

Factors Affecting Knowledge and Attitude Regarding Iron Deficiency Anemia in Pregnancy among Pregnant Females

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Abstract:

Objective: Objective of this study is to determine the knowledge and attitude of pregnant women regarding iron deficiency anemia.

Methodology: Two analytical designs were combined in this study which is cross sectional survey and qualitative inquiry. Total no. of 1230 cases was included in the study. Study was conducted in department of Obstetrics and Gynecology Nishtar Hospital Multan, Quid e Azam Medical College, Bahawalpur and Azra Naheed Medical College, Lahore from May 2016 to September 2017. A questionnaire was developed that was divided into three major parts covering demographic data, awareness and approach of women during pregnancy about iron deficiency anemia. Blood samples were collected from all participants and complete blood count (CBC) was conducted for all pregnant women. All the patients were divided into two groups after being diagnosed as iron deficiency anemia or non iron deficiency anemia group IDA and group non-IDA respectively. Multiple demographic variables and possible risk factors regarding knowledge attitude and practice were determined by using predesigned questionnaire. Data thus obtained through questionnaire and blood testing was subjected to statistical analysis by using SPSS computer software version 23. Chi square test was applied to check the significance of different variables and incidence of iron deficiency anemia. P value less than 0.05 was considered as significant.

Results: Overall, 100% (n=1230) female patients were included, in this study; divided into two groups i.e. IDA 67% (n=824) and non-IDA 33% (n=406) patients. High level of knowledge was reported by IDA group of the participants and non-IDA groups of the participants, in regard to the knowledge towards IDA. Significant difference was found between the questions, in both the groups. It is important to note that high level of knowledge was found, for all aspects related to IDA, among non-IDA group of the study population, thus reflected an acceptable level of knowledge among the study population in general. No significant difference was found between demographic and clinical variables, in groups, except health problems (p=0.000). High positive attitude was found of non-IDA group as compare to IDA group. Significant difference was found between attitudes towards IDA, in groups.

Conclusion:

From this study it is concluded that despite provision of primary health care in accord to international recommendations, level of knowledge and attitude regarding iron deficiency among pregnant women anemia is still deficit and requires further conduction of educational programs to enhance public awareness.

Keywords: Knowledge, Attitude, Anemia, Pregnancy, Iron Deficiency

Introduction:

Anemia is a condition which diagnostically refers to decreased number of red blood cells (1). It comprises the conditions in which body is incapable of producing healthy RBC's, destruction of too many RBC's, or loss of circulating RBC's. It is a circumstance of having amount of RBC's lower than normal or lower quantity of hemoglobin. There is reduction of ability of blood to carry oxygen during anemia. Patients suffering from anemia feel tired and fatigued, develop trembling, appear pale and have short breath (2). Children having chronic anemia are susceptible to infections and learning difficulties. The most common causes of anemia are hemorrhage, hemolysis, lower production of RBC's and normal hemoglobin (3). In women unlikely to men there are more chances of anemia due to blood loss during menstruation (4).

According to WHO, if a woman during pregnancy has level of hemoglobin less than 11gm/dl, she is said to have anemia while in case of less than 7gm/dl it is said to be severe (5). The anemia is defined as hemoglobin level less than 11gm/dl in first and third trimester by The Center for Disease Control and Prevention (1990) (6). Generally in pregnancy, erythroid hyperplasia of the bone marrow takes place and hence the number of RBC's is increased. Conversely, unbalanced increase in volume of plasma causes hydremia (hemodilution). Hct reduces from b/w 38 and 45% in non-pregnant healthy women to 34% through late single fetal pregnancy and to about 30% through late multifetal pregnancy. So during pregnancy, anemia is said to be Hct < 30%. Women are treated

prophylactically due to consequent hemodilution usually decreases Hb to less than 10g/dl, if Hb is less than 11.5g/dl at the onset of pregnancy. In spite of hemodilution, during pregnancy the oxygen carrying capacity of blood remains normal. Hct normally rises instantaneously after birth (7). One third of women in pregnancy suffer from anemia during third trimester. Most familiar causes of anemia are; iron deficiency (8), folate deficiency (9), must assess the patients who usually reject transfusion of blood and in consultation with a primatologist. There are no specific early symptoms of anemia such as that of fatigue, tiredness, dyspnea during physical work. Other signs and symptoms involve pallor and in case of severe anemia tachycardia and hypotension. There are high threats of preterm child birth and postpartum maternal infections (10).

