Prevalence of Anemia among Pregnant Women Attending Primary Health Care Center in Kirkuk City

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Abstract

Introduction: Anemia in pregnancy is considered one of the major risk factors contributing to maternal deaths in developing countries. The present study was carried out to determine the prevalence of anemia among pregnant woman according the hematological and biochemical parameters in Kirkuk health care centers.

Patients and methods: This study involved a total of 132 woman attending primary health care centers in Kirkuk city for the period from 1st July 2010 to 30th March 2011 in Iskan and Rahem-Awa region. They were consisted of three groups, Group one (G1) consisted of 87 pregnant women, second Group (G2) consist of 30 non pregnant women and third Group (G3) consisted of 15 were not married. They were investigated for hematological tests, Hb, PCV, RBC, WBC, MCV, MCH, MCHC, and biochemical test copper, magnesium, zinc, albumin. Anemia is classified as mild anemia from 10-10.9g/dl, moderate anemia from 8-8.9g/dl, and severe anemia < 8g/dl.

Result: The result showed that there was significant difference in level of Hb, PCV, RBC, MCH, between the pregnant woman and control groups; regarding the difference in trimesters the most influenced parameters were Hb, PCV, RBC, and MCV. The educational state had significant influence on the level of PCV, MCV, and MCH. The pregnancy trimesters had significant effect on albumin level, copper and zinc, while there was significant difference in level of zinc according to education.

Conclusion: It was concluded that there was no anemia in this study among pregnant woman although the Hb, PCV, RBC values among pregnant were lower than non pregnant but 37.9% of pregnant women had mild anemia.

Key Words: pregnant woman, Anemia, hematology parameter, zinc, copper, magnesium test.

انتشار الأنيميا بين النساء الحوامل اللاتي يراجعن مراكز الرعاية الصحية الأولية في محافظة كركوك

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الخلاصة

المقدمة: يعتبر فقر الدم احد العوامل الرئيسية الخطرة على حياة النساء الحوامل والتي تساهم في موت الامهات في الدول النامية وهذه الدراسة اجريت لتحديد انتشار فقر الدم بين النساء الحوامل طبقاً للمقاييس الدموية والكيمياوية في مراكز الرعاية الصحية الأولية في مدينة كركوك.

الطريقة: تضمنت الدراسة على (132) امرأة من اللاتي يراجعن المراكز الصحية الاولية في مدينة كركوك من الفترة الاول من تموز 2010 ولغاية الثلاثين من أذار 2011 في منطقتي الاسكان ورحيم آوه، وتم فحص هذه العينات لكل المجاميع حيث شملت 3 مجاميع الاولى منهم 87 من النساء كانت حوامل، المجموعة الثانية 30 منها نساء غير حوامل، والمجموعة الثالثة 15 منها كانت عازبات. الفحوصات الدموية التي اجريت كانت : الهيموغلوبين، حجم الخلايا المضغوطة، عدد كريات الدم الحمر، عدد كريات الدم البيض، متوسط حجم الخلايا، متوسط خضاب الدم ومتوسط تركيز خضاب الدم، والفحوصات الكيميوحيوية التي اجريت هي مصل الالبومين بالاضافة الى النحاس والخارصين والمغنيسيوم.

النتائج: اظهرت النتائج ان هناك فرقآ معنويآ بين مجموعة السيطرة والحوامل من حيث الهيموغلوبين ،حجم الخلايا المضغوطة، عدد كريات الدم الحمر ومتوسط خضاب الدم. اما بخصوص الفرق في مراحل الحمل الثلاثة حيث كانت الهيموغلوبين، حجم الخلايا المضغوطة، كريات الدم الحمر ومتوسط حجم الخلايا هي أكثر المقاييس تأثرآ. اما من حيث الحالة الثقافية فأكثر المقاييس تأثرآ كانت حجم الخلايا المضغوطة ومتوسط حجم الخلايا ومتوسط خضاب الدم.

