

Research article

The effectiveness of an educational session about folic acid on pregnant women's knowledge in Yanbu City, Kingdom of Saudi Arabia

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Abstract: Background: Folic Acid (FA) is an important nutritional element during pregnancy. It is B vitamin which is found in the natural and complementary source. Deficiency of FA during pregnancy leads to many maternal and fetal complications such as neural tube defect (NTD), birth defect, spontaneous abortion, and megaloblastic anemia. This study aims to assess the effectiveness of an educational session about FA on pregnant women's knowledge in the Kingdom of Saudi Arabia (KSA).

Methods: A quasi-experimental design was conducted on sixty-five pregnant women from the outpatient clinic in Yanbu General Hospital (YGH) using pre-test and post-test questionnaire to assess their FA knowledge. A purposeful sampling method was used to involve the study participants. All the findings were analyzed through SPSS. Descriptive statistic was used to first generate information about the study participants, after which a t-test was conducted. **Results:** The participants had poor knowledge about FA before the session but the level was increased after the session with mean difference 5.49. Majority of the study participants 81.5% had knowledge that FA protects against NTD. While, 70% understood that FA is an important vitamin during pregnancy. There is a significant association between the age, income, working status, age of marriage, and knowledge of participants. **Conclusions:** An educational session had good effect on pregnant women's knowledge. Health care providers and social media should play more active role to increase the knowledge of FA to pregnant women.

Keywords: folic acid; educational session; knowledge; pregnant women; Kingdom of Saudi Arabia

1. Introduction

The supplementation of folic acid (FA) benefits the general population and plays a critical role during pregnancy [1]. The World Health Organization (WHO) recommends increasing the nutrition status of women in the first 12 weeks of pregnancy to prevent maternal and fetal adverse outcome [2]. Therefore, mothers should take FA before and during pregnancy to decrease the risks particularly that related to congenital anomalies.

According to Kharb et al. [3] and Cieślik et al. [4], FA deficiency leads to various complications in mothers and the fetus, such as spontaneous abortion, megaloblastic anemia, neural tube defect (NTD), and low birth weight. It also affects fetal neurodevelopment and language development. NTD is the most common congenital anomaly in the world with around 300,000 cases a year. Spina bifida is particularly common in Kingdom of Saudi Arabia (KSA), affecting 1.2 in 1000 people [5]. According to the Centers for Disease Control and Prevention (CDC) [6], healthy eating is better complemented by FA supplementations. 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 [2]. Therefore, they should eat meals with folate and take vitamins. Additionally, eating fortified foods such as breakfast cereals, cornflour, and bread helps meet the recommended daily folate intake [7]. However, women must combine fortified foods and FA supplements after seeking proper advice from healthcare providers. Moussa et al. [8] and Sonawane et al. [1] emphasized how women's knowledge of FA can reduce the predisposition of complications such as cardiovascular diseases (CVD) and NTDs.

Lack of educational knowledge of pregnant women regarding FA intake predisposes them to blood and cardiovascular diseases during and after pregnancy. NTDs are common congenital anomalies that develop within the first month of pregnancy. FA deficiency is a potential predisposing factor to NTDs. Such anomalies lead to anencephaly due to the lack of essential nutrients in the brain for healthy development [9,10]. The level of awareness among women about the effect of FA on lowering congenital problems or cardiovascular risks remains unclear. Sonawane et al. [1] many researcher have argued that the knowledge of supplementation or dosage may be scarce among the patients. The level of awareness of FA supplementation or diet intake during preconception varies from region to region. Alblowi and Alomayri (2018) [11] recommended increasing women's knowledge regarding FA. Consequently, a study that determines the relationship between educational sessions and women's knowledge regarding FA supplementation in KSA will be helpful. The current study thus aims to fill the gap in the literature by assessing the effect of an educational session on the knowledge of pregnant women regarding FA supplementation. The study findings will help the government and relevant healthcare providers predicate required developments to enhance pregnant women's knowledge regarding FA supplementation.

2. Materials and methods

2.1. Study design

In the current study, quantitative, quasi-experimental design was used. It was selected as the proper method that helps to gather insights to reveal the effect of an educational session about FA on Saudi pregnant women's knowledge. In addition, it helps to determine the causal effect of educational sessions on study target population.

Sampling technique involved the selection of the subjects as study samples from the population under study. There are two types of sampling design used in quantitative research: probability sampling and non-probability sampling [12]. In the current study non-probability sampling through purposeful were used. This type of sampling is widely used as it allows the researcher to selects elements through nonrandom methods. The researcher tends to use it when it is impossible to draw random probability sampling due to time or cost considerations. A purposeful sampling requires the researcher to examine the study population to ensure that they fit the purpose of the study in order to measure what is suppose to measure.

