Iron Deficiency Anaemia and Beta Thalassaemia Trait in Anaemic Pregnant Women.

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Summary:

Back ground: Anaemia is one of commonest health problems in antenatal care units of developing countries and contributes significantly to increased maternal and fetal morbidity and mortality.

Patients and methods: During the period from 1st of July 2007 to the end of October 2007, hundred anaemic pregnant women attending the gynaecology and obstetrics department in Al- Yarmook teaching hospital in Baghdad and 20 apparently healthy pregnant women,aged between 17 - 46 years as a control were included in this study. Anaemic women included in this study fulfilled the criteria of haemoglobin concentration of less than 110 g/L in first trimester and 105g/L in the second and third trimesters, no history of acute or chronic illnesses, not receiving any treatment & without any family history of haematological disorders. These women were randomly selected in relation to age , parity ,trimester of pregnancy & social status. Ten mls of venous blood samples were aspirated from each pregnant women in the studied group , two mls were put in ethylendiaminetetra acetic acid (EDTA) tube and analyzed for peripheral blood smear , reticulocyte count & haemoglobin A2 (Hb A2)using standard methods for hematological investigation .While the remaining 8 ml were put in a plain tube to evaluate serum iron , total iron binding capacity & serum ferritin. Serum iron, total iron binding capacity was done by colometric method, while serum ferritin was done by immunoenzymatic assay and hemoglobin A2 (HbA2) level by haemoglobin electrophoresis.

Results: Peripheral blood smear study revealed a hypochromic microcytic anaemia in 81% of cases, 8% of cases showed macrocytic anaemia, 8% a normochromic normocytic anaemia while the remaining 3% of cases showed a dimorphic picture .Iron deficiency anemia constitutes 79% of the cases confirmed by serum ferritin. Only two cases (2%) had elevated level of HbA2 .Serum iron, total iron binding capacity & serum ferritin had significant differences in those cases with low social status, increasing parity & increasing gestational age (trimesters).Iron deficiency anaemia was not found to have a significant association with increasing age , while patients with para 4 & more, in the third trimester & low social status were more significantly affected with iron deficiency anemia .

Conclusion: Iron deficiency anemia was found in 79% of anemic pregnant females confirmed by measurement of serum ferritin level. There were a significant difference between parity; social status and gestational age with the incidence of iron deficiency anemia.β-thalassaemia trait constitute only 2% of anemic cases in the studied sample.

Keywords: Anaemia & pregnancy, Thalassaemia, Iron deficiency.

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Introduction:

Iron deficiency anaemia (IDA) is a common nutritional disorder in developing countries and contributes significantly to reduced work productivity and economic output as well as increased morbidity and mortality.(1) Anemia in pregnancy is an important public health problem worldwide, and one of the most common haematological complication of pregnancy. Pregnant women are particularly at a higher risk for developing iron deficiency anemia (2). The loss of iron in normal pregnancy, delivery and lactation tend to put reproductive women to the side of negative iron balance (3). IDA is more common in women who have inadequate diet and who are not receiving prenatal iron supplements and one of the commonest problems in the antenatal care unit is a progressively falling haemglobin level particularly during the last trimester (4) .The possible causes of this fall in Hb in such pregnant women are numerous, ranging from physiological increase in the plasma volume, to serious underlying haematological disorder which can lead to a significant maternal morbidity or even fatality.(5) .Carriers for β – thalassaemia are usually symptoms free except in the period of stress such as pregnancy when they become more anaemic.(6) Anemia directly or indirectly contributes to a significant proportion of maternal death in developing world and may also contributes to prenatal morbidity and mortality by increasing the likelihood of intrauterine growth retardation and preterm delivery. (7, 8) The aim of this study is to evaluate the current prevalence of iron deficiency anemia and β-thalassaemia trait among sample of anaemic pregnant women attending the gynecology and obstetric department in Al- Yarmouk teaching hospital.

