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Assessment of Iron Deficiency Anemia (IDA) and Dietary Pattern among pregnant women in Baghdad City, Iraq

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Abstract

Background: Iron deficiency is the primary cause of anemia throughout the world especially during pregnancy.
Objective: This study aimed to assess the prevalence of anemia and dietary pattern among pregnant women attending ALan -Noaman Teaching Hospital in Baghdad City for a period of three months; July to September 2016.
Patients and Methods: It was a cross-sectional study in which pregnant women in their 3rd trimester were recruited. Data collection sheet was prepared to capture the dietary pattern including main food items which associated with iron body level. Hematological indices were calculated using standard updated techniques.
Results: Out of the 400 females, 135 of were found to be anemic. Of the 135 anaemic women, 87 (64%) were aged (18-35)years (mean Hb=8.5 g/dL). 70% were living in the rural area (mean Hb=7.5 g/dL) that all of them had a haemoglobin level less than 8 d/dl. Around 45% completed primary education (mean Hb=7.4 g/dl) . About 75% were housewives (mean Hb=8.9 g/dL) and (70%) were multigravidae (mean Hb=8 g/dL). About 91% had iron deficiency anemia of which 40% had mild anemia (mean Hb=9.7 g/dL), 40% had moderate anemia (mean Hb=8.3 g/dL) while 20% had severe anemia (mean Hgb=6.5 g/dL). About 45% had iron-folic acid tablet once a day. Most of those females had tea with breakfast or after meals. For dietary pattern, there was a poor intake of meat; less than half had an average intake of milk products, and most of them had rice & bread daily. There was a poor intake of vegetables, fresh & dry fruits.
Conclusion: Anemia is prevalent among pregnant women. Being a housewife, dwell in a rural area, multigravida and low education were associated with anemia. Insufficient intake of iron-folic acid tablet/day with an unhealthy nutritional habit of drinking tea & poor intake of food rich in iron was prominent.

KeyWords: *iron deficiency anemia, anemic pregnant female, dietary pattern.*

INTRODUCTION

Iron deficiency is the leading cause of anemia throughout the world particularly during pregnancy as the demand for iron increases about six to seven times from early pregnancy to late pregnancy.[1]
World Health Organization defined anemia as hemoglobin (Hb) levels less than 11 g/dl during pregnancy & it is considered mild when hemoglobin level from10.0-11 g/dl, moderate when hemoglobin falls between 7.0–9.9 g/dL, severe when hemoglobin is less than 7.0 g/dL, [2]. The average physiological increase in plasma volume leads to hemodilution in pregnant women where plasma volume increases disproportionately with the red cell mass resulting in a further lowering of the hemoglobin[3].
The prevalence of anemia in pregnancy is estimated to be around 38% worldwide (compared to 29% of non-pregnant women) [4]. The prevalence of anemia in developing countries is relatively high (33% to 75%) [5,6].
About 15% of pregnant women are anemic in developed countries. In the UK, the prevalence of anemia is estimated to be 24.4% antenatally [5] & nearly a third of women are anemic postpartum.
The most common cause of anemia in pregnancy worldwide is iron deficiency [5]. It is usually caused by nutritional deficiency or low iron stores resulting from previous pregnancy or previous heavy menstrual blood loss. Physiological requirements for iron in pregnancy are three times higher than in non-pregnant menstruating women and iron requirement increases as pregnancy advances [7].
Poor nutrition, multiparty, abortions, parasitic infections, consumption of excess tea or coffee directly after meals are found to be associated with anemia in reproductive age women.[8]
Studies documented the association of anemia with maternal morbidity and mortality; reduction of productivity; the occurrence of premature births, low birth weight, fetal impairment, and infant death.[9]
Data about the prevalence of anemia and association with the dietary pattern are scarce in Iraq. Health professional need to be informed about the severity of the problem and stakeholder need to prioritize resource to curb this problem. We undertook this study to assess the prevalence of anemia the dietary pattern among pregnant women in AL-attending general teaching hospital in Iraq.
Intake of food rich with chelating agents as rich with fibers, drinking tea & coffee directly after a meal or during breakfast [1o]

PATIENTS AND METHODS

Study design: A cross-sectional hospital-based study was carried out in AL-Noaman Teaching Hospital in which 400 pregnant females in the 3rd trimester were assessed for anemia during the period from July- September-2016.

