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The prevalence of anemia and its risk factors among supplemented and non-supplemented pregnant women in Sulaimania city in Kurdistan-Iraq

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Abstract:

Background: Anemia is a serious global public health problem that particularly affects pregnant women.
Objectives: The objectives of the study were to find out the prevalence of anemia and its associated risk factors among supplemented and non-supplemented pregnant women.
Cases and methods: Six hundred and forty-one blood samples were collected through simple random sampling from pregnant women and controls. The collected data from the participants included age, education, residence, and obstetrical related factors, and blood samples were taken for blood tests.
Results: One hundred and sixty-four (74.2%) and 73 (34.9%) of non-supplemented and supplemented pregnant women respectively were found to be anemic. Age of pregnant women, gestational age, high gravidity, employment status, level of education, body mass index, daily activity, and blood pressure were significantly associated with anemia in the supplemented group. However, in the non-supplemented group only gestational age and high gravidity factors were significantly associated with anemia. There were significant differences between the rate of anemia among supplemented and non-supplemented pregnant women in all factors except birth intervals. The frequencies of low serum ferritin level among non-supplemented and supplemented anemic pregnant women were 137 (83.5%) and 45 (61.6%) respectively.
Conclusion: The prevalence of anemia was very high among non-supplemented compared to supplemented pregnant women in Sulaimani city in Kurdistan-Iraq. The risk factors that were associated with anemia were: Age of pregnant women, gestational age, high gravidity, employment status, level of education, body mass index, daily activity, and blood pressure.
Keywords: Anemia, Supplemented pregnant women, Serum ferritin.

Introduction:

Anemia is a serious global public health problem that particularly affects pregnant women. It was estimated that 41.8% of pregnant women worldwide were anemic in according to a report published in 2015 (1). It is more predominant in developing countries ranging between 43-56% compared to 9-18% in developed countries (2). According to a study done in Babil governorate, Iraq, the prevalence of anemia among pregnant women was 48.6% (3). Anemia is a state of decreased amount of Anemia is a state of decreased amount of haemoglobin in red blood cells below the normal cut-off point in pregnancy of 11 g/dl (4) and has been classified by the World Health Organization (WHO) during pregnancy as; mild, moderate and severe anemia when haemoglobin (Hb) concentration ranged between 10.0-11.0, 7.0-9.9, and less tahn7.0 gram/dl respectively (5). Globally, the most common complication in pregnancy is anemia and this may lead to premature births, low birth weight, foetal impairment, and infant deaths (6). Furthermore, pregnant women with anemia especially those with severe anemia will be at risk of low physical activity, increased maternal morbidity and mortality (7, 8). Many risk factors are associated with anemia in pregnancy, these include: Nutritional factors (iron folate and vitamin B12 deficiencies), genetics, infectious diseases, socio-economic status, gravidity, trimesters, dietary diversity and medical history of chronic diseases (9, 10). This study aimed to find out the prevalence of anemia and its associated factors among supplemented and non-supplemented pregnant women in Sulaimania city.

Cases and methods:

Six hundred and forty-one samples from different trimesters were collected through simple random sampling from the pregnant women, who attended for routine care to private and public hospitals and from control women (non-pregnant, from the community), in Sulaimania city Kurdistan-Iraq during period from September 2021 to February 2022. Data related to age, education, residence, and obstetrical factors was collected by direct interview with pregnant women and control group who agreed to participate in this

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study. Finally, 5 ml of venous blood were collected from each pregnant woman and non-pregnant woman(control)for complete blood count, serum iron, serum ferritin, folic acid and vitamin B12 determination.

Statistical analysis

Data was entered into computer files using the statistical package for social sciences "SPSS" version 21 for storage and statistical analysis. The Chi – square test was applied to test for association between categorical variable, with a P value of 0.05 or less considered as significant.

Ethical considerations

This study conformed with the Helsinki's declaration regarding ethical principles. Permission was obtained from the College of Health and Medical Technology / Sulaimania Polytechnic University. The pregnant women and their controls enrolled for this study were informed about the objective and the technique of the study. Individual level medical information obtained from the women was kept strictly confidential.

