



ADHERENCE OF PREGNANT WOMEN TO FOLIC ACID INTAKE AND ROLE OF PHYSICIAN ON ADHERENCE IN AL AHSA DISTRICT OF SAUDI ARABIA

SaknahTaher Al-haddad¹, Ahlam Mansour Al-duwaiel² and Abdul Sattar Khan³

^{1,2}Ministry of Health, Saudi Board of Family Medicine Al-Ahsa Province, Saudi Arabia

³Family Medicine department, Medical faculty, King Faisal University Al Ahsa, Saudi Arabia

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ABSTRACT

Background: Studies on the level of adherence to folic acid (FA) and factors associated were limited in number and showed discrepancy within the same area and among different populations. By detecting these factors, there will be a possibility to improve the compliance and then decrease in the prevalence of undesirable outcomes as NTD. The health care providers have an important role in this adherence.

Method: A cross-sectional study that uses a multistage sampling technique was used. It was conducted among multiple primary health care centers in Al-Ahsa city. The sample size was 176 pregnant women based on the prevalence of awareness regarding FA intake during pregnancy. It was 160 initially, however 10% patients were added in order to manage the dropouts.

Result: The prevalence of use of FA among pregnant in their first trimester was satisfactory (87%). Only 2% of pregnant have previous child with NTD. By assessing the FA adherence level, we found that only 15% are highly adherent. A common reason (71%) of low adherence was forgetfulness secondary to taking care of others followed by being a working mother and unawareness of FA importance. A 13% of pregnant did not take FA at all. The main reasons behind non-use of FA as participant mentioned that FA was not prescribed for them, followed by unawareness of its importance during pregnancy.

There was a positive correlation between level of adherence and patient-doctor relationship. A 74% patient had totally appropriate rapport with their primary health care physicians (PHCP).

Conclusion: For high adherence, the patient should know and understand the importance of the FA taking, and why she takes it and when she can stop it safely. Improvement of adherence is required, and this need qualified physician with good communication skill, enough time for each pregnant.

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INTRODUCTION

The demand for the ingested folic acid is increased during the pregnancy due to its role in high rates of cell division, rapid fetal growth and placental development. Henceforth the pregnant women are more susceptible to folate deficiency without its supplementation during the pregnancy.^[1,2]

Folate is required for normal cell division as In the synthesis of DNA, and it has an important role in the formation and maturation of red blood cells also It works in the formation of essential amino acids and derivatives in combination with Vitamin B12^[3]. Supplementation of folic acid is essential during the periconceptional care of women in the reproductive age group. The folic acid deficiency during pregnancy can be leading cause for undesired outcomes for both the mother such as "anemia or pregnancy complications" and as congenital malformations in the fetus like Neural Tube Defect (NTD).^[4,5] Most of these defects can be prevented if a woman consumes an adequate folic acid supplement with the right

dose with high adherence daily during the preconception period and throughout the first 12 weeks of pregnancy.^[6-9]

Both observational and Interventional studies emphasized that adequate consumption of folic acid during periconceptional period can protect against 50-70% of Neuronal Tube Defect (NTD) and the deficiency of FA could lead to neural tube defects (NTDs) in the fetus. Furthermore, many studies from developed countries have discovered large reductions in NTDs with the adequate intake of FA supplementation and after food fortification.^[10,11]

NTD registry was established in Saudi Arabia in the year 2000 and 579 patients with NTD were registered till the year 2009. This registry showed that there were a significant number of mothers of these children who did not take folic acid (FA) before conception (98%). Only 19% started FA in the first trimester.^[12]

In the United States, each year; approximately 4000 pregnancies are affected by NTD; most of these defects could

*Corresponding author: SaknahTaher Al-haddad

Ministry of Health, Saudi Board of Family Medicine Al-Ahsa Province, Saudi Arabia

be prevented by daily intake of folic acid throughout the periconceptional period.^[13] Saudi Arabia and Qatar studies has showed a high proportion of women who were not aware of the importance of FA in pregnancy for preventing NTDs.^[14] The World Health Organization (WHO) guidelines recommend a standard oral dose containing 0.4 mg once per day of folic acid supplements during gestation as part of their antenatal care follow up.^[15] The recommendations from most major national medical organizations and public health authorities suggest that all women of childbearing potential, not only those who are planning to conceive, to receive the folic acid supplement to prevent (NTDs).^[5] Therefore, in order to get a good outcome, adherence to folic acid during pregnancy is required as WHO considered the adherence to medication one of the important factors that affect the outcome of therapy.^[1]

