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Folic acid supplementation and neural tube defects: a cross-sectional study of knowledge and practice among pregnant mothers in Lira, Northern Uganda

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Abstract

Background and aim Folic acid requirements increase during pregnancy to meet the metabolic needs, DNA synthesis, and rapid cell division during fetal development. Low levels of folate before and during pregnancy augment the chances of poor pregnancy outcomes, like neural tube defects. Awareness of the importance of folic acid in the prevention of neural tube defects is low among women of childbearing age. This study intended to explore the level of knowledge and practices of pregnant mothers regarding folic acid supplementation in preventing neural tube defects in Lira, northern Uganda.

Study design This study employed a cross-sectional approach of data collection. A consecutive sampling technique was employed to recruit and interview 199 pregnant mothers attending antenatal care at Lira regional referral hospital. Descriptive statistics and chi-square tests were performed using SPSS V20 to determine the association between knowledge and practices of folic acid supplementation for prevention of neural tube defects. A p-value of ≤ 0.05 was statistically significant.

Results The knowledge level regarding folic acid was adequate. 88% had ever heard of it; 73.0% knew its benefits, but only 20.1% knew that it prevents neural tube defects; 83.9% were currently taking it while only 18.0% took it before conception. In addition, the practice of folic acid supplementation was significantly associated with cues to action ($p < 0.001$), and perceived risk ($p < 0.001$) while knowledge was significantly associated with practice ($p < 0.001$).

Conclusion Pregnant mothers in Lira had limited knowledge of the role of folic acid in preventing neural tube defects. The pre-conception intake of folic acid was very low. Health education should include the role of folic acid in averting neural tube defects among women of childbearing age. Mothers should be encouraged to take folic acid pre- and post-conception, especially during the first trimester.

Keywords Neural tube defects, Folic acid supplementation, Pregnant mothers, Lira, Uganda

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Background

Vitamin B9 (folic acid, FA) is essential for various body functions [1]. It is required in the human body for bio-synthesis, repair, and methylation of DNA, plus serving as a cofactor in biological reactions [2]. Maternal folate is the key epigenetic factor in the prevention of neural tube defects. Folate is essential in helping close the neural tube during the 4th week post-conception, before a woman is aware of the pregnancy [3]. Research shows that women who consume low levels of folate before and during pregnancy have a greater likelihood of poor pregnancy outcomes such as neural tube defects (NTDs) [4]. Unfortunately, in sub-Saharan Africa, very few pregnant women take folic acid during pregnancy [5, 6]. In 2023, the World Health Organization recommended fortification of food with FA due to its essential benefits [7]. Folic acid obtained as a supplement is important in averting the occurrence and reoccurrence of NTDs in families with a history of NTDs [8–10]. The World Health Organization (WHO), Ministry of Health (MOH), and other organizations recommend the use of FA before and after conception because of its proven benefit in preventing NTDs [11]. Neural tube defects (NTDs) are congenital abnormalities caused by failed closure of the embryonic neural tube by day 28 of pregnancy [12]. Whereas the incidence of NTDs is around 1/1000 in the United States, it is 3 to 5-fold higher in Northern China and 3-fold higher in India [13]. The prevalence of NTDs was estimated at 9.0 and 11.7 per 10,000 births in European countries and Africa, respectively [14]. In Uganda, 1400 children are born with spinal bifida every year. This prevalence rate is most likely high due to a lack of folic acid supplementation (FAS) by pregnant mothers before and during pregnancy [15]. Studies in the UK revealed that FA knowledge and pre-conception use for NTD prevention varied by ethnicity [16]. A study conducted in Abu Dhabi United Arab Emirates, indicated that the majority (79.1%) of mothers had heard of FA, while 66.7% reported that they knew its importance in pregnancy, and among them, only 46.6% had accurate knowledge about the role of FA in the prevention of NTDs. In this study, however, only 7.8% of the women took FAS before pregnancy, and 65.3% took it after the first trimester, but the majority (78.2%) took it daily in its recommended doses [17]. In a related study conducted in Australia, most mothers took FA during pregnancy in its recommended doses; 64% of the mothers took dietary FAS before conception, whereas 61% took pre-conception FA tablets, with 57% taking the recommended dosage of 400 mcg daily [18]. A study conducted in India found out that the practice of folic acid supplementation was still low (6%), especially before pregnancy [19]. In a comparable study conducted among pregnant mothers in Gulu District, Northern Uganda, only 33.5% had ever heard about spinal bifida (S.B.); 1%

