http://www.ljmr.com.ly/ eISSN:2413-6096

Original Article

Prevalence of anemia associated with risk factors among pregnant and non-pregnant women attending Zawia hospital

Khaled Alawaini[1] Hanan Thwer[1], Suhaela Twair[2] and Mustafa Abugila[1]

1- Phd, Memorial University, biochemistry department, Canada.

2- Faculty of Medical Technology, University of Zawia. Zawia, Libya and National Medical Research Centre,Zawia, Libya.Head, Biochemistry and Clinical Biochemistry department, faculty of pharmacy, University of Tripoli, Libya

Abstract:

Anemia is a common health problem in women in developing countries since anemia is more common in women than men due to physiological processes. This study was conducted in Zawia area and included 210 women of childbearing age (18-45years) who were visiting Zawia teaching hospital. After filing the questionnaire, blood samples were taken and analyzed for hematological and biochemical profiles. Biochemical tests included serum iron, ferritin, and total-iron binding capacity. Among the total sample (210women), there were 87(41.4%) pregnant and 123 (58.6%) non-pregnant women (including married and single). Pregnant women (87) were classified according to the gestational age into first, second, and third trimesters. Out of 87 pregnant women, there were 7 (8.04%) pregnant women in the first trimester,34 (39.1%) in the second trimester, and 46 (52.9%) pregnant women in the third trimester. The mean biochemical and hematological parameters in the studied samples were: Hb = 10.37± 2.03 g /dl, serum iron = 61.86 ± 40. 28 µg / dl, TIBC = 386.01 ± 94.91 µg / dl, serum ferritin = 29.45 ± 30.59 ng / ml and RBC = 3.78 ± 1.03 m /cmm. This study considers that women with hemoglobin below 11.5g/dl are anemic. 89.1%, 69.5%, and 47.8% of pregnant women who belonged in the third trimester had low Hb, serum iron, and ferritin, i.e., iron deficiency anemia was more common in the third trimester among the first and the second trimester. Third-trimester pregnant women also had higher TIBC than in the first and second trimesters. We have compared pregnant and non-pregnant women regarding hematological and biochemical parameters. We found that 85%, 65.3% and 36.7% of pregnant women have low Hb, serum iron, and ferritin.This study showed that 45 (21.5%) out of 210 women (The whole samples) had iron deficiency anemia. i.e., 21.5% of women included in this study in Zawia area had iron deficiency anemia. Among 45 women with iron deficiency anemia, 30 (66.6%) were pregnant, and 15 (33.3%) were non-pregnant. Therefore, the prevalence of iron deficiency anemia was higher in pregnant than in non-pregnant, which was expected. This study showed the impact of lifestyle on iron absorption in 42.4% of women with low serum iron levels.

Key wards: Hemoglobin, Red blood cells, Total iron-binding capacity.

Citation: Alawaini K, Thwer H, Twair S, Abugila M.Prevalence of anemia associated with risk factors among pregnant and non-pregnant women attending Zawia hospital Libya J Med Res. 2022;16(1):135-144
https://doi.org/10.26719/LJMR.19.049 **Received**: 10/05/2022; **accepted**: 29/05/2022; **published**: 30/06/2022

Introduction:

Anemia is a significant health problem affecting the population of 1.62 (24.8%) billion people worldwide. Anemia is characterized by reductions in hemoglobin concentration, red-cell count, or packed-cell volume (1). Moreover, *anemia* is defined as hemoglobin below 11.5 g/dL in adult females or hematocrit of less than 36% in adult females (2). One of the most important causes of anemia could be poor nutrition. Therefore, deficiency of the essential nutrients such as iron, folic acid, vitamin B12, vitamin B6, vitamin C, and proteins can lead to anemia (3). or other factors such as bacterial or parasite diseases. An average iron in the body contains 3-5 grams. A diet could supply up to 15 mg of iron per day. The acidic environment helps iron absorption. As a result, administration of acidic compounds, such as ascorbic acid. After absorption, iron is transported into the bone marrow to produce red blood cells. However, excess iron is stored in the liver as ferritin (4). The prevalence of ID was estimated to be between 20%-80% worldwide. In Africa, ID ranges from 53%–to 61% (5). The amount of iron required each day to compensate for bodily losses and growth varies with age and sex. Women need an additional 1mg of iron a day during their reproductive years to make up for menstrual losses (about 50 ml blood /month) (6). Factors that cause anemia include iron deficiency, worm infection, frequent labour bleeding, gastric ulcers, aspirin, and poor nutrition. In addition, factors that reduce iron absorption include (tea, coffee, bran, and egg yolk) and enhancers (meat, dairy products, and ascorbic acid) on iron absorption and iron stores (7). In pregnancy, the most cause of anemia is iron deficiency (ID). Anemia in pregnancy increases the risk of maternal and perinatal mortality, whereas mothers can lead to other complications such as adverse health effects for the mother, including fatigue, disturbance of immune system function, cardiac diseases, and mortality (8).

