Effect of Educational Program on Married Women's Awareness Regarding Folic Acid Intake

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Abstract

Background: Folic acid is one of the essential vitamins for women of childbearing age. **Aim:** To evaluate the effect of educational program on married women's awareness regarding folic acid intake. **Research Design**: A quasi-experimental research design (pre and post) was utilized to fulfill the aim of the study. **Setting**: The study was conducted at outpatient antenatal clinics in Minia General Hospital. **Sample:** A convenient sample of (100) married women who met the inclusion criteria was recruited. **Tools**: Three tools were utilized, tool (1) an interviewing questionnaire include (socio-demographic characteristics, medical and past and present obstetric history), tool (2) women's knowledge about folic acid, and tool (3) women's self-reported practice regarding folic acid intake. **Results:** Demonstrates that the majority of studied women (86%) have poor knowledge about folic acid in the pre-test, while (76% and 61%) of them have good knowledge in the post-test and at the follow-up, respectively. Additionally, the majority of studied women (86%) had an unsatisfactory level of self-reported practice regarding folic acid intake in the pre-test, while (82%) of them had a satisfactory level in the post-test at the follow-up. Also, there was a statistically significant relationship between total knowledge and total practice regarding folic acid pre and post-educational program implementation. **Conclusion:** Statistically significant improvement in women's knowledge and self-reported practices regarding folic acid intake after implementing the educational program. **Recommendation**: Regular educational program for married/unmarried women about the importance of folic acid intake and follow-up of FA nutrition status by dietary assessment or by estimation of blood folic acid concentration is needed.

***Keywords*:** Awareness, Educational program, Folic acid.

Introduction:

Nutrition in preconception and during pregnancy is very important for normal general health, maternal nutritional status, and the normal development of the fetus. During pregnancy, the need for essential nutrients, vitamins, and minerals increases due to the development of the fetus, placenta, and maternal tissues. One of the most critical elements for synthesizing nucleic acids in rapidly dividing cells is folic acid/folate **(Milosavljević et al., 2022).**

A folic acid is a water-soluble form of vitamin B9, also known as folate, in its natural form. A coenzyme transports single carbon groups for nucleic acid and amino acid metabolism. Folic acid is required for DNA/RNA synthesis, amino acid conversion, red blood cell formation, and body cell formation and maintenance. Folic acid requirements rise during intervals of rapid growth and cell partitioning throughout life; it aids in neural tube formation during early evolution. Low folic acid consumption during pregnancy will result in poor pregnancy outcomes **(Sadiq & Hussein, 2022).**

Folic acid can be obtained in the form of folate from the dietary intake of a variety of foods. It can be found in leafy greens, beans, liver, egg yolks, and citrus fruits. Additionally, fortified foods such as whole grains and supplements can provide FA **(Sabi et al., 2022).** It has been shown that folic acid (FA) alone, combined with other minerals and vitamins taken during preconception, prevents neural tube defects (NTDs) such as anencephaly, spina bifida, or encephalocele **(Wojtowicz et al., 2022).**

The world health organization (WHO) recommends that all women of childbearing age consume 400 μg of folic acid daily and that women with pregnancies previously affected by NTDs consume 5,000 μg of folic acid daily at least one month prior to conception (**Teshome et al., 2022).** Guidelines recommend 0.4 mg of folic acid per day in the periconceptional period, and certain guidelines recommend high doses (4-5 mg/day) in women at higher risk for neural tube defects, such as those with diabetes, body mass index ≥30, or taking antiepileptic medications or other folate antagonists. High-quality evidence from a large randomized clinical trial supports using 4 mg per day of folic acid for those who had a previous pregnancy affected by a neural tube defect **(Dwyer et al., 2022).**

Pregnant women should not rely on these supplements alone, as they would not meet the amount required to prevent NTDs or other pregnancy-related complications. Therefore, they should eat meals with folate and vitamins. Additionally, eating fortified foods such as breakfast cereals, cornflour, and bread helps to meet the recommended daily folate intake. However, women must combine fortified foods and FA supplements after seeking proper advice from healthcare providers **(Al-Zahrani, & Al-Marwani, 2022)**

Maternity nurses play a crucial role in counseling and educating women about the importance of folic acid, its sources, and recommended doses in the preconception and pregnancy period; it also helps them to understand the effect of its deficiency to avoid long-term complications for the mother and her fetus, e.g., preterm birth, preeclampsia, heart disease and congenital abnormalities **(Carter et al., 2022).** So nursing education programs and campaigns are important to increase awareness about folic acid benefits through verbal discussions, leaflets, booklets, or referrals to high-risk groups **(Berhane & Belachew, 2022).**

The Significance of the Study

Studies indicate that folate deficiency may be associated with a higher risk of defects of the heart، urinary tract, limbs, cleft palate as well as being associated with a higher risk of preeclampsia. The incidence of neural tube defects (NTDs) has been declining in recent years in industrialized countries. At the same time, it remains high in the less developed countries of Latin America, Africa, the Middle East, and Far East Asia. It is estimated that approximately 300,000 babies are born each year with NTDs worldwide **(Kindie & Mulu, 2022)**.

