ORIGINAL ARTICLE

Awareness of Folic Acid Intake Before and During Early Pregnancy at A Primary Health Polyclinic in Saudi Arabia

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ABSTRACT

Objective: To assess awareness and attitudes towards folic acid intake before and during early pregnancy.

Study Design: A cross-sectional study.

Place and Duration of Study: The study was conducted in a primary health polyclinic of King Faisal University in Al Ahsa, Saudi Arabia from 18th December 2022 to 30th March 2023.

Materials and Methods: The study employed a 22-item self-constructed questionnaire, developed after a thorough literature review. It encompassed six socio-demographic, two obstetric, four awareness, six knowledge, and three attitudes items. A sample of 385 females participated through systematic randomized sampling. SPSS software version 26.0 was used for data analysis.

Results: About 40% (157) of participants were 36-45 years old and the mean age was 33.24 years with an 8.68 SD. While 89.4% (344) were married, 76.4% (294) were Saudi nationals, 51.7% (199) had a monthly income of 5000-10000 riyals, 41.8 % (161) were employed, 62.4% (241) held bachelor's degrees, 58.4% (211) were pregnant, 75.6% (291) had children, 42.9% (165) had heard of NTD and 3.1% (12) had neural tube defects affected children. A good knowledge score was achieved by 72.4% of participants, age 18-25 years, married status, students, and low income showed statistically significant association with knowledge level (p<0.05). Participants' affirmative attitude showed statistical significance (p<0.05) with their good knowledge.

Conclusion: Participants reflected good knowledge scores and a positive attitude about folic acid intake but had low awareness of neural tube defects and less knowledge regarding folic acid dose in a low-risk pregnancy.

Key Words: *Awareness, Folic acid, Neural tube defects, Health practitioners Pregnancy, Saudi Arabia*

Introduction

Folic acid is acknowledged as a crucial supplement during the initial four weeks of embryonic development.[1] The failure of the neural tube to fully close within the first month of pregnancy is associated with neural tube defects (NTDs). Insufficient folic acid intake (less than 400 micrograms per day in low-risk and less than 5 mg in high-risk pregnancy) during this period can lead to deficiencies with potential consequences on the development of the fetal brain and spinal cord.[2]

The prevalence of neural tube defects is less than 10 per 10,000 births in countries with folic acid fortification policies.[3] Neural tube defects are documented worldwide in literature. A study in Saudi Arabia reported spina bifida as the most prevalent NTD.[4] Neural tube structural defects vary in extent and severity, and newborns with anencephaly are unable to live after birth while spinal cord defects are corrected surgically.[1,8] A hospital-based NTD registry study observed the majority of pregnant women whose fetuses encountered NTDs had not taken folic acid in the initial post-conception weeks (4 weeks from conception) of pregnancy and one-third did not take it in the pre-conception period.[5] Therefore, all pregnant women need to follow a folic acid-rich diet like spinach, lettuce, broccoli, and folic acid-fortified foods but the recommended daily intake is not up to the mark with diet alone in pregnancy.[6] Taking folic acid before pregnancy and continuing in the early post-conception period for a minimum of four weeks can prevent 50% of neural tube defects.[7] Therefore, it is recommended to take preconception daily supplementation of 400 micrograms of folic acid at least one month before pregnancy and continue for three months until the

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first 12 weeks of pregnancy while those who had NTD-affected pregnancies before or using antiepileptic drugs should take 4milligrams folic acid three months before pregnancy and continue till the first 12 weeks.[8] A meta-analysis and systematic review demonstrated a 21% decrease in congenital heart disorders in women taking folic acid supplementation in the pre and early post-conception period.[9]

Following WHO recommendations, oral supplements frequently combine folic acid with iron to prevent deficiencies in both nutrients, mitigating the risk of anemias associated with these nutritional shortcomings.[10] Studies in western and northern regions of Saudi Arabia have assessed awareness of folic acid and its role in preventing NTDs with varied findings and gaps in awareness.[11,12] Gaps in awareness and delayed initiation of folic acid supplementation missing the critical period of neural tube development in the early embryonic weeks of pregnancy, can be improved with educational sessions.[13]

The current study aims to assess females of Al Ahsa City in eastern Saudi Arabia for preconception and early pregnancy folic acid use. Due to variations in the population across eastern, western, and northern regions, this necessitates a dedicated study in the eastern region as well to add a body of evidence regarding folic acid usage awareness from eastern Saudi Arabia. The objectives include: i) To assess awareness and determine knowledge of Al-Ahsa females about folic acid intake, and its deficiency outcomes primarily on neural tube structural defects level, ii) To evaluate their attitudes toward folic acid use in pregnancy and to find the percentage of NTD affected pregnancies.

