Iron deficiency anemia in women in Zawia region

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Abstract: Anemia is a common health problem in women in developing countries, since anemia is more common in women than man due to physiological processes. This study was conducted in Zawia area and included 210 women in childbearing age (18-45 years) who were visiting Zawia teaching hospital. After filling the questionnaire, blood samples were taken and analyzed for hematological and biochemical profiles. Biochemical testes included measurement of serum iron, ferritin, and total-iron binding capacity. Among the total sample (210 women), there were 87 (41.4%) pregnant and 123 (58.6%) non-pregnant women (includes 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 means of biochemical and hematological parameters in the studied samples were: Hb = 10.37 ± 2.02 g/dl, RBC= 3.78 ± 1.037 m/m3, serum iron 61.86 ± 40.28 µg /dl, and TIBC = 386.01 ± 94.91 µg/dl. In this study, it is considered that any women have hemoglobin below 11.5 g/dl is anemic. 89.1%, 69.5%, and 47.8% of pregnant women who belong to third trimester had low (below normal value) Hb, serum iron, and ferritin, i.e. iron deficiency anemia was more common in third trimester among the first and the second trimesters. Third trimester pregnant women also had high TIBC more than first and second trimesters. We have compared between pregnant and non-pregnant women in the terms of 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 who included in this study in Zawia area had iron deficiency anemia. Among 45 women who have iron deficiency anemia, there were 30 (66.6%) pregnant, and 15 (33.3%) non-pregnant. That means prevalence of iron deficiency anemia was more in pregnant than non- pregnant as we expected. This study showed the effect of tea on absorption of iron. In this matter, drinking tea women in this study showed 42.4% a decrease in serum iron level.

Key wards:Hemoglobin, red blood cells, total iron- binding capacity.

Introduction

Anemia is present when there is a decrease in the level of hemoglobin in the blood below the reference level for the age and sex of the individual (1). It means that anemia is indicated by a hemoglobin concentration in the blood of less than 13.5 g/dl in adult males and less than 11.5 g/dl in adult females or haematocrit of less than

41% in adult males and less than 36% in adult females (2). Iron absorption responds to daily need and is influenced by the amount and type of iron accessible from food, the functional state of the gastro-intestinal mucosa and pancreas, current iron stores, and erythro-poietic needs (3). Iron absorption can thus be influenced at several different stages (4). Much of the dietary iron is non- haem iron derived from cereals, with a lesser component of haem iron derived from haemoglobin or myoglobin in red or organ meats. Haem iron is more readily absorbed than non-haem iron, being less subject to influence by other dietary constituents (5). Even when animal foods form only a small part of diet, they have a disproportionate effect on the total iron absorbed, this is because an unidentified ligand present in meat promotes an enhanced availability of the non - haem iron in the rest of the diet (6).

Iron absorption may be regulated both at the stage of mucosal uptake (possibly by varying the expression of metal transport proteins) and at the stage of transfer to the blood. Factors favouring increased iron absorption include iron deficiency, pregnancy, hypoxia and increased erythro-poiesis. Iron absorption is usually decreased when the body is overloaded with iron, and in acute and chronic infections (7). Very little iron is excreted by normal persons. Healthy adult males lose about one mg each day, mostly as hemoglobin storage iron in desquamated cells and erythrocytes in feces (8). Nearly negligible amounts of iron are excreted in sweat and urine (9). With each menstrual cycle, women lose approximately 20- 40 mg of iron (10). Iron deficiency is one of the most prevalent disorders known, with 30% of the world wide population affected (11). Those with a higher than average risk for iron deficiency anemia include pregnant women, both young children and adolescents, and women of reproductive age (12). Increased blood loss, decreased dietary iron intake, or decreased release from ferritin may result in iron deficiency. Reduction in iron stores usually procedes both a reduction in circulating iron and anemia, as demonstrated by a decreased red blood cell count, mean corpuscular hemoglobin concentration, and microcytic red blood cells (10). Although a decrease in serum iron and an increase in transferrin / Total iron binding capacity are classic indices of iron deficiency, the serum ferritin concentration has evolved as a more sensitive and reliable test for confirming this condition (13).