In Egypt, the incidence of congenital central nervous system malformations ranges from 1 to 2 cases per 1000 births**.** Its epidemiology is influenced by environmental and genetic factors, as evidenced by geographical variations in its incidence. We can evaluate and diagnose CNS malformation during the prenatal period at any gestational age **(Hassan et al., 2022).**

Multiple studies in different areas showed that women's knowledge of the role of folic acid in preventing NTDs and the utilization of preconception folic acid is very low. Some of them revealed that women's awareness about folic acid consumption in the preconception period is affected by socio-demographic characteristics such as age, educational status, income, and marital status (**Raad& AbuAlhommos, 2021).** So nurses play a significant role in raising awareness about the importance of folic acid to avoid its deficiency complications for mother and fetus.

Aim of the study:

To evaluate the effect of educational program on married women's awareness regarding folic acid intake.

Research Hypotheses

H 1: The mean scores of post-test married women's awareness will be significantly higher than pre-test.

H 2: There will be a significant association between pre-and post-test married women's awareness scores regarding folic acid and their selected demographic characteristics.

Subject and Method

Research design: Quasi-experimental research design (one group pre and post-test) was utilized to fulfill the aim of this study.

Setting: The study was conducted at antenatal outpatient clinics in Minia General Hospital**.**

Sample type: Aconvenient sample of antepartum women who attended out-patient clinics in Minia General Hospital according to inclusion criteria.

Inclusion criteria: married women at reproductive age from 18 to 45 years of age & Pregnant women, and women planning for pregnancy.

Exclusion criteria: Women who refused to participate were excluded.

Sample size: According to the Minia General Hospital census, the flow rate of women who attended the antenatal clinics of Minia General Hospital in the last year (2019) was (315) women. Hence, the estimated sample size was (100) women according to the sample size calculator (the Raosoft), with a margin of error of 5% and a confidence level of 95%.

The sample size n and margin of error E are given by this equation:-

$$x = Z(c/100)^2 r(100-r)$$
$$n = Nx/((N-1)E^2 + x)$$
$$E = \mathrm{Sqrt}[(N-n)x/n(N-1)]$$

N is the population size (315), r is the fraction of responses you are interested in, and Z(c/100) is **the critical value** for the confidence level c.

Tools of data collection:

To achieve the aim of the study, data was collected by using the following tools:

The First Tool (pre-test): The investigator designed an interviewing questionnaire to collect data after an extensive literature review; it includes three parts:

Part (I): Socio-demographic characteristics: such as age, residences, educational level, income, occupation, consanguinity……. etc)

Part (II): Medical history: history of chronic illness as hypertension, diabetes mellitus, anemia…etc.

Part (III): Past and present Obstetric History: such as the history of previous pregnancy complication as abortion, stillbirth, and congenital malformations among her children and in the closer family, parity, and gravidity.

The Second Tool: Knowledge Assessment Tool (Pre and post-test): The investigator modified it after an extensive literature review, it was designed to assess women's knowledge regarding FA; it included 20 MCQs concerned with knowledge about FA among women of childbearing age. (Definition, importance, sources, complications from its deficiency, time should take, side effects and recommendation dose,……..etc).

(https://www.cdc.gov/ncbddd/folicacid/about.html)

Scoring System*:* the correct answer was given a score (1), and the incorrect answer was given a score (0). The total marks were summed; the percentage for all participants was calculated and judged by the following: poor (<50%), fair (50%-75%), and good (> 75%).

The Third Tool: Self-reported Practice Assessment Tool of FA Intake (Pre and follow-up): the investigator modified it after an extensive literature review, and it was designed to assess past and present history of women's self-reported practice regarding FA intake. It includes 14 questions such as (Did you take any vitamin or mineral supplement? Did you take any vitamins or supplements that have folic acid? Do you currently take folic acid supplement? If yes: when do you take it?.....etc) **(Nady et al., 2014).**

Scoring System*:* the correct answer was given a score (1), and the incorrect answer was given a scores (0). The total marks were summed; the percentage for all participants was calculated and judged by the following: unsatisfactory (< 60%) and satisfactory (≥ 60%

The Validity and Reliability

To establish validity, the questionnaire was piloted on a panel of 5 experts of Obstetrics and Gynecological staff and Nursing professors who reviewed the instruments for clarity, relevance, comprehensiveness, understanding, applicability, and easiness. To establish reliability, we used alpha Cronbach's way to check the stability of the tool's internal consistency.

Pilot Study:

A pilot study was conducted on 10% of antenatal women (10 women) at the previously mentioned setting to assess the current study tools for its clarity, validity, and time required to be applied. According to the results of the pilot, all required and necessary modifications were done, and the women tested in the pilot study were excluded from the total study sample.

Procedure*:*

The current study was achieved through three phases; assessment phase (pre-test), implementation phase (conducting education program), follow-up, and evaluation phase (post-test). The data collection period began from May 2021 to the end of September 2021.

1. Assessment phase:

- During the assessment phase, the researcher introduced herself to women and explained the study's nature, purpose, duration, and activities. They were informed that participation in this study was voluntary and they had the right to withdraw at any time. Oral approval of women to share in the study was achieved.
- After obtaining acceptance from women to participate in the current research, each participant was given an Arabic standardized interviewing sheet to evaluate socio-demographic data, past and present obstetric history and evaluate their knowledge and self-reported practice regarding FA intake. For illiterate women, the researcher filled out the sheet for them. It took 15-25 minutes for each woman to complete the questionnaire.