"Adherence" defined by many studies as: "the extent to which the patient's behavior matches agreed recommendations from the prescriber", which mean there is a participation of both patient and physician to accomplish adherence then to improve the patient's health by combining of the physician's medical judgment and the patient's attitude for own care. In addition, adherence is included that health providers have a responsibility to form a relationship with patients, to encourage them to agree to a recommended treatment regimen.^[16]

There are two methods of measuring adherence one is self-report while the other the use of pill counts. These methods can be utilized in clinical practice as part of the vital signs that patients receive at their clinic visit.^[17-19] The understanding of why patients do not adhere to their medicines can help to avoid some of the unwanted outcomes and enable health providers to improve patient adherence. There are several barriers and a variety of factors that affect adherence to folic acid as discovered by various studies in order to improve and reach a good level of folic acid adherence. In order to look for those factors, "dis-adherence" could be defined in different types. It is categorized into the following; The first type is known as primary non-adherence, in which health providers write a prescription but the medication is not filled or initiated, while the second type of non-adherence is the discontinuation of taking medicine according to the patient's decision after starting it, without being advised by health providers to do so.^[20] Though these categories can help us to understand the different ways, in which patients are non-adherent, also for identifying barriers and understanding the factors that make patients non-adhere to folic acid.

The WHO (2003) has identified five dimensions of the factors considered to influence patient adherence, which are: Social and economic factors; which include age, social class, level of education, employment status, income, level of literacy, lack of effective social support networks, unstable living conditions, and family dysfunction. Healthcare team and system-related factors; a good relationship and communication between patients and health care providers are helping patients adhere to medication. Condition-related factors: as the symptomatic patients may be more likely to adhere to their medications. Therapy-related factors: therapies with multiple different medicines, Complex regimens or taken several times a day could be influencing the levels of adherence. Patient-related factors; including patients' knowledge, beliefs, and attitudes to medicines and disease.^[16] Thus, all of "patients,

health care providers, and health care systems" have a role in improvement of adherence to folic acid.^[20]

There are many factors cited by different studies responsible for non-adherence of folic acid intake during pregnancy. The lack of parental education, older aged women, belonging to the lowest household wealth index, no utilize of ANC services, and rural residence were associated factors with non-use of iron and folic acid supplements among pregnant women in the survey conducted in Pakistan^[21]. However side effect of folic acid was blamed as the main reason for non-adherence among mothers in an Ethiopian study.^[22] An Indonesian study has found rural residence, high birth rank infants, low economic status, level of parental education, mothers with low autonomy on own health care, low exposure to mass media, low knowledge of obstetric complications, financial problems and the distance to health services as factors for non-adherence to folic acid. In Kenyan study Lack of folic acid supplement supplies, dislike of the taste of folic acid supplements, ignorance of the importance of folic acid supplements, side effects, forgetfulness and religious/cultural beliefs were blamed as the main reasons for folic acid non adherence.^[3] In a similar study in Qatar and Al-Qassim of Saudi Arabia, higher education level was significantly associated with awareness and usage of folic acid in the periconceptional and first trimester period.^[23-25]

Primary care physician plays pivotal role in educating and introducing folic acid to pregnant women. Therefore, knowing the nature of the relationship between pregnant women concerned with studies of the status of adherence to folic acid and primary care physicians is important for estimation the good communications, therefore improving more adherence state to folic acid supplementation among pregnant women and then decrease on the probability of undesirable consequences and it also may improve health care providers attitude towards their job as awareness about the importance of folic acid to pregnant women.

A Pakistan study found that those women who attended the ANC clinics regularly were significantly more adherent to folic acid intake.^[24] The study on Kenya (2010) confirmed the need to improve general health and emphasized health care worker advice for pregnant women as it had found that they were significantly associated with higher adherence to folic acid supplementation.^[3] Iraq study has found that the poor communication between health care providers and pregnant women, lack of knowledge about folic acid supplements and inability to retain medical instructions as the mean reasons for non-adherence to folic acid intake in pregnant women.^[1] In Qatar study also the result assured the role of physicians on introducing and awareness about folic acid.^[26] Also, the study conducted in Al-Qassim corresponded with the study on Qatar, where most of the respondents indicated that the source of information about folic acid was from physicians.^[28] Studies on the status of adherence to folic acid and the affecting factors to the adherence were limited and showed variation within the area and among different populations.^[3,29] Therefore, the current study was conducted to assess the adherence, to identify the factors affecting the adherence during pregnancy, and to assess the role of primary health care physicians on this adherence status among pregnant women attending antenatal care clinic in primary health care centers of Al-Ahsa city. As long as, knowing the prevalence of the use of antenatal FA supplements and detecting the factors that affect the adherence

to folic acid supplementation are important to provide guidance for improving the adherence to folic acid supplementation among pregnant women and then reduce the prevalence of undesirable outcomes as NTD.