Procedure/Data collection

The researchers designed the questionnaire form, and it included the following:
Demographic & social characteristics that included age, education, and job status, residence.
-Obstetrical history as: (gravidity, ANC visits, iron-folic supplementation, space between 2 last babies).
- Dietary Habits & pattern were rated according to the frequency where an intake of food (4-5/ week) is considered as good pattern, (2-3/week) as average pattern, (< 2/week) as poor pattern that intake of food mostly rich with iron according to their groups (as meat group, milk groups, egg, Legumes, seeds, Vegetables, fruits) [1o].

Statistical Analyses

Data were entered and analyzed using SPSS v.22 with use of means, frequencies, proportions, and rates of the given data for each variable and presented in tables and graphs. The X^2 Test analysis was done to see the association of each independent variable with the outcome variable. A value of less than 0.05 was considered statistically significant.

Laboratory Analysis of IDA: Complete blood count was carried out including red blood cell count, hemoglobin concentration (Hb), mean cell volume (MCV), mean cell hemoglobin (MCH), mean cell hemoglobin concentration (MCHC), platelet count, and

white blood cell count. Blood Film, serum iron concentration and Iron Binding Capacity (IBC) were estimated by Siemens broad spectrum of hematology immunoassay Auto Analyzer System by using 4 Dimensions Sysmex Machine. Transferrin saturation also was calculated.

Assessment of Anemia hemoglobin cutoff value was adjusted to classify the degree of severity by using WHO criteria. The normal range of hematological indices is as follows: Mean Corpuscular Volume (MCV)= 80-98 FL**;** Mean Corpuscular Hemoglobin (MCH)= 27.0-33.5 pg **;** Mean Corpuscular Hemoglobin Concentration (MCHC)= 32.0-36.0 g/dl**;** Erythrocyte Width distribution (RDW)=11.9-14.5%**; Red Blood Count (RBC)=**3.8-5.8x10^{12}/L in adult females**; Packed cell volume (PCV)=** 36-47 in adult females**;** White **Blood Count (**WBC)= 5-10x10^{3}**;** Platelet Count (PLT)=(150–450x10^{3}) [11,12]. The cut-off level was used to indicate Serum Iron deficiency is ((50µg/dl and the normal value; 60-170µg/dl). Ferritin is the cellular storage protein for iron & its measurement is important in the diagnosis of the disorder in iron metabolism with normal value in female (11-306 ng/ml) & it´s level decreases with iron deficiency & hemodialysis. When Transferrin Saturation (TS) is less than 10.2%, it is an indicator of iron deficiency anemia (normal value: 20-50%). TS was calculated by using the equity of serum iron×100/IBC. The normal value of the Total Iron Binding Capacity (IBC)is 240-450 µg/dl [13,14].

RESULTS

Table 1 shows the distribution of hematological indices by selected socio-demographic characteristics. It is observable that 64% of the sample were of age group 15-35 years (mean Hb=8.5 g/dl)**;** while 21% of the sample were below 18 years of age & 15% above 35 years (mean Hb=8.5 g/dl, 9.6 g/dl respectively). There was 70% who were living in a rural area. In regard to educational level, about 45% completed primary school (mean Hb=7.8 g/dl); 33% completed secondary school (mean Hb=8.5 g/dl); and about 22% earned higher education degree (mean Hb=9). Around a fifth (22%) of respondent were employees (mean Hb=9.2 g/dl).

Table 2 depicts the obstetrical history of pregnant women and their mean of Hb. It was shown revealed that 70% were multigravida (mean Hb=8 g/dl) who had an interpregnancy interval of fewer than 48 months. Only 30% had ANC visits for more than four times in the current pregnancy. About 45% had one tablet day of iron-folic acid while only 6% had two tablets a day & others didn't intake it (statistically significant association with p=0.001).

