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Research Article

Determinants of Adherence to Iron and Folate Supplementation among Pregnant Women in West Iran: A Population Based Cross-Sectional Study

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ABSTRACT

Background: Iron and/or folate deficiency are prevalent health problems in pregnant women worldwide, especially in less developed countries. Although such a problem could be prevented by an adequate prenatal care including providing iron and folate supplementation, adherence to the prescribed supplementations is still problematic in many nations.

Purpose: This study was aimed to assess adherence to Iron and Folate supplementation, and the associated factors, among pregnant women in western, Iran.

Design/methodology/approach: This cross-sectional study conducted on 433 pregnant women selected randomly among those (n=8500) attending 40 Health Care Centers in west Iran (2015-2016). A validated questionnaire was used to gather data related to the aim of study including demographic characteristics, compliance to iron/folate and reasons for non-adherence. Using Chi-square, the relationships between outcome variable and predicting variables were assessed.

Findings: Participant's ages and their gestational ages were (27.86 ± 5.54 years) (μ ± SD) and (23.29 ± 9.86 weeks), respectively. Adherence and on time, respectively, were 71.6%/28% for Iron, and 81.5%/40% for Folate. Most common cause of non-adherence was forgetfulness and medical side-effects concerning. Educational status, age and history of anemia were significantly associated with adherence to Folate, against, Iron with a positive association with educational status only.

Conclusion: Although adherence to iron and Folate was relatively high, most women had not started taking the supplements at the correct time, mostly due to insensibleness and fear of side effects which could be improved by educating women and providing a strategy remembering women to take their pills on time.

Keywords: Compliance; Folic acid; Iron; Pregnancy; Prenatal care

Introduction

Pregnancy is a critical stage of women's life affecting in the next generation. During pregnancy, iron and folic acid requirements are enhanced due to physiological and hormonal changes in mother and high fetal demands hence, the probability of occurrence iron deficiency and acid folic deficiency is relatively high [1-3]. Iron deficiency anemia in pregnancy is a significant health problem [1-4].

According to the Centers for Disease Control and Prevention's approach, hemoglobin (Hb) levels less than 11 g/dl, during the first and third trimesters and also Hb levels less than 10.5 g/dl in the second trimester is considered as anemia in pregnancy [5]. Overall, the causes for pregnancy anemia are nutritional deficiencies, incompatibility between needs and nutritional intakes, parasitic and bacterial diseases and hematological disorders (e.g. thalassemia). It is estimated that 20% to 80% of female population in the world are suffering from anemia during pregnancy, the majority being due to iron deficiency [6] resulted in a hypochromic and microcytic anemia. Anemia in pregnancy is aggravated by condition such as postpartum hemorrhage and active hemorrhagic events associated with delivery. In addition to the general adverse effects of iron deficiency anemia, it increases the risk of maternal mortality [7], premature delivery, intrauterine growth retardation and low birth weight (less than 2500 g) [8,9]. The definitive diagnosis comes from a low

serum ferritin level or percent transferrin saturation (TSAT) plus iron bound capacity [10]. Oral iron therapy is generally effective and convenient to prevent and treat iron deficiency anemia [11]. In pregnant women suffering from gastric bypass, uterine bleeding, inflammatory bowel disease and hereditary hemorrhagic telangiectasia or in those who oral iron is to be ineffective, the intravenous iron is prescribed [10].

Pregnancy-related Folate deficiency is often associated with megaloblastic anemia, low birth weight (less than 2500 g) and congenital anomalies (e.g. Neural tube defects) [12]. NTDs are accounted as the second common group of congenital anomalies [13]. NTDs arise because of the defect in neurulation during embryogenesis, a process that occurs in 21-28 days after conception, often before women even know they are pregnant [14-16]. The burden associated with NTDs is substantial, it is usually related with other congenital abnormalities and all these lead to various disabilities and financial burden on the family and society [15]. The evidence is strong that the administration of acid folic 3 months before and during conception can reduce the risk of NTDs by 75% [12,14,15,17]. Spinabifida and anencephaly is the most common neural tube defects. A bout 0.3-0.4 million infants are affected by Spina bifida and anencephaly yearly. The serious defects like anencephaly is incompatible with life and majority do not survive and the others live with a huge disability [15].