MATERIAL AND METHODS

It was a cross sectional descriptive study conducted in Al-Ahsa, located in the eastern province of Saudi Arabia. This study included all the antenatal care clinics running at the primary health care centers of Al-Ahsa region during the period August 2017 to January 2018. All the pregnant women attending antenatal care clinics of primary health care centers in Al-Ahsa were the study population. To get the representative sample and with presumption on the prevalence of awareness regarding folic acid intake during pregnancy in similar study^[30] with 95% of confidence level, the sample size for the study calculated was 176 pregnant women which consisted of extra 10% of patients to manage the dropouts. It was obtained by using the Epi info.

Multistage sampling technique was used (stage 1: stratified cluster and stage, 2: systemic random sampling). There are 70 PHC centers in Al-Ahsa, of which ten centers were excluded because of long distance. Sixty centers were divided into three regions, i.e. Al-Omran (with 21 PHCs), Al-Mubarraz (with 19 PHCs), and Hofuf (with 20 PHCs). The cluster sampling was done for all three regions proportionately. Three centers from each region of Al-Omran and Al-Mubarraz and 4 centers from Hofuf were chosen randomly. Nineteen patients from each clustered PHC center of Al-Omran and Al-Mubarraz and Sixteen patients from each clustered PHC center of Hofuf were included in the study by simple random sampling. Saudi pregnant women in the first trimester attending the antenatal clinic of primary health care centers were the inclusion criteria while the non-Saudi pregnant and Saudi pregnant women in the second and third trimesters were the exclusion criteria.

Data was collected by the researcher through interview with the eligible study participants. It involved demographic data (including age, nationality, living city, educational level, occupation and present of any comorbid diseases) and questionnaires on the reasons of non-use and low adherence to FA and if having a child with NTD. In additions, two validated questionnaires were also used as both of them needed to cover our objectives. A first questionnaire was Medication Adherence scale that contains 8 items.^[31] It was used to assess the adherence in relation to patient, physician and medication. For each item, there were two possible answers (Yes, No) and their values differ based on the question. The total score was 8 and the adherence was rated as highly adherence (<6 = low adherence; 6 to < 8 = medium adherence). One question on this questionnaire was modified (adapted) to meet the study need. Another questionnaire was about Patient-Doctor Relationship (PDR-9), and it had 9 items.^[32] It was used to assess the patient understanding and feeling toward his primary health care physician. For each item there were 5 variables (1= "not at all appropriate," 2= "somewhat appropriate," 3= "appropriate," 4= "mostly appropriate," 5= "totally appropriate. The total score was interpreted as: Score 18 = 40%, score 27 = 60%, and score 36= 80%. Being not appropriate = $\geq 40\%$, somewhat appropriate = 40%-60%, mostly appropriate = 60%-80%, and very appropriate = $\geq 80\%$. Also, one question on this questionnaire was modified (adapted) to meet the need of the study. Data was entered and analyzed in SPSS version 23. Each variable in the

questionnaire was coded for easy analysis. Frequencies and descriptive were run for all categorical variables like age, occupation, level of education and co-morbidity. To measure the association between dependent and independent variables like demographic variables, Chi-square was applied. Pearson coefficient was applied to see the correlation between the level of adherence, demographic characteristics and the doctor-patient relationship. The P-value of < 0.05 was considered as significant. The study power was calculated as 95%.

Consent was taken from participants before interview and after explaining the study purpose. All information from the questionnaires was kept confidential. Before conducting the study, the necessary approvals were obtained from the ethical committee of Health Directorate of Al Ahsa region.