2-Implementation phase:

- The researcher collected the sample through five months, and visited the hospital two days per week from the beginning of the study. The researcher attended the antenatal out-patient clinic from 9:00 a.m. to 12:00 p.m. and performed face-to-face interviews. After assessing women's knowledge and self reported practice regarding folic acid by knowledge and practice assessment questionnaire. The researcher implemented health education sessions, two sessions per day, each session included (3-4) women and lasted for around 20 to 30 minutes. The total number of sessions about (36) sessions.
- During the implementation of the health education program, the woman in the study sample received knowledge about folic acid intake through face-to-face verbal discussion and the researcher used illustrations, such as a brochure and sample of the folic acid tablets, to achieve the proposed goal and allowed women to ask and reach a high level of understanding. The discussion emphasized on improving women's knowledge and self-reported practice regarding FA intake. An additional 15 minutes were assigned at the end of the discussion for a question and to obtain feedback to ensure that the women got maximum benefits.
- All the study samples received a brochure that included information related to folic acids, such as (definition, benefits, dose, the best time for taking folic acid, and sources of folic acid…….etc)

3- Evaluation phase:

Three-time of evaluations were done for each woman :

- First time of evaluation (pre-test) was done before implementing an educational program to assess socio-demographic characteristics, medical history, past and present obstetric history, knowledge, and self-reported practice of women regarding FA intake.
- Second time of evaluation (immediate post-test) was done immediately after the educational program's implementation to assess women's knowledge regarding FA intake.
- Third time of evaluation (post-test done after three months) of the educational program implementation to assess knowledge and self-reported practice of the women regarding FA intake. Some women did follow-up test in the hospital during their antenatal care, and others through the telephone.
- The effect of the health education program was done by comparing the pre-test and post-test conducted immediately and after three months of the educational program to assess their knowledge and self-reported practice regarding FA intake.

Limitations: The COVID-19 pandemic occurred during the data collecting process, which caused data collection to take longer because women were fearful of infection at the time and desired prenatal care at private clinics.

Ethical Consideration:

Written initial approval was obtained from the Dean of the Faculty of Nursing and the research ethics committee of the Faculty of Nursing at Mania University. Oral informed consent was obtained from married women who participated in this study. Each assessment sheet was coded, and the names of the pregnant women did not appear on the sheets for privacy and confidentiality.

Statistical Design

Data was collected, categorized, analyzed, tabulated, and computerized using the statistical package for social sciences program version 20 (SPSS). The percentage distribution, frequency, standard deviation, mean, and correlation coefficient were employed as descriptive statistics. The data were evaluated with the relevant quantitative variable, and statistical significance was determined when the P value was less than 0.05. High statistical significance was regarded when the P value was less than 0.001. No statistical significance was considered when the P value was greater than 0.05. The Fisher exact test was used to determine the relationship between women's knowledge, their selected socio-demographic characteristics, and the related variables. Furthermore, the tables and figures were accurately created and presented in order to properly and accurately illustrate the study's findings **(Ong and Puteh 2017).**

Results

Table (1): Distribution of the Studied married Women Regarding Their Socio-demographic Characteristics (n=100)

Socio-demographic Characteristics	Study (n=100)	
	No.	%
Age / Years		
15-<25	44	44.0
25-<35	48	48.0
35-<45	8	8.0
Mean ± SD	**26.3 ± 4.89**	
Residence		
Rural	73	73.0
Urban	27	27.0
Level of Education		
Illiterate	28	28.0
Primary education	19	19.0
Secondary education	41	41.0
University education	12	12.0
Occupation		
House Wife	87	87.0
Working	13	13.0
Consanguinity		
yes	23	23.0
No	77	77.0

Table (1): Reflected that nearly half of the sample age belonged 25: 35 years with mean ± SD was (26.3 ± 4.89), related to residence; the majority of the study sample (73%) were lived in rural, while the highest percentage of sample (41%) was secondary education and related to occupation the majority of the study sample (87%) were housewife.

Table (2): Distribution of the Studied married Women Regarding Their Obstetrical History (n=100)

Obstetrical History	No.	%
Previous history of pregnancy complications (n=100`)		
- Yes	32	32.0
- No	68	68.0
Type of Previous Pregnancy Complications (n=32`)		
- Preterm labor	4	12.6
- PROM	6	18.7
- Abortion	22	68.7
Previous History of Fetal Anomalies (n=100`)		
- Yes	4	4.0
- No	96	96.0
Types of Congenital Anomalies (n=4`)		
- Cleft lip	1	25.0
- Cleft palate	3	75.0
Family History of Congenital Anomalies (n=100`)		
- Yes	5	5.0
- No	95	95.0
Degree of Relation (n=5`)		
- From Mother	3	60.0
- From Father	2	40.0
Past Obstetrical History (n=100`)		
- Never pregnant	12	12.0
- Past two years	65	65.0
- 3 to 4 years	17	17.0
- Five years or more	6	6.0
Present Obstetrical History		
Gravidity (n=100`)		
- Never pregnant	8	8.0
- Primigravida	16	16.0
- Multigravida	76	76.0
Parity (n=100`)		
- Nullipara	٨	٨.0
- Primipara	30	30.0
- Multipara	62	62.0

Table (2): Reflected that more than two thirds of the studied sample (68%) didn't have previous pregnancy complication, and abortion was the most frequent complication (68.7%), the majority of studied sample didn't have a previous history and a family history of congenital fetal anomalies (96% & 95%) respectively, finally related to the present obstetrical history more than three quarters (76%) of the studied sample were multigravida and near two thirds (62%) of the studied sample were multipara.

