Assessing Adherence of Pregnant Women to Iron Supplementations in Sohag district

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Abstract

Background: Nutritional iron deficiency (ID) is the most widespread nutritional deficiency disorder; IDA in pregnancy may have a serious effect on the health of both the mother and the baby. Anemia can increase maternal and infant morbidity and mortality. **Objective**: This study aimed at measuring the prevalence rate of anemia in pregnant women in the study population, and the adherence of pregnant women to iron supplementation, and identifying different factors affecting adherence to iron supplementation during pregnancy. **Method:** A cross sectional study was carried out in Gezert Mahros primary health care center, Dar Salama Abd Alla maternal and childhood health care center and Neda primary health care center. We included a sample of 400 pregnant women. The data were collected through personal interviews with the participants using a standardized questionnaire containing questions about socioeconomic status, obstetric history, and the use of health care services during pregnancy, exploring women's knowledge about anemia, adherence assessment, and factors affecting adherence. **Results:** The anemia prevalence rate was 44.75%. By pill counting adherence 25.5% of pregnant women were found to be adherent to iron supplements, there were significant associations between pill counting adherence and the family role to encouraging the woman to take medications, maternal education and maternal occupation. **Conclusion:** Family physicians should be aware of non-adherence problem and factors affecting adherence and try to improve adherence of pregnant women to iron supplement intake.

Key words: *Anemia, adherence, iron tablets, Sohag.*

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Introduction

Nutritional iron deficiency (ID) is the most widespread nutritional deficiency disorder. Globally, anemia affects 1.62 billion people. The highest prevalence is in preschool-age children (47.4%) and the pregnant women (41.8%), with the lowest prevalence in men (12.7%).[1] According to EDHS 2014, for every four married women, there is one anemic (about 25%) and there is regional differences where the highest rate is among women in rural upper Egypt 31%.[2] Although pregnant women and infants from developing countries are at higher risk, it frequently occurs not only in developing countries but also in developed ones.[3]

During pregnancy there is an increase of iron and folate requirements, therefore the likelihood of presenting iron deficiency and folate deficiency is high if there is no supplementation during the pregnancy. Diagnosing both deficiencies in pregnant women is critical because there are several evidences relate iron deficiency anemia to

increased risk of maternal and fetal morbidity and mortality, premature delivery and low birth weight.[4]

Iron deficiency anemia in women brings extensive consequences to the individual's health. Iron deficiency anemia leads to poor pregnancy outcomes, decreased educational performance, reduced work capacity and productivity and other socioeconomic vulnerabilities. It is well established that the incidence of ID and IDA (iron deficiency anemia) in infants who born to mothers who are anemic is higher.[5]

Therefore, it is essential that women initiate gestation with an appropriate iron status to avoid the risks produced by ID and IDA. The Centers for Disease Control and Prevention (CDC) recommends that all pregnant women should begin to have a 30 mg/day iron supplements at the first prenatal visit, whereas the WHO (world health organization) suggests 60 mg/day for all pregnant women.[6] Adherence to a medication regimen is generally defined as the extent to which patients take medications as prescribed by their health care providers.[7]

This study aimed at promoting maternal health and ensuring favorable outcome of pregnancy.

Objective: To measure the adherence of pregnant women to iron supplementation, and to identify different factors affecting the adherence to iron supplementation during pregnancy.

Method

*Design***:** A cross sectional study. *Site*: This study was performed in three primary health care centers (Gezert Mahros, Dar Salama Abd Alla and Neda) in Sohag.

Inclusion criteria: All pregnant women attending for follow up pregnancy in the study places who agreed to participate in the study until the study sample is completed.

Exclusion criteria: pregnant women with hemolytic anemia, hemoglobinopathies, and mental disorders

The sample size was conveniently decided as 400 pregnant women.

Sampling method: We made preparatory estimation for each center mentioned above about the flow of pregnant women attending the center each day; it was average 20-30 pregnant women visiting each center in the studied places per day, then the researcher visited each center once weekly for about 3 months, we did systematic random sample technique for the pregnant women attending the centers asking every other one to participate in the study for the study period until the sample size was completed.

Data collection

Participants were interviewed at the study clinics in the predetermined places using the standardized questionnaire[8] containing questions about socioeconomic status, obstetric history (gravidity, parity, history of abortion, pregnancy spacing, gestational age, history of bleeding), detection of women's knowledge about anemia, adherence assessment by pill counting method, causes of lack of adherence and factors affecting adherence. Data collection occurred through personal interviews with the pregnant women from the predetermined places after explaining the nature and the aim of the study.