RESULT

A total of 178 participants responded the questionnaires giving the response rate to be 100%. All the participants were Saudi, living in Al-Ahsa and they were in their first trimester. More than half (58%) of the women belonged to age group 20 – 29 years followed by 35% who were between age 30 – 39 years and 5% who were below 20 years of age. Almost three fourth of the participants (71%) were housewives, 11% students, 6% teachers and 4% doctors. However, 51% of the participants had the university degree, and 36% had completed their secondary school. Majority of patients (89%) had no associated comorbid whereas, 4% had diabetes mellitus and 3% had sickle cell disease. The details of the demographic characteristics are shown in table 1.

Table 1 Demographic characteristics of participants (n = 178)

Demographic variables	Number	Percentage
Age:		
<20 years	8	5%
20 - 29 years	103	58%
30 - 39 years	63	35%
> = 40 years	4	2%
Occupation:		
Doctor	7	4%
Teacher	10	6%
Student	19	11%
Housewife	126	71%
Other	16	9%
Education:		
Illiterate	15	8%
Primary school	8	5%
Secondary school	64	36%
University Or Equivalent	91	51%
Comorbid:		
No comorbid	7	89%
DM	1	4%
Sickle cell	1	3%
Thalassemia	6	2%
HTN	1	1%
Asthma	4	1%
Other	158	11%

Majority of women (87%) took prescribed folic acid during pregnancy. However, 98% of women do not have any child with a neural tube defect. Twenty-four women were non-users of folic acid, and those women were asked for the reasons for not taking FA. Out of 24 women, 16 participants state that FA was not prescribed to them, followed by 13% who did not know the importance of folic acid during pregnancy. Whereas, 3% of women did not feel comfortable taking folic acid during pregnancy and 2% suggested that FA was not easily available to them.

Table 2 Showing frequency of folic acid intake and the reason of non-intake of folic acid

Questionnaire	Number	Percentage
Do you take FA during pregnancy?	154	87%
Yes	24	13%
No		
Does your child have NTD?		
Yes	4	2%
No	174	98%
Reason for not taking FA		
Not prescribed	16	64%
Not easily available	2	8%
Too many medicines	0	0
Not feeling comfortable	3	12%
Do not know its importance	13	52%

The use of folic acid and its association with demographic characteristics was calculated and the results were summarized in table 3. For all the demographic factors, taking folic acid during pregnancy is significantly associated with age (p-value 0.001) and level of education (p-value 0.001). However, occupation (p-value 0.15) and having comorbid or not (p-value 0.79) have no significant association with taking folic acid during pregnancy.

Table 3 Association between demographic factors and FA users (n = 153)

		Yes - Frequency	P - value
Do you take FA during pregnancy?	<20 years	4	0.001
	20 - 29 years	94	
	30 - 39 years	53	
	>= 40 years	2	
Age groups	Doctor	7	0.15
	Teacher	10	
	Student	15	
	Housewife	105	
	Other	16	
Occupation	Illiterate	8	0.001
	Primary school	8	
	Secondary school	51	
	University	86	
Level of education	No comorbid	134	0.79
	Diabetes	7	
	HTN	1	
	Asthma	1	
	Sickle cell disease	6	
	Thalassemia	1	
Comorbid	Other	3	

The Morisky adherence questionnaire based on eight items was used to calculate adherence to folic acid during pregnancy. The total score for adherence to the drug was obtained based on the Morisky score. Table 4 suggests the number of women & percentage for all the eight components which indicated that thirty nine percent showed low adherence to folic. However, 32% were moderately adherent, and 15% showed high adherence to folic acid use.

Table 4 Adherence to folic acid during pregnancy (N = 178)

Items	Number (%)	
	Yes	No
Do you sometimes forget to take medicine?	68 (44%)	85 (56%)
During last two weeks any day you forgot to take medicine?	59 (39%)	94 (61%)
Have you ever stopped taking medicine without the instructions of the doctor?	22 (14%)	131 (86%)
During travelling you usually forget to bring your medicine.	22 (14%)	131 (86%)
Did you take all medicine on time yesterday?	135 (88%)	18 (12%)
Do you know when you can stop medicine safely?	77 (50%)	76 (50%)
Do you feel difficult to strictly follow the	24 (16%)	129

treatment plan?	(84%)
How often you forget to take all your medicines?	Number (%)
Tick only one	
A. Usually	21 (12%)
B. Sometimes	73 (41%)
C. Never/Rarely	84 (47%)
Adherence Score* (n = 153)	Number (%)
Low adherence	69(39%)
Medium adherence	57(32%)
High adherence	27(15%)
*Score: < 6= Low adherence; 6 - <8 = Medium adherence; 8= High adherence	

Table 5 shows the result on Patients-Doctor Relationship Questionnaire (PDRQ-9). The questionnaire was measured based on the Likert scale. Majority of the responses showed agreement towards totally appropriate on the scale. Furthermore, the overall score of PDRQ was calculated which shows that 74% of patients had totally appropriate rapport with their primary health care physicians.