Materials and Methods

A Cross-sectional study using a self-constructed questionnaire was conducted in the Polyclinic of King Faisal University (KFU), Al-Ahsa Eastern Province of Saudi Arabia from December 2022 to March 2023. Research Ethical approval was obtained from King Faisal University Research Deanship (KFU-REC-2022-OCT-ETHICS273). The Polyclinic was chosen because it deals with a representative population of Al Ahsa residents. It serves as an important health care center as consultation services are led by the specialists and consultants of Medicine College in addition to general physicians. A total of 385 participants from Al-Ahsa City needed to be recruited in the study and the sample size was calculated by the Raosoft sample size calculator to achieve a confidence level of 95%, and a margin of error of 5%. It involved Saudi and non-Saudi pregnant and non-pregnant females between 18-50 years of age. Females who were younger than 18 or older than 50 years and belonging to medical and paramedical fields were excluded from the study. An English questionnaire was designed by the researchers after going through published studies and literature in depth.[14-18] Afterward, it was translated into the Arabic language by Arabic experts for Saudi nationals who cannot understand English. The questionnaire had 22 items: The first section addressed six socio-demographic, two obstetric characteristics, and four awareness items. The second part had six items for multiple-choice knowledge questions. The third had three statements for attitude with close-ended options of yes & no and one statement for any misconception about folic acid. For the knowledge assessment score, all six multiple choice questions with correct answers were allocated 1 score and wrong 0, therefore making a total of 6 scores. A score of 4 and above is considered adequate/good whereas 3 and less is low knowledge. Before initiating data collection, both (Arabic and English) questionnaires' validity was tested in a pilot study of 20 patients (Cronbach alpha > 0.70 for all items). Participants' consent to respond to the questionnaire was taken verbally. It was distributed to every third female client with a systematic random technique after randomly choosing the first female from the clinics' computer appointment lists on the working days of the week by the leading researchers and a data collector nurse. After completion and submission of the questionnaire, the participant was informed about folic acid usefulness, its deficiency outcomes mainly NTDs, and dosage in low-risk pregnancy by the data collectors and researchers. Initially, the awareness of the participants was assessed whether they had a piece of understanding or idea about NTDs in pregnancy, and then their true deep knowledge about folic acid and NTDs with six questions was assessed.

The data was analyzed in SPSS version 26. Descriptive

statistics were utilized as frequencies, means, and standard deviations. Associations with the independent and dependent variables were assessed with the Chi-square test for knowledge scores and attitudes. Multiple linear regression was applied to analyze predictors for good knowledge scores of participants. The *p* value < 0.05 was considered statistically significant.

Results

Among three hundred and eighty-five females the mean age was 33.24 years (SD± 8.68), and 40% of participants were 36-45 years of age which is twofold more than other age ranges. About 89.4% (344) were married, 76.4% (294) were Saudi nationals, 51.7% (199) had monthly income of 5000-1000 riyals, 41.8 % (161) were employed, 62.4% (241) held bachelor's degrees, 58.4% (211) females were pregnant, 75.6% (291) had children, 42.9% (165) have heard of NTD and 3.1% (12) had NTDs affected. children, displayed in Table I.

Knowledge items with correct answers are depicted in Table II where a good score was achieved by 72.4% (278) of participants.

Table I: Demographic Characteristics and Awareness of Neural Tube Defects.

Variables	Category	Frequency, n	Percentage, %
Age	18-25	108	28.1
	26-35	111	28.8
	36-45	157	40.8
	46-50	9	2.3
Marital status	Single	15	3.9
	Married	344	89.4
	Divorced	18	4.7
	Widowed	8	2.1
Nationality	Saudis	294	76.4
	Non-Saudis	91	23.6
Monthly income in SAR	<5000	73	19.0
	5000-10000	199	51.7
	>10000	113	29.4
Occupation of participants	Student	120	31.2
	employed	161	41.8
	Not working / housewife	104	27.0
Education of participants	illiterate	17	4.4
	< high school	13	3.4
	High school education	83	21.6
	Bachelor’s Degree	241	62.6
	Master and Advance	31	8.1
Are you pregnant	No	174	45.2
	yes	211	54.8
Do you have children	No	94	24.4
	yes	291	75.6
Have you heard of spina bifida or neural tube defects?	No	220	57.1
	yes	165	42.9
From where heard?	GP	326	84.7
	Neighbor,relative,friend	43	11.2
	Newspaper	8	2.1
	Social media	8	2.1
Have u taken Folic acid before/during pregnancy	No	62	16.1
	Yes	323	83.9
Do you have any child with NTDs	No	373	96.9
	Yes	12	3.1