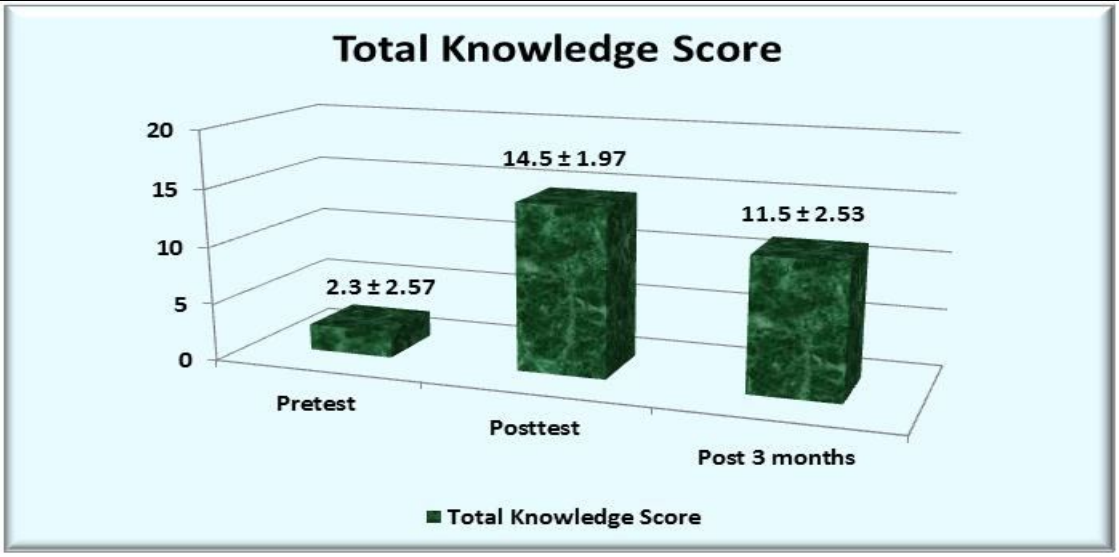

Figure (1): Mean Score of Total Knowledge Level of the Studied married Women Regarding Folic Acid Pre and Post Educational Intervention (n=100)

Figure (1): revealed that the mean score of the studied women's knowledge was (2.3 ± 2.57) in the pre-test pre-implementing the educational intervention, and that level increased in the post-test after implementing the educational intervention and at follow-up as presented by mean score (14.5 ± 1.97) and (11.5 ± 2.53) respectively.

Figure (2): Mean Score of Total Practice Level of Studied Women Regarding Folic Acid Pre and Post Educational Intervention (n=100)

Figure (2): revealed that the mean score of the studied women's self-reported practice was (4.55 ± 2.63) pre-implementing the educational intervention, and that level increased after implementing the educational intervention, as presented by mean score (8.61 ± 1.74) after implementing the educational intervention.

Table (3): Relation between Socio-demographic Characteristics and Women's Level of Knowledge Pre and Post Educational Intervention (n=100)

Socio-Demographic Variables	Pre-test						Post 3 months					
	Poor (n=86)		Fair (n=9)		Good (n=5)		Poor (n=23)		Fair (n=16)		Good (n=61)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Age												
15-<25	39	45.3	4	44.4	1	20.0	9	39.2	5	31.3	30	49.2
25-<35	40	46.5	5	55.6	3	60.0	14	60.8	8	50.0	26	42.6
35-<45	7	8.2	0	0.0	1	20.0	0	0.0	3	18.7	5	8.2
Fisher (P value)	(0.625)						(0.164)					
Residence												
Rural	24	27.9	2	22.2	1	20.0	6	26.1	6	37.5	15	24.6
Urban	62	72.1	7	77.8	4	80.0	17	73.9	10	62.5	46	75.4
Fisher /X^2 (P value)	Fisher (0.876)						1.08 (0.581)					
Educational status												
Illiterate	28	32.6	0	0	0	0.0	10	43.5	2	12.5	16	26.2
Primary education	18	20.9	1	11.1	0	0.0	5	21.7	1	6.2	13	21.3

Socio-Demographic Variables	Pre-test						Post 3 months					
	Poor (n=86)		Fair (n=9)		Good (n=5)		Poor (n=23)		Fair (n=16)		Good (n=61)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Secondary education	35	40.7	5	55.6	1	20.0	8	34.8	6	37.5	27	44.3
University education	5	5.8	3	33.3	4	80.0	0	0.0	7	43.8	5	8.2
Fisher /X^2 (P value)	**Fisher** (5.23)						**7.55 (0.037*)**					
Occupation												
House Wife	78	90.7	6	66.6	3	60.0	21	91.3	11	68.8	55	90.1
Working	8	9.3	3	33.4	2	40.0	2	8.7	5	31.2	6	9.9
Fisher /X^2 (P value)	**Fisher** (0.063)						4.77 (0.087)					

** P- value is highly statistically significant * P- value is statistically significant

Table (3): This table shows that there was no significant association between the level of knowledge scores in pre and post-educational intervention and socio-demographic variables (age, residence, and occupation) except (educational status) there was a statistically significant difference post-educational intervention (p= 0.037).