لوحظ ان مستوى مصل النحاس والخارصين والالبومين تتأثر في مراحل الحمل الثلاثة بينما لوحظ ان هناك فرقآ معنويآ في مستوى الخارصين من حيث الحالة الثقافية

الاستنتاج: استنتجت هذه الدراسة بأنه لايوجد فقر دم لدى النساء الحوامل بالرغم من إن قيم خضاب الدم،وحجم الخلايا المضغوطة، وكريات الدم الحمراء لدى النساء الحوامل اقل من النساء الغير حوامل.

الكلمات الدالة: النساء الحوامل، فقر الدم، الفحوصات الدموية، قياس الزنك، والنحاس، والمغنسيوم

Introduction

Anemia is a medical condition may be either due to a decrease in normal number of red blood cell (RBCs) or less than normal quantity of hemoglobin in the blood [1,2] or increased plasma volume as in pregnancy. However, it can include decreased oxygen binding ability of each Hb molecule duo to deformity or lack in numerical development as in some other types of Hb deficiency.

Anemia is classified in to mild, moderate, severe [3]. There are many reasons for anemia and the treatment will depend upon the cause. The normal range of Hb in pregnant women 11-12 g/dl, and normal hematocrit levels are 31-40% for pregnant women [4].

Anemia is the most common hematological problem in pregnancy. In pregnancy the diagnosis of anemia may be influenced by physiologic changes. During the first and second trimesters, hemoglobin and hematocrit decrease as the maternal blood volume expands, with adequate iron intake; there is a rise in hemoglobin and hematocrit during the third trimester [5].

Anemia in pregnancy is associated with maternal and prenatal morbidity and mortality [6]. Since it reduces resistance to blood loss, death may occur from bleeding associated even with normal delivery. Association of anemia with adverse maternal outcome such as puerperal sepsis, antepartum hemorrhage, postpartum hemorrhage and mortality is no longer a debatable issue. That is why early diagnosis and treatment of anemia is very important in pregnant women [7].

During pregnancy, 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 [8].

The development of iron deficiency anemia is associated with increased risk of preterm births and low birth weight infants, various studies have been conducted to understand how anemia predisposes to preterm labour either directly or indirectly due to increase risk of infection [9]. Direct effect is due to hypoxia induced by anemia which induces synthesis of corticotrophin-releasing hormone (CRH) associated with stress predispose to preterm labour and even pregnancy induced hypertension [10]. It is also said that increase level of CRH in mother stimulates increase production of cortisol in fetus which intern inhibits the longitudinal growth of the fetus [11]. Another indirect mechanism is iron deficiency leads to oxidative damage to erythrocytes in the fetoplacental unit which stimulates production of CRH and both in vivo and in vitro [11,12].

Anemia in pregnancy is a global problem and is associated with increased maternal morbidity and mortality. It is more common in developing countries than in developed countries [13].

The present study was carried on to determine the rate of anemia among pregnant women according the hematological and biochemical parameters in Kirkuk health care centers.

Patients and Methods

The study was involved 132 women attending Primary Health Care Centers in Iskan, Rahem-Awa in Kirkuk city. The sample were consisted of three groups (G1) of 87 pregnant, (G2) included 30 non pregnant, and G3 were of 15 not married , for the period from 1st July 2010 to 30th March 2011 selected randomly. Five ml of blood samples were obtained from each individual in two tubes, 2 ml were put in to first tube contain Ethylene Diamine Tetra Acetic acid (EDTA) and 3ml were put in to plain tube without anticoagulant, centrifuged and sera were kept at (-20 C$^{\circ}$) for biochemical parameters tests to determine albumin, zinc, copper, and magnesium.

The hematological parameter was done to determine Hb which estimated by using hemoglobin-meter, the PCV was estimated by using hematocrit, the white blood cells numbers were counted under light microscope using Neubauer counting chamber, the W.B.C count was estimated by diluting (0.2ml) of whole blood in Turk's solution. For the R.B.C (0.2ml) of whole blood was diluted in Hayem's solution following the method of Dacie and Lewis [14].

The biochemical parameters: Albumin determination was performed by using bromocresol green to form a colored compound, the absorbance measured at 630 nm by using

spectrophotometer [15]. The concentration of copper was measured by the method of [16]. The concentration of zinc was measured by the method of [17], and the concentration of magnesium was measured by the method of [18]. A special questionnaire form was arranged and full information obtained from each individual including: age, level of education, and stages of pregnancy.