Prevalence of anemia in women during pregnancy ranges from 35-81% in developing countries (11). However, prevalence reported for severe form of anemia is lower than 2-7% in developing countries. Iron deficiency anemia is a serious public health problem affecting more than 700 million people in the world (12). Rationale of this study is to assess the factors affecting knowledge and attitude of pregnant women regarding anemia as very few literature has been published regarding this concern. This study will focus on these social and environmental factors which have great impact on prevalence of anemia in pregnancy especially iron deficiency anemia and results of this study can help improve social conditions as well as better counseling of patients during antenatal care. Reference for this study was obtained from a previous study conducted by Abu Hasira et al (13).

Materials and Methods:

Two analytical designs were combined in this study which is cross sectional survey and qualitative inquiry. Total no. of 1230 cases was included in the study. Study was conducted in department of Obstetrics and Gynecology Nishtar Hospital Multan Quid e Azam Medical College, Bahawalpur and Azra Naheed Medical College, Lahore from May 2016 to September 2017. Ethical approval was obtained from the Hospital Ethics Committee. Sample size was calculated using non probability sampling technique from the reference article (13). The sample for the study constituted pregnant women who visited governmental MCH centers, in the age group of 17-41 years during 2nd and 3rd trimester. Women unwilling to participate were excluded from the study. A questionnaire was developed that was divided into three major parts covering demographic data, awareness and approach of women during pregnancy about iron deficiency anemia.

Random samples were dispersed and used again for this purpose for the verification of steadiness. On the basis of suggestions of controller and other specialists of the field, alterations were made relating to the validity of questionnaire. Blood samples were collected from all participants and complete blood count (CBC) was conducted for all pregnant women. Based on hemoglobin level, all samples with a value less than 10.5 g/dL (second trimester) and less than 11 g/dL (third trimester) were considered to be at risk and were subjected to serum ferritin test. Blood samples were drawn by the person conducting this research and then transferred in ice box to central lab of Nishtar Hospital for analysis. Complete blood count, serum ferritin test was performed to confirm iron deficiency anemia. All the patients were divided into two groups after being diagnosed as iron deficiency anemia or non iron deficiency anemia group IDA and group non-IDA respectively. Multiple demographic variables and possible risk factors regarding knowledge attitude and practice were determined by using predesigned questionnaire.

Data thus obtained through questionnaire and blood testing was subjected to statistical analysis by using SPSS computer software version 23. Chi square test was applied to check the significance of different variables and incidence of iron deficiency anemia. P value less than 0.05 was considered as significant.

Results:

Overall, 100% (n=1230) female patients were included, in this study; divided into two groups i.e. IDA 67% (n=824) and non-IDA 33% (n=406) patients. The mean age, family members, age at marriage, age at first pregnancy, number of pregnancies, spacing and birth weight of last baby was 25.64±3.10 years, 4.97±1.63 members, 21.93±1.97 years, 24.08±2.35 years, 3±1.29 pregnancies, 1.96±1.13 years and 2.92±1.23 kg respectively. While, the mean age, family members, age at marriage, age at first pregnancy, number of pregnancies, spacing and birth weight of last baby was 25.74±3.22 years, 4.98±3.22 members, 21.92±1.97 years, 23.89±2.31 years, 2.96±1.17 pregnancies, 2.04±0.05 years and 2.92±1.23 kg respectively. There were 38%

(n=313) IDA patients lived in urban areas, while 62% (n=511) lived in rural areas. Whereas, there were 38.4% (n=156) non-IDA patients lived in urban areas, while 61.6% (n=250) lived in rural areas. There were 55.9% (n=461) IDA patients were educated, while 44.1% (n=363) were un-educated. Whereas, there were 51.2% (n=208) non-IDA patients were educated, while 48.8% (n=198) were un-educated. Working status observed as 68.4% (n=564) and 70.2% (n=285) for IDA and non-IDA patients respectively. There were 53.3% (n=439) IDA patients had low income and 46.7% (n=385) patients had high income, while there were 50.5% (n=205) non-IDA patients had low income and 49.5% (n=201) had high income. 41% (n=338) IDA patients had 2nd trimester, and 59% (n=486) had 3rd trimester. Whereas, 36.9% (n=150) non-IDA patients had 2nd trimester, and 63.1% (n=256) had 3rd trimester. 27.9% (n=230) IDA patients were suffering from health problems while, 66.7% (n=271) non-IDA patients were suffering from health problems. There were 11.3% (n=93) IDA patients were smokers, while 11.8% (n=48) non-IDA patients were smokers. There were 60.1% (n=495) IDA patients previous used iron supplements, while it was 60.8% (n=247) of non-IDA patients. There were 63.6% (n=524) IDA patients currently used iron supplements, while it was 63.3% (n=257) of non-IDA patients. No significant difference was found between demographic and clinical variables, in groups, except health problems (p=0.000) (Table. 1).