Materials and methods

This study was a cross-sectional survey including two hundred and ten blood samples were taken from non-pregnant and pregnant women in reproductive age in different stages of pregnancy and investigated for different biochemical and hematological parameters such CBC, blood film, serum iron, ferritin, and total iron binding capacity (TIBC). Its saturation with the purpose of assess the cases of IDA in pregnant and compare them with non-pregnant women. 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. I ron kits (Fluitest iron- Bicon diagnostic Hecke 8-Germany), TIBC kits (Fluitest TIBC- Bicon diagnostic Hecke 8-Germany), Ferritin kits (Ortho-Clinical Diagnostics- Johnson- Johnson- Co.), Wrigts stain-UK. Sysmax (kk21- Japane),

Microscope (hundwetzlar- Germany), Centrifuge (Eppendrof- Germany), Spectrophotometer (Biosynthesis BTs-302- Spain) and Vitros system (Ortho-Clinical Diagnostics- Johnson- Johnson-Co.).

Data analysis was performed with computer software (SPSS, Version 14.0, SPSS Inc., Chicago, IL). Age was presented as mean ± SD, frequencies; percentages of different variables were computed. Chi Squire analysis for independence was used to examine the relationship significance between Hb, and different biochemical test and different gestation age and to examine the significance of differences in risk characteristics associated with Hb concentrations and iron status markers. Students T test was used to compares the means of Hb, Iron and RBC in both pregnant and non pregnant group of women.

Two hundred and ten samples collected from Zawia central hospital (women clinic) and 2nd March polyclinic, analysis were performed Zawia hospital laboratory. Blood samples were taken, using needle (size 23Gχ1½). After taking 5 ml of venous blood, the blood is transferred then in two tubes in one tube (type AFMA-Disg) and gently mixed for 3- 4 times. The tube contains an anti-coagulation substance called ethylene diamine tetra-acetic acid (EDTA) to prevent blood coagulation. Each tube labeled by a sticker contains number, name of the subject, time of collection, and the place of collection. Blood samples were transferred to the hospital laboratory for CBC (complete blood count) and blood film, the CBC analyzed by using sysmax kk21 machine. All hematological parameters for each subject were recorded in a strip paper from the sysmax machine. Each strip paper was numbered. The time consumed to get a one strip is ranged between one to a half minute. All obtained data of blood parameters for each woman were stored in the computer.

Blood films were examined to reveal any pathological changes in RBC in case of iron deficiency anemia. The slides were examined in hematology department in Zawia teaching hospital. In case of biochemistry samples, was separated from the clot or cells within 1 hour. Samples were centrifuged within at least 3000 rpm for 5 minutes. Biochemistry profile included measurement of serum iron and total iron binding capacity (TIBC) by using commercial biochemical kits (Biconfluitest B-Germany) according to standard spectrophotometeric methods which were in routine used in the biochemistry laboratory.

Results and discussion

This study included 210 women in Zawia area. During the study, 210 blood samples were taken from reproductive age (18 - 45 years). The samples analyzed to investigate the anemia and iron deficiency as assessed by biochemical and hematological parameters and determined the distribution of anemia among no pregnant and pregnant women. Moreover, to determine the frequency of anemia in the different stages of gestation. The age range was between 18 - 45 years old, with mean age of 30. 2 ± 7. 28 years in the whole sample. 122 married (58%), 88 single (41%). 87 were pregnant women (41.4%) and 123 non-

pregnant women (that included single and married women). The age structure among the sample was divided into four different age groups. Age concentrated between 18 and 33 years 141(67%) figure (3). 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. 288 µg/dl, TIBC = 386.01 ± 94.918 µg/dl, serum ferritin = 29.45 ± 30.592 ng/ml and RBC = 3.78 ± 1.037 m/m^3 (table 1).

Table 1: mean and ± S.D of some biochemical parameters.

	Hb	Iron	TIBC	Ferritin	RBC
Total samples	210	210	153	77	210
Mean	10.37	61.86	386.01	29.45	3.78
Std. Deviation	± 2.038	± 40.28	± 94.91	± 30.59	± 1.03