Pregnant women living in low and middle income countries, suffering from a base-line malnutrition, need more attention about starting Iron and Folate supplementation therapy in an appropriate stage of their pregnancy [12]. The World Health Organization (WHO) recommends that all pregnant women should take a daily dosage of 30-60 mg of elemental Iron[1] and 400 µg (0.4 mg) Acid Folic as a part of antenatal and neonatal care program in order to improve pregnancy outcome and prevent adverse effects of elemental deficiency [3,16]. This includes women with normal hemoglobin (Hb) as well as those with anemia of iron deficiency, however the time for starting regular taking supplement is different for those with anemia in whom anemia must be treated before getting pregnant, if not possible anyway, taking extra dosage of supplements during pregnancy.

Nowadays, providing elemental Iron/Folate supplements by health care systems in the most of countries across the world, the major problem with Iron and Acid Folic deficiency is related to non-adherence or a poor adherence arise from personal behaviors, cultural issues, environmental factors, etc. [18,19]. Most common reason declared by evidence is lack of awareness, Sociodemographic factors, economic status, inadequate service delivery and side effects [20]. For example, women taking Iron supplements, especially those with lower price, may experience unpleasant side effects such as constipation and sometimes diarrhea, gastric cramping, a metallic taste and thick, green and tenacious stool [10,18]. Some of these factors are modifiable and preventable so, greater focus on factors associated with adherence to iron and acid folic supplementation in pregnancy may improve outcomes [13]. In Iran, where Iron and Acid Folic are provided by Primary health care centers for all pregnant women freely, adherence to Iron/Folate supplements is not optimal. On the other hand, recently, a huge governmental concerning about aging population and reducing fertility rate leading to encourage people to birth more child, may increases pregnant women resulting in pregnancy-related issues. Iron/Folate supplementation therapy and the associating factors to non-adherence or poor adherence, therefore, must be clarified to be addressed appropriately. This study was aimed to assess factors associated with adherence to Iron and Folate supplementation among pregnant women in Kermanshah, Iran 2015-2016.

[1]The equivalent of 30 mg of elemental iron is 150 mg ferrous sulfate heptahydrate, 90 mg ferrous fumarate or 250 mg ferrous gluconate.

Materials and Methods

Setting

Kermanshah, in western Iran, with 1952433 inhabitants of whom 964419 are women, is a capital city in which many people are disadvantaged. In this city, more than 40 Primary Health Care Centers (PHCC) provide people, especially children and women, with primary care services for free. One of care taker groups are pregnant women, therefore, a good setting for our study.

Study design and sampling

In this cross-sectional study, 433 people among pregnant women attending in the PHCC in Kermanshah were selected to participate in the study. A multi-stage sampling technique (including cluster sampling, proportional and then randomized sampling) was used to select the samples. First, the 10 PHCC (clusters) were selected among 40 PHCC randomly. Then, samples size for each PHCC was considered based on its population coverage and the number of pregnant women taking care there. In the last stage, the pregnant women registered to each PHCC were selected randomly using Excel randomization.

According to two similar previous studies reporting an adherence rate of 50% [21] and 40% [1] and using a confidence level of 95% and marginal error of 5%, the computed sample size was 385. On the other hand, based on Cochran table for determining sample size, the minimum sample size was 379. However considering 10-15% nonresponse, a sample size of 433 was considered to be enrolled in this study.

Exclusion criteria

Participants were excluded from the study if be non-residential and/or were in the last month of pregnancy and/or those who did not sign consent form to participate in the study.