Physical examination was performed by the physicians at the predetermined places (GP graduated by MBBCh), and blood samples were collected by a trained technician graduated from Health Technical Institute.

Knowledge assessment: Knowledge about iron and anemia: nutritional causes, animal and plant sources of iron, increased requirements for iron, role of parasitic infestations, effect of anemia on fetus, and mother, side effects of iron tablets, The

Table (1): Socio-demographic characteristics of the study participants (N = 400)

Variable	N (%)	Variable	N (%)
Age group:		**Family monthly income:**	
<20 y	58 (14.5)	<500	5 (1.2)
20-25 y	137 (34.2)	500-1000	91 (22.8
25-30 y	109 (27.2)	1000-2000	202 (50.5)
>30 y	96 (24.1)	>2000	102 (25.5
Age in years:		**Parity (number of deliveries):**	
Mean ± SD	26.60± 5.70	Primigravida	182 (45.5)
		Multigravida	218 (54.5)
Maternal Education		**History of abortion:**	
Illiterate	35 (8.8)	Yes	69 (17.2)
Read and write	69 (17.2)	No	331 (82.8)
Basic-intermediate education	232 (58.0)		
High education	64 (16.0)		
Maternal occupation		**Pregnancy spacing:**	
working	79(19.8)	Primigravida	182 (45.5)
housewife	321(80.2)	≤ 2 years	119 (29.7)
		>2 years	99 (24.8)
Husband Education:		**Gestational age category:**	
Illiterate	28 (7.0)	Second trimester	238 (59.5)
Read and write	52 (13.0)	Third trimester	162(40.5)
Basic-intermediate education	257 (64.2)		
High education	63 (15.8)		
Residence:		**The family encourages a woman to take tablets:**	
Urban	150 (37.5)	Yes	130 (32.4)
Rural	250 (62.5)	No	270 (76.6)
Family size:		**Family monthly income:**	
≤4	318 (79.5)	<500	5 (1.2)
5-7	78 (19.5)	500-1000	91 (22.8)
≥8	4 (1.0)	1000-2000	202 (50.5)
		>2000	102 (25.5)
Crowding index:		**Parity (number of deliveries):**	
<2 people per room	255 (63.8)	Primigravida	182 (45.5)
2 people per room	76 (19.0)	Multigravida	218 (54.5)
>2 people per room	69 (17.2)		

knowledge were considered satisfactory if the total score was more than 60%.

Table (2): Anemia and hemoglobin level among pregnant women in the sample. (N=400)

Variable	N (%)
Second trimester:	
Anemic (Hb < 10.5)	135 (56.7)
Non anemic (Hb ≥10.5)	103 (43.3)
Third trimester:	
Anemic (Hb < 11)	44 (27.2)
Non anemic (Hb ≥11**)**	118 (72.8)

Anemia assessment: At the time of enrollment, 3 mL of venous blood was collected by a trained technician using standard procedures. The hemoglobin concentration was determined by heamoglobinometer, and the participants were categorized as anemic and non-anemic participants according to the CDC (Centre of Disease Control and prevention) definition of gestational anemia ,as The CDC, defines gestational anemia as a hematocrit less than 32% and/or a hemoglobin less than 10.5 g/dL during the

Table (3): The relation between pill-counting adherence to the intake of iron tablets and women's socio-demographic characteristics

Independent variable	Pill counting adherence		P value
	Adherent N (%)	Non adherent N (%)	
Age category			
• <20	13 (22.4)	45 (77.6)	0.19
• 20-25	33 (24.1)	104 (75.9)	
• 25-30	36 (33.0)	73 (67.0)	
• >30	20 (20.8)	76 (79.2)	
Maternal education			
• Illiterate	9 (25.7)	26 (74.3)	**<0.001**
• Read and write	5 (7.2)	64 (92.8)	
• Basic-intermediate	53 (22.8)	179 (77.2)	
• High	35 (54.7)	29 (45.3)	
Occupation			
• Working for cash	34 (43.0)	45 (57.0)	**<0.001**
• Housewife	68 (21.2)	253 (78.8)	
Residence:			
• Urban	38 (25.3)	112 (74.7)	0.63
• Rural	58 (23.2)	192 (76.8)	
Parity (number of deliveries):			
• Primigravida	42 (23.1)	140 (76.9)	0.26
• Multigravida	60 (27.5)	158(72.5)	
History of abortion			
• Yes	10 (14.5)	59 (85.5)	**0.02**
• No	92 (27.8)	239 (72.2)	
Pregnancy spacing			
• Primigravida	40 (22.0)	142 (78.0%)	0.20
• ≤ 2 years	30 (25.2)	89 (74.8)	
• >2 years	32 (32.3)	67 (67.7)	
Gestational age category			
• Second trimester	55 (23.1)	183 (76.9)	0.18
• Third trimester	47 (27.7)	115 (71.0)	

second trimester of pregnancy and a hematocrit less than 33% and/or a hemoglobin less than 11 g/dL during the first and third trimesters.[5]