Table (4): Relation between Socio-demographic Characteristics and Women's Level of Practice Pre and Post Educational Intervention (n=100)

Socio-Demographic Variables	Pre-test				Post 3 months			
	Satisfactory (n=14)		Unsatisfactory (n=86)		Satisfactory (n=82)		Unsatisfactory (n=18)	
	No.	%	No.	%	No.	%	No.	%
Age								
15-<25	5	35.7	39	45.3	36	43.9	8	44.5
25-<35	9	64.3	39	45.3	39	47.6	9	50.0
35-<45	0	0.0	8	9.4	7	8.5	1	5.5
X^2 (P value)	2.45 (0.293)				1.83 (0.912)			
Residence								
Rural	3	21.4	24	27.9	21	25.6	6	33.3
Urban	11	78.6	62	72.1	61	74.4	12	66.7
Fisher / X^2 (P value)	Fisher (0.613)				0.447 (0.504)			
Educational status								
Illiterate	4	28.5	24	27.9	21	25.6	7	38.9
Primary education	2	14.3	17	19.8	16	19.5	3	16.7
Secondary education	6	42.9	35	40.7	34	41.5	7	38.7
University education	2	14.3	10	11.6	11	13.4	1	5.5
Fisher / **X^2 (P value)**	Fisher (0.964)				1.77 (0.620)			
Occupation								
House Wife	12	85.8	75	87.3	72	87.8	15	83.3
Working	2	14.2	11	12.7	10	12.2	3	16.7
Fisher **(P value)**	(0.877)				(0.609)			

* P- value is statistically significant

Table (4): This table shows no significant association between the level of self-reported practice scores in pre and post-educational intervention and socio-demographic variables (age, residence, educational status, and occupation).

Table (5): Correlation between Studied Women's Level of knowledge and Level of Practice Regarding Folic Acid Pre and Post Educational Intervention (n=100)

Total practice	Total knowledge			
	Pre-test		Posttest	
	R	*P*	*r*	*P*
	0.228	0.026*	0.376	0.001**

* Correlation at 0.05 ** Correlation at 0.01

Table (5) shows a positive correlation between total knowledge and total practice scores regarding folic acid pre- and post-implementing educational intervention.

Discussion

Folic acid plays an important role in DNA / RNA synthesis, amino acid conversion, red blood cell formation, and body cell formation and maintenance. Folic acid requirements during intervals transmit rapid growth and cell partition throughout life. During early evolution, folic acid assists with neural tube formation; it can help stop some major birth defects, such as spina bifida and anencephaly **(Oleiwi et al., 2021).**

Folic acid intake is an important public health goal that can reduce the risk of neural tube defects (NTDs). This B-group vitamin is found naturally in green leafy vegetables, citrus fruits and legumes, and animal-source foods, such as eggs and liver. The supply of naturally occurring folates through food is possible; however, their absorption from food can be limited, as these compounds are susceptible to many factors, including high temperature **(Zadarko et al., 2021)**.

The study aimed to evaluate the effect of educational program on married women's awareness regarding folic acid intake.

Regarding the socio-demographic characteristics, the current study revealed that nearly half of the sample age was

25: 35 yrs. with mean ± SD (26.3 ± 4.89). related to residence, nearly three-quarters of the study sample lived in rural, while the highest percentage of the sample was secondary education and related to occupation; the majority of the study sample was a housewife. Finally, more than three-quarters of the studied sample didn't have consanguinity with their husband.

These results were supported by **Ali & Abdo (2022)**, who studied "Adherence to Iron-folic Acid Supplementation and Associated Factors Among Pregnant Women in Borena Woreda, South Wollo, Ethiopia," who concluded that the mean age of respondents was 27.11(±5.78 SD) years. Almost the majority were rural residents, and nearly two-thirds of mothers were housewives.

On the same line study performed by **Aldan & Ghoraba (2018)**, who studied "Maternal knowledge and use of folic acid among Saudi women attending antenatal care clinic at Security Forces Hospital, Riyadh, Saudi Arabia" and stated that, the age group of the 380 women who took part in the study was 26-30 years. More than two-thirds were housewifes, and nearly half were secondary education.

In contrast to the current results, **Al Arifi et al., (2022)**, who studied **"**Knowledge and Practice of Childbearing Women in Saudi Arabia towards Folic Acid Supplement Evidence from a Cross-Sectional Study" mentioned that approximately half of the participants aged between 36 and 40 years, and the majority had a high level of education (universities graduates).

Moreover, this result comes inconsistent with **Alquraini (2019),** who assessed **"**Perceptions of Folic Acid knowledge and intake among women of childbearing age in Al-Ahssa'a-Saudi Arabia 2018" and concluded that most of the participants were from the group age of 18 – 25. More than half of women lived in urban areas. More than half of the participants had a university degree, and nearly two-thirds were housewives.

Concerning the obstetrical history,, the present study mentioned that more than two thirds of studied sample didn't have previous pregnancy complications, and abortion was the most frequent complication; the majority of the studied sample didn't have a previous history and a family history of congenital fetal anomalies (96% & 95%) respectively. Near two-thirds of women have a history of being pregnant within the past two years, finally related to the present obstetrical history, more than three-quarters of the studied sample were multigravida and near two-thirds of studied sample were multipara.

This result comes in accordance with **Ali & Abdo (2022)**, who indicated that nearly three-quarters of mothers were multigravida, and more than half of the respondents were multiparous. And the lowest percentage of pregnant mothers during the past time had a history of abortion and stillbirth, respectively**.**

This finding was in the same line with **Oleiw et al. (2021),** who studied that **"**assessment of awareness of folic acid use among pregnant women in the primary health care center, " and reported the highest percentage of the study sample was multigravida pregnancies and the highest percentage of the study sample was multipara deliveries but disagree with about three-quarters percentage of study sample not having an abortion.