knew that FAS can prevent S.B.; 50.5% took FA; none took FAS pre-conception, while only 8.1% took it during the first trimester [20]. Further, in a similar study conducted in Lira district (Northern Uganda), adherence to FAS was 46%, with none pre-conception [21].

Despite the recommendations by the WHO, FAS still remains low in many countries, especially before conception. In a study conducted in Eswatini to investigate the factors associated with FAS, results indicated that inadequate supply, stock-outs, and high transport costs contributed to poor practices [22]. Similarly, a related study conducted in Indonesia among adolescent girls revealed that parental prohibition and the bad taste and smell, as well as the belief that FA supplements increased menstrual blood, hindered FAS [23]. Meanwhile, a study conducted in western Uganda highlighted the lack of awareness of the benefits of FAS as a cause for non-adherence [24]. Moreover, pre-conception FAS in most regions in Uganda is 0% [20]. This predisposes the newborns to NTDs and other congenital abnormalities. The current study was intended to investigate the level of knowledge and practices of pregnant mothers regarding folic acid supplementation and neural tube defects to guide interventions.

Methods

Study design and site: The study employed a cross-sectional design to collect quantitative data to minimize bias and maximize reliability. This study was conducted at the antenatal care (ANC) clinic of Lira Regional Referral Hospital (LRRH), Lira City, Northern Uganda. This hospital served an estimated population of 439,200 and has an annual antenatal attendance of 4,906. At LRRH, 20 babies were born with NTDs in the years 2016 and 2017, of which half died before discharge due to the associated complications.

Study Population and sampling: The study was conducted in January 2018 among pregnant mothers in Lira city. Eligibility: All pregnant mothers (Para 1+) aged 18 years and above who had attended the ANC clinic more than once at LRRH and were in good health. Mothers with medical backgrounds (such as nurses and doctors) were excluded. The sample size (199) was calculated and adjusted using the monthly attendance of 4906 mothers based on the formula described in Methodology [25] as indicated below:

Sample size $n = \frac{z^2 \cdot p(1-p)}{d^2}$ where n= minimal sample size required; Z=1.96 (deviation corresponding to 95% cumulative interval); P= proportion of the population with the desired attribute in question, which was taken as 0.5; and d= margin of error of 0.05.

Therefore, $n = 384$ participants. This number was adjusted based on the total annual attendance of pregnant women in LRRH = 4906 as follows:

$$\text{Adjusted sample size } (n) = \frac{n_o x N}{n_o + (N - 1)}$$

Where N = monthly attendance of pregnant women in LRRH = $\frac{4906}{12} = 408.83$.

n_o = the calculated sample size

$$\text{therefore } n = \frac{384.16 \times 408.83}{384.16 + (408.83 - 1)} = 199 \text{ participants}$$

Procedure: Data were collected using an interviewer-administered questionnaire to minimize errors by probing and recording only valid data [26]. The data collection tool was designed to collect participant demographics, knowledge regarding FAS and NTDs, the practice of FAS, and the factors that influence FAS. The tool was pre-tested using 10 pregnant mothers and accordingly adjusted for validity and reliability. Consecutive sampling was used to enroll and collect data from pregnant mothers who had come for their ANC visit during the data collection period after the acquisition of consent until the required sample size was achieved. The response rate was 100%.