Statistical analysis

Computer data entry and data cleaning done along the period spent on data collection. Data subjected to statistical analysis and tabulation using SPSS program version 22, Quantitative data were expressed as means ± standard deviation. Qualitative variables presented as frequencies and percentages. Chi-square ($\chi 2$) test was used for categorical variables; it was used for comparison regarding qualitative variables. Binary logistic regression was done between pill counting adherence and each of the determinants. Odds ratios (OR) at 95% confidence interval (CI) and p values were computed. Values those were significant at the bivariate level (p value ≤0.05) were entered into a multivariable logistic regression to identify the predictors of adherence to iron supplementation.

Table (4): The relation between pill-counting adherence to the intake of iron tablets and women's knowledge about anemia.

Independent variable	Pill counting adherence		P value
	adherent	Non-adherent	
knowledge of anemia			
• Yes	78 (34.3)	149 (65.6)	**<0.001**
• No	24 (13.9)	149 (86.1)	
knowledge of causes of anemia			
• Yes	60 (32.4)	125 (67.6)	**<0.01**
• No	42 (19.5)	173 (80.5)	
knowledge of anemia complication			
• Yes	22 (31.9)	47 (68.1)	0.18
• No	80 (24.2)	251 (75.8)	
knowledge of food rich in iron			
• Yes	6 (22.2)	21 (77.8)	0.69
• No	96 (25.7)	277 (74.3)	

Ethical consideration

The Ethical Committee of Sohag Faculty of Medicine approved the research proposal. A written informed consent was signed by the participants after explaining the objectives and the steps of the study to them. Ethical consideration was observed in each step of the study including written consent of the participants. The questionnaire used in data collection was anonymous and confidentiality was assured.

Results

Table 1 shows that a total of 400 pregnant women were interviewed. The mean age of the study subjects was 26.5±5.65 years. 61.4% of respondents were between 20 and 30 years old. 58.0% of the respondents had a basic-intermediate education. Regarding their occupational status as a majority, 80.2% were housewives. About 62.5% of women were livings in rural villages. In this study, 79.5% of respondents had an average family size of ≤4. (63.8 %) of respondents living in the same household with a crowding index less than 2 people per room. Household monthly income of (1000-2000 Egyptian pounds) was reported by 50.5% of the participants. About 82.8% had no past history of abortion. Regarding their parity, 45.5% were primigravida. About 29.7% of pregnant women had a pregnancy spacing ≤ 2 years. More than half of the participants, about 59.5% were in the second trimester. Only 32.4% of women, their family encouraged them to remember her tablets.

Table 2 shows the prevalence of anemia among the pregnant women in the study group; about 56.7% of the women in the second trimester were anemic, while about 27.2% of the pregnant women in the third trimester were anemic.

By pill counting adherence, about 74.5% of the participants were non-adherent as showed in Figure 1. Regarding causes of lack of adherence, we found that forgetting (32.2%), frustration from taking a lot of tablets (24%), and side effects of the drug (23.5%) were the most common causes among participants as showed in Figure 2. Figure 3 shows that the number of ANC visits in the previous pregnancy was about (2-3) visits in 53% of interviewed women, while about 24% performed only one visit, and only 23% had ≥ four visits during their

Table (5): Binary regression analysis of factors affecting adherence to iron supplementation.