Table 3 Shows the distribution of hematological indices according to severity of anemia which reveals that 40% had mild anemia (mean Hb=9.7) with modest decrease in most of these indices as PCV=31.1, MCV=74.7, MCH=25.3, with normal level of MCHC=32.2, RBC=3. 9 & Ferritin=11, a TS=11.25 & modest increase in WBC=10.84. Another 40% of anemic pregnant females had moderate anemia (mean Hb=8.3) & decreass of all indices as PCV=26.2, MCV=68.6, MCH=20.87, MCHC=30.4, Serum Iron= 40, Ferritin= 9, TS=7.4 with normal RBC=4.11 & increased WBC=11.04, IBC=463. About 20% had severe anemia (mean Hb=6.5) with substantial decreass in indices as PCV=23.8, ((MCV) =60, MCH=18.7, MCHC=26.9, PLT=350.7, serum iron=30, Ferritin=8, TS=6.13 with increasing in IBC=489 &WBC=12.8.

Table 4 shows the association of severity of anemia with selected explanatory variables. There is a statistically significant association between the severity of anemia & intake of the iron-folic acid tablet where anemia increased with lower doses of iron-folic acid (p=0.01). It was shown that there was a significant association between severity of anemia & residence where women of the urban dwelling had a higher percentage of mild and moderate anemia than those residing in a rural area (p=0.01). In regards to the association between severity of anemia & intake of meat, those with good meat intake had the lowest percentage of severing anemia(p=0.01). Tea was found to be detrimental and associated with an increased rate of anemia (p=0.001).

Table1: Distribution of the hematological indices according to Socio demographical characteristics

Characteristics	No	%	Mean Hb	Mean MCV	Mean PCV	Mean MCHC	Mean MCH
1.Age							
≤ 18	28	21%	8.5	67.8	26.1	25.5	17.3
18-35	87	64%	8.5	66.2	26.9	29.1	21.3
≥ 35	20	15%	9.0	69.2	28.1	30.9	23.5
Total	135	100%					
2.Residence							
Rural	85	70%					
Urban	50	30%					
Total	135	100%					
3.Education							
1st school	60	45%	7.8	62.6	24.9	26.5	17.8
2nd school	45	33%	8.5	66.7	26.7	30.6	21.5
Higher education	30	22%	9	70.8	30.1	32.8	22.3
Total	135	100%					
4. Occupation							
Non employed	105	78%	8.9	69.2	28	31.2	23.2
Employed	30	22%	9.2	69.4	28.9	31.7	25.01
Total	135	100%					

Table 2: Obstetrical history of pregnant women and mean of Hb

Obstetrical history			Mean Hgb
1. Parity	**No.**	**%**	
Primi	40	30%	8.8
Multi	95	70%	8
Total	135	100%	
2. ANC visits	**No.**	**%**	
< 4 times	88	65%	8.2
> 4 times	27	20%	8.7
No visits	20	15%	7.5
Total	135	100%	
3. iron-folic acid tablet	**No.**	**%**	
1 tab/day	60	45%	8.5
2 tab/day	30	22%	10
No intake	45	33%	7.6
Total	135	100%	
4. space between last two babies	**No.**	**%**	
<48 months	95	70%	8
> 48 months	40	30%	9
Total	135	100%	

Table 3: Distribution of the hematological indices according to the severity of anemia

Severity of Anemia	Mean Hb	Mean PCV	Mean MCV	Mean MCH	Mean MCHC	Mean PLT	Mean WBC	Mean RBC	Mean Serum Iron	Mean Ferritin	Mean IBC	Mean TS
Mild	9.7	31.1	74.7	25.3	32.2	296.5	10.84	3.9	45	11	400	11.25
Moderate	8.3	26.2	68.6	21.3	30.4	322.8	11.24	4.11	40	9	463	8.64
Severe	6.5	23.8	60	18.7	26.9	350.7	12.8	4.8	30	8	489	6.13

* 91% had iron deficiency anemia with blood film of hypochromic microcytic erythrocytes