Furthermore, another supported finding argued by **Teshome *et al.* (2022)**, who studied that **"**A survey on women's awareness of iron and folic acid intake during the preconception period and its associated factors in Manna District, Oromia region, Southwest Ethiopia" which revealed that the highest percentage of the total of respondents were multigravida and more than two third were multiparous, and the majority of the respondents didn't have any medical illness.

The current study demonstrates that the total knowledge level about folic acid pre and post-educational intervention revealed that the majority of the study sample had a poor level of knowledge about folic acid while the lowest percentage had a good knowledge level pre-educational intervention. On the other hand, nearly three-quarters and nearly two-thirds of the studied sample have a good knowledge level in the post-test after implementing the educational intervention and at the follow-up, respectively, with statistically significant improvements in their knowledge level. The result of the present study may be rendered to a lack of ANC counseling by medical professionals about the importance of FA and a shortage of FA tablets provided by the government.

This result in support with **Teshome et al. (2022)**, who showed that women who had four or more ANC visits were 2.3 times more likely to have an awareness of iron and folic acid intake during the preconception period compared to those who had <4 ANC visits. Moreover, these findings were in the same line with the study conducted **Raad and AbuAlhommos, (2021)**, which found that the majority of them had poor awareness about folic acid, and nearly one-quarter of the participants had a good awareness level.

A supported view by **Kamau et al. (2019),** who studied **"**Effect of community-based health education on knowledge and attitude towards iron and folic acid supplementation among pregnant women in Kiambu County, Kenya: A quasi-experimental study**"** stated that there was a great improvement (from two thirds at baseline to the majority at end line) in the proportion of respondents who had heard of IFAS.

Furthermore, a parallel finding reported by **Koirala and Pokharel (2018)**, who study **"**Assessing the level of knowledge in the periconceptional use of folic acid supplement among primigravida women**"** who clarified that among total respondents, nearly two-thirds had poor knowledge, nearly one quarter had average, and lowest percentage had good knowledge about the periconceptional folic acid supplement.

Contrary findings, according to **Zadarko et al. (2021),** who found that the women who use folic acid supplements have greater knowledge about their role in the prevention of neural tube defects than those who do not use such supplementation ($p = 0.001$).

Regarding total knowledge level about folic acid pre and post-educational intervention revealed that the mean score of the studied women's knowledge was higher in the posttest after implementing the educational intervention and at follow-up than in the pretest pre-implementing the educational intervention. From the researcher point of view, those prominent findings are related to low educational level, communities cultures.

This results in support with **Al-Zahrani, & Al-Marwani (2022**), who studied **"**The effectiveness of an educational session about folic acid on pregnant women's knowledge in Yanbu City, Kingdom of Saudi Arabia. AIMS Medical Science**"** reported that the mean of the participants' knowledge about FA after the intervention is significantly higher than the mean of it before the intervention ($p < 0.001$)

Also, in the same line with **Soliman et al. (2021),** who studied **"**Effect of Nutritional Education Intervention on Knowledge, Attitude and Practice of Pregnant Women towards Dietary habits, Physical activity and Optimal Gestational Weight Gain. Zagazig University Medical Journal**"** clarified that there was statistically significant difference of mean knowledge score of pregnant women about health nutrition folic acid during pregnancy from lower percentage before the health education sessions to higher after the health education sessions.

Concerning women's total self-reported practice level about folic acid intake pre and post-educational intervention revealed that the majority of the study sample had an unsatisfactory level of self-reported practice about folic acid in pre-test pre-educational intervention while the majority of them had a satisfactory level after implementing the educational intervention and at the follow-up. This finding of the present study might be due to cultural and socio-economic differences and access to nutritious food. The researcher normalizes her findings to the study of women's poor knowledge, which directly reflects on their practice.

This finding is in agreement with **Nakitto (2021),** who conducted **"**Knowledge, Attitudes and Practices regarding iron and Folic acid Supplementation among pregnant women attending Antenatal care clinics in Kira Municipality health centers**"** reported that majority of participants agreed to take iron and folic acid supplements for their future pregnancies.And nearly two thirds of them were taking these supplements for their current pregnancy.

Furthermore, a parallel finding reported by **Kama et al. (2019),** who noticed that during the study period, there was an improvement in the proportion of pregnant women counseled on various components of Iron Folic Acid Supplementation (IFAS) as they received IFAS tablets from health care providers at the ANC room.

Regarding the relation between socio-demographic characteristics and women's level of knowledge pre and post-educational intervention, the finding of the current study found that there was no significant association between the level of knowledge scores in pre and post-educational intervention and socio-demographic variables (age, residence, and occupation) except (educational status) there was a statistically significant difference post educational intervention (p= 0.037**).** This may be due to lack of mothers' awareness about Folic acid pre intervention which improved through the educational sessions.

The current study result was consistent with the result of **Yasmin et al . (2022),** who revealed that a significant association was also found between knowledge of folic acid and participants' education (P=0.004). the same study was incongruent with the relation between women's level of knowledge and women's age that showed that a significant association was also found between knowledge of folic acid and participants' age (P=0.001).

Also, this finding was supported by **Cui et al. (2021),** who showed that Women with a college or university degree were more likely than women with primary or secondary school education to know about FA and to begin taking FA at the correct time.