Results

The current study found that there were significant differences in haemoglobin concentrations (anemia) between supplemented and non-supplemented pregnant women and control groups (non-pregnant women). Table (1) shows that 74.2% and 34.9 of non-supplemented and supplemented pregnant women respectively were anemic and only 28.4% of non-pregnant (controls) were anemic. Haemoglobin (Hb) concentrations less than 11 g/dl were considered anemic in pregnant women and less than 12 g/dl in non-pregnant controls.

Table (1): The distribution of the three study groups by supplementation status and anemia

Hb g/dl	Non-supplemented		Supplemented		Control		Chi Square Test
	No.	%	No.	%	No.	%	
Anemic	164	74.2	73	34.9	60	28.4	107.172 P=0.000
Non- Anemic	57	25.8	136	65.1	151	71. 6	
Total	221	100	209	100	211	100	

The prevalence of severe, moderate, and mild anemia among non-supplemented pregnant women was 1.8%, 14.0%, and 58.4% respectively. Among supplemented pregnant women it was 0.0%, 0.0% and 34.9% respectively. As for non-pregnant controls it was 3.8%, 3.8% and 20.9% respectively. The results are shown in table 2.

Table (2): The distribution of the three study groups according to the severity of anemia and the supplementation status

HGB g/dl		Non supplemented		Supplemented		Control		Chi-Square Test
		No.	%	No.	%	No.	%	
Severe	< 8	4	1.8	0	0.0	8	3.8	135.734 P=0.000
Moderate	8-9.9	31	14.0	0	0.0	8	3.8	
Mild	10-11.9	129	58.4	73	34.9	44	20.9	
Normal	≥ 12	57	25.8	136	65.1	151	71.6	
Total		221	100	209	100	211	100	

The current study found that the rate of anemia was highest (74.4%) among women between 20-30 years old in the non-supplemented pregnant women, and 47.7% among the supplemented pregnant women, with a statistically significant association for all three groups. Concerning occupation, level of education, presence of chronic disease, body mass index, family income, daily activity and blood pressure; the highest anemia prevalence in the non-supplemented pregnant women were among housewives (73.7%), illiterate (84.6%), presence of chronic disease (80%), low body mass index (83.3%), low family income (79.3%), no activity (84.6%) and normal blood pressure (75.9%) respectively. As for the supplemented pregnant women these rates were lower than the non-supplemented (39.7%), (42.9%), (26.1), (12.5%), (44.4%), (18.2%) and (28.6%) respectively. In the supplemented group all factors except chronic disease and family income were significantly associated with anemia. However, for the non-supplemented group factors were not significantly associated with anemia, table 3.

Table (3): The distribution of socio-demographic characteristics by anemia status for the three study groups.

Categories	Non Supplemented		P-value	Supplemented		P-value	Control		P-value	Total		P-value
	N (%) Anemia	N (%) No-Anemia		N (%) Anemia	N (%) No-Anemia		N (%) Anemia	N (%) No-Anemia		N (%) Anemia	N (%) No-Anemia	
Age (years)												
20-30	99(74.4)	34(25.6)		53(47.7)	58(52.3)		24(25)	72(75)		176(51.8)	164(48.2)	
31-40	57(71.3)	23(28.8)	0.207	20(20.4)	78(79.6)	0.000	20(32.8)	41(67.2)	0.559	97(40.6)	142(59.4)	0.013
>40	8(100)	0(0.0)		0(0.0)	0(0.0)		16(29.6)	38(70.4)		24(38.7)	38(61.3)	