2.2. Study site

This study was conducted in antenatal clinic at Yanbu General Hospital (YGH) from February 2021 to May 2021. YGH is a governmental hospital located in Yanbu City which is a small and beautiful city located in the Western provenance of KSA.

2.3. Study sample

The sample size was a total of 65 pregnant women. A purposeful sampling method was used to include the study participants. The inclusion criteria include: (a) Saudi pregnant women; (b) age 18–45 years; (c) living in Yanbu City; (d) ability to speak Arabic. The exclusion criteria include: (a) non-Saudi pregnant women; (b) age < 18 or > 45 years; (c) living outside the Yanbu City.

2.4. Instrument

The instrument of this study was developed by the researchers concerning the comprehensive reading of the literature, and it was then revised by two academic professors specialized in maternity health nursing in the Nursing Faculty at King Abdulaziz University (KAU). The reliability tested by using Cronbach's Alpha (α) test using the IBM-SPSS package. The technique confirmed that the scales used in the survey items are reliable. The data was collected using a questionnaire divided into three parts: (1) Demographic data and obstetric history; (2) Knowledge about FA before and after the session, this part was same and administered twice before and after the educational session; (3) Satisfaction about the educational session which conducted one time only immediately after the educational session.

The study intervention was made through an educational session related to FA provided by one of the researcher. The educational session was developed by the researchers. The objective of the educational session is to provide knowledge related to FA. The educational session includes information about the importance of FA, complication related to not using FA, the advantages of taking FA on women and child health. The session was provided for each participant through a PowerPoint presented by the researcher at the antenatal clinic, and the duration of the session was 10–15 min.

2.5. Data collection process

In quantitative studies, the researcher explains how to operationalize their variables and collect their data. Their data collection plan is usually before a single piece of data is gathered. The researcher must transfer the phenomena that interested into data that can be analyzed through the data collection stage. The researcher visited the clinic daily for data collection. The sample subjects included those who visited the waiting area of the antenatal clinic at YGH. The researcher introduced herself and explained the title, aims, and study objectives to each of the participants to obtain their consent for participation.

Pre-test questionnaires were filled by the researcher based on the interview with each participant individually. Then, the researcher provided the educational session. At the end of the educational session, the participants were asked to evaluate the session presented to them. For this purpose, the participants who could read and write were left alone and asked to fill the feedback form. While those who couldn't, they filled the evaluation by the help of the relatives or nurse or attending visitors available in the clinic. After two weeks, the researcher contacted each participant through telephone to collect their post-test answers by reading the question and fill the questionnaires. Evaluating the impact of education after two weeks was suitable in this study as it help to follow up with the study participants and not losing the contact data.

2.6. Data analysis

All data were coded, computed, and analyzed using the Statistical Package for Social Science (SPSS; version 25). The researcher started by reviewing the data obtained (i.e., eliminating missing data and outliers). Descriptive statistic was used to first generate information about the study participants, after which a t-test was conducted to determine if there is a significant difference between the means of two groups. In addition, Tukey hoc test is used with one way ANOVA and when the P value significant difference between the means of two groups, which may be related in certain features. It is considered the best available method when confidence intervals are desired. Coding refers to a numerical or textual label implemented to a section of raw data to facilitate subsequent analyses. The researcher prepared codes to depict categories of subject or rank order placement. A coding system was developed to convert the verbal data into numbers.

2.7. Ethical considerations

The research proposal for this study was first approved by the Ethical Committee of the Nursing Faculty at KAU (Ref. No. 1M.10) and then by the ethical committee in Ministry of Health (MOH) in Madinah (IRB 555) to facilitate access to the participants and to gather the necessary data. The researcher was cleared that the participation in the study is voluntary and they can withdraw at any time or stage during the study. The participant's privacy and confidentiality of their personal information were well maintained. The data were anonymized and protected from unauthorized parties.

3. Results

3.1. *Sample distribution according to the participants' age, marital status, income, residence, education, working status, age at marriage, and age at first delivery*

Table 1 shows the distribution of study participants according to their age groups, their husbands' age, marital status, income, and their residence. Women aged 26–30 years old constitute 30.8%, while, 26.2% of them are aged between 18–25 and 16.9% of them are from 36–45 years old. In addition, the age of 40.0% of the participants' husbands is >36 years old, while the age of 24.6% of participants' husbands is 26–30 years. The majority 90.8% of the participants are married, while 9.2% are separated or divorced. Regarding their income, 40.0% of the participants have an income between 3000–6000 SAR, 36.9% of them have an income between 7000–9000 SAR, while 23.1% have an income >9000 SAR. The majority of the samples, 86.2%, are from the West, while 6.2% of them originate from the North.