Data processing and analysis: The completed questionnaires were coded, and the data was entered into the Statistical Packages for Social Sciences (SPSS) software version 20 for analysis while excluding inconsistent data. Descriptive statistics such as frequencies and percentages were used to describe mothers' demographic characteristics, knowledge, and practices, while the chi-square test was used to identify factors influencing FAS among mothers. A p -value of ≤ 0.05 was statistically significant. Knowledge and practice/consumption were measured based on percentage responses as high/adequate knowledge (50% to 100%) or low level/inadequate knowledge ($\leq 49\%$), while best practice 50%–100%, and poor practice was $\leq 49\%$. In this study, participant socio-demographics, and perceived risk were the independent variables; knowledge was the dependent variable that would affect practice as the outcome variable.

Ethical issues: The study was approved by the Lira University Faculty of Nursing and Midwifery Research Ethics Committee (LUFNREC_033/18), and participation was voluntary following informed consent in accordance with the Declaration of Helsinki. Informed consent was obtained from each participant before recruitment into the study. Confidentiality was ensured by using participant codes instead of names.

Results

Socio-demographics

A total of 199 respondents were interviewed, most of whom were 26–30 years old (35.2%); married (87.9%); had attained tertiary education (41.7%); had informal employment (53.8%); were from urban areas 81.4%; and had 0–5 pregnancies 64.3% (Table 1).

Knowledge regarding folic acid supplementation and NTDs

A majority (88.4%) of the respondents reported having ever heard about FA; 89.2% correctly described FA; 73.0% knew the benefits of FAS, of whom only 20.1% knew that it prevents NTDs; 67.3% knew the correct time to take FA but only 15.0% said before pregnancy; and 76.9% mentioned the correct dose. 20.6% had heard about NTDs, but only 36.4% explained correctly what NTDs are, while 3.0% had a family history of NTDs (Table 2).

Overall knowledge

The overall knowledge in this study indicates that the majority (58.8%) of the respondents had adequate knowledge regarding FAS. This was generated from the questions that measured knowledge during data collection (Table 3).

Source of information regarding FA

Majority (84%) said they got information from midwives and nurses (Fig. 1).

Table 1 Socio-demographic characteristics of respondents

Variable		Frequency	Percentage (%)
Age	15–20	17	8.5
	20–25	65	32.7
	26–30	70	35.2
	31–35	35	17.6
	36–40	12	6.0
Marital status	Married	175	87.9
	Single	13	6.5
	Divorced	9	4.5
	Separated	2	1.0
Level of education	No formal education	6	3.0
	Primary	33	16.6
	Secondary	77	38.7
	Tertiary	83	41.7
Occupation	Formal employment	31	15.6
	Informal employment	107	53.8
	Peasant	58	29.1
	Student	3	1.5
Address	Urban	162	81.4
	Rural	37	18.6
Previous pregnancies	0–5	81	64.3
	6–8	45	35.7

Table 2 Showing knowledge regarding FAS and NTDs

Variable		Frequency	Percentages
Ever heard of FA?	Yes	176	88.4
	No	23	11.6
What is folic acid?	Correct answer*	132	89.2
	Incorrect answer	16	10.8
Do you know the benefits of FAS?	Yes	147	73.9
	No	52	26.1
If yes, mention the benefits.	Prevents NTDs	29	20.1
	Increases blood in the body	101	70.1
	Food supplement	5	3.5
	Incorrect answer	9	6.3
Are you aware of women who need FAS?	Yes	155	77.9
	No	40	20.1
Do you know the correct time to take FA?	Yes	134	67.3
	No	33	16.6
	Don't know	32	16.1
If yes, when?	Before pregnancy	19	15.0
	First trimester	81	63.8
	> Twelve weeks	26	20.5
Are you aware of the correct dose of FA?	Yes	156	78.4
	No	24	12.1
If yes, mention the dose.	Correct dose**	153	76.9
	Incorrect dose	3	1.5
Have you ever heard of NTDs?	Yes	41	20.6
	No	158	79.4
If yes, explain briefly?	Correct answer***	15	36.4
	Incorrect answer	26	63.6
Have you or your relative ever delivered a child with NTDs?	Yes	7	3.0
	No	192	96.5