1- To determine the prevalence of iron deficiency anemia in childbearing women, pregnant and non-pregnant women, and gestational stages of pregnancy in Zawia.

2-To assess the iron deficiency risk factors leading to iron deficiency anemia.

Blood samples were taken and tested for biochemical and hematological parameters such as CBC, blood film, serum iron, ferritin, and total iron-binding capacity (TIBC). Questionnaires contain different data completed for each subject, including personal data (name, address, age, nationality), and other data (age of gestation, data on variables of interest including drinking tea status, education, diet, data were collected from each subject. A cross-sectional study was conducted among pregnant women from February 2017 to June 2017. The data on determinant factors were collected using a structured questionnaire. Data was entered and analyzed using SPSS version 23 statistical software. Bivariate and multivariate regressions were computed, and the odds ratio was determined at a 95% confidence interval.

Methods: Blood Samples were collected from 210 women who attended Zawiya teaching hospital and the 2nd of March polyclinic. Five (5) ml of venous blood samples were taken to separate plasma and serum. The plasma was separated using an EDTA tube, while a plain tube separated serum. Each tube was given a number and labelled by name, time of collection, and collection place.

Hematological analysis:

Complete blood count (CBC). Blood samples were transferred to the hospital laboratory for CBC (complete blood count) and blood film; the CBC was analyzed using sysmax KX21 equipment. All hematological parameters for each subject were recorded

on a strip of paper from the sysmax machine. Each strip of paper was numbered. The time to get one strip ranged from half to one a minute. All obtained data of blood parameters for each woman were stored in the computer. Blood indices such as WBC, RBC, Hb, HCT, MCV, MCH, MCHC, RDW.

Data analysis was performed with computer software (SPSS, Version 14.0, SPSS Inc., Chicago, IL). Chi-Square analysis for independence was used to examine the relationship significance between Hb, different biochemical tests, different gestation ages and the significance of differences in risk characteristics associated with Hb concentrations and iron status markers. The student's T-test was used to compare the means of Hb, Iron and RBC in both pregnant and non-pregnant groups of women.

Results and discussion:

The means of biochemical and hematological parameters in the study sample were as following: Hb was 10.37±2.038 gm/ dl, serum iron= 61.86± 40.288µ g/ dl,TIBC = 386.01± 94.918µg/ dl, serum ferritin = 29.45 ± 30.592ng/ ml and RBC = 3.78 ± 1.037 m/m3 (table 1).

Table1: The mean and ± S.D of the hematological and biochemical parameters in pregnant and non-pregnant women attended Zawia hospital and polyclinic.

Total samples	Hb	Iron	TIBC	Ferritin	RBC
	210	210	153	77	210
Mean	10.37± 2.03	61.86± 40.28	386.01± 4.91	29.45± 30.59	3.78± 1.03

The results showed a high prevalence of anemic patients among pregnant and non-pregnant women; this high number could reflect that more than 50% of them were with low acknowledgement of the causes of anemia as explained by the results of socioeconomic status; in addition, women either usually drink coffee or tea after a meal or did not take iron supplementation regularly.

Table2: *Pregnant and non-pregnant women in each age group.*

Age groups	Pregnant	Non-pregnant	Total	Percentage of the age group
18-25	26	42	68	32.38 %
26-33	30	43	73	34.76%
34-40	20	24	44	20.95%
41-45	11	14	25	11.90 %
Total	87	123	210	100 %

Table2 shows that 73 (34.76%) women (pregnant and non-pregnant) were in the 26- 33 age group, whereas 68 (32.38%) women (pregnant and non-pregnant) belong to the 18- 25 age group. Only 44 women are 34- 40 (20.95%). Twenty-five (25) women (11.90%) women belong to the 41-45 age group, the lowest percentage. The data in Table 2 also shows that the majority141(67%) were between 18-33 years old. However, the minority (33%) are from 34- 45 years old. In the age group 18-33 years, 56 pregnant women *(64.4%) out of 87 pregnant women.* Pregnancy occurred at 18-33 years, which was expected. However, many pregnant women like having babies in the fourth decade.