Instrument used for data collection

The eligible pregnant women signed consent forms were interviewed separately by two trained interviewers using a questionnaire developed based on the study objectives. The validity and reliability of questionnaire was tested and established, using a pilot study with 30 participants (Chronbach alpha=77%) and obtaining expert opinions including 7

specialists of prenatal care and national affairs. The questionnaire included three parts, the first part contained socio-demographic information, obstetrics and medical characteristics, second part comprised questions about adherence to the Iron and Acid folic supplementation consumption, and third part contained questions about causes of likely non-adherence. The socio-demographic characteristics included age, educational status, employment, the economic characteristics includes family income, house ownership and living status. The medical characteristics included gestational age, parity, distance from previous pregnancy and past medical history. The adherence to iron/acid folic supplementation was evaluated using following questions: Do you take Acid Folic and Iron supplements? When you started or will start Acid Folic and Iron supplements? And how do you take Acid Folic and Iron (regularly, irregularly or rarely/never). The interviewer had been trained to be sure that the participants understand her words completely. In addition, In order to increase the accuracy of answers, the care givers working in PHCC were asked to answer these questions regarding participant's adherence to Iron /Folate supplements. The causes of non-adherence were evaluated via an open ended question. After collecting data, the results of this question were categorized into eight items.

Data analysis

Data analysis was performed using statistical package for social sciences (SPSS). Quantitative data such as age and gestational age were described as mean ± standard deviation (M ± SD). Association between adherence to iron/acid folic supplementation and explanatory factors was assessed using Chi-square test. A probability value (p-value) of less than 0.05 was considered statistically significant.

Ethics approval

The Research Ethics Committee of the Deputy of Research of the Kermanshah University of Medical Sciences (KUMS) approved the study protocol. Participants were given adequate information about purpose of study. The written consent signed by the study participants was obtained. In addition, we have promised to keep personal information in a confidentially.

Results

Over ally 433 pregnant women participated in the study. In this study, nobody refused the consent and no missing data were found in the study. The mean ± standard (μ ± SD) age and gestational age of their pregnancies were 27.86 ± 5.54 years and 23.29 ± 9.86 weeks, respectively. Two hundred forty four (56.4%) participants were between 21 and 30 years of age and 39.7% had completed high school. Most of them (90.3%, 391/433) were unemployed or housewives. The mean income was 1532820 ± 1059980T (Iranian Currency=320$US) with a median of 15×10^5 T per mount. About 56% of the households were tenant and 40.0% were owner (Table 1).

About 33.3% of participants have been taken Iron supplement after being aware of their pregnancy, just 124 people (28.6%) reported taking Iron from 4 month after pregnancy(the standard time) (Table 1). One hundred and seventy five (40.4%) were initiated Folate before conception while 39.3 reported taking Folate after knowing they were pregnant. The form of Ferrous sulfate pills were the most common type of Iron supplement used by participants (50.8%). More than half of the pregnant women were carrying their first babies (51%). The previous child birth of 154 (35.6%) cases was 4 years or more (Table 1).

Three hundred and seventy one (85.7%) women have been receiving prenatal care regularly, during their current pregnancy and about 78.5% had access to PHCC as well as specialist to take health care services. The prevalence of history of premature birth and low birth weight were 8.5% and 3.2%, respectively. Eleven percent of the participants had past history of anemia in their previous pregnancy. A bout 20% had a past history of a major illness such as hypertension, heart diseases, diabetes, rheumatism, anemia, asthma or epilepsy (Table 1).

According to the self-reported information, adherence to Iron supplement was 71.6%, and 81.5% to Acid Folic, similarly, care givers reported adherence to iron and acid folic 72.3% and 81.3%, respectively. There was no significant association between the self-reported results and PHCC care givers' report (p-value>0.05). Table 2 presents association between adherence to Iron/Acid Folic supplementation and personal characteristic. Educational status, age and past history of anemia were factors associated significantly with adherence to acid folic supplementations (P-value ≥ 0.05).