Employment												
House wife	143(73.7)	51(26.3)	0.652	73(39.7)	111(60.3)	0.000	54(31.6)	117(68.4)	0.036	270(49.2)	279(50.8)	0.000
Employed	21(77.8)	6(22.2)		0(0.0)	25(100)		6(15)	34(85)		27(29.3)	65(70.7)	
Level of Education												
Illiterate	22(84.6)	4(15.4)	0.292	6(42.9)	8(57.1)	0.022	12(19.7)	49(80.3)	0.012	40(39.6)	61(60.4)	0.014
Primary	72(77.4)	21(22.6)		28(34.1)	54(65.9)		26(44.8)	32(55.2)		126(54.1)	107(45.9)	
High school	24(70.6)	10(29.4)		27(48.2)	29(51.8)		8(22.2)	28(77.8)		59(46.8)	67(53.2)	
University	46(67.7)	22(32.4)		12(21.1)	45(78.9)		14(25)	42(75)		72(39.8)	109(60.2)	
Chronic disease												
Yes	8(80)	2(20)	0.668	6(26.1)	17(73.9)	0.346	4(10.8)	33(89.2)	0.009	18(25.7)	52(74.3)	0.000
No	156(73.9)	55(26.1)		67(36)	119(64)		56(32.2)	118(67.8)		279(48.9)	292(51.1)	
Body mass index (kg /m²)												
Low	5(83.3)	1(16.7)	0.619	2(12.5)	14(87.5)	0.013	0(0.0)	10(100)	0.003	7(21.9)	25(78.1)	0.017
Normal	116(72.5)	44(27.5)		53(42.4)	72(57.6)		38(25)	114(75)		207(47.4)	230(52.9)	
High	43(78.2)	12(21.8)		18(26.5)	50(73.5)		22(44.9)	27(55.1)		83(48.3)	89(51.7)	
Family income												
Low	23(79.3)	6(20.7)	0.193	20(44.4)	25(55.6)	0.07	4(25)	12(75)	0.141	47(52.2)	43(47.8)	0.000
Intermediate	141(73.8)	50(26.2)		49(35)	91(65)		56(30.1)	130(69.9)		246(47.6)	271(52.4)	
High	0(0.0)	1(100)		4(16.7)	20(83.3)		0(0.0)	9(100)		4(11.8)	30(88.2)	

Categories	Non Supplemented		P-value	Supplemented		P-value	Control		P-value	Total		P-value
	N (%) Anemia	N (%) No-Anemia		N (%) Anemia	N (%) No-Anemia		N (%) Anemia	N (%) No-Anemia		N (%) Anemia	N (%) No-Anemia	
Daily activity and exercise												
Yes	152(73.4)	55(26.6)	0.372	67(38.1)	109(61.9)	0.028	52(29.4)	125(70.6)	0.489	271(48.4)	289(51.6)	0.004
No	11(84.6)	2(15.4)		6(18.2)	27(81.8)		8(23.5)	26(76.5)		25(31.3)	55(68.8)	
Blood pressure												
Low	96(74.4)	33(25.6)	0.414	33(36.7)	57(63.3)	0.006	28(36.8)	48(63.2)	0.111	157(53.2)	138(46.8)	0.005
Normal	63(75.9)	20(24.1)		30(28.6)	75(71.4)		24(25)	72(75)		117(41.2)	167(58.8)	
High	5(55.6)	4(44.4)		10(71.4)	4(28.6)		8(20.5)	31(79.5)		23(37.1)	39(62.9)	

As for obstetric factors: Gestational age, gravidity, history of abortion and birth intervals; in the non-supplemented pregnant women, high prevalence rates of anemia were in the second trimester (87.8%), gravidity equal or more than five (90.9%), history of abortion (74.3%) and more than 2years birth intervals (77.8%). On the other hand, in the supplemented pregnant women, high rates of anemia were in the second trimester (61.5%), gravidity equal or more than five (50.0%), history of no abortion (39.3%) and more than 2years birth intervals (30.4%), with statistically significant associations for all studied factors except birth interval, the rates were lower in the supplemented group, table 4. In the supplemented group, only trimester factor was associated with anemia but other factors such as gravidity, abortion and birth interval were significantly associated with anemia. On the other hand, in the non-supplemented group, factors such as trimester and gravidity were significantly associated with anemia but other factors such as abortion and birth interval were significantly associated with anemia, table 4. Table 5 shows that the percentages of normal levels of serum iron, folic acid and vitamin B12 among non-supplemented anemic pregnant women were very high; 98.8%, 95.7% and 78.4% respectively very close to those of supplemented anemic pregnant women which were 89%, 98.6% and 87.7% respectively. However, the normal percentage of serum ferritin was very low; 16.5% and 38.4% among non-supplemented and supplemented anemic pregnant women respectively. In this study, the level of serum iron, serum ferritin, folic acid and vitamin B12 were considered low when less than 30 µg/L, 280 ng/ml, 3ng/ml and 200 pg/ml respectively.