Table3: *Age of gestation and Hb level*

Anemia is highly prevalent in the different stage of gestation and is particularly prevalent in the third trimester 41(89.13%) out of 46 has low Hb level p<0.01 (Table 3).

Age of gestation	Hb			
	Normal	Low	Hb low %	Total
First trimester	1	6	85.71 %	7
Second trimester	7	27	79.41%	34
Third trimester	5	41	89.13%	46
Non pregnant women	53	70	56.91%	123
Total	66	144	100 %	210

Another study that was carried out on pregnant women in Thailand found that pregnant women in the third trimester had a lower hemoglobin level when compared with the first and second trimesters (9). Table 3 shows that 56.91% of non-pregnant women (including single and married women) have low hemoglobin. In the third trimester, Iron deficiency anemia was observed, possibly due to high iron demand. These results are pretty like to the results of some other studies. As in Kazakhstan, non-pregnant women aged 18-45 years (10).

Table4:*Percentage of low and normal iron in the Pregnant women during pregnancy*

Plasma iron level	**Pregnancy duration**		
	First trimester	Second trimester	Third trimester
Normal	4	20	14
Low	3	14	32
Percentage of low iron	42.85 %	41.17 %	69.56 %

There are significant differences in plasma iron level frequency in different gestational ages. In general, it is significant that in the third trimester, 32 out of 46 have low plasma iron levels $p < 0.001$. (Table 4). The table shows that the highest percentage of low iron (69.56%) was found in the third trimester. The first and the second trimester show a similar percentage (41.17- 42.85%) of iron deficiency. The highest percentage (69.5%) of iron deficiency occurred in the last stage of pregnancy (third- trimester). That may be due to fetal and placental growth, which demand 400 mg of iron, and another 400 mg of iron to compensate for maternal red cell increment (11). The low percentage of low iron in the third trimester could be explained due to the increase in iron requirement for the fetus's growth.

Table5: *Age of gestation and TIBC level during pregnancy*

	Pregnancy duration		
TIBC	First trimester	Second trimester	Third trimester
Normal	3	21	15
High	4	13	28
Low	0	0	3
Percentage of high TIBC	57.14 %	38.23 %	60.86%

Out of 46 women who were in the third trimester, 28 women had high TIBC, i.e., 60.86% of pregnant women in the third trimester had high TIBC (Table5). Thirty-four (34) pregnant women were in the second trimester, and 13 had high TIBC (38.23%). The table shows only 7 women in the first trimester, and 4 had high TIBC. i.e., 57.14% of the first trimester had high TIBC. In the first- trimester, n =7 (only), so the high percentage of high TIBC may be due to a low number of the sample (n = 7).

Table6:*Show percentage of normal and low ferritin during pregnancy stages*.

	Pregnancy duration		
Ferritin level	First trimester	Second trimester	Third trimester
Normal	5	26	24
Low	2	8	22
Percentage of low ferritin	28.5 7%	23.52 %	47.82 %

These results show that 46 pregnant women were in the third trimester, and 47.82% (22 women) had low serum ferritin. Out of 34 pregnant women in the second trimester, 8 (23.52%) women had low serum ferritin.

***Table7**: Percentage of Hb, iron, and ferritin, and percentage of TIBC in different periods of pregnancy*

Period of pregnancy	Low% of Hb	Low% of serum iron	Low% of serum ferritin	High% of TIBC
1st-trimester	85.71	42.85	28.57	**57.14**
2nd-trimester	79.41	41.17	23.52	**38.23**
3rd-trimester	**89.13**	**69.56**	**47.82**	**60.86**

Table 7: shows that pregnant women in the third trimester have a lower percentage of hemoglobin (89.13%), serum iron (69.56%), and serum ferritin (47.82%) than women in the first and second trimester. In the same manner, pregnant women in the third trimester have the highest percentage of TIBC in the first and second trimesters. i.e., a high percentage of TIBC indicates iron deficiency anemia. These data indicate that iron deficiency anemia is more common in the third trimester than in the first and second trimesters; this could be explained due to the development of the fetus. Moreover, the consequence is increasing the requirement for iron and other essential elements in the mother's diet. If the diet is unbalanced, then the mother becomes anemic.