Among those with low adherence, two main reasons for not taking pills were: 1- they forgot to take the pills in most days and 2- they experienced side-effects such as gastrointestinal side-effects (Table 3).

Discussion

The current study examined the adherence to Iron and Folate supplementation and the associated factors among pregnant women in west Iran. In general, the total adherence in terms of taking was at a relatively high level (72 % to iron and 82% to acid folic) that has been approved by PHCC health services providers. These results are consist with some studies, and even shows better situation than many other studies. However, the time of starting to take supplement was not optimal.

Ratanasiri and colleagues from Nepal have reported 73% for total adherence to Iron and Acid Folic (IFA) supplement therapy in 2014 [22]. Likewise, Seck and Jackson work conducted in Senegal showed 69% adherence to Iron supplement in 2007 [23]. Also a 81.4% adherence rate was reported, by Riazi and Bashirian, for Acid Folic in Hamadan another state of Iran with relatively different culture from Kermanshah [24].

Other studies showed a less adherence rate than ours. A study conducted by Ibrahim et al from Ismailia showed 41% adherence to Iron-Folic Acid supplement therapy in 2008 [1]. Similarly, Gebre's survey conducted in Tigray, Ethiopia reported about 37% adherence to IFA supplement therapy in the urban communities and 29% adherence to IFA supplement therapy in rural communities [25]. Likewise, 50% adherence rate was reported, by Habib and colleagues for Iron in Riyadh, Saudi

Table 1: Sociodemographic, economical, and medical information of pregnant women, west Iran 2015-16 (n=433).

	Character	Subgroup	N (%)		Character	Subgroup	N (%)
Sociodemographic Variables	**Age, years**	18 ≥	15 (3.5)		**Iron supplementation**	Non pre-conception	76 (17.6)
		19-24	108 (24.9)			with pregnancy	88 (20.3)
		25-30	171 (39.5)			4 month after	144 (33.3)
		31-35	105 (24.2)			pregnancy	124 (28.6)
		36 ≤	34 (7.9)				41 (9.5)
	Educational status	Illiterate	4 (0.9)		**Folate supplementation**	Non pre-conception	175 (40.4)
		Primary/guidance school	119 (27.5)			with pregnancy after	170 (39.3)
		High school	172 (39.7)			pregnancy	46 (10.6)
		College and university	138 (31.9)				
	Work status	Housewife/ unemployed	391 (90.3)		**Type of iron supplement**	Ferrous sulfate tab	220 (50.8)
		White collar	29 (6.7)			Hematinic tab	16 (3.7)
		Other	11 (3.0)			Phenols capsules	88 (20.3)
						Other	33 (7.6)
Economic Variables	**House ownership status**	Owner	173 (40.0)	Past Medical History	**Antenatal care (ANC) status**	Rarely	13 (3.0)
		Rent	242 (55.9)			Unregularly	48 (11.1)
		Other	18 (4.2)			Regularly	371 (85.7)
	Living situation	Self-governing	354 (81.8)		**Healthcare access**	PHCC (only)	87 (21.1)
		With parents	79 (18.2)			GP (only)	0 (0.0)
	Family income	5×10^5 T[a]>	190 (43.9)			Private midwife (only)	0 (0.0)
		5×10^5-10×10^5 T	0 (0.0)			Specialist (only)	1 (0.2)
		10×10^5-20×10^5 T	182 (42.5)			PHCC and GP	4 (0.9)
		20×10^5-25×10^5 T	24 (5.5)			PHCC and midwife	1 (0.2)
		25×10^5 T ≤	37 (8.5)			PHCC and specialist	340 (78.5)
	Gestational age	12 ≥	101 (23.3)		**Previous anemia**	No	383 (88.5)
		13-28	184 (42.5)			Yes	50 (11.5)
		29 ≤	148 (34.2)		**Previous premature birth**	No	396 (91.5)
	Parity	Nullipara	221 (51.0)			Yes	37 (8.5)
		1	145 (33.5)		**Previous low birth weight (LBW)**	No	419 (96.8)
		2	56 (12.9)			Yes	14 (3.2)
		3 and above	11 (2.6)				
	Distance from previous pregnancy	First birth	221 (51.0)		**Previous chronic diseases**	No	342 (79.0)
		Interval<2 years	25 (5.8)			Yes	91 (21.0)
		2-3 years	33 (7.6)				
		Interval 4 years and more	154 (35.6)				