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Patients and Methods:

One hundred anemic pregnant women were included in the current study .Those patients attended the gynaecology and obstetrics department in Al-Yarmouk teaching hospital from the 1st of July 2007 to the end of October 2007.They were randomly selected, in relation to different trimesters of gestation ,not on haematinics ,no history of acute or chronic illness and no family history of haematological disorders . Pregnant females with Hb concentration of less than 110 g/L in their first trimester ,and those with a Hb concentration of less than 105 g/L in their second or third trimester were considered anaemic and are included in this study (5). The pregnant women were categorized into five groups according to their age, four groups according to parity and three groups according to the trimesters (See table (1)). The criteria chosen for the selection of the control group includes: Twenty apparently healthy non anaemic pregnant women, randomly selected (in relation to different age, trimesters of gestation), no history of recent illness , no history of haematinics intake , normal physical findings & haematological parameters (Hb. and peripheral blood smear) and serum iron status. Sample collections, for each patient 10 mls of venous blood sample were collected from the cubital vein.Two mls were put in ethylendiaminetetra acetic acid (EDTA) tube for hematological investigation (Hb, peripheral blood smear, reticulocyte count &Hb electrophoresis),while the remaining 8 ml were put in a plain tube to evaluate serum iron,TIBC&serum ferritin(9) Statistical analysis of data was carried out using the available statistical package of SPSS-15 (Statistical Packages for Social Sciences- version 15). Data were presented in simple measures of frequency, percentage, mean, standard deviation, and range (minimum-maximum values). The significance of difference of different means (quantitative data for different means) was tested using analysis of variance (ANOVA) for more than two means, using independent student-t-test for difference between two means, while different percentages (qualitative data) were tested using chi-square test (χ^2-test). Values of statistical significance was considered whenever the P value was less than 0.05.

Results:

The studied sample consisted of 100 of anaemic pregnant women aged between 17- 46 years old.

Twenty non anemic pregnant women were taken as control aged between 17- 46 years. Mean age of patients included in the current study was (28.17±5.57SD). Parity ranged from one (15%) up to 4+ (30%) (See table (1)).

Table (1): The age, parity and trimester distribution of patients and controls.

	Patients		Controls		
	No	%	No	%	P value
Age groups < 20 years	4	4.0	2	10.0	0.573
20-24 years	22	22.0	6	30.0	
25-29 years	35	35.0	7	35.0	
30-34 years	25	25.0	4	20.0	
=>35 years	14	14.0	1	5.0	
Mean±SD Range	28.17±5.57 (17-46)		25.60±4.75 (18-36)		
Parity Primi	20	20.0	6	30.0	0.513
Para 1	16	16.0	4	20.0	
Para 2-3	34	34.0	7	35.0	
Para 4 -7	30	30.0	3	15.0	
Mean±SD Range	2.34±1.76 (0-6)		1.75±1.74 (0-6)		
Trimesters First	26	26.0	8	40.0	0.447
Second	31	31.0	5	25.0	
Third	43	43.0	7	35.0	

Table (2): Demonstrate the A. Peripheral blood smear findings & B. Haematological analytic data of patients and controls.

A. Peripheral blood smear findings of patients and controls.

Peripheral blood smear	Patients (n = 100)		Controls (n = 20)	
	No	%	No	%
Normochromic normocytic	8	8.0	20	100.0
Hypochromic micocytic	81	81.0	-	-
Macrocytic	8	8.0	-	-
Dimorphic	3	3.0	-	-

B. Haematological analytic data of patients and controls.

Haematological Parameters	Patients (n = 100)	Controls (n = 20)	P value
Haemoglobin (g/l)	90.10±8.59 (60.00-104.00)	119.50±6.68 (110.00-135.00)	0.0001*
Corrected retic count	0.65±0.41 (0.13-3.30)	-	-
Serum iron (µmol/l)	9.35±4.25 (3.60-23.50)	23.70±5.03 (15.00-32.00)	0.0001*
TIBC (µmol/l)	72.12±11.40 (30.00-92.00)	56.45±6.59 (47.00-68.00)	0.0001*
Serum Ferritin (µg/l)	21.01±29.65 (2.00-142.00)	24.80±7.99 (16.00-41.00)	0.573
HbA2 Electrophoresis	2.51±0.67 (1.20-5.80)	2.68±0.35 (2.20-3.20)	0.278

Table (3): Serum iron, TIBC, Serum Ferritin and HbA2 Electrophoresis of patients and controls distributed according to the age of pregnant women.