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Table II: Knowledge Questions and Participants' Scores About Folic Acid

Questions	Answer Options	Frequency, n	Percentage, %
What is folic acid?	Vitamin [a]	236	61.3
	Mineral	62	16.1
	Do not know	87	22.6
How many times folic acid should be taken?	once a day [a]	297	77.1
	once a week	7	1.8
	Do not know	81	21.0
Sources of Folic acid	Natural[a]	208	54
	Supplements/ daily tablet[a]	102	26.4
	Don't know	75	19.5
	selected both correct answers	2	0.5
Deficiency of Folic acid can cause:	Spina bifida, ancephaly. [a]	162	42.1
	Folic acid deficiency anemia [a]	134	34.8
	Don't know	89	23.1
When should folic acid be used to reduce congenital malformations	Before conception and during the first 3 months of pregnancy [a]	181	47.0
	In the first 3 months of pregnancy	146	37.9
	Do not know	28	7.3
	Two correct answers	30	7.8
What is the normal recommended dose of folic acid in low-risk pregnancy	400 micrograms [a]	93	24.2
	400mg	125	32.5
	Do not know	167	43.4
Total Knowledge Score: 6	Low (less and equal to 3)	107	27.8
	Good (4 and above)	278	72.2
	Total	385	100.0

[a] Correct answer

Figure I showed that 60% (231) of the participants preferred taking folic acid from natural sources, 97.4% (375) would take it during pregnancy, 98.2% (378) would advise others to use it while no one had any misconception about folic acid use.

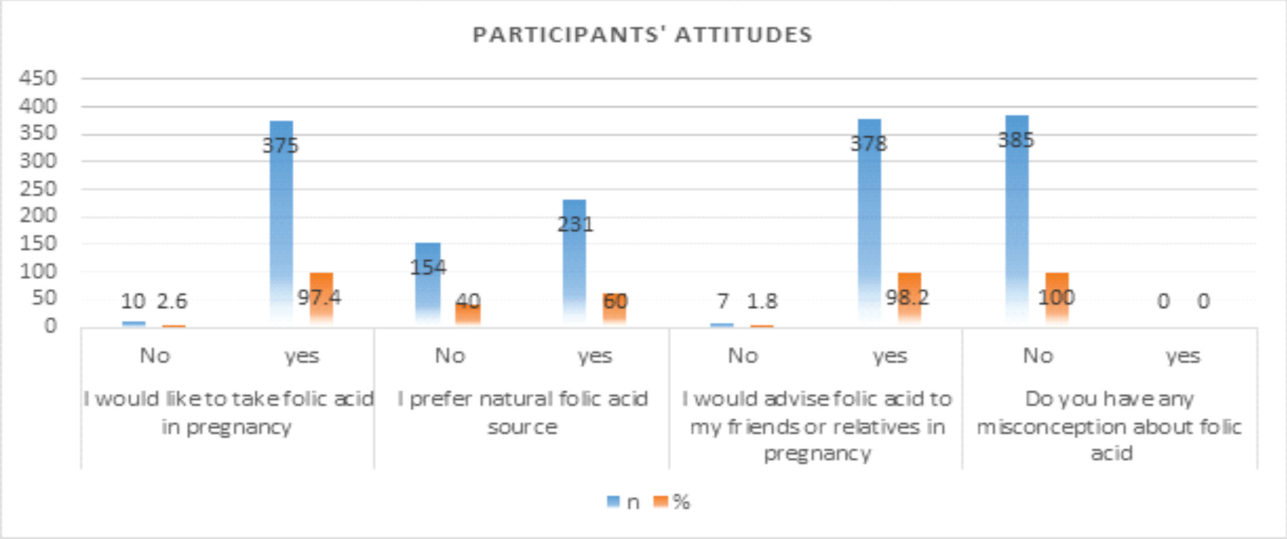

Figure 1: Participants' Attitudes Toward Folic Acid Use

In Table III good knowledge scores showed statistical significance ($p \leq 0.05$) with age 18-25 years, married status, being a student, having a bachelor's degree, monthly income less than 5000 riyals, and those who have heard of NTDs. Participants' attitudes association with good knowledge and other study variables are also displayed in it.