*- Vitamin B complex; **--400mcg once daily; ***-Birth defects of brain/spinal cord

Table 3 Showing the overall knowledge regarding FAS

Variable		Frequencies	Percentage (%)
Overall knowledge	Adequate knowledge: 50–100%	117	58.8
	Inadequate knowledge: 0–49%	82	41.2

Practice regarding FAS

Majority (83.9%) of the respondents were taking FA tablets during the current pregnancy, while 63.5% started taking them during the first trimester. However, only 18.0% started taking FAS before conception, with 64.3% taking it daily. A small percentage (15.1%) were not taking it at all due to stockouts (81.8%). Of those who were not taking FA daily, 78.6% were due to forgetfulness (Table 4).

Overall practice regarding FAS

Overall, 77.4% had best practice. This was generated from the questions that measured practice (Table 5).

Perceived susceptibility, severity and challenges

This study found that the majority 73.6%) of the respondents felt that they were at risk of getting complications/health problems during this pregnancy or after birth if they don't take FA; 61.5% reported that both mother and baby would be affected because FA prevents the mother from anemia and the baby from congenital abnormalities like spinal bifida; 73.5% felt that the mother may die of bleeding after birth and the baby may die of congenital abnormalities like spinal bifida (13.5%). 73.6% reported challenges in acquiring FA tablets like out of stocks of folic acid and expenses (Table 6).

Factors that influence folic acid supplementation among pregnant mothers

Factors associated with knowledge

Mothers who were employed had 3 times the odds (OR = 2.880, 95% CI = 1.548–5.359), and those who perceive a risk had 10 times the odds (OR = 10.131, 95% CI = 4.738–21.663) to have adequate knowledge regarding FAS respectively (Table 7).

Factors associated with practice

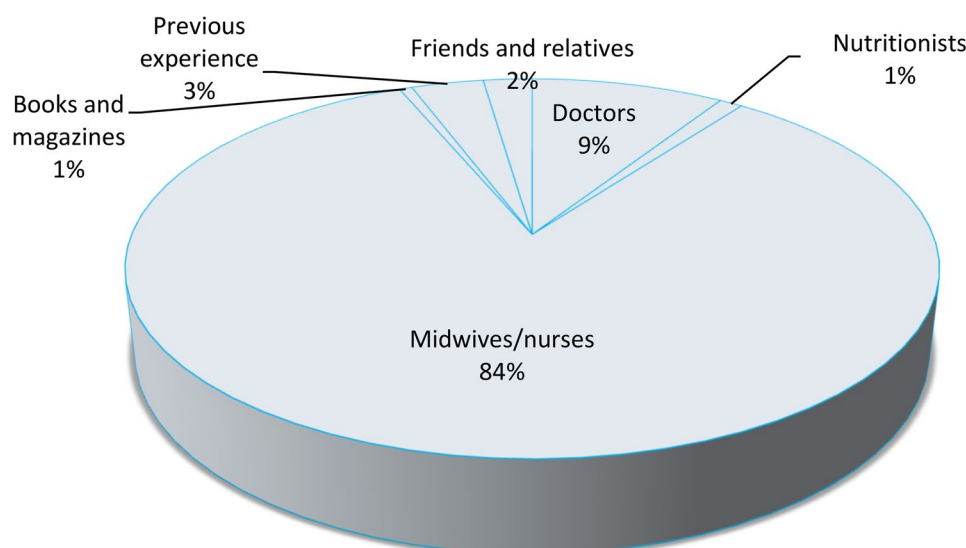
The practice of FAS was significantly associated with cues to action ($p < 0.001$, OR = 0.095) and perceived risk ($p < 0.001$, OR = 7.529). Mothers who perceived a risk had 7 times the odds to have best practices (OR = 7.529, 95% CI = 3.583–15.822) (Table 8).