Statistical analysis

Statistical analysis for all parameters applied, using t-test to show the significant differences between each two group (pregnant and non pregnant women and not married), P value at < 0.05 level was considered statistically significance [19].

Results

A total of hundred thirty two women who attended primary health care center were selected randomly, to show the rate of anemia among them. Present result was illustrated in table1-8, all values expressed in terms of Mean ± SD.

Table(1) shows the hematological parameter in pregnant women, and control groups (not married groups and non pregnant woman), there was significant difference between pregnant women and control group in Hb g/dl and the Hb value in pregnant women is lower than others ($p<0.05$). There was significant difference between pregnant and control group in PCV value, it's value in pregnant women was significantly lower than control group ($p<0.01$). The RBC value in pregnant woman was lower than control group ($p<0.05$), while the WBC value did not differ significantly between pregnant and non pregnant women. Although the MCV and MCHC did not vary between pregnant and non pregnant women, while the MCH value in pregnant woman was lower than single group ($p < 0.05$).

Table (1) The hematological parameters in pregnant women and control groups.

Group	No	Hb g/dl	PCV %	WBC×10^3/ mm^3	10^6 ×RBC /mm^3	MCV (fl)	MCH (pg)	MCHC %
		Mean ± SD						
Pregnant G1	87	11.26 ± 7.9	34.1 ± 24.1	4.433 ± 3.134	3.38 ± 2.39	100.8 ± 71.3	33.3 ± 23.5	33 ± 23.3
Non pregnant G2	30	12.78 ± 9.0	37.4 ± 26.4	4.426 ± 3.271	3.74 ± 2.6	99.4 ± 70.3	34.1 ± 24.01	34.2 ± 24.2
Not married G3	15	12.28 ± 8.7	35.4 ± 25.0	4.680 ± 3.309	3.55 ± 2.51	99.7 ± 70.5	35 ± 24.8	34.7 ± 24.5
		p<0.05	p<0.01	N.S	p<0.05	N.S	p<0.05	N.S

T-Test: P<0.05=significant, N.S = not significant

The hematological parameter according to trimester stages of pregnancy is shown in table (2). Statistically there was significant difference in Hb value and its value in second and third trimesters were lower than first trimester group ($p<0.05$). The PCV and RBC value in second trimesters were lower than first and third trimester of pregnancy women ($p<0.05$), while the WBC value did not differ significantly among different trimesters of pregnancy. The MCV value in third trimester was significantly lower than first and second trimesters ($p<0.05$), while the MCH and MCHC values were significantly higher in first trimester than second and third trimesters ($p<0.05$).

Table (2) The hematological parameters according to trimester stages in pregnant women.

Stage of pregnancy	NNo.	Hb g/dl	PCV %	WBC×10^3/ mm^3	×RBC $10^6/mm^3$	MCV (fl)	MCH (pg)	MCHC %
		Mean ± SD						
First	36	11.77 ± 8.3	35.1 ± 24.8	4.383 ± 3.099	3.51 ± 2.48	100 ± 70.7	33.5 ± 23.7	33.5 ± 23.7
Second	36	10.91 ± 7.7	32.7 ± 23.1	4.48 ± 3.168	3.22 ± 2.27	101.6 ± 71.8	30.9 ± 21.8	31.2 ± 22.1
Third	15	10.63 ± 7.5	34.1 ± 24.1	4.560 ± 3.224	3.44 ± 2.43	99.1 ± 70.1	30.9 ± 21.8	31.2 ± 22.1
		p<0.05	p<0.05	N.S	p<0.05	p<0.05	p<0.05	p<0.05

T-Test : P<0.05=significant, N.S = not significant

Regarding the age groups (table3) shows, there was no significant difference in Hb, PCV, RBC,MCV, MCHC values in all age group, but the WBC value in third age group was lower than first and second age groups ($p<0.05$), although the MCH in third age group was lower than first and second age group ($p<0.05$).

Table (3) The hematological parameters in pregnant women according to age groups.