Table (4): The distribution of the pregnant women by obstetrics variables, anemia and supplementation status

Items	Non supplemented		p-value	Supplemented		P-value	Total		P-value
	Anemia N (%)	No-Anemia N (%)		Anemia N (%)	No-Anemia N (%)		Anemia N (%)	No-Anemia N (%)	
Trimester of pregnancy									
First	37(52.1)	34(47.9)	0.00	4(16.7)	20(83.3)	0.000	41(43.2)	54(56.8)	0.000
Second	65(87.8)	9(12.2)		32(61.5)	20(38.5)		97(77)	29(23)	
Third	62(81.6)	14(18.4)		37(27.8)	96(72.2)		99(47.4)	110(53.6)	
No. of pregnancies (gravidity)									
1 to 2	95(79.2)	25(20.8)	0.004	32(30.2)	74(69.8)	0.224	127(56.2)	99(43.8)	0.022
3 to 4	49(62)	30(38)		33(37.9)	54(62.1)		82(49.4)	84(50.6)	
5 +	20(90.9)	2(9.1)		8(50)	8(50)		28(73.7)	10(26.3)	
Abortion									
Yes	54(74)	19(26)	0.955	27(29.3)	65(70.7)	0.133	81(49.1)	84(50.9)	0.047
No	110(74.3)	38(25.7)		46(39.3)	71(60.7)		156(58.9)	109(41.1)	
Birth									
≤2 years	12(63.2)	7(36.8)	0.212	10(27.8)	26(72.2)	0.791	22(40)	33(60)	0.099
>2 years	42(77.8)	12(22.2)		17(30.4)	39(69.6)		59(53.6)	51(46.4)	

Table (5): The distribution of the anaemic women by the levels of haematological parameters and the supplementation status

Variables	Categories	Non supplemented	supplemented
		N (%) Anemic women	N (%) Anemic women
Iron	Low level	2 (1.2)	8 (11)
	Normal level	162 (98.8)	65 (89)
Serum Ferritin	Low level	137 (83.5)	45 (61.6)
	Normal level	27 (16.5)	28 (38.4)
Folic Acid	Low level	7 (4.3)	1 (1.4)
	Normal level	157 (95.7)	72 (98.6)
Vitamin B12	Low level	35 (21.6)	9 (12.3)
	Normal level	127 (78.4)	64 (87.7)

Discussion:

The higher prevalence of anemia among non-supplemented pregnant women than the to supplemented pregnant women and non-pregnant controls is in agreement with a WHO report which stated that 35-75% of pregnant women in developing countries suffered from anemia (11). Supplemented pregnant women in this study had lower rates of anemia due to the intake of iron, folic acid and vitamin B12 since most cases of anemia during pregnancy are due to nutritional deficiencies mostly of iron (12). Many studies confirmed that iron rich dietary habits play a role in decreasing the rate of anemia in pregnant women (13). The current study found that most of the anemia cases were mild for all three groups in concordance with a study done in Libya, which found the same result (14). The current study had also shown higher rates of moderate anemia among non-supplemented pregnant women compared to the supplemented, which is also an outcome of the supplementations, in agreement with a study done in Sudan which attributed this to regular iron intake during pregnancy (15). In the supplemented pregnant women, factors such as age, employment status, level of education, body mass index, daily activity and blood pressure have greatly associated with the prevalence of anemia. These results were in agreement with a study from India which suggested direct effects of low socio-economic and illiteracy on the occurrence of anemia (16, 17). Furthermore, a recent study in Sulaimania city found that pregnant women under 25 years of age were at risk of anemia (18). The trimester of pregnancy and gravidity were significantly associated with the rate of anemia among non-supplemented pregnant women conversely, while only the trimester of pregnancy was significantly associated with the rate of anemia among supplemented pregnant women. This is similar to what was reported by studies in Nigeria and Iraq where the anemia rates were high 49.3% and 53.2% respectively in the second trimester of pregnancy (19, 20). In contrast to our result, a study in Erbil found no significant association between gravidity and the rate of anemia (21). The present study found that serum iron, folic acid and vitamin B12 were normal in both non-supplemented and supplemented anemic pregnant women. However, serum ferritin levels were very low in non-supplemented and in supplemented anemic pregnant women. This indicates that most of the anemic cases were iron deficient. Other studies reported that the majority (74%) of the Singapore pregnant women had iron deficiency (ferritin level lower than 30µg/L) and 52% of Palestinian pregnant women had (serum ferritin lower than 15µg/L) (22, 23). In addition, a study in France revealed that 60% of pregnant women were at risk of iron deficiency (24). Moreover, a study in Baghdad-Iraq found that 79% of anemic pregnant women were due to iron deficiency by measurement of serum ferritin level (25). Another study in Al-Yarmouk Teaching Hospital in Baghdad confirmed that iron deficiency anemia is the most common cause of anemia during pregnancy (26).