Table 4: Association between severity of anemia & selected explanatory variables

	Anemia						Total	
	Mild	**No. %**	**Modarate**	**No. %**	**Sever**	**No. %**		
Iron-folic intake*								
1 tablet/day	10	17%	20	33%	30	50%	60	45%
2 tablet/day	15	30%	10	33%	5	17%	30	22%
No intake	10	22%	15	34%	20	44%	45	33%
Total	35	100%	45	100%	55	100%	135	100%
Residence**								
Rural	10	12.5%	20	25%	50	62.5%	80	100%
Urban	35	63.6%	20	36.4%	---------	---------	55	100%
Total	45		40		50		135	100%
Meat intake ***								
Good	8	57%	4	29%	2	14%	14	10%
Average	12	44%	10	37%	5	19%	27	20%
Poor	10	15%	20	31%	35	54%	65	48%
No intake	6	21%	10	34%	13	45%	29	22%
Total	36	27%	44	33%	55	41%	135	100%
Tea intake ****								
1 time/ day	12	20%	10	18%	3	17%	25	19%
2 times/ day	42	70%	40	70%	6	33%	88	65%
> 2 times/ day	6	10%	7	12%	9	50%	22	16%
Total	60	100%	57	100%	18	100%	135	100%

$\times^2$=33.97, P Value=0.001 , ** $\times^2$=41.14, P Value < (0.001), *** $\times^2$=20.36, P Value < (0.001), * $\times^2$=17.87, P Value=0.001**

Figure 1 shows the distribution of the dietary pattern of different food items. In regards to meat intake, it was revealed that 10% and 40% had
an excellent &average intake of red meat, respectively while 50% had an inadequate intake. Around 30%**;** 40% of the sample indicated that they had good &average poultry intake respectively, while 30% had an inadequate intake. Approximately 60% of the respondent did have fish in their meals, and around 80% didn't have a liver.
Figure 2 depicts the dietary pattern of eggs intake where 70% had eggs daily, 20% weekly, 10% monthly& mostly the respondent had the eggs with oil & tea while 50% had them with milk at breakfast.
Figure 3 presents the dietary pattern of milk intake; it is shown that 40% and 30% had a good & average consumption of cheese respectively while 40%; 30% had an average & poor intake of milk respectively and 30% had average & and inadequate use of yogurt each.
Figure 4 displays the dietary pattern of vegetables which showed that 30%; 40% had a good & average intake of tomato respectively and 50% had an average and inadequate absorption of cucumber each. Around 70% didn't have green pepper, lattice, spinach, chard parsley or other green leaves.
Figure 5 shows the dietary pattern of fruit intake which showed that half of the sample had an inadequate intake of apple and banana. Around 40% had an inadequate intake of dates while 30% had an inadequate consumption of grape. All respondents didn't have dried fruits.
Figure 6 describes the dietary pattern of starchy food & legumes which showed that all respondents (100%) had rice (with oil) & bread daily. Around 25% of the sample had lentils monthly, and another 25% had fava on a monthly basis.