Age group	No.	Hb g/dl	PCV %	WBC×10^3 /mm^3	10^6 ×RBC /mm^3	MCV (fl)	MCH (pg)	MCHC %
		Mean ± SD						
(14-20) Years	16	11.28± 7.9	34.1 ± 24.1	4.450 ± 3.146	3.4 ± 2.4	99.7 ± 70.5	35 ± 24.8	34.7 ± 24.5
(21-30) Years	45	11.34± 8.0	33.8 ± 23.9	4.664 ± 3.227	3.74 ± 2.64	99.4 ± 70.3	34.1 ± 2401	34.2 ± 24.2
(31-42) Years	26	10.09± 7.1	34.6 ± 24.4	4.023 ± 2.844	3.38 ± 2.39	100.8 ± 71.3	33.3 ± 23.5	33 ± 23.3
		N.S	N.S	P<0.05	N.S	N.S	P<0.05	N.S

T-Test : P<0.05=significant, N.S = not significant

It is indicated in (table 4), that there was no significant difference in Hb, WBC, MCHC values according to educational levels. Although the PCV value in secondary school level was higher than primary and high school level, while the RBC in secondary stage level was lower than primary and high school level (p<0.05). The MCV and MCH values in higher education level were higher than primary and secondary school level (p<0.05).

Table (4) The hematological parameters in pregnant women according to educational levels.

Education level	No.	Hb g/dl	PCV %	WBC×10^3/ mm^3	RBC×10^6 /mm^3	MCV (fl)	MCH (pg)	MCHC %
		Mean ± SD						
Primary	42	11.48± 8.1	10.93 ± 7.7	4.500 ± 3.181	3.46 ± 2.44	100.9 ± 71.3	33.2 ± 23.5	32.9 ± 23.3
Secondary	22	11.17± 7.9	34 ± 24.0	4.004 ± 2.831	3.4 ± 2.4	100 ± 70.7	32.9 ± 23.3	32.9 ± 23.3
High-education	23	10.93± 7.7	32.7 ± 23.1	4.721 ± 3.338	3.17 ± 2.23	103.1 ± 70.9	34.5 ± 24.4	33.4 ± 23.6
		N.S	P<0.05	N.S	P<0.05	P<0.05	P<0.05	N.S

T-Test: P<0.05=significant, N.S = not significant

Result in (table 5) represent the biochemical parameters pregnant women and in control groups, serum concentration of copper, magnesium, zinc did not vary in all groups, but there was significant difference in albumin value and its value was lower in pregnant women group than single group ($p<0.05$).

Table (5) The Biochemical parameters in controls and patient group.

Group	No.	Copper µg/dl	Magnesium mg/dl	Zinc µg/dl	Albumin g/dl
		Mean ± SD			
Pregnant G1	87	224.9 ± 159	1.26 ± 0.89	61.2 ± 43.3	4.77 ± 3.37
Non pregnant G2	30	189.9 ± 134	1.38 ± 0.98	52.5 ± 37.1	4.83 ± 3.41
Not married G3	15	217.6 ± 153	1.25 ± 0.88	60.9 ± 43.1	4.75 ± 3.36
		N.S	N.S	N.S	P<0.05

T-test: P<0.05=significant, N.S = not significant

The biochemical parameters according to trimester of pregnancy are shown in table (6). The value of serum copper concentration according to trimester stages is significantly different ($p<0.05$). The level of copper in first trimester was lower than second and third trimester. There was no significant difference in serum magnesium concentration in all trimester stages. Also there was significant difference in zinc value and its value was lower in the second trimester than other ($p<0.05$). There was significant difference in albumin value and its value was lower than in the third trimester than other ($p<0.05$).

Table (6) The biochemical parameters according to trimester stages in pregnant women.