Knowledge versus practice

Knowledge was significantly associated with practice ($p < 0.001$, OR = 6.826), mothers who had adequate knowledge were 6 times more likely to have best practice (OR = 6.826, 95% CI = 3.190–14.604.190.604) (Table 9).

Discussion

The study investigated the knowledge level regarding folic acid supplementation among pregnant mothers attending ANC at Lira regional referral hospital. In this study, the knowledge level of mothers regarding FAS was adequate (58.8%). Majority (88.4%) of the mothers reported having ever heard of FA; 73.9% reported that they knew its benefit in pregnancy while only 20.1% correctly explained the role of FAS in preventing NTDs. Majority were currently taking folic acid but only a limited number (18%) took it before conception. There was a significant relationship between knowledge and occupation, marital status, previous pregnancy, and perceived risk ($p < 0.005$). In

**Fig. 1** Information source**Table 4** Showing practice regarding FAS

Variable		Frequency	Percentage
Accessed to FA tablets since conception	Yes	168	84.4
	No	30	15.1
If no, what are the reasons?	Was not provided	21	77.8
	Don't know	6	22.2
If yes, supplement to diet or medicine?	Supplement	167	99.4
	Medicine	1	0.6
Source of FA tablets?	Public hospital pharmacy	138	82.6
	Private hospital pharmacy	8	4.8
	Business owned pharmacy	21	12.6
Taking FA tablets in the current pregnancy?	Yes	167	83.9
	No	29	14.6
	Don't know	2	1.0
If yes, when did you start taking FA tablets?	Before pregnancy	30	18.0
	First trimester	106	63.5
	Second trimester	31	18.6
How do you take FAS?	Daily	128	64.3
	Not daily	41	20.6
	Not at all	30	15.1
What are the reasons for not taking daily	Forgetfulness	33	78.6
	Side effects	6	14.3
	Lack of money to buy FA	3	7.1
If you don't take it at all, why?	Don't like drugs	2	6.1
	Out of stock and lack money	27	81.8
	was not advised to buy	4	12.1

Table 5 Showing overall practice

Variable		Frequencies	Percentages (%)
Overall practice	Best practice: 50–100%	154	77.4
	Poor practice: <50	45	22.6

addition, the practice of folic acid supplementation was significantly associated with cues to action and perceived risk ($p < 0.005$). Moreover, knowledge was significantly associated with practice ($p < 0.005$).

These findings are in line with a study that was conducted in Abu Dhabi United Arab Emirates which indicated that the majority (79.1%) of mothers had heard of FA, 66.7% knew its importance in pregnancy, and prevention of NTDs (46.6%) [17]. This could be attributed to the wide spread of information on mass media since both studies were conducted among the educated mothers. This study also found that 67.3% of the mothers knew the correct period to take FA, although only 15.05% said before conception. This percentage is lower than the 29.5% pre-conception intake reported in Arab countries [17] probably due to poor pre-conception counseling in the current study setting. Developing countries should adopt preconception counseling to enable potential mothers to prepare for their newborns. This study reports 63.8% of mothers taking FA in the first trimester. This finding is closely related to the study in Arab countries where 65% of mothers took FA in the first trimester possibly due to the WHO recommendation and promotion of FAS during pregnancy [4]. In this study, 76.9%

Table 6 Showing perceived susceptibility/risk, severity, and challenges of respondents

Variables		Frequency	Percentage
Perceived risk if you don't take FA?	Yes	145	73.6
	No	52	26.4
Who is likely to be affected by the health problem that may arise during this pregnancy and after birth?	Mother	20	13.7
	Baby	37	25.3
	Both	89	61.0
If mother, give reasons	Anemia	14	82.4
	Not sure	3	17.6
If baby, give reasons	Prevents abnormalities	18	62.1
	Not sure	10	34.5
If both give reasons	Protects from abnormalities and mother from anemia	40	61.5
	Not sure	25	38.5
Health problems that can arise during this pregnancy would be serious if FA is not taken	Yes	139	73.5
	No	50	26.5
If yes, why?	Mother may die of bleeding	64	86.5
	Death due to abnormalities like spinal bifida	10	13.5
If no, why?	Folic acid has less importance	3	14.3
	Not sure	18	85.7
Do you face any challenges/barriers in acquiring FA tablets?	Yes	145	72.9
	No	45	22.6
If yes, which one?	Out of stock of folic acid and expenses	109	73.6
	Long distances	6	4.1
	Insufficient instructions from health workers	33	22.3