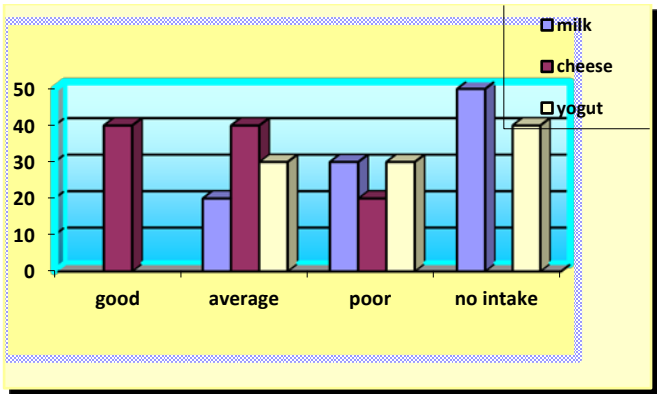

Figure (3) Dietary pattern of milk group

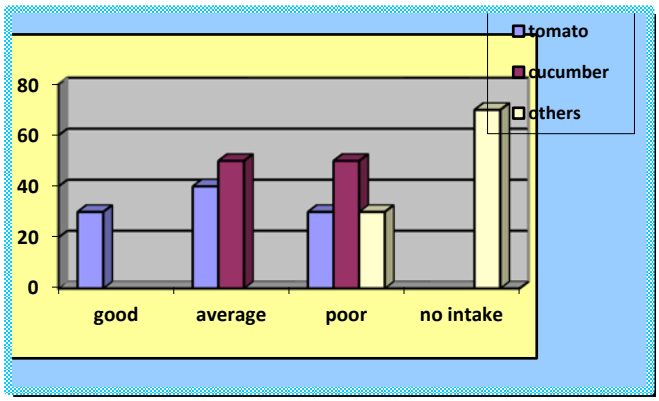

Figure (4); Dietary pattern of vegetables

* Others: green pepper, lattice, parsley& other green leaves spinach, chard

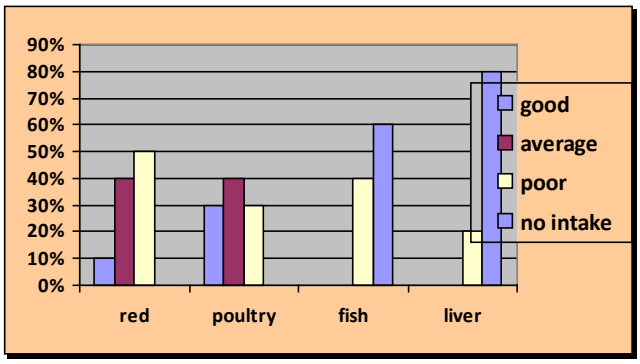

Figure (1) Dietary pattern of the meat group

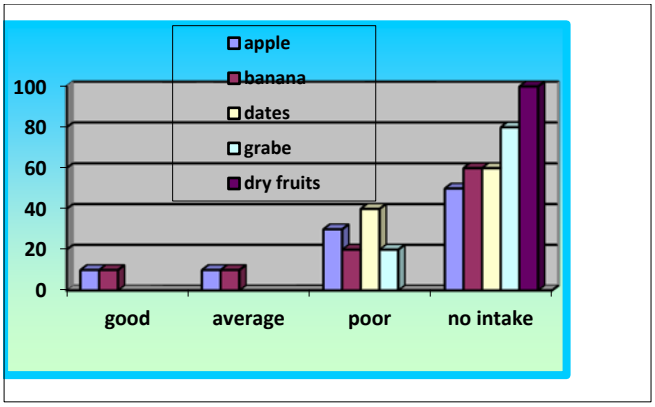

Figure (5); Dietary pattern of fruits

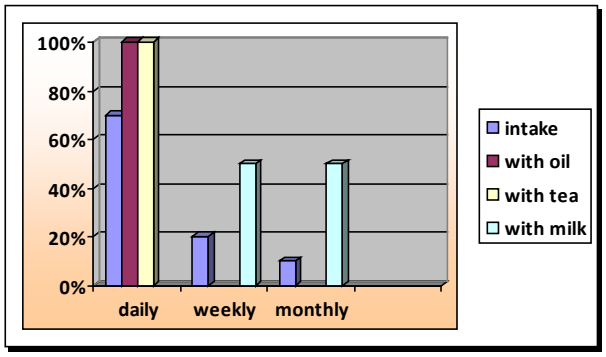

Figure (2) Dietary pattern of intake of eggs

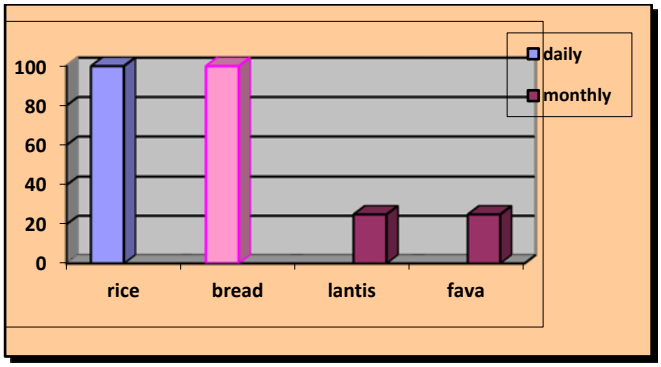

Figure (6); Dietary pattern of starch & legumes

DISCUSSION

Anemia is common health that affects a large number of people. It attracts special attention among pregnant women as it affects the outcome of conception as well. The results of this study are expected to inform clinicians and public health specialist on the extent and contributing factors that need to be addressed. This study revealed that most of the anemic pregnant females who presented with moderate anemia were between 18-35 years of age, lived in rural areas, completed primary education and housewives. Most of the those who completed higher education & above 35 years had mild anemia. The result might be explained by the impact of living in urban areas and the available amenities and access to health care compared to rural dwelling respondents. It also might be defined by the facts that higher education leads to better access of health information and better nutrition that contribute to lower proportion of severing or moderate anemia. The results of this study came in line with a report which shows that the education plays a role in the awareness of iron deficiency anemia [15]. Most of the hematological values of those anemic women showed a pattern of iron deficiency anemia that its mean MCV value was with a lower limit, mean hemoglobin value was low, mean MCHC value was with a lower limit, RDW was elevated, WBC & RBC values were close to normal. Iron indices & TS were low with elevated IBC. Erythrocytes had a picture of hypochromic microcytic anemia. The result was not unexpected as the increasing physiological demand with pregnancy necessitates women to increase iron intake inform of iron-rich food or supplement. Many studies have documented the occurrence of IDA among pregnant women especially from developing countries where awareness about the problem still low [16-19].

Similar results were reported from Turkey in which 68.5% of the sample had higher percentages of iron deficiencies among anemic pregnant women in Istanbul, and half of them had a Transferrin Saturation (TS)less than 10% which indicative of iron deficiency[20]. Different figures have been cited in the literature which signifies the increasing prevalence of anemia. It was reported that Iron deficiency anemia affects about 50% of pregnant women in the world [21,22]. In 2006 WHO reported that 57. 