However, the current study was incongruent with the findings of **Koirala and Pokharel (2018)**, who found that Women who were employed were more likely to know about FA and to begin taking FA before pregnancy than women who were homemakers. There was a significant difference in knowledge about FA among pregnant women living in northern versus southern areas. Respondents' age, place of residence, and occupation are statistically significant with their level of knowledge.

Regarding the relation between socio-demographic characteristics and women's level of self-reported practice pre and post-educational intervention, the finding of the current study found that there was no significant association between the level of self-reported Practice scores in pre and post-educational intervention and socio-demographic variables (age, residence, educational status, and occupation). Based on the researcher interpretation, this finding may be interpreted to women's practice not depends on their age, residence, educational status, and occupation but there are other factors affecting their practice as work loaded, forgetting and FA tablets costs.

The current study's finding was supported by **Ezzeddin et al. (2019)**, who reported that the results did not show any significant association between economic satisfaction scores and folic acid supplementation. However, in contrast, women's education levels who had taken supplements were found to be significantly higher (P<0.001).

The finding of the current study is in contrast with **Khan et al. (2021)**, who conducted a study entitled "Awareness of Folic Acid Intake among Women of Childbearing Age in Ha'il region, Kingdom of Saudi Arabia" showed that the relationship between intake of Folic Acid with demographic profile, women who were having higher education level took Folic Acid regularly (p≤ 0.000). However, in contrast with women age that shows who was married, pregnant, grand-multipara, and above 36 years of age took Folic Acid more than other women, this difference is si2gnificant (p≤ 0.000).

Finally, a positive correlation between total knowledge and total self-reported practice scores regarding folic acid pre- and post-implementing educational intervention. This may be due to the need for consistent women's education, using a range of educational models, as an integral component of antenatal care program that can contribute to the desired change in women's practice.

This result aligns with **Mohamed et al. (2020)**, who showed that there was a statistically significant positive correlation between total knowledge and total practice scores pre and post-preventive program (P ≤ 0.001).

Another supported finding argued by **Kim et al. (2018)**, who studied **"**Awareness, knowledge, and use of folic acid among non-pregnant Korean women of childbearing age**"** observed that the rate of folic acid supplement use was compared between women with knowledge of folic acid and women without knowledge. Overall, knowledgeable women were more likely to take folic acid supplements than unknowledgeable women.

Conclusion

Based on the present study findings, the study concluded that:

The current study concluded that there was a highly statistically significant difference between the mean scores of married women's total knowledge and total self-reported practice pre and post-test. Also there was a significant association between married women's total knowledge and total self-reported practice scores regarding folic acid and their selected demographic characteristics pre-and post-test.

Finally, there was a significant positive correlation between total knowledge and total self-reported practice scores regarding folic acid intake pre and post-implementing educational intervention. So, the educational program effectively improved married women's knowledge and self-reported practices regarding folic acid intake.

Recommendations:

- Distribute Arabic colored Boucher about folic acid, its importance, requirements, and sources should be available in each family health center and given to each married woman.
- Promote regular follow-up of folic acid nutrition status for married women, either by dietary assessment or by estimation of blood folic acid concentration, is needed.
- Improve healthcare providers' knowledge and adherence to the folic acid supplement recommendation, which reflects on patient knowledge through health education.
- Taking advantage of television and social media to make doctors talk about the importance of folic acid to promote awareness about folic acid in reproductive-age women.
- Implement further studies should be undertaken on a wide range of the population in different places (married & unmarried women).