Table 5 Patient Doctor Relationship Questionnaire (PDRQ-9) (n = 178)

Statements	Percentage				
	NAA	SA	A	MA	TA
My PCP helps me	2%	7%	12%	8%	71%
My PCP has enough time for me	1%	12%	30%	7%	51%
I trust my PCP	2%	7%	11%	10%	70%
My PCP understands me	3%	8%	10%	10%	70%
My PCP is dedicated to help me	1%	9%	8%	8%	74%
My PCP and I agree on the importance of my medication	1%	12%	16%	5%	66%
I can talk to my PCP	2%	9%	11%	7%	71%
I feel content with my PCP's treatment	2%	10%	8%	7%	75%
I find my PCP easily accessible	2%	11%	27%	5%	54%
Overall score* for PDRQ	NA	SA	MA	TA	
	8%	7%	11%	74%	

*NAA= not at all appropriate, NA= not appropriate, SA= somewhat appropriate, A= appropriate, MA= mostly appropriate, TA= totally appropriate.

* Score: 18 = 40%, score 27= 60%, and score 36= 80%; Not appropriate (NA) = < 40%, somewhat appropriate (SA) = 40%-60%, Mostly appropriate (MA) = 60%-80%, totally appropriate (TA) = >= 80%.

The association between demographic factors and PDRQ was calculated and is summarized in table 6 which shows that the majority of the components (7 out of 9) were significantly associated with age groups (p-value < 0.05). Regarding occupation, only three out of nine components were significant, i.e. my PCP has enough time for me (p-value 0.04), I can talk to my PCP (p-value 0.00), and I find my PCP easily accessible (p-value 0.01). Whereas, the level of education was highly significant among all other demographic factors. Eight out of nine statements had shown significant association with educational level p-value < 0.05.

Table 6 Association between demographic factors and PDRQ - 9 (n = 178)

Statements	Age groups	Percentage					P-value
		NAA	SA	A	MA	TA	
My PCP helps me		0	1	2	2	3	0.00
		1	7	11	9	75	
		1	5	6	4	47	
		1	0	2	0	1	
My PCP has enough time for me		0	3	3	0	2	0.00
		1	9	28	9	56	
		0	8	20	3	32	
		1	1	2	0	0	
I trust my PCP		0	2	2	1	3	0.00
	<20 years	3	6	8	9	77	
	20 - 29 years	0	5	7	7	44	
	30 - 39 years	1	0	2	0	1	
My PCP is dedicated to help me	>= 40 years	0	2	2	1	3	0.03
		1	6	5	9	82	
		1	6	5	9	82	

Statements	Occupation:	NAA	SA	A	MA	TA	P-value		
My PCP and I agree on the importance of my medication		0	7	6	5	45	0.01		
		0	1	2	0	1			
		1	3	2	0	2			
		0	9	17	6	71			
		1	7	9	3	43			
		0	2	0	0	2			
I can talk to my PCP		0	1	4	0	3	0.00		
		1	8	9	7	78			
		1	6	6	6	44			
		1	1	1	0	1			
		0	2	3	0	3			
		1	9	4	8	81			
I feel content with my PCP's treatment		1	6	5	4	47	0.01		
		0	0	2	0	2			
	My PCP has enough time for me		0	0	0	0		7	0.04
			0	0	1	0		9	
			0	3	9	1		6	
			1	16	42	10		57	
		1	2	1	1	11			
		0	0	0	0	7			
I can talk to my PCP	Doctor	0	0	0	0	10	0.00		
	Teacher	0	1	6	1	11			
	Student	1	15	14	12	84			
	Housewife	2	0	0	0	14			
	Other	0	0	0	0	7			
		0	0	1	0	9			
I find my PCP easily accessible		1	1	9	1	7	0.01		
		1	17	37	8	63			
		2	2	1	0	11			
	My PCP helps me		2	2	6	1		4	0.00
			0	0	1	0		7	
			0	7	6	8		43	
		1	4	8	6	72			
		1	5	8	0	1			
		0	2	4	0	2			
My PCP has enough time for me		1	9	20	7	27	0.00		
		0	5	21	5	60			
		1	2	6	2	4			
	I trust my PCP		0	0	1	0		7	0.00
			3	7	6	7		41	
			0	4	6	8		73	
		2	4	4	1	4			
		0	0	1	0	7			
		2	7	8	7	40			
My PCP understands me		1	4	4	9	73	0.00		
		0	4	6	1	4			
	My PCP is dedicated to help me	Illiterate	0	0	0	1		7	0.00
		Primary school	1	7	5	5		46	
		Secondary school	0	5	4	8		74	
		University	1	6	3	0		5	
		0	0	4	1	3			
		1	9	10	3	41			
My PCP and I agree on the importance of my medication		0	6	11	5	69	0.00		
		1	4	4	3	3			
	I can talk to my PCP		0	0	0	1		7	0.01
			1	6	8	4		45	
			1	6	8	5		71	
			1	3	5	1		5	
I feel content with my PCP's treatment			0	1	0	0	7	0.00	
			1	7	5	6	45		
		0	6	4	5	76			