7% of pregnant females in Africa as Sudan were anemic [23]. Nonetheless, the prevalence of anemia during pregnancy in Saudi Arabia was 5.2% [24]. Compared to local studies from Iraq. The prevalence of anemia in the 3rd trimester in Baghdad was found to 16.2 % [25]. The main reason for the high prevalence of anemia in our sample was attributed to short pregnancy spacing, multiparity and lower intake of iron-folic supplement. The risk of developing anemia in pregnant women with 3–5 pregnancies is increased when compared with those who had less than three pregnancies [26]. In our sample multiparty was as high as 86% which is higher than in other studies. Most of the pregnant women in this study had an intake of an iron-folic acid tablet once a day which was associated with the severity of anemia.

Most of the females in our sample reported twice daily tea intake or even more. The same results were published in Baghdad previously [27]. Around 98% of Ethiopian sample reported drank tea before & after meals, and 59.5% of them have had tea more than two times a day [28]. A pattern reflecting unhealthy dietary habits was reported in Turkey where 90% of pregnant females drank tea at breakfast or just after meals and only 8% consumed animal protein daily [29]. It is well-known that iron body store and production depends on the dietary intake of iron. Some food items are known to be rich in iron, and some others are chelator and might cause anemia like tea [30,31]. It is well known that culture shapes the human behavior, in the middle east and some African countries, tea is considered one of the main complimentary items used on a daily basis. In this study, most of the pregnant women had inadequate intake of iron-rich as meat, poultry, fish & liver which contributed to increased prevalence of anemia in our sample as it is documented that meat & poultry are the main dietary recommended to prevent anemia for their high-quality protein, iron, and zinc & other nutrients [32]. All pregnant females in our sample had a high intake of starchy & oily food with inadequate consumption of fruits & vegetables. An earlier report from Baghdad showed that 26.8 % of pregnant females consumed meat, chicken, eggs, and milk while 21.4% had consumption fruit [33].

Generally speaking, meat consumption in Iraq was reported to be 52.3g/day, 400 gram/person/week, 79 kg/capita/year while for the USA it was 124 kg/capita/year and about 100kg/capita/year for European countries [34], These data might explain the lower prevalence of anemia among developed countries while many people in developing countries depend on monotonous cereal-based diets and have little access to animal products or variety of fruit and vegetables [35,36]. Even when such foods are available, cultural beliefs may deny pregnant women access to these foods rendering them at risk of micronutrient deficiencies [37]. Moreover, low socioeconomic status is usually associated with both clinical & subclinical, micronutrient deficiency [38].

CONCLUSION

Most of those anemic females who had iron deficiency anemia were multipara and had iron-folic acid tablet once a day with a bad nutritional habit of drinking tea & poor dietary pattern of food intake that is rich

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