References

1. Al Arifi, M. N., Alqahtani, A. M., Alotaibi, A. N., Babelghaith, S. D., Alwhaibi, A., Alsanea, S., ... & Al-Arifi, N. M. (2022). Knowledge and Practice of Childbearing Women in Saudi Arabia towards Folic Acid Supplement—Evidence from a Cross-Sectional Study. Nutrients, 14(2), 357.
2. Ali, S. H., & Abdo, Z. A. (2022). Adherence to Iron-folic Acid Supplementation and Associated Factors Among Pregnant Women in Borena Woreda, South Wollo, Ethiopia. American Journal of Health Research, 10(2), 24-32.
3. Aldan, A. A., & Ghoraba, D. A. (2018). Maternal knowledge and use of folic acid among Saudi women attending antenatal care clinic at Security Forces Hospital, Riyadh, Saudi Arabia. IOSR J Nurs Health Sci, 7(5), 11-9.
4. Alquraini, H. M. A. (2019). Perceptions of Folic Acid knowledge and intake among women in childbearing age in Al-Ahssa'a-Saudi Arabia 2018. EC Pharmacology and Toxicology, 8(12), 01-09.
5. Al-Zahrani, A., & Al-Marwani, S. (2022). The effectiveness of an educational session about folic acid on pregnant women's knowledge in Yanbu City, Kingdom of Saudi Arabia. AIMS Medical Science, 9(3), 394-413.
6. Berhane, A., & Belachew, T. (2022). Effect of Picture-based health education and counseling on knowledge and adherence to preconception Iron-folic acid supplementation among women planning to be pregnant in Eastern Ethiopia: a randomized controlled trial. Journal of Nutritional Science, 11.
7. Carter, C., Harnett, J. E., Krass, I., & Gelissen, I. C. (2022). A review of primary healthcare practitioners' views about nutrition: implications for medical education. International Journal of Medical Education, 13, 124-137.
8. Cui, M., Lu, X. L., Lyu, Y. Y., Wang, F., Xie, X. L., Cheng, X. Y., & Zhang, T. (2021). Knowledge and intake of folic acid to prevent neural tube defects among pregnant women in urban China: a cross-sectional study. BMC pregnancy and childbirth, 21(1), 1-9.
9. Dwyer, E. R., Filion, K. B., MacFarlane, A. J., Platt, R. W., & Mehrabadi, A. (2022). Who should consume high-dose folic acid supplements before and during early pregnancy for the prevention of neural tube defects? BMJ, 377.
10. Ezzeddin, N., Zavoshy, R., & Noroozi, M. (2019). Prevalence of folic acid supplement consumption before and during pregnancy, and its determinants among community health center referrals. Obstetrics & gynecology science, 62(6), 454-461.
11. Hassan, H. H., Mohamed, M. A., & Elgibaly, F. A. Z. R. (2022). The proportion of Central Nervous System Fetal Malformations in patients attending Fetomaternal Unit Minia University as an observation study. Minia Journal of Medical Research, 33(2), 137-145.
12. Kamau, M., Mirie, W., Kimani, S., & Mugoya, I. (2019). Effect of community-based health education on knowledge and attitude towards iron and folic acid supplementation among pregnant women in Kiambu County, Kenya: A quasi-experimental study. PloS one, 14(11), e0224361.
13. Khan, F. H. K., Alahmed, S. K., Alsaad, W. S. and Alshammari, A. H. (2021) "Awareness of Folic Acid Intake among Women of Childbearing Age in Ha'il region, Kingdom of Saudi Arabia", Journal of Pharmaceutical Research International, 33(16), pp. 42-54. doi: 10.9734/jpri/2021/v33i1631295.
14. Kim, M. J., Kim, J., Hwang, E. J., Song, Y., Kim, H., & Hyun, T. (2018). Awareness, knowledge, and use of folic acid among non-pregnant Korean women of childbearing age. Nutrition research and practice, 12(1), 78-84.
15. Kindie, Z., & Mulu, A. (2022). Prevalence of neural tube defects at Debre Berhan Referral Hospital, North Shewa, Ethiopia. A hospital-based retrospective cross-section study. Plos one, 17(2), e0261177.
16. Koirala, S., & Pokharel, S. (2018). Assessing the level of knowledge in the preconceptional use of folic acid supplement among primigravida women. Kathmandu Univ Med J, 64(4), 306-10.
17. Milosavljević, J., Pejčić, A., Arsenijević, P., Dimitrijević, A., Milosavljević, M., Mihajlović, D., & Janković, S. (2022). Testing of new instrument for measuring quality and diversity of nutrition in pregnancy. Ginekologia Polska.
18. Mohamed, S. H., Elkholy, G. A., Ramadan, S. A., & Ramadan, E. A. (2020). Application of Health Belief Model on Nursing Students' Perception regarding Benefits of Preconceptional Folic Acid Intake
19. Nakitto, R. (2021). Knowledge, Attitudes and Practices regarding iron and Folic acid Supplementation among pregnant women attending Antenatal care clinics in Kira Municipality health centers (Doctoral dissertation, Makerere University).
20. Oleiwi, S. S., Mansoor, H. I., & Hussein, Z. S. M. A. S. (2021). Assessment Of Awareness Of Folic Acid Use Among Pregnant Women In Primary Health Care Center. Age, 20(8), 1-2.
21. Ong, M. H. A., & Puteh, F. (2017). Quantitative data analysis: Choosing between SPSS, PLS, and AMOS in social science research. International Interdisciplinary Journal of Scientific Research, 3(1), 14-25.
22. Raad, S. E., & AbuAlhommos, A. K. (2021). Female awareness about the preconception use of folic acid supplements in childbearing age: A cross□sectional study. International Journal of Clinical Practice, 75(6), e14091.
23. Sabi, E. M., Mujamammi, A. H., Alturki, N., Alzaid, T., Almutairi, A., Algarni, R., ... & Sumaily, K. M. (2022). Level of Knowledge and Awareness of Female Undergraduate Students and Determinants of Knowledge of Folic Acid and Supplementation. Medicina, 58(8), 986.
24. Sadiq, Z. A., & Hussein, H. K. (2022). Assessment of knowledge and attitudes among pregnant women's towards folic acid intake during pregnancy in a sample of women attending primary health care centers in Babylon province. Medical Journal of Babylon, 19(2), 142.
25. Teshome, F., Kebede, Y., Girma, K., & Birhanu, Z. (2022). A survey on women's awareness of iron and folic acid intake during preconception period and its associated factors in Manna District, Oromia region, Southwest Ethiopia. Nursing Open, 9(2), 950-958.
26. Wojtowicz, A., Babczyk, D., Galas, A., Skalska-Swistek, M., Gorecka, M., Witkowski, R., & Huras, H. (2022). Evaluation of the prevalence of folic acid supplementation before conception and through the first 12 weeks of pregnancy in Polish women at high risk of fetal anomalies. Ginekologia Polska, 93(6), 489-495.
27. Yasmin, S., Siddiqa, A., Rockliffe, L., & Miyan, J. (2022). Knowledge of Neural Tube Defects and Prevention Through Folic Acid Use Among Women in Faisalabad, Punjab, Pakistan: A Cross-Sectional Survey. International Journal of Women's Health, 14, 425-434.
28. Zadarko-Domaradzka, M., Kruszyńska, E., & Zadarko, E. (2021). Effectiveness of Folic Acid Supplementation Recommendations among Polish Female Students from the Podkarpackie Region. Nutrients, 13(3), 1001