Based on Table V of multiple linear regression analysis, hearing about folic acid was found related to adequate knowledge with a positive relationship (3.243) while hearing from GP depicted a negative relationship with a knowledge score (-0.381). Furthermore, hearing about spina bifida or NTDs was related to knowledge with a positive relationship (0.803).

Table III: Association of Demographic and Other Study Variables with Good Knowledge and Attitudes

Variables		Frequency, n (percentage, %)	Chi-square	*p* value
Age * good knowledge	18-25	89(82.4%)	11.33	0.010
Marital status * good knowledge	Married	260(75.6%)	22.25	0.001***
Monthly income in SAR* good knowledge	<5000SAR	63(86.3%)	12.43	0.002
Occupation of participants* good knowledge	Student	103(85.8%)	20.36	0.001***
Education of participants* knowledge score	Bachelor's degree	187(77.6%)	34.64	0.001***
Have you heard of spina bifida or neural tube defects	Yes	149(90.3%)	47.11	0.001***
I would like to take folic acid in pregnancy* good knowledge	yes	278(74.1%)	26.67	0.001***
I would advise folic acid to my friends or relatives in pregnancy* good knowledge.	yes	278(73.5%)	18.52	0.001***
Age* I prefer natural folic acid source	26-35yr	83(74.8%)	16.13	0.001***
Age* I would advise folic acid to my friends or relatives in pregnancy	46-50yr	9(100%)	17.59	0.001***
Monthly income in SAR* I would like to take folic acid in pregnancy & advise my relatives in pregnancy.	5000-10000	199(100%)	14.29	0.001***
Occupation of participants* I would like to take folic acid in pregnancy	Housewife	104(100%)	8.76	0.034
Occupation of participants* I would advise folic acid to my friends or relatives in pregnancy.	Student	120(100%)	9.92	0.007
Education* I would advise folic acid to my friends or relatives in pregnancy	Master and higher	31(100%)	154.34	0.001***
Have children* I would like to take folic acid in pregnancy & advise others	Yes	289(99.3%)	17.186	0.001***
Have you heard about Folic acid* I would like to take folic acid in pregnancy & advise others.	Yes	371(99.2%)	166.76	0.001***
From where heard * I would like to take folic acid in pregnancy	magazine/ newspaper	8(100%)	17.54	0.001***
Have u taken Folic acid before/during pregnancy* I would like to take folic acid in pregnancy & advise others in pregnancy?	yes	321(99.4%)	31.02	0.001***
Have you heard of spina bifida or neural tube defects* I would advise folic acid to my friends or relatives in pregnancy	yes	165(100%)	5.35	0.021

Discussion

The prime significance of folic acid lies in its crucial role in preventing NTDs in the developing fetus and supporting overall maternal and fetal health.[13] In the current study, overall, a large proportion of females exhibited good knowledge scores and positive

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Table V: Multiple linear regression analysis

Coefficients								
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**	**95.0% Confidence Interval for B**	
		B	**Std. Error**	**Beta**			**Lower Bound**	**Upper Bound**
1	(Constant)	0.996	0.560		1.779	0.076	-0.105	2.096
	Age	0.154	0.084	0.102	1.845	0.066	-0.010	0.319
	Marital status	-0.330	0.176	-0.103	-1.879	0.061	-0.676	0.015
	Nationality	0.123	0.147	0.040	0.834	0.405	-0.167	0.413
	Monthly income in SAR	-0.130	0.089	-0.068	-1.465	0.144	-0.305	0.045
	Occupation of participants	0.118	0.072	0.104	1.633	0.103	-0.024	0.260
	Education of participants	-0.006	0.102	-0.004	-0.061	0.952	-0.207	0.195
	Are you pregnant	0.113	0.112	0.043	1.007	0.315	-0.108	0.334
	have children	-0.016	0.195	-0.005	-0.083	0.934	-0.400	0.368
	Have you heard about Folic acid	3.243	0.434	0.412	7.465	**0.001*****	2.389	4.097
	From where heard	-0.381	0.103	-0.168	-3.699	**0.001*****	-0.584	-0.179
	Have u taken Folic acid before/during pregnancy	0.208	0.170	0.058	1.219	0.224	-0.127	0.543
	Have you heard of spina bifida or neural tube defects	0.803	0.126	0.303	6.380	**0.001*****	0.556	1.051
	Do u have any child with NTDs	0.557	0.460	0.074	1.212	0.226	-0.347	1.461

attitudes. Medical practitioners were the primary source of information, less than half had awareness and knowledge of NTDs. Predictors of good knowledge included familiarity with folic acid and awareness of NTDs. Hearing about folic acid from a medical practitioner correlated negatively with knowledge scores. Young age, marriage, lower income, student status, and awareness of NTDs were associated with statistically significant good knowledge.