Table 2 represented a set of questions asked in order to evaluate knowledge towards IDA of the respondents of the current study. High level of knowledge was reported by IDA group of the participants and non-IDA groups of the participants, in regard to the knowledge towards IDA. Significant difference was found between the questions, in both the groups. It is important to note that high level of knowledge was found, for all aspects related to IDA, among non-IDA group of the study population, thus reflected an acceptable level of knowledge among the study population in general.

Data presented in Table 3, represent a set of questions used to evaluate the attitude of pregnant women enrolled in the study towards IDA. High positive attitude was found of non-IDA group as compare to IDA group. Significant difference was found between attitudes towards IDA, in groups.

Table. 1

Demographic and clinical variables

Variable	IDA n=(824)	Non-IDA n=(406)	Test of Sig.
Age	25.64±3.10 years	25.74±3.22 years	t=-0.560 p=0.576
family members	4.97±1.63 members	4.98±3.22 members	t=-0.169 p=0.866
age at marriage	21.93±1.97 years	21.92±1.97 years	t=0.101 p=0.920
age at first pregnancy	24.08±2.35 years	23.89±2.31 years	t=1.38 p=0.168
number of pregnancies	3±1.29 pregnancies	2.96±1.17 pregnancies	t=1.009 p=0.313
Spacing	1.96±1.13 years	2.04±0.05 years	t=-1.261 p=0.207
birth weight	2.92±1.23 kg	2.92±1.23 kg	t=0.013 p=0.989
Area	Rural=62%, Urban=38%	Rural=61.6%, Urban=38.4%	χ²=0.022 p=0.882
Education Status	Educated=55.9%, Un-edu=44.1%	Educated=51.2%, Un-edu=48.8%	χ²=2.44 p=0.118
Working Status	Yes=68.4%	Yes=70.2%	χ²=0.390 p=0.532
Income Status	Low=53.3%, High=46.7%	Low=50.5%, High=49.5%	χ²=0.845 p=0.358

Stages of Pregnancy	2 nd trimester=41%, 3 rd trimester=59%	2 nd trimester=36.9%, 3 rd trimester=63.1%	$\chi^2=1.88$ p=0.170
Health problems	Yes=27.9%	Yes=66.7%	$\chi^2=169.9$ p=0.000
Smoking status	Smokers=11.3%	Smokers=11.8%	$\chi^2=0.077$ p=0.781
previous used iron supplements	Yes=60.1%	Yes=60.8%	$\chi^2=0.066$ p=0.797
currently used iron supplements	Yes=63.6%	Yes=63.3%	$\chi^2=0.010$ p=0.920

Table. 2

Knowledge towards IDA among study population

Question		IDA n=(824)		Non-IDA n=(406)		P-value
Q1. What's anemia?		n	%	N	%	
Poor Nutrition	Yes	410	49.8%	345	84.9%	0.000
	No	414	50.2%	204	15.1%	
Iron deficiency	Yes	396	48.1%	320	78.8%	0.000
	No	428	51.9%	86	21.2%	
Low Hb level	Yes	285	34.6%	350	86.2%	0.000
	No	539	65.4%	56	13.8%	
Q2. Symptoms of anemia						
Exceptional shortness of breath	Yes	244	29.6%	302	74.4%	0.000
	No	580	70.4%	104	25.6%	
Fatigue	Yes	253	30.7%	322	79.3%	0.000
	No	571	69.3%	84	20.7%	
General weakness	Yes	247	30.1%	299	73.6%	0.000
	No	577	69.9%	107	26.4%	
loss of appetite	Yes	246	30%	254	62.6%	0.000
	No	578	70%	152	37.4%	
Dizziness and fainting	Yes	302	36.7%	366	90.1%	0.000
	No	522	63.3%	40	9.9%	
Headache	Yes	466	56.6%	356	87.7%	0.000
	No	358	43.4%	50	12.3%	
Pallor of face, lips and nail beds	Yes	349	42.4%	299	73.6%	0.000
	No	475	57.6%	107	26.4%	
Q3. Causes of anemia						
Poor nutrition	Yes	233	28.3%	350	86.2%	0.000