The participants' educational qualifications 49.2% of the participants have a University degree, 24.6% of them are Illiterate, while 23.1% have a secondary school education. Regarding their husbands' educational qualifications, the majority of them, 49.2%, have a secondary school education, while 46.2% of them have a University degree. In addition, more than half, 53.8%, of the participants are housewives, while 30.8% are working. Furthermore, 87.7% of the participants' husbands are working, while 12.3% of them are not working. Regarding the participants' age at marriage, 50.8% of them were married when their age was less than 20 years, while 26.2% were married after the age of 25. On the other hand, the age at the first delivery of 38.5% of the participants was 20 years or less, and that of 33.8% of participants was 21–25 years.

Table 1. Sample distribution according to the participants' age, marital status, income, residence, education, working status, age at marriage, and age at first delivery.

Variables	Number (n)	Percentage (%)
Participant's age groups		
18–25 years	17	26.2
26–30 years	20	30.8
31–35 years	17	26.2
36–45 years	11	16.9
Husband's age groups		
18–25 years	3	4.6
26–30 years	16	24.6
31–35 years	20	30.8
More than 36 years	26	40.0
Marital status		
Married	59	90.8
Separated/Divorced	6	9.2
Income		
3000–6000 SAR	26	40.0
7000–9000 SAR	15	23.1
> 9000 SAR	24	36.9
Residence		
North	4	6.2
South	3	4.6
East	2	3.1
West	56	86.2
Participants' education		
Read and Speak Arabic	16	24.6
Secondary	15	23.1
University	32	49.2
Others	2	3.1
Husbands' education		
Intermediate	3	4.6
Secondary	32	49.2
University	30	46.2
Participants' working status		
Housewife	35	53.8
Student	10	15.4
Working	20	30.8
Husbands' working status		
Not working/Retired	8	12.3
Working	57	87.7
Age at marriage		
Less than 20 years old	33	50.8
21–25 years	15	23.1
More than 25 years	17	26.2
Age at first delivery		
Less than 20 years old	25	38.5
21–25 years	22	33.8
More than 25 years	18	27.7

3.2. Sample distribution according to the participants' history of diseases, previous operations, planning for current pregnancy, and nature of current pregnancy

Table 2 below shows that majority of the participants 67.7% did not have any history of diseases, 23.1% had anemia, while 4.6% had diabetes mellitus. Furthermore, 70.8% of the participants did not have any previous operations, 12.3% of them had a Cesarean Section (CS), while 7.7% of them had a cholecystectomy. Regarding planning for the current pregnancy, more than half, 52.3%, of the participants had a plan for a pregnancy, while 47.7% did not. Moreover, all participants had spontaneous pregnancies.

Table 2. Sample distribution according to the participants' history of diseases, previous operations, planning for current pregnancy, and nature of current pregnancy.

Variables	Number	Percentage (%)
History of medical diseases		
No history of diseases	44	67.7
Anemia	15	23.1
Obesity	1	1.5
Diabetes mellitus	3	4.6
Hypertension	1	1.5
Others	1	1.5
History of previous operations		
No	46	70.8
Appendectomy	4	6.2
Cholecystectomy	5	7.7
Cesarean section	8	12.3
Others	2	3.1
Planning for current pregnancy		
Yes	34	52.3
No	31	47.7

3.3. Sample distribution according to their obstetric history

Table 3 shows that the gestational age of 64.6% of participants is 1–3 months, and the gestational age of 23.1% of them is 4–6 months. Regarding gravida, 76.9% of the participants had 1–3 pregnancies, while 23.1% of them had 4–6 pregnancies. Regarding the number of previous deliveries, 50.8% of the participants had 1–3 deliveries, while 26.2% of them did not have any delivery. In addition, 60.0% of the participants had previous normal vaginal delivery, while 1.8% of them had previous CS delivery. Regarding the number of alive children, 44.6% of the participants had 1–3 children, 38.5% of them did not have children, while 16.9% had 4–6 children. In addition, the majority, 93.8%, of the participants did not have congenital anomalies for their previous births.

Moreover, the time difference between the current and last pregnancy of 32.3% of the participants is 2–4 years, while the time difference of 30.8% of the participants is less than 2 years. 27.7% of the participants were pregnant for the first time.

Table 3. Sample distribution according to their obstetric history.