Stage of pregnancy	No.	Copper µg/dl	Magnesium mg/dl	Zinc µg/dl	Albumin g/dl
		Mean ± SD			
First	36	204.2 ± 144.4	1.32 ± 0.87	61.3 ± 43.3	4.8 ± 3.39
Second	36	249.1 ± 176.1	1.19 ± 0.84	53.3 ± 37.7	4.6 ± 3.25
Third	15	227.5 ± 160.9	1.22 ± 0.86	80.6 ± 56.9	4.5 ± 3.18
		p<0.05 sig	N.S	p<0.05 sig	p<0.05 sig

T-Test: P<0.05=significant, N.S = not significant

Result in table (7) demonstrate the value of serum level concentration of copper ,magnesium and zinc in pregnant women and control group according to all age groups. Results show no significant different in all age for magnesium. The albumin value among 31-42 years old pregnant women was significantly lower than other age groups ($p<0.05$). Serum concentration of copper significantly in31-42 years old and zinc significantly in (14-20) years old group.

Table (7) The biochemical parameters according to age groups in pregnant women.

Age group	No.	Copper µg/dl	Magnesium mg/dl	Zinc µg/dl	Albumin g/dl
		Mean ± SD			
(14-20) years	16	253.3 ± 179	1.34 ± 0.95	50.6 ± 35.8	4.72 ± 3.34
(21-30) years	45	223.8 ± 158	1.2 ± 0.85	61.9 ± 43.8	4.74 ± 3.35
(31-42) years	26	209.2 ± 174	1.30 ± 0.92	66.4 ± 47	4.51 ± 3.19
		P<0.05	N.S	P<0.05	P<0.05

T-Test: P<0.05=significant, N.S = not significant

Table (8) shows the biochemical parameters according to educational levels. There was no significant difference in serum level concentration of magnesium and albumin values in all educational level. While the value of serum copper concentration was significantly lower in secondary school level than other educational level ($p<0.05$). The value of zinc was significantly lower in primary school level than other educational levels($p<0.05$).

Table (8) The biochemical parameters according to educational levels in pregnant women.

Education level	No.	Copper µg/dl	Magnesium mg/dl	Zinc µg/dl	Albumin g/dl
		Mean ± SD			
Primary	42	219.3 ± 155	1.21 ± 0.86	55.32 ± 39.1	4.65 ± 3.23
Secondary	22	213 ± 150	1.3 ± 0.92	71.38 ± 50.5	4.69 ± 3.31
High-education	23	248.9 ± 175	1.32 ± 0.93	61.99 ± 43.8	4.69 ± 3.31
		P<0.05	N.S	P<0.05	N.S

T-Test: P<0.05=significant, N.S = not significant

Discussion

Anemia is the most common disorder of the blood, it lead to hypoxia in organs. Since all human cell depend on oxygen for survival, varying degrees of anemia can have a wide range of clinical consequences [1,2]. In this study the Hb value (11.26±7.9) in pregnant woman was lower than non pregnant woman and not married table (1). This is in agreement with study done in Maharaj[20], who showed that the Mean and SD value of Hb in pregnant women was (11±6.1 g/dl), Mean and SD value of PCV in pregnant women was (34.1±24.1), which was lower than single and non pregnant women (35.4±25), (37.4±26.4). This is also in agreement with the study done in Nigeria which showed that the PCV value of pregnant women was (31.72±4.30), this reflects anemia that leading to decrease of the blood Hb, PCV values in pregnant women which lead to increase in plasma and decrease in RBC. The present result was illustrated that statistically negative correlation between age and Hb and this is inagreement with the study done by Nesimi Kisioglu[21], who showed that the anemia prevalence (Hb level 10.99 g/dl and below) was progressively increased by increasing the age group of pregnant woman. Table 3 showed a decrease of Hb level by increased age of pregnant women as in table(3).

Result in table 1 shows that, the value of RBC in pregnant women ($3.38\times10^6\pm2.39$) was lower than Non pregnant women ($3.74\times10^6\pm2.6$), and not married ($3.55\times10^6\pm2.51$) this is in agreement with study done in India [22], that showed that the RBC value was less than 4 million/mm^3, this may be due to low food intake, and lack of appetite

According to the trimester stages in table 2, this shows that the RBC value in second trimester (3.22×10^6) was lower than first and third trimester, this is not agreement with study done in India [22] who showed that the RBC value in first trimester (3.72×10^6) was lower than second and third trimester; that may be due to increase demand of fetus for iron and folic acid during pregnancy.