	No	591	71.7%	56	13.8%	
Bleeding during pregnancy	Yes	276	33.5%	245	60.4%	0.000
	No	548	66.5%	161	39.6%	
Multiple pregnancies, and spacing	Yes	401	48.7%	326	80.1%	0.000
	No	423	51.3%	80	19.9%	
Age at pregnancy	Yes	235	28.5%	299	73.6%	0.000
	No	589	71.5%	107	26.4%	
Uses of contraceptives	Yes	309	37.5%	350	86.2%	0.000
	No	515	62.5%	56	13.8%	
Q4. Importance of iron supplements						
Woman health	Yes	556	67.5%	399	98.3%	0.000
	No	258	32.5%	7	1.7%	
Prevent anemia	Yes	234	28.4%	288	70.9%	0.000
	No	590	71.6%	118	29.1%	
Baby's health	Yes	316	38.4%	305	75.1%	0.000
	No	508	61.6%	101	24.9%	
Q5. Impact of anemia in women						
Postpartum anemia	Yes	466	56.6%	326	80.1%	0.000
	No	385	43.4%	80	19.9%	
Preterm birth	Yes	432	52.4%	299	73.6%	0.000
	No	392	47.6%	107	26.4%	
Low birth weight	Yes	521	63.2%	399	98.3%	0.000
	No	303	36.8%	7	1.7%	
Complications during delivery	Yes	466	56.6%	299	73.6%	0.000
	No	358	43.4%	107	26.4%	
Susceptibility to infections	Yes	278	33.7%	320	78.8%	0.000
	No	546	66.3%	86	21.2%	
Fetal death	Yes	205	24.9%	350	86.2%	0.000
	No	619	75.1%	56	13.8%	
Abortion	Yes	322	39.1%	399	98.3%	0.000
	No	502	60.9%	7	1.7%	
Q6. Iron-rich food sources						
Red meat	Yes	456	55.3%	302	74.4%	0.000
	No	368	44.7%	104	25.6%	
Liver	Yes	542	65.8%	322	79.3%	0.001
	No	282	34.2%	84	20.7%	
Chicken	Yes	364	44.2%	299	73.6%	0.000
	No	460	55.8%	107	26.4%	
Fish	Yes	266	32.3%	254	62.6%	0.000
	No	558	67.7%	152	37.4%	
Eggs	Yes	556	67.5%	326	80.1%	0.000
	No	258	32.5%	80	19.9%	
Legumes	Yes	234	28.4%	302	74.4%	0.000

	No	590	71.6%	104	25.6%	
Fruits	Yes	316	38.4%	299	73.6%	0.000
	No	508	61.6%	107	26.4%	
Vegetables	Yes	542	65.8%	299	73.6%	0.000
	No	282	34.2%	107	26.4%	
Q7. Iron supplements / absorption and side effects						
Use of iron after meal decreases heartburn and vomiting	Yes	364	44.2%	322	79.3%	0.000
	No	460	55.8%	84	20.7%	
Tea, coffee, and milk reduce iron absorption	Yes	316	38.4%	299	73.6%	0.000
	No	508	61.6%	107	26.4%	
Fruit juice increase iron absorption	Yes	266	32.3%	254	62.6%	0.000
	No	558	67.7%	152	37.4%	
Anti-acids reduce iron absorption	Yes	456	55.3%	326	80.1%	0.000
	No	368	44.7%	80	19.9%	
Q8. Spacing						
Best Period	< 2 years	325	39.4%	99	24.4%	0.054
	2 years	211	25.6%	203	50%	
	3 years	209	25.4%	90	22.2%	
	>3 years	79	9.6%	14	3.4%	
Q9. Source of information about anemia						
Maternal care centers	Yes	364	44.2%	299	73.6%	0.000
	No	460	55.8%	107	26.4%	
Leaflets (MCH)	Yes	205	24.9%	254	62.6%	0.000
	No	619	75.1%	152	37.4%	
Media	Yes	266	32.3%	326	80.1%	0.000
	No	558	67.7%	80	19.9%	
Lectures	Yes	322	39.1%	399	98.3%	0.000
	No	502	60.9%	7	1.7%	