Variables	Number (n)	Percentage (%)
Gestational age		
1–3 months	42	64.6
4–6 months	15	23.1
7–9 months	8	12.3
Number of pregnancy		
1–3 pregnancies	50	76.9
4–6 pregnancies	15	23.1
Number of delivery		
0 deliveries	17	26.2
1–3 deliveries	33	50.8
4–6 deliveries	15	23.1
Abortion		
0 times	43	66.2
1–3 times	22	33.8
Mode of previous deliveries		
No previous deliveries	17	26.2
Normal vaginal delivery	39	60.0
CS	9	13.8
Mode of last delivery		
No previous deliveries	17	26.2
Normal vaginal delivery	38	58.5
CS	10	15.4
Number of alive children		
0	25	38.5
1–3	29	44.6
4–6	11	16.9
Previous congenital anomalies		
No	61	93.8
Yes	4	6.2
Time difference between current and last pregnancy		
Pregnant for the first time	18	27.7
Less than 2 years	20	30.8
2–4 years	21	32.3
More than 3 years	6	9.2

3.4. Participants' knowledge about FA before and after the educational session

Table 4 shows the frequency and percentages of correct and incorrect answers of each item within the participants' knowledge about FA before and after intervention. Majority of the participants 81.5% had correct answers about the item "FA during pregnancy protects against malformations of the fetus's nervous system", 70.0% had correct answers about the item "FA is one of the important vitamins during pregnancy", and 60.0% had correct answers about "FA promotes the health of the mother and the fetus during pregnancy". On the other hand, 84.6% of the participants had incorrect answers about

the item “The appropriate dose of FA for a pregnant woman who does not suffer from diseases is 800 micrograms”, 75.4% of them had incorrect answers about the item “Natural sources of FA only are sufficient to get the right dose during pregnancy”, and 73.8% of them had incorrect answers about the item “The appropriate daily dose of FA for a non-disease-free pregnant woman is 400 micrograms”.

Table 4. Participants' knowledge about FA before and after the educational session.

Knowledge statements	Before session		After session	
	Correct answer n (%)	Incorrect answer n (%)	Correct answer n (%)	Incorrect answer n (%)
1. FA is one of the important vitamins during pregnancy.	46 (70.8)	19 (29.2)	61 (93.8)	4 (6.2)
2. FA is an important mineral during pregnancy.	36 (55.4)	29 (44.6)	55 (84.6)	10 (15.4)
3. FA helps in iron absorption.	36 (55.4)	29 (44.6)	62 (95.4)	3 (4.6)
4. FA protects against early miscarriage.	31 (47.7)	34 (52.3)	64 (98.5)	1 (1.5)
5. FA protects against depression and promotes mental health.	31 (47.7)	34 (52.3)	65 (100.0)	0 (0.0)
6. FA during pregnancy protects against malformations of the fetus' nervous system.	53 (81.5)	12 (18.5)	64 (98.5)	1 (1.5)
7. FA promotes the health of the mother and the fetus during pregnancy.	39 (60.0)	26 (40.0)	61 (93.8)	4 (6.2)
8. One of the sources of FA is beans.	34 (52.3)	31 (47.7)	63 (96.9)	2 (3.1)
9. One of the sources of FA is orange.	29 (44.6)	36 (55.4)	61 (93.8)	4 (6.2)
10. One of the sources of FA is green leaves, such as watercress.	36 (55.4)	29 (44.6)	65 (100.0)	0 (0.0)
11. One of the sources of FA is corn.	27 (41.5)	38 (58.5)	61 (93.8)	4 (6.2)
12. Avocado is one of the sources of folate.	29 (44.6)	36 (55.4)	62 (95.4)	3 (4.6)
13. Banana is one of the sources of folate.	28 (43.1)	37 (56.9)	61 (93.8)	4 (6.2)
14. Pomegranate is considered a source of FA.	28 (43.1)	37 (56.9)	62 (95.4)	3 (4.6)
15. FA should be taken at least three months before planning a pregnancy	25 (38.5)	40 (61.5)	62 (95.4)	3 (4.6)
16. FA should be taken three months after pregnancy.	23 (35.4)	42 (64.6)	63 (96.9)	2 (3.1)
17. A pregnant woman needs a dose of FA that differs from the dose of a non-pregnant woman.	21 (32.3)	44 (67.7)	64 (98.5)	1 (1.5)
18. The appropriate dose of FA for a pregnant woman who does not suffer from diseases is 800 micrograms.	10 (15.4)	55 (84.6)	62 (95.4)	3 (4.6)
19. The appropriate daily dose of FA for a non-disease-free pregnant woman is 400 micrograms.	17 (26.2)	48 (73.8)	63 (96.9)	2 (3.1)
20. Natural sources of FA only are sufficient to get the right dose during pregnancy.	16 (24.6)	49 (75.4)	65 (100.0)	0 (0.0)
21. Nutritional supplements only are sufficient to get the right dose during pregnancy.	34 (52.3)	31 (47.7)	62 (95.4)	3 (4.6)
22. It is safe to buy FA without a prescription.	34 (52.3)	31 (47.7)	64 (98.5)	1 (1.5)

Frequency and percentages of the correct and incorrect answers of each item within the participants' knowledge about FA after the intervention changed. It shows that all participants had correct answers about the item “One of the sources of FA is green leaves, such as watercress”, 98.5% had correct answers about the item “It is safe to buy FA without a prescription”, “FA protects against

early miscarriage”, and “FA during pregnancy protects against malformations of the fetus’ nervous system”. On the other hand, all participants had correct answers about the item “Natural sources of FA only are sufficient to get the right dose during pregnancy”, 98.5% of them had correct answers about the item “A pregnant woman needs a dose of FA that differs from the dose of a non-pregnant woman”, and 96.9% of them had correct answers about the item “FA should be taken three months after pregnancy”.