Conclusion

The prevalence of anemia among non-supplemented pregnant women was significantly higher than supplemented pregnant women. The majority of anemia cases were mild. Factors such as: age, occupation, lower level of education, no activity, body mass index, blood pressure and gestational age were associated with anemia among supplemented pregnant women. Most of the anemic cases in our result were iron deficient.

Author's contributions:

Aras Q. Pirot: Master student. data analysis, data collection and writing the paper.

Sardar M. Weli: Supervisor: writing proposal of the work, review the writing and helped the student for data collection and data analysis.

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انتشار فقر الدم وعوامل الخطر الخاصة به بين الحوامل اللواتي يأخذن المكملات واللواتي لا يأخذنها في مدينة السليمانية - كردستان العراق

ناراس قادر بيروت
أ.م.د. سردار محمد ولي

الخلاصة:
الخلفية: فقر الدم هو مشكلة صحية عامة عالمية خطيرة تؤثر بشكل خاص على النساء الحوامل.
الهدف: معرفة مدى انتشار فقر الدم وعوامل الخطر المرتبطة به بين النساء الحوامل اللواتي يأخذن المكملات واللواتي لا يأخذنها.
الحالات والمنهجية: جمعت ستمائة وواحد وأربعين عينة عشوائياً من النساء الحوامل (الحالات) وغير الحوامل (العينة الضابطة). تم جمع البيانات المتعلقة بالعمر والتعليم والإقامة والعوامل المتعلقة بالتاريخ التوليدي. وبعد ذلك، تم جمع 5 مل من الدم الوريدي من كل امرأة حامل لتعداد الدم الكامل، وحديد المصل، وفيريتين المصل، وحمض الفوليك، وفيتامين ب 12.
النتائج: وجدت هذه الدراسة أن 74.2٪ و 34.9٪ من النساء الحوامل اللواتي لا يأخذن المكملات واللواتي يأخذنها على التوالي مصابات بفقر الدم. تؤثر عوامل مثل عمر الحمل وعدد مرات الحامل وتاريخ الإجهاض وفترات الولادة والعمر والمهنة ومستوى التعليم ومؤشر كتلة الجسم ودخل الأسرة وضغط الدم بشكل كبير على معدل فقر الدم. كان هناك إرتباط بين معدل فقر الدم بين النساء الحوامل على المكملات وبدونها وجميع العوامل. كانت النسبة الطبيعية للفيريتين في الدم منخفضة جدا. 16.5٪ و 38.4٪ على التوالي بين النساء الحوامل المصابات بفقر الدم بدون المكملات وبالمكملات.
الإستنتاجات: كان انتشار فقر الدم مرتفعا جدا بين النساء الحوامل اللواتي لا يأخذن المكملات مقارنة بالنساء اللواتي يأخذنها في مدينة السليمانية في كردستان العراق. كانت عوامل الخطر المرتبطة بفقر الدم هي عمر المرأة الحامل، وعمر الحمل، وعدد الأحمال، والوضع الوظيفي، ومستوى التعليم، ومؤشر كتلة الجسم، والنشاط اليومي وضغط الدم.
الكلمات المفتاحية: فقر الدم، الحوامل على المكملات، الفيريتين المصلي.