Independent variable	Odds ratios (CI 95%)	P value
Maternal education:		
Illiterate	Reference	
Read and write	0.11 (0.01-1.52)	0.10
Basic-intermediate	0.38 (0.03-5.09)	0.46
High	1.18 (1.01-2.23)	**0.04**
Maternal occupation:		
Housewife	Reference	
Working for Cash	2.52 (1.01-6.31)	**0.04**
Husband education		
Illiterate	Reference	
Read and write	0.72 (0.02-3.27)	0.31
Basic-intermediate	0.85 (0.06-11.25)	0.89
High	1.53 (0.08-29.36)	0.78
Family monthly income:		
<500	Reference	
500-1000	0.55 (0.05-5.38)	0.61
1000-2000	1.18 (0.13-10.82)	0.88
>2000	2.58 (0.28-23.93)	0.40
Parity		
Primigravida	Reference	
Multigravida	1.24 (0.77-1.93)	0.38
History of abortion		
Yes	Reference	
No	1.69 (0.60-4.72)	0.32
knowledge of anemia		
No	Reference	
Yes	2.37 (1.01-5.58)	**0.04**
knowledge of causes of anemia:		
No	Reference	
Yes	2.25 (1.41-3.61)	0.19
knowledge of anemia complication:		
Yes	Reference	
No	0.68 (0.39-1.20)	0.18
knowledge of side effects of iron:		
Yes	Reference	
No	0.81 (0.49-1.33)	0.40
knowledge of food rich in iron:		
Yes	Reference	
No	1.21 (0.48-3.09)	0.69
The family encourages a woman to take tablets		
No	Reference	
Yes	13.83 (7.15-26.74)	**<0.001**

last pregnancy.

Figure 4 shows the relation between pill counting adherence and women's education in the study sample. It shows that 54.7% of highly educated women

were adherent compared to 74.3% of illiterate women were non adherent.

Table 3 shows that adherence was 54.7% among the highly educated compared to 25.7% among the illiterate group. Regarding women occupation, 43.0 % of working women were adherent. Adherence was 60.3% among the women have husbands with high education compared to 32.1% among those who married to illiterate husbands. 40.2% of women with family monthly income (>2000) were adherent compared to 20% of women with family monthly income (<500).85.5% of pregnant women who had history of abortion were non adherent.

Table 4 shows statistically significant associations between pill counting adherence and women's knowledge of anemia and its causes. About 86.1 % of women who didn't have correct knowledge about anemia, and its causes (80.5%) were non adherent (P value<0.01). However, there are no statistically significant associations between pill counting adherence and women's knowledge of food rich in iron, and knowledge of anemia complications.

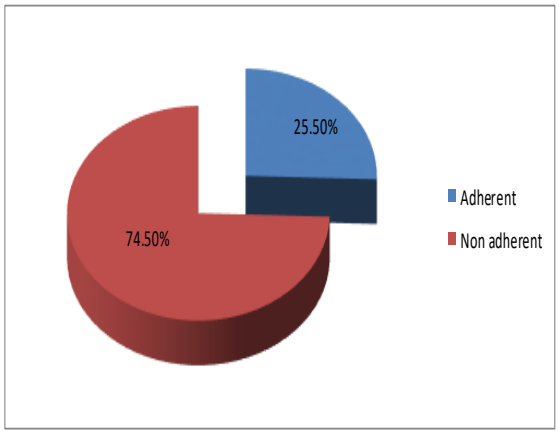

Figure (1): Pill counting adherence

Table 5 shows by binary logistics regression that there were statistically significant associations between pill counting adherence and the family role to encourage the woman to take tablets, maternal occupation, women's knowledge about anemia and maternal education. The women who were encouraged by her family to take their supplements were more adherent [p<0.001; Odds Ratio 13.83; CI (7.15-26.74)]. Regarding occupation; working women [p=0.04; Odds ratio 2.52; CI (1.01-6.31), women who knew about anemia [p=0.04; odds ratio= 2.37; CI (1.01-5.58)],] and highly educated women were more adherent [p=0.04; Odds ratio 1.18; CI (1.01-2.23)].

Table 6 shows the final multivariate logistics regression model. It revealed that there are statistically significant associations between pill counting adherence and the family role to encourage the woman to take tablets, maternal education maternal occupation and knowledge of anemia.

Table (6): The final multivariate regression model

Independent item	AOR (CI 95%)	P value
Maternal education:		
Illiterate	Reference	**<0.001**
High education	1.05 (1.01-1.26)	
The family encourages a woman to take tablets		**<0.001**
No	Reference	
Yes	16.4 (8.7-31.2)	
Maternal occupation:		
Housewife	Reference	**0.04**
Working	2.53 (1.03-6.23)	
knowledge of anemia		**0.04**
No	Reference	
Yes	1.30 (1.01-5.58)	

Discussion

A total of 400 pregnant women were interviewed. The mean age of the study subjects was 26.5 ±5.65 years.14.5% of the respondents were adolescent (age <20 years). More than half, 58.0% of the respondents had a basic-intermediate education.8.8%of the respondent were illiterate. Regarding their occupational status as a majority, 80.2% were housewives. About 62.5% of women were livings in rural villages. Household monthly income of (1000-2000 Egyptian pounds) was for 50.5% of the respondents. About 45.5% of the respondents were primigravidas, and 27.2% had a pregnancy spacing ≤ 2 years.