NAA= not at all appropriate, NA= not appropriate, SA= somewhat appropriate, A= appropriate, MA= mostly appropriate, TA= totally appropriate

The association between adherence to folic acid and the patient-doctor relationship is described in table 7. The results suggest that the level of adherence is not significantly associated with the patient-doctor relationship (p-value 0.24).

Table 7 Association between adherence & patient doctor relationship (PDRQ) (n = 153)

Variables	PDRQ - 9				P - value
	NA	SA	MA	TA	
Lowadherence	3	2	10	54	

Medium	1	0	3	53	0.24
Lowadherence					
High adherence	0	0	2	25	

NA= not appropriate, SA= somewhat appropriate, A= appropriate, MA= mostly appropriate, TA= totally appropriate

Pearson coefficient was applied to see the correlation between adherence level, patient-doctor relationship and demographic variables. Age doesn't show any correlation with the level of adherence (p-value 0.77) and patient-doctor relationship (p-value 0.49). Similar results are shown by occupation (p-value 0.09 and 0.20). However, the level of adherence is positively correlated with the patient-doctor relationship (p-value 0.02), and patient-doctor relationship is showing positive correlation towards the level of adherence (p-value 0.02) (table 8).

Table 8 Correlation between demographic characteristics and level of adherence, PDRQ

Variables	Correlation				
	1	2	3	4	5
Age	--	0.090	0.001	0.777	0.490
Occupation	0.090	--	0.003	0.098	0.201
Education	0.001	.003	--	0.182	0.001
Level of adherence	0.777	.098	0.182	--	0.021
PDRQ	0.490	.201	0.001	0.021	--

DISCUSSION

This study depicted that the majority of pregnant women use folic acid (FA) during their first trimester. Hence, the overall rate of using FA is satisfactory. However, this study demonstrated that the high adherence is very low among participants' pregnant women. While one-third women showed moderate to low adherence with FA. When explored the reasons for low to moderate adherence, forgetfulness ranked top among all reasons. Whereas, other reasons include: being a working mother, do not know about FA importance, medication not prescribed or not easily available and in addition to taking of other medication. Since one of the major complications for not using FA is a neural tube defect (NTD), this study also illustrated that 2% of pregnant women have the previous child with NTD. There are many reasons for not using FA or adhere to it. However, the good patient-doctor relationship is as important as other factors on utilization or adherence to medication. This study attempted to explore this area too, and the results endorsed that there was a positive correlation between the level of adherence and the patient-doctor relationship. This study found that the prevalence of FA uses among pregnant in the first trimester was 87%. This is consistent with previous studies done in Ireland.^[33,34] However Al-Qassim and Qatar studies showed comparatively lower percentage of pregnant women taking the folic acid as prescribed by their attending gynecologist.^[24,25] This difference may result from the difference of the study population as compared to our study. Whereas both studies were a community survey among women aged 18-45 years.

A significant association between age and FA use was noted in this study, which is supported by other studies too, such as studies in Pakistan, Indonesia, and others.^[21,29] In contrast, a study done in Al-Qassim found no association between age and FA use.^[26] The women of age between 20 – 39 have more capability to use supplements during pregnancy, especially if they receive proper education and this what found in this study.