Iron profile and Hb A2		Patients (n = 100)	Controls (n = 20)
Serum iron (µmol/l)	<20 years	12.70±6.73	22.50±3.54
	20-24 years	8.24±2.32	23.50±5.50
	25-29 years	9.49±3.75	23.43±4.54
	30-34 years	10.16±5.95	27.25±4.57
	=>35 years	8.36±2.87	15.00±
	P value	0.221	0.285
TIBC (µmol/l)	<20 years	71.75±4.79	56.00±5.66
	20-24 years	73.36±8.95	57.33±6.38
	25-29 years	70.03±10.31	54.29±6.07
	30-34 years	71.48±14.06	57.75±9.88
	=>35 years	76.64±13.24	62.00±
	P value	0.451	0.821
Serum Ferritin (µg/l)	<20 years	28.25±38.51	23.50±3.54
	20-24 years	16.14±21.75	26.17±7.81
	25-29 years	29.00±37.63	27.86±10.29
	30-34 years	17.48±25.74	19.50±3.42
	=>35 years	12.93±18.38	19.00±
	P value	0.315	0.511
HbA2 Electrophoresis	<20 years	2.15±0.37	2.45±0.07
	20-24 years	2.54±0.50	2.55±0.45
	25-29 years	2.73±0.84	2.81±0.32
	30-34 years	2.36±0.52	2.80±0.29
	=>35 years	2.25±0.61	2.40±
	P value	0.072	0.467

Most of the cases of anemic pregnant women (81%) had hypochromic micocytic blood film picture, (8%) showed normochromic normocytic, (8%) showed macrocytic blood film picture,the remaining (3%) of cases had a dimorphic blood film picture (See table 2 – A).The mean Hb of cases was (90g/l) which was significantly lower than the control group (119 g/l) (See table (2 – B)). When Hb.electrophoresis was done to all cases, 2 of our cases were found to have an elevated haemoglobin A2 level with a hypochromic microcytic blood picture, consistent with the diagnosis of β-thalassaemia trait. Serum iron, TIBC, serum ferritin and Hb. electrophoresis showed no significant difference with increasing age of anemic pregnant women (See table 3) .There was a significant difference between TIBC and increasing parity of anaemic pregnant women, while serum iron, serum ferritin and HbA2 levels showed no statistically significant differences (P value more than 0.05) (See table (4 - A)). There were significant differences between serum iron, TIBC, serum ferritin and the progress of the anemic pregnant women (See table (4 - B)) .

Table (4): Serum iron, TIBC, S. Ferritin and HbA2 Electrophoresis of patients and controls distributed according to A. Parity & B. Trimesters of the pregnant women

A. Parity

	Parity	Patients (n = 100)	Controls(n = 20)
Serum iron (µmol/l)	Primi	10.93±5.09 (20)	24.17±4.88 (6)
	Para 1	8.83±2.87 (16)	22.25±4.79 (4)
	Para 2-3	9.43±4.23 (34)	26.00±5.16 (7)
	Para 4 & more	8.50±4.17 (30)	19.33±3.79 (3)
	P value	0.241	0.259
TIBC (µmol/l)	Primi	67.95±14.72 (20)	58.67±5.92 (6)
	Para 1	68.94±11.17 (16)	53.75±4.50 (4)
	Para 2-3	70.71±9.94 (34)	53.14±6.79 (7)
	Para 4 & more	78.20±8.17 (30)	63.33±4.16 (3)
	P value	0.004*	0.080
Serum Ferritin (µg/l)	Primi	30.25±36.35 (20)	23.33±9.33 (6)
	Para 1	22.94±26.24 (16)	29.00±5.03 (4)
	Para 2-3	24.15±35.37 (34)	26.57±8.68 (7)
	Para 4 & more	10.27±12.76 (30)	18.00±1.73 (3)
	P value	0.095	0.295
HbA2 Electrophoresis	Primi	2.64±0.89(20)	2.57±0.29(6)
	Para 1	2.99±0.75(16)	2.73±0.46(4)
	Para 2-3	2.48±0.46(34)	2.79±0.42(7)
	Para 4 & more	2.20±0.50(30)	2.57±0.15(3)
	P value	0. 1	0.686