3.5. Total knowledge before and after the educational session

Table 5 below shows that 44.6% of participants had poor knowledge about FA before the intervention, while no participants had a poor level of knowledge after the educational intervention. Moreover, the percentage of participants having excellent knowledge after the educational intervention increased from 30.8% to 92.3% after the intervention. In addition, the percentage of participants having adequate knowledge after the educational intervention decreased from 24.6% before the intervention to 7.7% after the intervention.

The table also shows that the educational intervention about FA during pregnancy has a significant effect on the participants’ level of knowledge. The mean of the participants’ knowledge about FA after the intervention is significantly higher than the mean of it before the intervention ($p < 0.001$).

Table 5. Total knowledge before and after the educational session.

Level of knowledge	Before (%)	After (%)			
Poor (< 40.0%)	29 (44.6)	0 (0.0)			
Adequate (40–60%)	16 (24.6)	5 (7.7)			
Excellent (> 60.0%)	20 (30.8)	60 (92.3)			
Total	65 (100.0)	65 (100.0)			
Knowledge about FA before and after the educational session					
FA knowledge before and after	N	Mean difference	SD difference	T (df)	P-value*
	65	-5.49	5.34	-8.285 (64)	0.000

3.6. Sources, time and benefits of information regarding FA

Table 6 below shows the sources of information, time, and benefit regarding FA among the study participants. The most common source of information used by them was physicians (58.2%). It was followed by social media (46.2%) and then nurses (6.2%), while the health education program and newspapers accounted for 0.0%. (84.6%) of the participants stated that they had information about FA before marriage, while less than one-fourth (15.4%) did not have any information. In addition, more than half (53.8%) of the participants did not agree with “My prior knowledge of FA helped me to take the dose at the right time during pregnancy”, while less than half (46.2%) mentioned it did.

Table 6. Sources, time and benefits of information regarding FA.

	Question answer	Frequency	%
Source of information			
Social media	Yes	30	46.2
	No	35	53.8
Health education program	No	65	100.0
Physicians	Yes	38	58.5
	No	27	41.5
Nurses	Yes	4	6.2
	No	61	93.8
Family	Yes	25	38.5
	No	40	61.5
Newspaper	No	65	100.0
Others	Yes	4	6.2
	No	61	93.8
Time of information			
Got information about FA well before pregnancy	Yes	10	15.4
	No	55	84.6
Benefits of information about FA			
My prior knowledge of FA helped me to take the dose at the right time during pregnancy	Yes	30	46.2
	No	35	53.8

3.7. Differences in the participants' knowledge of FA before the educational session with regard to their age, marital status, income, and residence

Table 7 below shows that there is a significant difference in the mean level of the total participants' knowledge regarding FA during pregnancy with regard to their age groups ($p < 0.05$). The Tukey post hoc test showed that the difference is between the age group 18–25 years and 31–35 years in favor to participants who are 31–35 years. The participants who are aged 31–35 years had a significantly higher mean knowledge score than the participants aged 18–25. In addition, there is a significant difference in the mean level of the total participants' knowledge regarding FA during pregnancy with regard to their income ($p < 0.05$). The Tukey post hoc test showed that participants who have an income > 9000 SAR had significantly higher mean knowledge scores than those who have an income between 7000–9000 SAR. On the other hand, there is no significant difference in the mean level of the total participants' knowledge regarding FA during pregnancy with regard to their marital status, husbands' age, and residence ($p > 0.05$).

Table 7. Differences in the participants' knowledge of FA before the educational session with regard to their age, marital status, income, and residence.

Total level of knowledge before the educational session	N	Mean	SD	F/t (df)	P-value*
Age groups					
18–25 years	17	7.76	5.36	3.439 (3, 61)	0.022 ^a
26–30 years	20	10.85	5.08		
31–35 years	17	12.94	5.56		
36–45 years	11	8.54	3.64		
Marital status					
Married	59	9.949	5.40	-1.184 (63)	0.241 ^b
Separated/divorced	6	12.66	4.67		
Husband's age					
18–25 years	3	8.66	1.52	1.120 (3, 61)	0.156 ^a
26–30 years	16	8.50	6.12		
31–35 years	20	12.35	4.29		
≥ 36 years	26	9.76	5.58		
Income					
3000–6000	26	9.30	4.71	3.918 (2, 62)	0.025 ^a
7000–9000	15	8.13	5.78		
> 9000 SAR	24	12.45	5.17		
Residence					
North	4	9.50	6.45	0.352 (3, 61)	0.788 ^a
South	3	10.66	5.50		
East	2	6.50	2.12		
West	56	10.35	5.43		

3.8. Differences in the participants' knowledge of FA before the educational session with regard to their education, working status, age at marriage, and age at first delivery

Table 8 below shows that there is a significant difference in the mean level of the total participants' knowledge regarding FA during pregnancy with regard to their working status ($p < 0.05$). The Tukey post hoc test showed that the difference is between working women and housewives in favor to working women. The participants who are working had significantly higher mean knowledge scores than housewives.