Arabia [26]. Passarelli and colleagues from Sao Paula, Brazil have reported 42% for adherence to Acid folic supplement therapy in 2014 [27].

In regard with the starting to take Iron/Folate supplement by participants, our findings showed that women in western Iran had not followed an optimal schedule. According to Iranian guidelines for Iron and Acid Folic supplement therapy in pregnant women, they should take a daily dosage of 30-60 mg of elemental iron from 4 months after pregnancy and continuing until 3 months after postpartum. Also, a daily dosage of 400 µg (0.4 mg) acid folic starting from 3 months or at least 1 month before conception until 10 to 12 weeks postpartum. In the present study, results showed that participants mostly started supplement therapy in a wrong time. Only 29% had started Iron in an optimal time. But the result was better for Acid folic by more than 40%.

The results demonstrated that educational status, age and experience of anemia were factors significantly associated with adherence to Acid Folic supplementation. These results are consistent with the findings from previous studies .In the studies conducted by Passarelli et al. [27] and García-Fragoso et al. [28] showed that a higher level of education had a positive association with adherence to Acid folic supplement therapy. These differences might be explained by the potential effect of education on self-care behaviors, the more educated are more likely to meet their needs during pregnancy, thus, more likely to adhere with the prescriptions [29]. It is obvious as described by Ogundipe et al. [30] and Gebre1et al. [25], women with a history of anemia during their previous pregnancy will be more likely to perceive the benefit of supplementation during current pregnancy. The current study showed that the higher compliers were older women. An earlier study conducted in Nepal has reported these relationships [31]. Conversely, in another study conducted in Tigray, Ethiopia; elder age was statistically independent negative predictors for adherence to Folic acid supplement therapy [25].

On the other hand, a significant association was not found between family income and adherence to both supplementations.

Table 2: Frequency of personal characteristic and their association with adherence to folate/iron.

Factors [a]		Adherence to Iron				Adherence to folate			
		Yes (%)	No (%)	Total (%)	P-value	Yes (%)	No (%)	Total (%)	P-value
Age	18 ≥	8 (53.3)	7 (46.7)	15 (3.5)	0.41b	9 (60.0)	6 (40.0)	15 (3.5)	0.01
	19-24	79 (73.1)	29 (26.9)	108 (24.9)		85 (78.7)	23 (21.3)	108 (24.9)	
	25-30	125 (73.1)	46 (26.9)	171 (39.5)		142 (83.0)	28 (17.0)	171 (39.5)	
	31-35	71 (67.6)	34 (32.4)	105 (24.2)		86 (81.9)	19 (18.1)	105 (24.2)	
	36 ≤	26 (76.5)	8 (23.5)	34 (7.9)		31 (91.2)	3 (8.8)	34 (7.9)	
Educational status	Illiterate	1 (25.0)	3 (75.0)	4 (0.9)	0.1	1 (25.0)	3 (75.0)	4 (0.9)	0.02
	Primary/guidance school	80 (67.2)	39 (32.8)	119 (27.5)		94 (79.0)	23 (19.3)	119 (27.5)	
	High school and College	28 (74.4)	44 (25.6)	172 (39.7)		141 (82.0)	31 (18.0)	172 (39.7)	
	University	100 (72.5)	38 (27.5)	138 (31.9)		117 (84.8)	21 (15.2)	138 (31.9)	
Family income	5 × 105 T>	128 (67.4)	62 (36.2)	190 (43.9)	0.09	190 (43.9)	30 (15.8)	160 (84.2)	0.47
	5 × 105-10 × 105	-	-	-		-	-	-	
	10 × 105-20 × 105	138 (75.8)	44 (24.2)	182 (42.0)		182 (42.0)	39 (21.4)	141 (77.5)	
	20 × 105-25 × 105	20 (83.3)	4 (16.7)	24 (5.5)		24 (5.5)	3 (12.5)	21 (87.5)	
	25 × 105 T ≤	23 (62.2)	14 (37.8)	37 (8.5)		37 (8.5)	6 (16.2)	31 (83.8)	
Previous anemia	No	275 (71.8)	108 (28.2)	383 (88.5)	0.34	383 (88.5)	108 (28.2)	275 (71.8)	0.03
	Yes	34 (68.0)	16 (32.0)	50 (11.5)		50 (11.5)	14 (28.0)	35 (70.0)	
	Total							433 (100.0)	