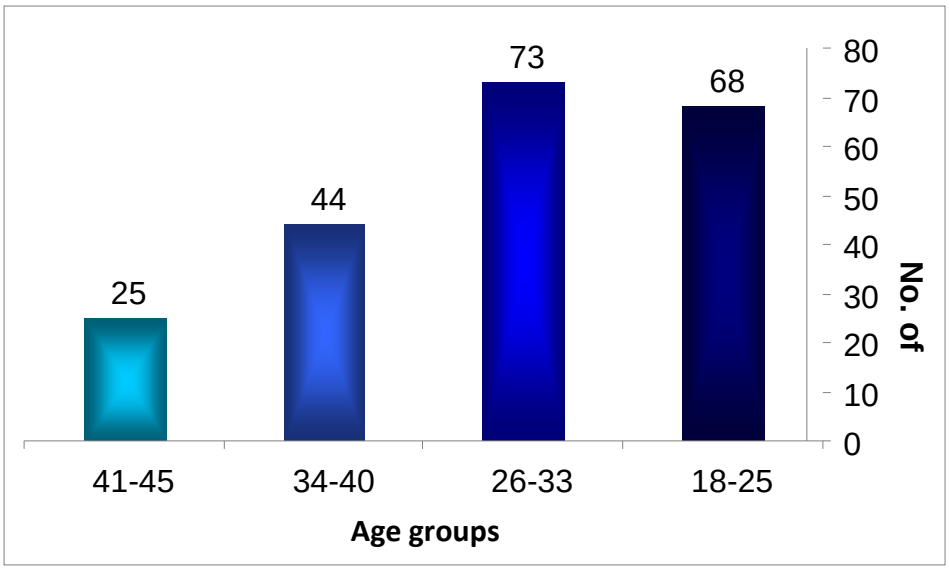

Figure 3: Age grouping of sample population.
Numbers above the bars represent number of cases.

The pregnant women screened in this study were 87 and having different gestational stages. In first trimester, the number of pregnant women was 7 out of 210 women (Total studied sample) and that represents 8.04%, second trimesters were 34 pregnant women 39.08%, and third trimester were 46 pregnant women 52.8%. The highest percentage was third trimester of gestational stage in the study sample as shown in (Table 2).

Table 2: Distribution of gestational age

Pregnancy duration	Frequency	Percent
First trimester	7	8.04 %
Second trimester	34	39.08 %
Third trimester	46	52.87 %
Non-pregnant women (single-married)	123	58.09 %
Total	210	100 %

In the whole sample, the results show that 66 women have normal Hb (31.42%) whereas 144 women have low Hb (68. 57%). The mean value of Hb was 10. 37 ± 2.03 g/dl and RBC 3.78 ± 1.03 m/m^3. (Table 3).

Table 3: Frequency and percentage of hemoglobin

Hb	Frequency	Percent
Normal*	66	31.42 %
Low**	144	68.57 %
Total	210	100 %

* Samples equal to or greater than 11.5 g/dl considered normal
** Samples less than 11.5 g/dl considered anemic (11).

We considered any women in childbearing age who has hemoglobin level below 11.5 g / dl is anemia according to WHO and many other studies (14, 15, 16, 17). The mean value of hemoglobin level in the whole studied sample (210 women) was 10.37± 2.03 g/dl which is below the normal value (11.5g /dl). My explanation for this low value of the mean hemoglobin is due to big variation between hemoglobin values in the non- pregnant and pregnant women. Since single females have a higher hemoglobin level than pregnant women. In my study, there were 87 (41.42%) pregnant women out of the total sample (210). That certainly decreases the mean value of hemoglobin of the whole studied sample. Serum iron concentration; the frequency of normal serum iron in the study sample were 128 women (60.95%) and low serum iron were 82 women (39.0%). The frequency of normal serum ferritin were 162 (77.14%), and low serum ferritin were 48 samples (22.9%) (table 4).

Table 4: Frequency and percentage of normal,and low serum iron

Iron level	Frequency	Percent
Normal	128	60.95 %
Low	82	39.0 %
Total	210	100 %

Table 4 shows that 82 (39%) women out of the total sample (210) have low serum iron. Table5 shows that 48 (22.9%) women have low serum ferritin. Table 6 shows that 70 (33.3%) women have high TIBC level. So the percentage of low serum iron, ferritin, and high TIBC is ranging between 22.9% to 39%. These results are very close to results of some workers who have done studies on Lebanese women (14). It should be mentioned here that (14) have done their study only on non-pregnant women, but the similarity between my study and their study is the age of the studied sample (18- 45 years).

Table 5: Frequency and percentage of serum ferritin

Ferritin level	Frequency	Percent
Normal	162	77.1 %
Low	48	22.9 %
Total	210	100 %

Frequency of cases with normal TIBC were 132 women (62.9%), and 70 women with high TIBC (33.3%), and only 8 cases with low TIBC (3.8%).