The 2014 EDHS results indicate that 7% of adolescents are already mothers, and 4% are pregnant with their first child. Also, more than one quarter of ever-married women cannot read at all while slightly more than half of the women completed at least the secondary level. The proportion of women unable to read at all was highest in rural Upper Egypt 41 %. A minority of respondents (14%) were working for cash. The population in rural Upper Egypt is especially concentrated at the lower end of the wealth index, with 41 % falling into the lowest wealth quintile. One-fifth of non-first births were born within 24 months of a prior birth, an interval which has been shown to place a child at higher risk of mortality.

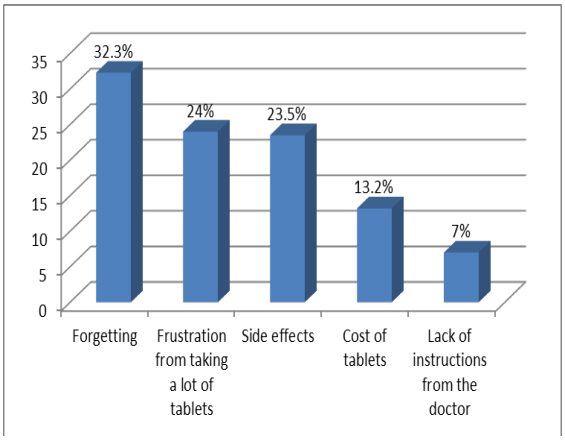

Figure (2): causes of lack of adherence

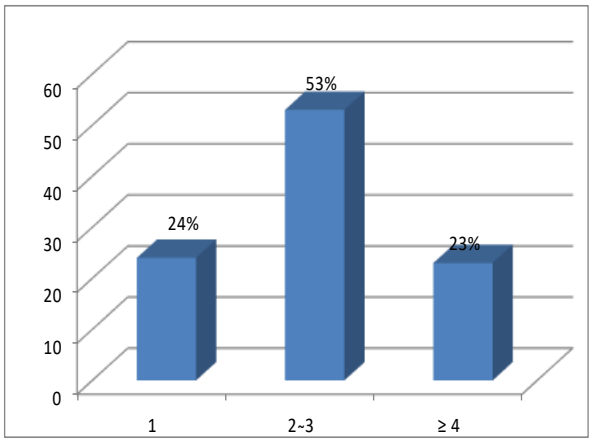

Figure (3): Number of antenatal care visits for multipara during last pregnancy

The prevalence rate of iron deficiency anaemia (IDA) in the current study was 44.75%. This is higher than that of Sohag governorate announced by DHS 2014. This may reveal deterioration of the socioeconomic conditions of studied population in the last five years. Another study in Menoufia rural areas found that the prevalence of IDA is 51.3%.[9]

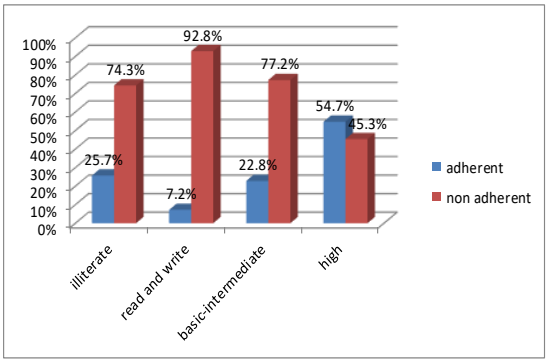

Figure (4): Relation between pill counting adherence and women's education in the study sample

The prevalence of IDA in the second trimester was 56.7% and 27.2% in the third trimester in this study. This can be explained by the occurrence of sudden increase in the cardiac output and

hydration of the blood in the second trimester. Gradually the body compensate for this physiological anaemia and some improvement occur. So the defining level of anaemia is lower in the second trimester than in the third trimester.

The study revealed that, 25.5% of pregnant women were found to be adherent to iron supplements by pill counting adherence, this finding is in parallel with studies conducted by Taye, Abeje, & Mekonen done in Amhara region of Ethiopia in 2015, which revealed that 20.4% adherence rate [10]. But it is lower as compared to the comparative study done in North Western Zone of Tigray, Ethiopia which revealed that 74.9% of pregnant women were found to be adherent to iron supplements approved by Gebremedhin et al., 2014[11], the probable reason may be the difference in the socioeconomic conditions and the time gap between studies.