In addition, there is a significant difference in the mean level of the total participants' knowledge regarding FA during pregnancy with regard to their age at marriage ($p < 0.05$). The LSD post hoc test showed that the difference is between the participants who have been married at ≤ 20 years old and those who have been married at age of > 25 years old in favor to participants who have been married at age > 25 years. The participants who had been married at the age > 25 years had significantly higher mean knowledge scores than those who had been married at ≤ 20 years. On the other hand, there is no significant difference in the mean level of the total participants' knowledge regarding FA during pregnancy with regard to their education, husbands' education, husbands' working status, age at first delivery, and planning for current pregnancy ($p > 0.05$).

Table 8. Differences in the participants' knowledge of FA before the educational session with regard to their education, working status, age at marriage, and age at first delivery.

Total Level of Knowledge before the educational session	N	Mean	SD	F/t (df)	P-value*
Participants' education					
Illiterate	16	8.50	4.00	1.999 (3, 61)	0.123 ^a
Secondary	15	8.60	5.85		
University	32	11.62	5.56		
Others	2	13.00	1.41		
Husbands' education					
Intermediate	3	8.33	4.16	2.279 (2, 62)	0.111 ^a
Secondary	32	8.96	4.61		
University	30	11.70	5.94		
Participants' working status					
Housewife	35	9.11	4.15	8.633 (2, 62)	0.000 ^a
Student	10	6.90	5.83		
Working	20	13.75	5.37		
Husbands' working status					
Not working/Retired	8	12.62	2.77	1.373 (63)	0.175 ^b
Working	57	9.85	5.57		
Age at marriage					
≤ 20 years old	33	8.45	4.86	3.858 (2, 62)	0.026 ^a
21–25 years	15	11.93	5.63		
> 25 years	17	12.05	5.23		
Age at first delivery					
≤ 20 years old	25	8.72	5.18	2.480 (2, 62)	0.092 ^a
21–25 years	22	10.13	5.35		
> 25 years	18	12.33	5.21		
Planning for current pregnancy					
Yes	34	9.35	5.47	-1.340 (63)	0.185 ^b
No	31	11.12	5.18		

3.9. Participant satisfaction with the educational session

Table 9 is the evaluation of the educational session that was given to participants about FA. All study participants satisfied from the educational session provided to them. 100.0% of participants benefited from the educational session that was presented to them about FA, 100.0% of them said that the educational session is sufficient in terms of time, 100.0% of them were satisfied with the educational session given, 100.0% of them said that the educational session helped them make sure to take FA, and 100.0% of them said that the educational session provided them with information that they did not previously know about FA.

Table 9. Participant satisfaction with the educational session.

Educational session evaluation	Yes (%)	No (%)
1. I benefited from the educational session that was presented to me about FA.	65 (100.0)	0 (0.0)
2. The educational session is sufficient in terms of content.	53 (81.5)	12 (18.5)
3. The educational session is sufficient in terms of time.	65 (100.0)	0 (0.0)
4. Overall, satisfied with the educational session given.	65 (100.0)	0 (0.0)
5. The educational session helped me make sure to take FA.	65 (100.0)	0 (0.0)
6. The educational session provided me with information that I did not previously know about FA.	65 (100.0)	0 (0.0)

4. Discussion

The present data shows that the majority of the study sample had poor total score of knowledge about FA before the educational session 44.6%. The results are consistent with the findings of national and international studies about FA. The finding aligns with the views of Nemri et al. (2019) [13] that 45.7% of pregnant women queried in the study lacked the fundamental knowledge about FA. The finding also in line with a questionnaire-based cross-sectional study in Riyadh, KSA involved two hundred and fifty four Saudi pregnant women and has reported that only 51.4% of the women in their study gave the correct reason for taking FA [10]. A study by Alreshidi et al. (2018) [14] have concluded that there is a distinct need to increase the level of Saudi women's awareness of the importance of taking FA in the preconception period. In contrary, a Saudi study conducted in Hail city found that majority 91.0% of the subjects were aware of FA [15]. There are possible reasons for finding poor knowledge about FA in the current study. The current study conducted in Yanbu which is a small city with relatively low health resources. Decease in health care services can have impact on the quality of services provided to women in hospital such as antenatal education and counselling which consequently inhibit women's awareness about FA.