Table. 3

Attitude towards IDA among study population

Attitudes		IDA n=(824)		Non-IDA n=(406)		P-value
		n	%	n	%	
Q1. Importance of regular visits to MCH centers	Yes	364	44.2%	299	73.6%	0.000
	No	460	55.8%	107	26.4%	
Q2. Use of iron	Yes	466	56.6%	299	73.6%	0.000

supplements daily approval	No	358	43.4%	107	26.4%	
Q3. Approval of early marriage	Yes	349	42.4%	254	62.6%	0.000
	No	475	57.6%	152	37.4%	
Q4. Approval of multiple pregnancies	Yes	396	48.1%	299	73.6%	0.000
	No	428	51.9%	107	26.4%	
Q5. Use of contraceptives	Yes	285	34.6%	254	62.6%	0.000
	No	539	65.4%	152	37.4%	
Q6. Pregnancy in older age	Yes	556	67.5%	326	80.1%	0.004
	No	258	32.5%	80	19.9%	
Q7. Do you agree that iron supplements affect mother and fetus' health	Yes	234	28.4%	302	74.4%	0.000
	No	590	71.6%	104	25.6%	
Q8. Importance of regular visits to MCH centers after delivery	Yes	316	38.4%	302	74.4%	0.000
	No	508	61.6%	104	25.6%	
Q9. Approval of tea drinking with meals	Yes	364	44.2%	322	79.3%	0.000
	No	460	55.8%	84	20.7%	
Q10. Approval of taking iron supplements with fruit juice	Yes	456	55.3%	299	73.6%	0.000
	No	368	44.7%	107	26.4%	
Q11. Approval of taking iron supplements after eating	Yes	349	42.4%	299	73.6%	0.000
	No	475	57.6%	107	26.4%	
Q12. Approval of use of three regular meals	Yes	456	55.3%	254	62.6%	0.031
	No	368	44.7%	152	37.4%	

Discussion:

In this study we compared the knowledge and attitude of women about anemia during pregnancy in urban, and rural areas. The women living near the health services and those who worked with public servants and are educated have better knowledge about the anemia in pregnancy. Knowledge about anemia had a positive impact on the practices to manage and stop the anemia. The effects of unawareness on the health behaviors and the outcomes have been underlined previous studies. For example, interventions in prevention and management of the malaria heavily depend upon the level of awareness and status of knowledge of the women in the Nigeria (1, 2, 3 and 4). Studies in different areas approve the same link between the applications of public health mediation and educational prominence of the proposed clientele (5, 6 and 7).

Early age marriages seem to be the main reason IDA of lower iron stores in the body at the young age (8). Poor dietary status, lesser time gaps of pregnancies, multiple pregnancies or too much bleeding from vagina are the causes of IDA among the women (9). There is higher requirement of iron among the pubescent girls because of expansion of blood associated with the growth and menstruation (10). Iron deficiency anemia during pregnancy;

Scholl and Hediger reported to be mainly associated with the multiple pregnancies, poor socioeconomic status, smoking and extremes of maternal age, all of these become a cause of poor outcomes of pregnancy (11). Higher prevalence of IDA was reported in few rural areas of Jordan (12). Hb and Hct level remain lower among the pregnant women not taking iron supplement during 3rd trimester.

Conclusion:

From this study it is concluded that despite provision of primary health care in accord to international recommendations, level of knowledge and attitude regarding iron deficiency among pregnant women anemia is still deficit and requires further conduction of educational programs to enhance public awareness.

Conflict of Interest:

NIL

Funding Source:

Nil

References:

- 1- Cappellini MD, Motta I. Anemia in clinical practice—definition and classification: does hemoglobin change with aging?. In Seminars in hematology 2015 Oct 31 (Vol. 52, No. 4, pp. 261-269). WB Saunders.
- 2- Chakraborty P, Bhattacharyya I. Empowering adolescent girls against anemia in West Bengal, India (1014.6). The FASEB Journal. 2014 Apr 1;28(1 Supplement):1014-6.
- 3- Kassebaum NJ, Jasrasaria R, Naghavi M, Wulf SK, Johns N, Lozano R, Regan M, Weatherall D, Chou DP, Eisele TP, Flaxman SR. A systematic analysis of global anemia burden from 1990 to 2010. Blood. 2014 Jan 30;123(5):615-24.
- 4- Adamu AL, Crampin A, Kayuni N, Amberbir A, Koole O, Phiri A, Nyirenda M, Fine P. Prevalence and risk factors for anemia severity and type in Malawian men and women: urban and rural differences. Population health metrics. 2017 Mar 29;15(1):12.
- 5- Stevens GA, Finucane MM, De-Regil LM, Paciorek CJ, Flaxman SR, Branca F, Peña-Rosas JP, Bhutta ZA, Ezzati M, Nutrition Impact Model Study Group. Global, regional, and national trends in haemoglobin concentration and prevalence of total and severe anaemia in children and pregnant and non-pregnant women for 1995–2011: a systematic analysis of population-representative data. The Lancet Global Health. 2013 Jul 31;1(1):e16-25.
- 6- US Department of Health and Human Services. Healthy People 2000: National Health Promotion and Disease Prevention Objectives-Nutrition Priority Area. Nutrition Today. 1990 Nov 1;25(6):29-39.
- 7- Goswami TM, Patel VN, Pandya NH, Mevada AK, Desai KS, Solanki KB. Maternal anaemia during pregnancy and its impact on perinatal outcome. Int J Biomed Adv Res. 2014;5(02):99-102.
- 8- Camaschella C. Iron-deficiency anemia. New England Journal of Medicine. 2015 May 7;372(19):1832-43.
- 9- Czeizel AE, Dudás I, Vereczkey A, Bánhidly F. Folate deficiency and folic acid supplementation: the prevention of neural-tube defects and congenital heart defects. Nutrients. 2013 Nov 21;5(11):4760-75.
- 10- Bedi R, Acharya R, Gupta R, Pawar S, Sharma R. Maternal factors of anemia in 3rd trimester of pregnancy and its association with fetal outcome. International multispeciality journal of health (IMJH). 2015;1:7.
- 11- Addis Alene K, Mohamed Dohe A. Prevalence of anemia and associated factors among pregnant women in an urban area of Eastern Ethiopia. Anemia. 2014 Aug 25;2014.
- 12- Dawood HS, Parakash P, Shubber KM. Iron deficiency anemia among pregnant Arab women in Kuwait. The Journal of the Kuwait Medical Association; 24 (2). 1990:167-72.
- 13- Abu-Hasira AW. Iron deficiency anemia among pregnant women in Nablus district; prevalence, knowledge, attitude and practices. An-Najah National University Faculty of Graduate Studies Nablus, Palestine. 2007;27(03).
- 14- (1)Onyeneho NG, Subramanian SV. Anemia in pregnancy: Factors influencing knowledge and attitudes among mothers in southeastern Nigeria. Journal of Public Health. 2016 Aug 1;24(4):335-49.

- 15- Okeibunor JC, Orji BC, Brieger W, Ishola G, Rawlins B, Ndekhedehe EU, Onyeneho N, Fink G. Preventing malaria in pregnancy through community-directed interventions: evidence from Akwa Ibom State, Nigeria. *Malaria journal*. 2011 Aug 5;10(1):227.
- 16- Okonofua F. Reducing maternal mortality in Nigeria: An approach through policy research and capacity building. *African Journal of Reproductive Health*. 2010;14(3):9-14.
- 17- Ekanem EI, Agan TU, Efiok EE, Ekott MI, Okodi E. A study of anemia in women with asymptomatic malaria parasitaemia at their first antenatal care visit at the General Hospital, Ikot Ekpene, Akwa Ibom State, Nigeria. *Asian Pacific Journal of Tropical Medicine*. 2010 Aug 1;3(7):567-70.
- 18- Balarajan Y, Ramakrishnan U, Özaltın E, Shankar AH, Subramanian SV. Anaemia in low-income and middle-income countries. *The lancet*. 2011 Dec 17;378(9809):2123-35.
- 19- Goonewardene M, Shehata M, Hamad A. Anaemia in pregnancy. *Best practice & research Clinical obstetrics & gynaecology*. 2012 Feb 29;26(1):3-24.
- 20- Bencaiova G, Burkhardt T, Breymann C. Anemia—prevalence and risk factors in pregnancy. *European journal of internal medicine*. 2012 Sep 30;23(6):529-33.
- 21- English RM, Bennett SA. Iron status of Australian children. *The Medical journal of Australia*. 1990 Jun;152(11):582-6.
- 22- Hoffman JA. Iron deficiency anemia: An update. *The Journal of Perinatal & Neonatal Nursing*. 1993 Mar 1;6(4):13-20.
- 23- Dallman PR. Changing iron needs from birth through adolescence. In *Nestle nutrition workshop series (USA)* 1992.
- 24- Scholl TO, Hediger ML. Anemia and iron-deficiency anemia: compilation of data on pregnancy outcome. *The American journal of clinical nutrition*. 1994 Feb 1;59(2):492S-500S.
- 25- Husni SF. Prevalence of iron deficiency anemia during pregnancy in Jordan. *Journal of the Arab board of medical specializations* Vol. 2001;3.