Data from many studies imply that prenatal care can saves lives and show a connection between the number of prenatal visit and pregnancy outcome, the classical schedule for the prenatal visits is every 4 weeks until 28 weeks gestations every 2 weeks from 28 to 36 weeks, and then weekly until delivery. Porous women with uncomplicated medical or obstetrical history may be seen less often, women with problem are seen more frequently.[12] The MOH of Egypt recommended at least four visits for ANC to ensure satisfactory antenatal care.[2]

Our results proved decreased number of ANC visits where women could receive health education by the health professionals during their regular follow-up period. This lower number of ANC visits (only 23% of the studied women paid four visits to the PHC centers) may be due to lower education and socioeconomic status of women in the study sample in addition to the poor quality of ANC service. These results are contradictory to the data of the DHS 2014 which indicated that more than eight in ten mothers had regular antenatal care for their last live birth, i.e., at least four antenatal visits. Three-quarters of mothers reported that they had their initial antenatal care visit in the first three months of pregnancy.[2]. Similar study at Venezuela showed much better results where 34.44% of pregnant women did not have an appropriate prenatal care (less than 5 visits).[4]

By ford-Richardson et al., 2013 found that, it is important for health worker attitudes and actions to contribute to a positive ANC experience that encourages pregnant women to return for care.[13] Training nurses provide an opportunity to address wider issues of ANC quality, including counseling skills. This has been successful when integrating other interventions into ANC.[14]

This study showed statistically significant associations between pill counting adherence and maternal education, and husband education. This is in agreement with other studies describe the compliance, and stated that demographic factors influencing use of iron supplements among pregnant women at primary care level and showed that higher education was positively associated with adherence.[15]

This study revealed that women who are more or less knowledgeable about anemia were more likely to be adherent to iron tablets supplementation. This is consistent with studies done in Nigeria and Ethiopia[10,11,16,17] which found that pregnant women who received information about anemia, its causes and the importance of iron supplementation during pregnancy were more likely to be compliant.

Patients who do not understand their physician's instructions take medications less reliable than those who do. Educational interventions involving patients, their family members, or both can be effective in improving adherence.[18]

Having a household member that provide frequent encouragement and reminders could improve adherence to iron supplements. In our study the family role was statistically significant associated with pill counting adherence, as we found that several women reported that family member support positively influenced iron tablets adherence, which is consistent with iron supplements studies within other contexts as proved by Aguayo et al., 2005.[19] For some women, family members do not only encouraged them but also reminded them to take their iron supplements.[20]

In our study, 32.3% of the women reported that their cause of lack of adherence was forgetting to take the iron tablets, regarding the issue how to minimize forgetfulness, women should be continuously counseled to use different mechanisms like correlating with natural occurrences, sunrise or sunset, lunch or dinner. Kulkarni et al., 2010 showed that forgetting is a common challenge to consistent iron tablets adherence, and new strategies are needed to help women to remember.[21]

Also in the present study, 23.5% of the women reported that their cause of lack of adherence was the side effects of the iron tablets, health professionals in charge of ordering iron tablets during pregnancy should apply detail counseling about the possible mild side effects of the drug and tell them that these side effects are limited and self-managed. In our study, 13.2% of the women reported that their cause of lack of adherence was the cost of the iron tablets, this agrees with a study done by Noble et al., 2001 which found that non-adherence may result if the medications cost too much.[22]

Another factor was found to be a cause of lack of adherence for the pregnant women; the lack of clear instructions from the health care team and because there was only one visit done by 52.8% of pregnant participants, these were leading to the low rate of adherence in the study sample.

Conclusion

Anemia prevalence was 56.7% in second trimester and 27.2% in the third trimester. The total anemia prevalence percentage in our study was 44.75%. In this study, 25.5% of pregnant women were found to be adherent to iron supplements by pill counting adherence. This study showed there were statistically significant associations between pill counting adherence and the family role to encourage the woman to take tablets, maternal education, maternal occupation and knowledge about anaemia.

Recommendations

Iron supplements should be available at all levels of care and in forms suitable and with fewer side effects. Health education activities should be carried out to increase awareness of the importance of iron supplementation. Family physicians should be aware of non-adherence problem and factors affecting adherence and try to improve adherence of pregnant women to iron and folic acid. It is recommended to use pill-count adherence instead of self-report, as it is more accurate.

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