Our study also found that age of 45 years or above is an independent predictor of non-use of FA supplement and survey from Pakistan, Nepal and India is consistent with this.^[21,30,31] The survey reported the finding of a higher proportion of older women not taking antenatal IFA supplements compared to younger women. The possible cause of this finding may be that older women may have multiple pregnancies and child birth, so may feel that there is no need for IFA supplements as they may not have used them with earlier pregnancies. Surprisingly, this study notes that very young women, especially those younger than 20 years, also have a problem with FA use and this may be due to immature education or unaware of its importance and this is consistent with other study as in Tanzania.^[31] A significant association between FA taking and the level of education was also noted in this study, and it's consistent with a study done on Al-Qassim.^[25] The reasons could be that educated women have better access to information about healthy pregnancy and have greater concern about the health of their future newborn, so, they properly use Antenatal Care Service in opposite to illiterate women. Non-educated women usually have odds of using any supplements during pregnancy and this what found in other studies.^[32] However Riyadh study did not find any significant association between FA taking and level of education.^[12]

The occupation or being working mother was one of the reasons of non-adherence for some pregnant, but this reason was not significantly associated with FA taking on this study. While the study conducted in Ethiopia, showed that the incidence rate ratio of IFA supplement of mothers who had completed their secondary level education and employed in the company (especially private sector) were 34% and 28% times lower to take a number of tablets, respectively.^[22] The possible cause could be that working mother usually busy with their work and thus makes them forget to take their medication. In this study, having comorbidity or not, have no significant association with taking of FA, while on the other studies there were two types of relationship. In a Norwegian study, they found that the women with chronic disease (especially diabetes and heart disease) were more likely to take FA supplements during pregnancy. Similar results also noted on Iraqi study.^[1,32] Possible reasons that women with comorbidities during pregnancy tend to receive more intensive antenatal care. In contrast, the study from Tanzania found that women with comorbidities (other than anemia) have low utilization of antenatal care services and thus use of IFA supplements.^[33]

Our study is consistent with other study done in Pakistan, Kenya and Indonesia where pregnant over 45 years of age and above, no maternal or paternal education, belonging to the lowest household wealth index group, and non-use of antenatal care (ANC) services were the factors for non-adherence.^[3,34,35-39]

When the pregnant women who have a problem with adherence were asked about the main cause of this non-adherence, the majority of them (71%) give the reason of taking care of others as the main reason of forgetting to take FA. The same reason is found in the study done in Iraq.^[1]

The adherence rate of FA will be different based on the tools used to assess the adherence and if the FA prescribed alone or in combination with iron. We did not find any study even locally or internationally using the Morisky score to assess the adherence to folic acid in order to compare it with this study. In this study and by using the Morisky score for assessment of

the state of adherence to FA we found that the majority of the women (39%) show low adherence, which is considered high percentage, while the reminding (47%) even highly or moderately adherent. Our finding was consistent with a study done in Iraq showing that 51.47% of pregnant have satisfactory adherence to FA (they are the one who gives the tablets of pregnant, then recheck the use after a period and according to them, the high adherence defined by having an A ZMND 80% score). Also consistent with another study from Ethiopia showing that adherence rate to IFA supplements during pregnancy was 64.7 %.^[1,31]

This study found that 2% of pregnant women have the previous child with NTD. One of the most important findings that all women who, having a child with NTD, have higher adherence to FA. They could be afraid of having another child with the same problem. In contrast, a study was done in Riyadh showing that having a child with NTD will not affect the use of FA a subsequent pregnancy.^[12]

Our study also showed that the majority of patients (74%) having a totally appropriate rapport with their primary health care physicians. But still there are 8% of patients who have an inappropriate relationship with their doctor, and they required more effort to get benefit from the education setting. The lower level of knowledge about FA may be due to the short time of consultation, as the doctor cannot explain the benefit of it, but this not significant in this study.

Patient compliance with medication may depend on the content of the setting of health education that they had from healthcare provider about the importance of FA supplements. If they believe and understand the benefit of FA, they will take it properly, and this will improve the adherence as shown in the study done in Ethiopia.^[23] The poor relation or communication between HCP and pregnant may be due to lack of knowledge of HCP about pregnancy, inability to retain medical instruction or because of other behavioral factor or due to the patient factor as having difficulty in understanding and following of the doctor instruction as mentioned on some study.^[1]

This study shows that the level of adherence was positively correlated with the patient-doctor relationship and vice versa. This consistent with a study done in New Zealand as it shows that physician-patient concordance or agreement was significantly related to medication compliance.^[40]

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