WBC value was lower in (31-42 years) age group than second (21-30 years) and first (14-20 years) age group as in table 3, but its value within normal range, that indicate the WBC was increasing when the age is progress may be due to related to the pregnant women have other pathological conditions which lead to anemia, and its increasing in the pregnancy in stressful conditions[23] .

Regarding to the educational level it was showed that the Hb value in the primary school level (11.48±8.1) and the high school level (10.93±7.7), as in table 4 and this is not in agreement with study done by Nesimi kisioglu [21], who showed that the mean Hb level was

(10.73±1.70) for the pregnant women in primary school level and (11.9±1.50) for the university graduate, indicate that no significant relationship were observed between the education status and Hb level, this may be due to the pregnant women with high education had no time to care on their diet, but this is in disagreement with study done in Vietnam [24] who showed that the pregnant women with primary education or lower was more affected with anemia than secondary or high education, this may indicate that pregnant women with higher education have more demand for food and decrease in take of it either due to nausea decrease appetite, lack of knowledge.

At the educational levels, it was shown that the RBC value of those with high educational stages was lower than primary and secondary stages as in table 4, this may be due to people with higher education not attended to the health care centers for receiving their tablet of iron periodically following their health.

According to trimesters, the MCV value in the third trimester was lower than first and second trimesters, this is may be our sample is smaller than other study, at the education level showed that the MCV value in higher stage was higher than other stage, also due to food intake is district and lack to the necessary elements, minerals and vitamins. Pregnant woman MCH value was lowering than non pregnant and girl, this may be due to low Hb value in pregnant women. According to the trimester showed that the first trimester was higher than second and third trimester and this agree with study done in India [22] this indicate that MCH is depend upon Hb concentration but their value with normal range.

According to age group table 3, MCV value with third age was lower than other two groups but their value within normal range this reflects that there was no relationship between MCH value and the age groups.

At educational state the MCH value in the secondary education was lower than primary and high education but their values within normal range table 4, this indicate that in pregnant woman there was no relation between education of woman and MCH value.

According to the biochemical analysis it was shown that serum copper concentration in the first trimester was lower than the second trimester, this may be due to the diet or food intake of pregnant women is deficient to this necessary element and this is agreement with the study done in USA [25] by wolfe ; Battimore showed that the copper deficiency had also associated with complication of pregnancy like child birth or fetus development but not agree with study done in rural area in India [26] who showed that serum copper is lower than (80.0 µg/dl) but this study is showed more than (155 µg/dl) may be to different nutritional status of different

countries or due to sample size of the studied groups. The result showed that there was no significant difference in the serum magnesium in all group, this indicate that magnesium was not affected by mild anemia or may be these women had anemia but their nutrient had enough of magnesium, and this is not in agreement with study done in USA [25] may be their sample was larger than our sample or they taken from area deficient to these element, while in the other study done in New Delhi was agree with our study this may be their sample in the rural area deficient to the magnesium in their nutrient .

According to trimester stage the serum Zinc was lower in second trimester than other and this is in agreement with study done in India [26], and in Sudan [27], and according to the educational level the primary study was lower than secondary study this indicate that zinc is deficient in their diet especially in the trimester stage which is necessary to form the fetus and to increase their appetite to food intake while primary stage is lower than secondary because they were unaware to their health and not visiting the health care center to take their drugs to support them in pregnant stage. Anemia affect 20 percent of all childbearing age, due to the subtlety of the symptoms, affected women are often unaware that they have this disorder, as they attribute the symptoms to the stresses of their daily lives. Possible problems for their fetus include increased risk of growth retardation, prematurity death, rupture of the amnion and infection (1).

Serum albumin value in pregnant woman was lower than non pregnant woman, but their value were within normal range this is in agreement with study done in Latin America [28], in Victoria [29] and [30] who showed that serum albumin value was also within normal range this indicate that pregnant women their diet is rich with animal protein.

According to age group it was shown serum albumin value was lower in third age group (4.51± 3.19) and other age groups but their values were within normal range. According to trimesters, although the serum albumin value in all stages of trimester was within normal range but it's value in third trimester was lower than first and second trimester stage, this indicate that the pregnant women in the third trimester required to a good animal and vegetable protein.

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