia group are significantly lower than in pregnant control group (P<0.05), among pregnant women, Hb concentration decline during the first and second trimesters because of an expanding blood volume[15]. Among pregnant women who do not take iron supplements, Hb concentration and PCV remain low in the third trimester, but among pregnant women who have adequate iron intake, Hb concentration and PCV rise during the third trimester toward the prepregnancy

levels, as seen in Table2. Serum iron in the 1st, 2nd and 3rd trimesters of pregnant with iron deficiency anaemia group are significantly lower than in pregnant control group as a whole (P< 0.005, P< 0.001) respectively. While TIBC in the 1st,2nd and 3rd trimesters of pregnant with iron deficiency anaemia group are significantly higher than in pregnant control group (P<0.001), as showed in Table2, because TIBC increases when serum iron concentration is low in the all trimesters of pregnancy, especially in the 3rd trimester because gastrointestinal tract increases iron absorption when the bodys iron stores are low. This results in Table 2 ,which agree with the results of previous studies[4,5,16]. A women who is pregnant or planning to become pregnant, should talk to her doctor about iron supplements[17].

Table 2: comparison of Hb, PCV, SI, TIBC and TS% between pregnant control as a whole group and different stage of the pregnant with iron deficiency anaemia.

Variables	Pregnant control group (No.=40)	Pregnant with iron deficiency anaemia group		
		1st trimester (No.=13)	2nd trimester (No.=8)	3rd trimester (No.=21)
Hb. (g/1)	135.0 ± 15.00	105.49±17.64***	95.92±21.59***	113.74±20.87***
PCV (l/l)	0.45 ± 0.05	0.373±0.055	0.351±0.033*	0.393±0.059*
SI (µ mol/1)	20.91 ± 4.98	10.20±3.34 **	7.87±2.32***	6.05±0.92***
TIBC (µ mol/1)	56.09 ± 6.12	73.93±7.82***	72.83±8.15***	82.57±8.39***
TS%	37.3	13.8	10.8	7.3

*Significant differences P< 0.05
** Significant differences P< 0.01
***Significant differences P< 0.001

Among pregnant women, iron deficiency anaemia during the first two trimesters of pregnancy is associated with a twofold increased risk for preterm delivery and a threefold increased risk for delivering a low-birthweight baby[4].

Anaemia before and during pregnancy should be considered together. Because childbearing increases the risk for iron deficiency (both during and after pregnancy), and iron deficiency before pregnancy is likely increase the risk for iron deficiency during pregnancy[4,18,19]. Unfortunately, a baby is born with less stores of iron if the mother has low body iron stores during pregnancy and this can cause iron deficiency when the baby is only a few months old.

Ideally, women should be supplemented with iron during pregnancy[20,21], and encouraged to eat iron-rich foods because pregnant women whose diets are low in iron are at additional risk for iron deficiency anaemia[4], and these recommendations are intended to guide primary health-care providers and controlling iron deficiency in pregnant women. As shown in Table3, Hb, PCV and serum iron in the 1st, 2nd and 3rd trimesters of pregnant with iron deficiency are significantly lower than those in corresponding trimesters in pregnant control (P< 0.001, P< 0.01, P< 0.001) respectively and this study agrees with the results of previous studies[4,5]. Hb concentration and PCV decline during the first and second trimesters because of an expanding blood volume[15]. Also a marked progressive decrease in serum iron during different stages of pregnant with iron deficiency anaemia have been observed in the 3rd trimesters, which is consistent with the finding of other investigators[22].

Table 3: Comparison of Hb, PCV, SI, TIBC and TS% between three trimesters pregnant control group and three trimesters pregnant with iron deficiency anaemia group.

Variables	1st trimester		2nd trimester		3rd trimester	
	Group 1 No.=12	Group 2 No.=13	Group 1 No.=10	Group 2 No.=8	Group 1 No.=18	Group 2 No.=21
Hb. (g/1)	120.57 ±6.65	105.49±17.64	120.62±11.82	95.92±21.59**	114.67±19.77	113.74±20.87**
PCV (l/l)	0.448±0.011	0.373±0.055	0.473±0.072	0.351±0.033*	0.458±0.051	0.393±0.059*
SI (µ mol/1)	13.33±6.13	10.20±3.34	10.87±4.28	7.87±2.32**	10.96±2.19	6.05±0.92
TIBC (µ mol/1)	53..25±7.97	73.93±7.82**	55.20±7.68	72.83±8.15**	56.15±4.55	82.57±8.39**
TS%	25	13.8	19.7	10.8	19.5	7.3

Group 1= pregnant control, Group 2= pregnant with iron deficiency anaemia.
*Significant differences P< 0.01 , ** Significant differences P< 0.001

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