***Table8:** Percentage of Hb, serum iron, ferritin, and TIBC in pregnant and non-pregnant women.*

Type of sample	Low% of Hb	Low% of serum iron	Low% of serum Ferritin	High% of TIBC
Pregnant	85.0	56.32	36.78	**51.72**
Non-pregnant	**56.91**	**26.82**	**13.0**	**20.32**

Table8 shows the low Hb, serum iron, and ferritin percentage in pregnant and non-pregnant women. The same table shows the high percentage of TIBC (indicates IDA) in both samples.85% of pregnant women had low hemoglobin, whereas the percentage in non-pregnant (single and married) was only 56.91%. Similarly, pregnant women have less serum iron and ferritin level than non-pregnant. The percentage of TIBC was higher in pregnant than non-pregnant women and correlates with serum iron, ferritin, and hemoglobin level. i.e., iron deficiency anemia is more prevalent in pregnant women than non-pregnant. These results agree with the results of otherstudies in different countries (9,12,13).

Figure 1 shows the effect of tea drinking on serum iron in the studied samples. We found that 56 out of 132 women showed a low iron level. Lifestyle played a vital role in IDA. Moreover, women who drank tea immediately after the meal showed a lower serum iron level than others(14). These results agree with our expectations. Therefore, healthy food (rich in vitamins) or a doctor's recommendation must be followed to prevent the occurrence of IDA(15).

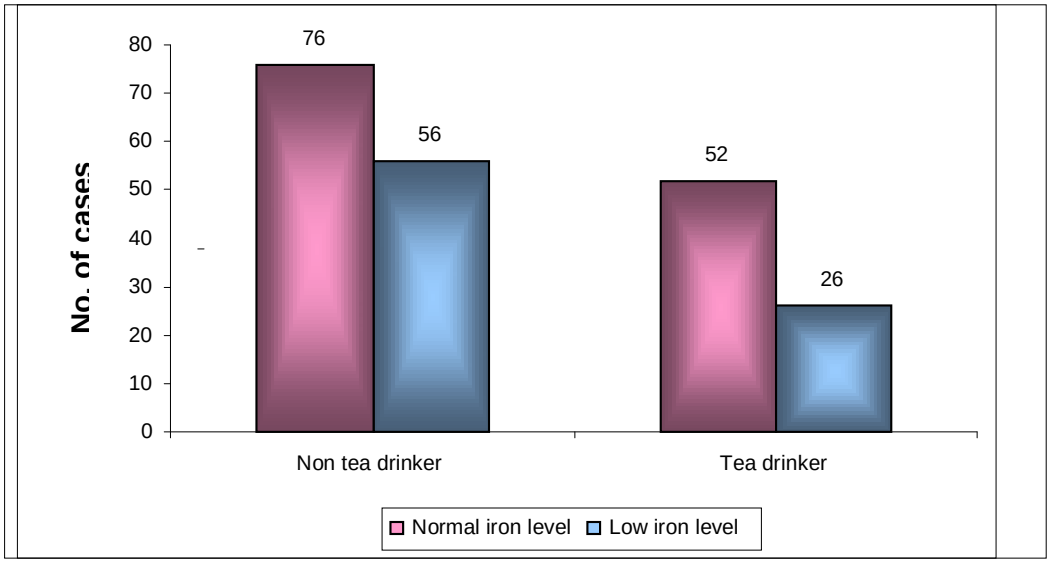

Figure 1: Iron level in tea drinker and non- tea drinker women

The diet and level of education in the studiedsamples

A healthy diet is one of the most influential factors in reducing the incidence of iron deficiency anemia. The level of education is also another essential factor. In the studied samples (210 women), there were 97 women highly educated (46.19%), and 113 women were low educated (53.81). Of the highly educated women (97 women), only 50 women were taking a balanced diet (51.54%). Among low-educated women (113 women), there were only 63 women take a balanced diet (55.7%).