Table 6: Frequency and percentage of TIBC

TIBC level	Frequency	Percent
Normal	132	62.9 %
High	70	33.3 %
Low	8	3.8 %
Total	210	100 %

The mean hemoglobin concentration in 87 pregnant women was 9.38 ± 1.86 gm/dl, whereas the mean in 123 non- pregnant women (single-married) was 11.08 ± 1.85 gm/dl. Figure 2 shows that 74 pregnant women (85%) out of 87 pregnant women have low hemoglobin (less than 11.5 gm/dl). Non- pregnant women (single and married) have a lower percentage (56.9%) of low hemoglobin (70 out of 123 women). The mean of hemoglobin concentration in married women was 10.56 ± 1.68 gm/dl and was 11.28 ± 1.89 gm/dl in single women. In my study, there were 123 non-pregnant women (married or single). 56.9% of these non- pregnant women had low hemoglobin level (Hb < 11.5 gm/dl). In contrast, hemoglobin level was measured for 87 pregnant women, and 85% of them had low hemoglobin level. i.e pregnant women in Zawia area has lower hemoglobin level compared to the non-pregnant women. Some other studies were conducted in Kazakhstan (18) and Nepal (19). Both stuidies included pregnant and non- pregnant women and considered any women have hemoglobin level less than 12gm/dl is anemic.

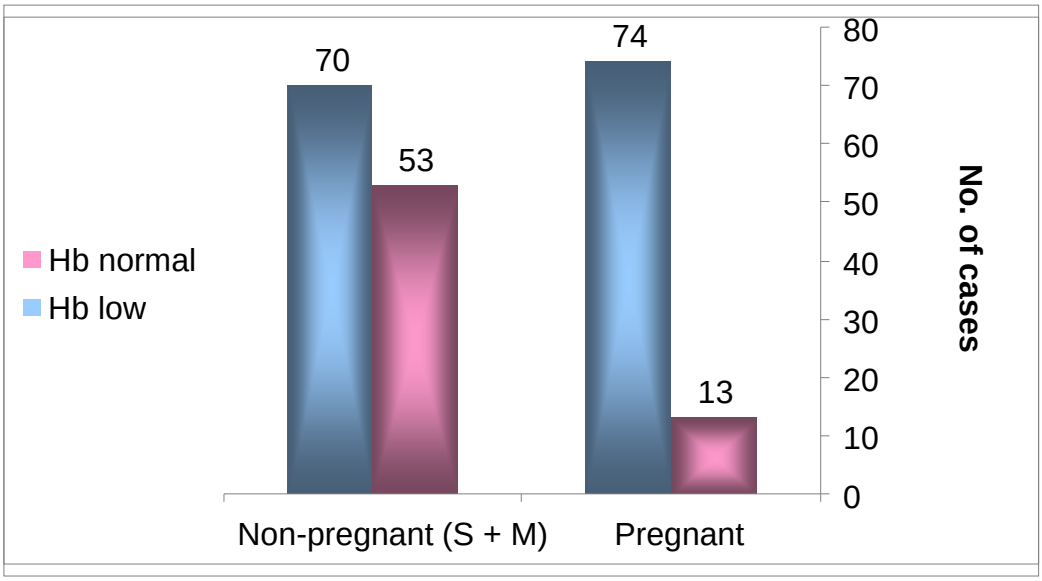

Figure 4: The number of cases with low and normal hemoglobin level in the pregnant and non-pregnant women, S = single, M = married

The mean of plasma iron in 87 pregnant women was 54.44 ± 39.58 µg/dl, whereas the mean in 123 non- pregnant women was 66.43 ± 40.20 µg / dl. Figure 4 shows that 49 pregnant women out of 87 pregnant women have low serum iron (56.3%). Non - pregnant women (single and married) have a lower percentage (26.8%) of low iron (33 out of 123 women). The mean of iron concentration in married women was 66.03 ± 34.56 µg/dl and was 66.33 ± 42.03 µg/dl in single women. It seems that ther is no significance differences in the mean of serum iron level in the married and in the single women.