Alreshidi et al[14] in Riyadh revealed high awareness, the majority knew the role of folic acid in preventing neural tube defects primarily through health care professionals which is opposite to our results as less participants knew the role of folic acid. They reported six percent of NTD-affected children while we had 3 percent. Likewise, a study in Riyadh by AlDuraibi et al.[15] also showed many women knew about folic acid and its deficiency outcomes on fetal neural tube closure. The high awareness in these two studies was due to good information disseminated by doctors and nurses, while in the current study hearing about folic acid from a medical practitioner displayed a negative relation with participants' knowledge.

Al-Mohaithef et al.,[16] in Jeddah showed similar findings with the current where a majority heard of folic acid, but a smaller number of females knew about neural tube defects, while a bachelor's degree and married status were associated with better knowledge.

Raad et al.,[17] reported low knowledge among Saudi women, regarding sources of folic acid and its generic name which differs from our findings but like

the recommended folic acid dosage. They found older age and irregular intake of folic acid as predictors of low awareness while in our study hearing from practitioners was a low predictor of awareness. Higher education was a good predictor of awareness whereas having heard about folic acid and NTD was a good predictor of awareness in the current study. Samar et al.,[18] found an association between better awareness and young age and higher education which matches our findings. Similarly, AlOdan et al.,[19] conducted a study on pregnant women which revealed high awareness of young age and education. The current study differs from AlOdan et al.,[19] by involving all women, irrespective of pregnancy, in the awareness assessment. This was done to disseminate knowledge to females at both the household and community levels.

A study in Hail by Khan et al.,[20] showed lower awareness which differs while good awareness with higher education matches with the current study. Li et al.,[21] in China showed a lack of awareness for preconception use of folic acid, with less education which differs from ours where most participants were literate and therefore reflected better awareness.

A Canadian study by Mida et al.,[22] assessed physicians' knowledge, attitude, and practice for preconception folic acid in low-risk women where only half of the physicians were aware of the correct recommended dose. This supports our findings, which indicated that low knowledge scores were associated with receiving information from physicians. Therefore, the practitioner's knowledge needs to be updated. According to Kim et al.,[23] a Korean study a minority of women reported preconception folic acid supplementation, despite a notable proportion being aware of the preconception use of folic acid. In contrast, most of the participants in our study were aware of preconception usage.

The results of the present study underscore the necessity for healthcare practitioners to accentuate and elucidate the significance of folic acid in pregnancy and its role in preventing NTD. The study implies that real-time information provided by healthcare professionals can establish a positive relationship between heightened knowledge and healthy fetal outcomes. Our results are not consistent with the studies that are conducted in the Western province of Saudi Arabia, especially in Riyadh city concerning high insight into NTD awareness and folic acid dosage, and slightly differ from international ones on participants' selection.

The key strength of this study lies in its implementation of a probability sampling technique, ensuring a more unbiased selection of female participants regardless of their pregnancy status. Additionally, the inclusion of older females is noteworthy, as they can play a crucial role in propagating awareness to younger females within their families and extended networks. The dissemination of this knowledge has the potential to have a lasting impact, benefiting numerous future females of reproductive age by encouraging the utilization of folic acid.

Conclusion

The study demonstrated an overall good knowledge concerning folic acid, endorsing favorable attitudes, but the knowledge regarding the dose of folic acid in low-risk pregnancies was comparatively lower. Interestingly, obtaining information from medical practitioners correlated with lower knowledge scores among women.

The practical implications of these findings suggest the need for healthcare professionals to elucidate the benefits and dosage of folic acid in low-risk pregnancies, during consultations with those aspiring to conceive or currently pregnant.

Limitation of Study

The study's limitation resides in its study design and the results cannot be generalized to all primary health care facilities in Saudi Arabia.

Recommendation

Further research be conducted in this regard in all Saudi primary health care facilities to deduce a large and authentic body of evidence.

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CONFLICT OF INTEREST

Authors declared no conflicts of Interest.

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DATA SHARING STATMENT

The data that support the findings of this study are available from the corresponding author upon request.