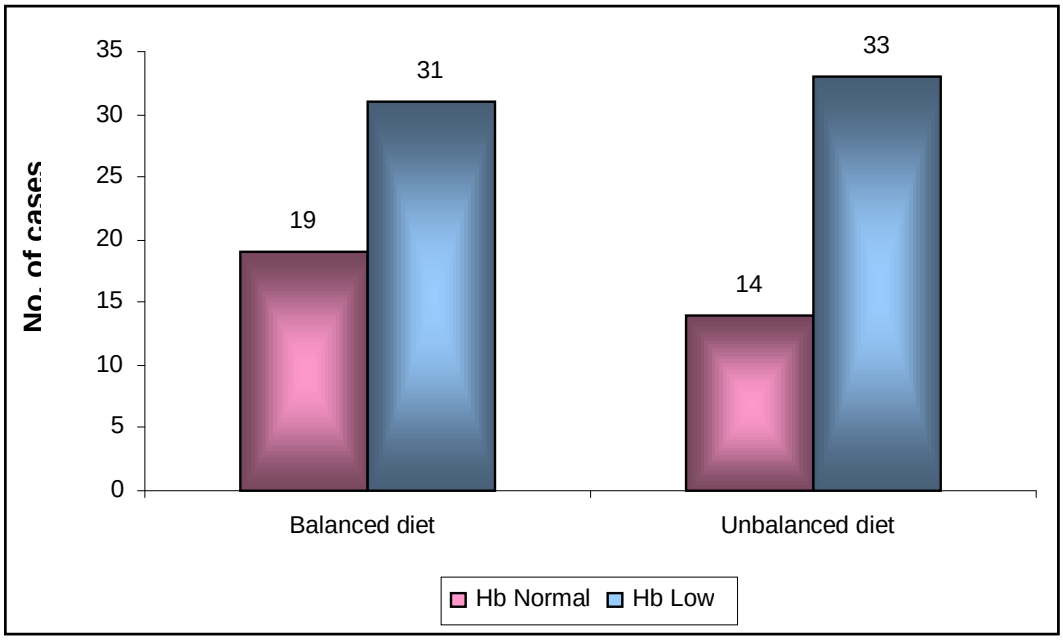

Figure2: Balanced and non-balanced diet among high educated women

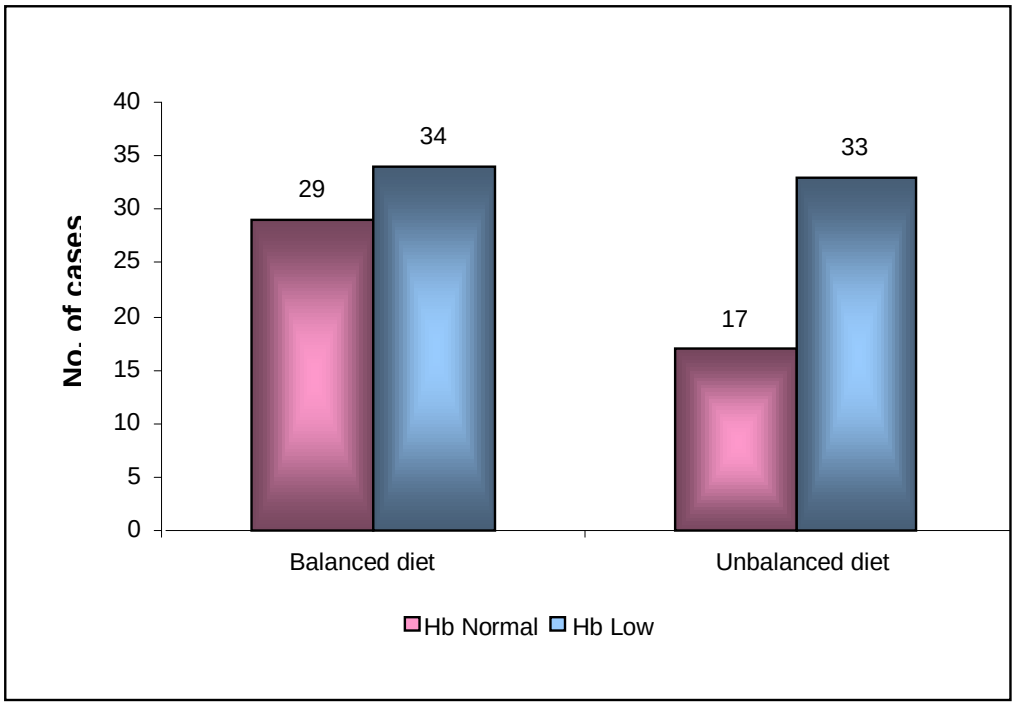

Figure 3: Diet (balanced, Unbalanced) among low educated women and frequency Of Hb (Normal, low)

The socio-economic status of the studied sample (210) certainly is one of the significant factors for the prevalence of iron deficiency anemia.

The data from figures 2 and 3 showed that 51.54% of educated women were on a balanced diet. This high level could be careless in giving correct information while filling the questionnaire in some cases of the studied sample, oranother possible explanation may be a lack of knowledge concerning a balanced diet for some of them. However, 55.75 % of non-educated women have taken a balanced diet which is unexpected.