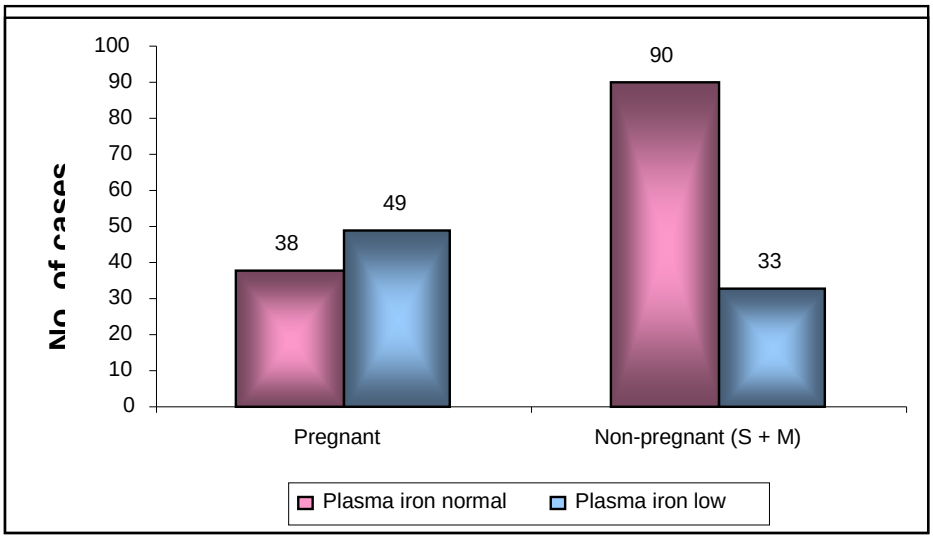

Figure 5: Plasma iron in pregnant and non-pregnantwomen.
S = single, M = married

The mean of RBC in 87 pregnant women was 3.361 ± 1.298 m /m^3, whereas the mean in 123 non- pregnant women was 4.100 ± .62315 m /m^3. Figure 5 shows 30 pregnant women out of 87 pregnant women have low RBC (34.4%). Non pregnant women (single and married) have a lower percentage (14.6%) of low RBC (18 out of 123 women). The mean of RBC in married women was 3.90 ± 0.61 m /m^3 and was 4.14 ± 0.619 m/m^3 in single women. Usually anemia is more common in pregnant women than in non-pregnant women due to fetus demand.

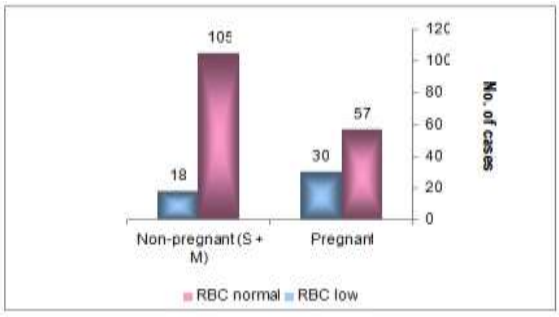

Figure 6: Shows RBC in pregnant and non-pregnantwomen.
S = single, M = married

The mean of ferritin level in pregnant women (87) was 20.105 ± 24.312 ng/ml. in non- pregnant (123) women the mean of serum ferritin was 36.063 ± 32.822 ng/ml. Figure 6 show that 32 pregnant women out of 87 pregnant women have low serum ferritin (36.7%). Non- pregnant women (single and married) have a lower percentage (13.0%) of low ferritin (16 out of 123 women). Tha mean of ferritin concentration in married women was 32.89 ± 32.54ng/L and was 37.20 ± 32.92 ng/l in single women.

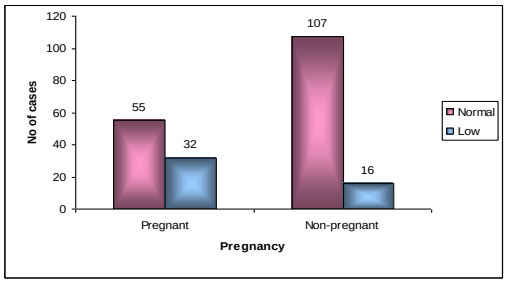

Figure7: Ferritin level in pregnant and non-pregnantwomen.
S=single, M=married

The mean of TIBC level in pregnant women (87) was 477 ± 87.605 µg/dl. in non- pregnant (123) women the mean of serum TIBC was 335 ± 94.675 µg / dl. Figure 7 shows that 45 pregnant women out of 87 pregnant women have a high TIBC level (51.72%). Non-pregnant women (single and married) have a lower percentage (20.32%) of high TIBC (25 out of 123 women). The mean of TIBC level in married women was 369.97 ± 77.02 µg / dl and was 32.89 ± 32.54 µg / dl in single women. Pregnant women have high TIBC level more than non- pregnant women and this in agreement with serum iron and hemoglobin levels.

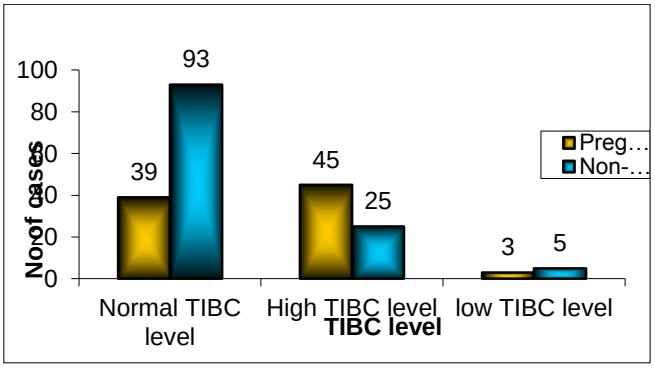

Figure 8 :TIBC level in pregnant and non-pregnant women

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