The current study revealed that the highest knowledge score was observed among the age group of 31–35, have income more than 9000, working and marriage at age of 25 or above. It can conclude that age, income, working status and age at marriage are all influence factors helped to increase the women's knowledge about FA. Women with high income are probably more able to take care of their health by frequent visiting to maternity clinic and ability to buy FA. While women aged 31–35 and marriage at age 25 or above may have pregnancy experience which increase their knowledge about FA. Al-Holy et al. (2013) [15] agree that the women aged from 26–35 years with income more than 5000 and working status helped to increase the knowledge of FA. Despite the fact that the current study participants had lower score for total knowledge about FA, however, they get high score in specific statements. It is worth to mention that more than half of the study sample 70.8% understood that FA is an important vitamin during pregnancy. The result aligns with international study conducted by Jamil et al. (2017) [16] found that 54% know about the importance of FA during pregnancy.

In addition, the present data shows that the majority of participants understood FA's role in preventing malformation of the fetus's nervous system. These findings agree with the results of Al-Ahmadi et al. (2014) [17] who conducted the study in Makkah, KSA and found that more than half of participants knew that FA prevents NTD. Another cross-sectional study conducted at King Fahad Medical City in Riyadh, KSA also found that 80.1% (n = 480) of women were aware that it is

used to prevent NTDs [14]. On the other hand, Kari et al. (2008) [18] conducted a national study between students in the college found a different result, that 88% of students didn't understand the importance of FA in preventing NTD during pregnancy. The student was in reproductive age between 20–25 years old and study was done in 2008 which may a reason of differences with the current study finding. There was also a study conducted in Egypt by Al-Darzi et al. (2014) [19] observed opposite result with current study, they reported that only 39.2% of the study sample had knowledge about the importance of FA in preventing NTD.

Regarding the knowledge about the correct dose of FA for pregnant women, the current study revealed that the majority of participants don't have knowledge about the correct dose of FA. Similarly, Kamran et al. (2018) [20] have reported that most women in their study did not know about FA dose. On the other hand, Alreshidi et al. (2018) [14] conducted study in King Fahad Medical City, Riyadh found different results, 84.3 % of women in their study know about FA dose. They conclude that greater awareness of the importance of FA, was attributed to better education for their study sample. The present study shows that 61.5% had an incorrect answer about the knowledge of the proper time of FA intake. The findings are consistent with national study conducted by AbdRabou (2019) [21] who found that 69.6 % of women in Sakaka, KSA did not understand the right time of FA intake. However, no relation between knowledge and education level of the participants was found. On the other hand, another study was conducted in Tabuk, KSA by Alblowi and Alomayri (2018) [11] had different results. They reported that most participants had knowledge about using FA three months before pregnancy and first trimester of pregnancy.

Although, the current study did not find significant relation between knowledge and participants educational level, however, many studies have reported that educated women had significantly better knowledge about FA. A Saudi study conducted in Hail reported that participants who were postgraduates have a significantly better knowledge regarding FA [22] Another study was conducted in Sudan found that the educated women had very good knowledge about FA [23] In their study, they reported that the women who were educated have advantages, lived in the urban country and visiting antenatal clinic which is a reason for having more knowledge about FA than others.

In the current study, the health education sessions affected participant's knowledge about FA positively. Majority of the study participants 92.3% had an excellent knowledge after the educational session. The increment in the knowledge of FA after education aligns with national and global studies, conducted by Alodan and Ghoraba (2018) [24] who reported improvement of participant's knowledge, they found that more than half of participants had very good knowledge 80% about FA after education sessions at Security Forces Hospital, Saudi Arabia. In addition, De Smit et al. (2015) [25] have established the value of the educational sessions in reducing the abnormalities or the extreme health implications with limited or zero intakes of FA after Dutch pregnant women received the knowledge during well-baby clinics (WBCs) to enhance the preconception intake of FA. It was argued that the way of presenting the information about FA through PowerPoint individually gave the participants the opportunity to understand the importance of FA during Pregnancy [26].

The current study also revealed that the educational session enhanced the participant's knowledge of specific statements which were incorrect before the educational session. Most of the current study samples were aware of the dose of FA after the session. Similar results were found by Kari et al. [18], they found that the level of awareness about the correct dose of FA increased after education lecturers. Various methods used by the health care providers such as Lectures, health programs, text messages, or poster have helped the women to know about FA dose and motivate them to use it during pregnancy.

In the current study most of the study sample had knowledge about the appropriate time of FA using three months before pregnancy after the educational session. A similar study conducted by De Smit et al. (2015) [25] found an increase in the knowledge about FA intake 3 months before pregnancy this improvement was noted after the educational session presented to them.