B. Trimesters of the pregnant women

Trimesters		Patients (n = 100)	Controls(n = 20)
Serum iron (µmol/l)	First trimester	11.35±5.61(26)	23.88±6.22(8)
	Second trimester	9.47±3.63(31)	25.00±5.39(5)
	Third trimester	8.06±3.20(43)	22.57±3.55(7)
	P value	0.007*	0.728
TIBC (µmol/l)	First trimester	65.31±13.37(26)	55.25±6.88(8)
	Second trimester	72.19±7.01(31)	57.80±7.50(5)
	Third trimester	76.19±10.93(43)	56.86±6.41(7)
	P value	0.0001*	0.796
Serum Ferritin (µg/l)	First trimester	33.81±38.72(26)	23.63±7.54(8)
	Second trimester	23.03±33.31(31)	23.20±9.73(5)
	Third trimester	11.81±13.99(43)	27.29±7.85(7)
	P value	0.009*	0.617
HbA2 Electrophoresis	First trimester	2.68±0.70(26)	2.56±0.40(8)
	Second trimester	2.39±0.58(31)	2.60±0.25(5)
	Third trimester	2.49±0.70(43)	2.86±0.32(7)
	P value	0.252	0.240

Discussion:

Iron Deficiency Anaemia (IDA) is recognized as a major public health problem through out the world especially in developing countries and women in reproductive age are most frequently affected (10,11) . Pregnant women were distributed according to their Hb concentration applying the W.H.O. standards for definition of anemia that pregnant women with Hb concentration less than

110 g/L were considered to be anaemic (12). In this study the majority of cases were aged between 25-29 years, para four and more and in their third trimester (See table 1). In this study, most cases of anemic pregnant females had hypochromic microcytic blood picture (81%), 79% had IDA by measurement of serum iron, TIBC and serum ferritin. Hb electrophoresis revealed an elevated HbA2 level in only 2% of cases and both of them had a hypochromic microcytic blood picture consistent with diagnosis of β-thalassaemia trait.This result revealed that IDA was the major cause of anemia in pregnancy. This was rather similar to the finding in USA by Vanda R.Lops et al (13) in which IDA accounted for 75% .The incidence in our study was higher than that reported by Brian S. Alper et al (14) in USA who found that 65% of anemia in pregnancy was IDA (13, 14) probably due to their better nutritional status , proper antenatal care or difference in sample size included in that study. A study done in Al- Mosul city by Asmaa A. found that 80% of anaemia in pregnancy is due to IDA which is also in agreement with the results of this study (15). IDA cases in this study showed an important association with increasing gestational age of the pregnant women, particularly in their third trimester .This may indicated that these women began their pregnancy with low iron stores and could not face the considerable iron needs during the progress of their pregnancy .So these women were at a higher risk of developing IDA. This is in agreement with the findings of Herbery et al in French area & Saeed B.A. in Al- Mosul – Iraq. (10, 16). In conclusion, IDA was the most common cause of hypochromic microcytic anemia as it affected 79% of anaemic pregnant women in the studied group. β- thalassaemia trait was responsible for 2% of anaemia of pregnant women in the studied group; this was confirmed by measurement of HbA2 level.

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