More attention should be given to increasing health education among the women population. Health visitors or health workers should educate females, especially of childbearing age, about a healthy diet, anemia, and requirements of pregnancy and lactation.

Conclusion

Iron deficiency anemia was more common in the third trimester than in the first and the second trimester. In the third-trimester pregnant women also had high TIBC than first and second trimesters. Pregnant women who were in the third trimester were more anemic due to the development of the fetus, and the consequence is an increase in uptake of iron from the mother; pregnant women should eat a diet rich in iron and folic acid more than other women because the requirement of iron raised in pregnancy. This study showed tea's effect on iron absorption after meals. In drinking tea, women in this study showed decreased serum iron levels. In the highly educated women (97 women), only 50 women were taking a balanced diet (51.54%); among low educated women (113 women), 63women were taking a balanced diet (55.75%). Overall, anemia, especially IDA, was very high among pregnant women in Zawia. Therefore, more attention, regular medical checkups, and a healthy diet should be considered.

References:

1.Ahmed R H. Yussuf A A, Ali A A, Lyow S N, Abdulahi L M, Mohamud M H T.Anemiaamong pregnant women in internally displaced camps in Mogadishu, Somalia: a cross-sectional study on prevalence, severity, and associated risk factors. *BMC Pregnancy and Childbirth* volume 21, Article number: 832 (2021)

2. Kalant, H., Grant, D. M., and Mitchell, J., (2007). Principles of Medical pharmacology, seventh edition, Saundres Elsevier: 537- 539.

3.Steensma, D.P., and Teffer, A., (2007). Anemia in the elderly: how showed be define it, when does it matter, and what can be done. Mayo clinic proceedings.

82(8): 958-966.

4. Noran M. Abu-Ouf, and Mohammed M. Jan. The impact of maternal iron deficiency and iron deficiency anemia on child's health. Saudi Med J. 2015; 36(2): 146–149.

5. Christian Breymann. Seminars in Hematology, Vol 52, No 4, October 2015, pp 339–347

6. Harmening, D. M., (1997). Clinical hematology and fundamentals of hemostasis, third edition, F. A. Davis company. Philadelphia: 99-102.

7. AlJohara M. AlQuaiz,[1,2] Ashry Gad Mohamed,[2] Tawfik A. M. Khoja,[3] Abdullah AlSharif,[4] Shaffi Ahamed Shaikh,[2] Hamad Al Mane,[5] Abdallah Aldiris,[6] Ambreen Kazi ,[1] and Durdana Hammad[1].Prevalence of Anemia and Associated Factors in ChildBearing Age Women in Riyadh, Saudi Arabia.Journal of Nutrition and Metabolism 2013 P.7

8.Grace Stephen,[1] Melina Mgongo,[2,3] Tamara Hussein Hashim,[2,4] Johnson Katanga,[1,5] Babill Stray-Pedersen,[3,6] and Sia EmmanueliMsuya. Anaemia in Pregnancy: Prevalence, Risk Factors, and Adverse Perinatal Outcomes in Northern Tanzania. Anemia. 2018; 2018: 1846280

9.Sukrat, B., and Sirichotiyakul, S., (2006). The prevalence and causes of anemia during pregnancy in MahraNakorn Chiang Mai Hospital: J. Med. Assoc. Thai, 4: s142-6.

10.Dangour, A., D., Hill, H., L., and Ismail, S., (2001). Hemoglobin status of adult non-pregnant Kazakh women living in Kzayl-orda region, Kazakhstan: Eur. J.Clin. Nutr; 55(12):1068-75.

11.Iannotti, L. L., Tielsch, J. M., Black, M. M., and Black, R. E., (2006). Iron supplementation in early childhood: health benefits. Am. J. Cli. Nutr; vol 84 (6): 1261-1276.

12. Engmann, C., Adnan, R., Lu, T., S., Bose, C., and Lozoff, B., (2007). Anemia and iron deficiency in pregnant Ghanaian women from urban areas: Int.J .Gynaecol; 6:10-

13.Liao, K., (2004). Prevalence of iron deficiency in pregnant and premenopausal women in china: a nationwide epidemiological survey. Zhonghuaxue ye xue za zhi: 25 (11): 653-7.

14.Cabrera, C., Mckay.D.L, and Blumbery, J.B., (2006). The role of tea in human health: American college of nutrion; 21(1):1-13.

15. Zijp, I. M ., Korver, O., and Tijburg ,L .B .,(2000). Effect of tea and other dietary factors on iron absorption. Crit. Rev. Food. Sci. Nutr; 40 (5): 371- 98.