The evidence from the current study shows that physician is the most reported source of knowledge about FA to pregnant women who seeking antenatal care. The results are congruent with findings of Al Essa et al. (2019) [27] when they studied 297 pregnant women at King Abdulaziz Medical City, Riyadh and found increased reliance on healthcare professionals. Other study conducted in Jeddah, KSA by Balkhair et al. (2019) [28] found also that doctor are the primary source of information about FA intake. Physicians are reliable sources of education and guidance needed to prevent complications during pregnancy. The results were also evident in another study by Al-Ahmadi (2014) [17] concurred with the results of the present study on Saudi women using informational sources such as physicians, internet, and media.

The social media was the second source in the current study, documented similar findings where the participants derive the information from social media platforms such as blogs, websites, Facebook, Twitter, YouTube, and Instagram. The results differed with the outcomes of Al-Hakeem (2012) [29] who established internet as among other informational sources for the 4000 women studied in King Khalid University Hospital, Riyadh, KSA. Agreeably, Yamamoto and Wada (2018) [30] considered the social media platforms and mass campaigns as interactive media that led to 20.5% of periconceptional FA intake. Therefore, different educational sources including social media and public health programs shape intake of FA by promoting behavioral changes among women of reproductive age.

The present study shows that family is the third source of FA insights for the study sample. The results show that pregnant women and those planning pregnancies rely on family to complement education from social media, mass campaigns, and interactive media. The outcomes were congruent with Alodan and Ghoraba (2018) [24] who had maternal knowledge after seeking informational sources from the antenatal in 80% of the pregnant women. The sources then shaped the intake of FA in the first 3 months and during pregnancy. Correspondingly, Kannan et al. (2020) [31] emphasized the importance of family as the source of education on FA when they analyzed the grocery store campaign in Michigan. Family is a free and convenient source of insights on dosage and nutritional modification to enhance fortification. Saudi community is featuring of extended family, and still with its strong ties. Family usually gathered with each other daily or weekly and during their gathering they talk about life, health, and other topics. In addition, due to cultural norm, women during postpartum period stayed at their family home and welcoming visitor from family and friends for around 40 days which is an opportunity for sharing experience and providing advice [32].

Sadly, the present study revealed that nurses 6.4% have limited role in educating pregnant women about the importance of FA during pregnancy. Other national studies agree with this finding [33]. They found that the nurse were the lowest source of information about FA. The role of the nurses in some hospitals is limited because these hospitals restrict the nurses from providing antenatal education to patients, as they may believe this is the doctor's role. Taking in account that there is a shortage in nursing staff in KSA and nurses are strictly allocated for clinical patients care particularly during COVID-19 pandemic. Mostly at antenatal clinics in KSA, the nurse's role was limited by receiving the patients, taking vital signs and prepares them for doctor examination. In addition, most nurses in KSA are non-Arabic speakers, which affects their participation in education due to the language barrier. However, in contrast to current study, Adebo et al. (2017) [34] conducted a study in Nigeria found that

a major source of FA was health care provider including nurses. Also a study conducted in KSA found that nurses' play an active roles in postpartum education [35]. The WHO have clearly emphasized about the importance of empowering nurses, advocating for expanded the roles of nurses, and increasing the investments in the nursing workforce [36]. Nurses can make significant differences in the public health in terms of prevention of disease and promotion of health.

5. Conclusions

FA before and during pregnancy is important because it help in preventing various maternal and fetal complication. Women awareness about FA can influence its intake. This study concludes that knowledge level about FA increased after providing an educational session. The role of Healthcare institutions and antenatal clinics should be effective by sensitizing pregnant mothers on the different sources of FA to increase their knowledge of the vitamins and should invest in educational initiatives through mass media options such as text messaging and broadcast. Also, the role of Hospitals is very important through investment in training programs presided by the nurses and physicians. Understanding the value of FA in preventing maternal and fetal complication can lead to enhancing women health. Therefore, training sessions within the healthcare institutions and communities should teach and empower pregnant mothers on the different intake of FA. The health care professional should provide educational sessions to emphasize the importance of taking FA to women, particularly during their premarital stage and antenatal visit. In addition, the Saudi government through the MOH should enhance women's knowledge about FA supplementation and diets through media, schools and universities, antenatal class, routine antenatal care, family planning clinics.

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Institutional review board statement

The study was conducted according to the guidelines of the Declaration of Helsinki. The research was reviewed and approved by the ethical committee of the Faculty of Nursing at King Abdulaziz University (Ref. No. 1M.10).

Informed consent statement

Informed consent was obtained from all study participants involved in the study.

Authors' contributions

Conceptualization: AAZ; data curation: SAM; formal analysis: SAM; methodology: AAZ and SAM; supervision: AAZ; writing original draft: AAZ and SAM; writing, review and editing: AAZ and SAM.

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Conflict of interest

The authors declare no conflict of interest.

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