a Chi-square analysis b P-value ≤ 0.05

Table 3: The factors barrier to adherence to folate and Iron in those with poor adherence.

Barrier to adherence	Poor adherence to Iron (n=123)		Poor adherence Folate (n=84)	
	N	%	N	%
Forgot to take the pills	69	56.25	54	67.5
Was unaware about the benefits of pills	5	4.0	2	2.5
Experienced side-effects	36	29.16	12	15.0
Was afraid that tables would harm for her/or his baby	3	2.08	2	2.5
Lost the tablets because the advised people	-	-	4	5.0
Could not afford to purchase the pills	5	4.0	2	2.5
Lack of belief in the usefulness of the pills	3	2.08	2	2.5
Grew tired of taking pills	3	2.08	-	-
Total	123	100	84	100

This might be because of easy access PHCC primary care services, maternity care in particular, that is free of charge in Iran. Accordingly, Folic Acid and Iron are dispensed with a very low co-payment in drug stores as well.

Participants mentioned several reasons for not being adherent to Iron/Folate supplements. The first most important factor was forgetfulness. This problem should be addressed with better counseling during the prenatal visit. Further, providing strategies remembering women to take their pills on time (e.g. placing the tablets in a site they see every day and etc.) may help to solve the problem [26]. The second important barrier to adherence was medical side-effects. For example, those taking oral iron usually suffered from gastrointestinal side effects resulting in non-adherence [10]. These finding were in line with studies conducted by previous authors. In studies conducted in Iranshahr, south Iran [21] and Semnan, central state of Iran [32] forgetfulness was found to be the main factors underlying poor adherence to IFA supplement therapy. While two similar research conducted in the Nepal [19] and Nigeria [30] indicated that perceived side-effects were the main barriers to adherence.

Although these side effects are transient and not harmful basically, providing supplements without side effect is recommended. Also, teaching women will be important, for instance they should be advised to take the iron supplements with food to reduce pain [19].

Limitations

The current study should be considered in view of a few limitations providing researchers with a guide for further studies. Firstly, we used self-reported data to assess the adherence to iron and acid folic supplements, these types of data may have a lower accuracy compared with observational methods, although we applied a strategy to move this limitation by asking the same question from caregivers. Secondly, the cross-sectional nature of the study design did not allow some further analysis directed to the associations and over the long times. Thirdly, we limited our focus on adherence and did not assess women's knowledge about Iron and Acid Folic supplementation that might be associated with adherence to Iron and Folate supplementation among pregnant women.

Conclusion

In conclusion, although adherence to Iron/Folate was relatively high, mostly had not started taking supplements at the correct time. Hence, health care providers and health educators should focus on the standard starting time during their education programs in prenatal care period. Adherence to Iron/Folate in pregnant women can be promoted by minimizing side-effects and providing a strategy remembering women to take their pills on time. According the results of the present study, the higher educational status was an important determinant of adherence hence, the educational programs for women in the reproductive age can improve their knowledge and intake of Folate and Iron on time.

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