Table 7 Showing relationship of social demographic characteristic with knowledge

Variable		Overall knowledge level		Chi-square	P-value	Odds ratio	95%confidence interval	
		Adequate knowledge	Inadequate knowledge				Lower	Upper
Age	15–30	84 (55.3%)	68 (44.7%)	2.723	0.099	0.524	0.260	1.058
	31–40	33(70.2%)	14 (29.8%)					
Education level	Informal	5(83.3%)	1(16.7%)	0.671	0.413	0.404**	0.415	31.544
	Formal education	112(58.0%)	81(42.0%)					
Marital status	Married	98(56.0%)	77(44.0%)	3.768	0.052*	0.335	0.120	0.938
	Not married	19(79.2%)	5(20.8%)					
Occupation	Employed	92(66.7%)	46(33.3%)	10.482	0.001*	2.880	1.548	5.359
	Not employed	25(41.0%)	36(59.0%)					
Address	Urban	97(59.9)	65(40.1)	0.215	0.643	1.268	0.618	2.603
	Rural	20(54.1)	17(45.9)					
Previous pregnancies	0–5	49(60.5%)	32(39.5%)	0.000	1.000	0.930	0.439	1.967
	6–8	28(62.2%)	17(37.8%)					
Monthly income	5000–500000	84(57.9)	61(42.1)	0.059	0.808	0.876	0.463	1.660
	> 500,000	33(61.1)	21(38.9)					
Source of information	Media & friends	8(27.6%)	2(72.4%)	12.181	< 0.001*	0.213	0.089	0.510
	H/W & family members	109(64.1%)	61(35.9%)					
Perceived risk	Yes	106(73.1%)	39(26.9%)	40.701	< 0.001*	10.131	4.738	21.663
	No	11(21.2%)	41(78.8%)					

knew the correct dose just like a related study in the Arab countries which indicated that 78% mothers took FAS daily in the recommended doses [17]. Most respondents in the present study acquired FAS information mostly from midwives and nurses at health facilities (84%) which

agrees with a similar study that was conducted in Iran [27]. In the present study, 20.6% had heard of NTDs like Spinal bifida (SB) which is in agreement with the findings of the study conducted in Gulu district northern Uganda that reported that 33.5% of the mothers had ever heard of

Table 8 Showing relationship between social demographics and practice

Variable		Overall practice		Chi-square	P-value	OR	95% CI	
		Best practice	Poor practice				Lower	Upper
Age	15–30	113(74.3%)	39(25.7%)	2.713	0.100	0.424	0.167	1.076
	31–40	41(87.2%)	6(12.8%)					
Educational level	Informal	5(83.3%)	1(16.7%)	0.000	1.000	1.000**	0.168	12.973
	Formal education	149(77.2%)	44(22.8%)					
Marital status	Married	133(76.0%)	21(24.0%)	1.006	0.316	0.452	0.129	1.592
	Not married	21(87.5%)	3(12.5%)					
Occupation	Employed	110(79.7%)	28(20.3%)	0.989	0.320	1.518	0.756	3.047
	Not employed	44(72.1%)	17(27.9%)					
Address	Urban	126(77.8%)	36(22.2%)	0.003	0.954	1.125	0.487	2.599
	Rural	28(75.7%)	9(24.3%)					
Monthly income	5000–500000	107 (73.8%)	38 (26.2%)	3.223	0.073	0.419	0.175	1.007
	> 5,000,000	47 (87.0%)	7(13.0%)					
Previous pregnancies	0–5	66 (81.5%)	15(18.5%)	0.249	0.618	0.677	0.243	1.889
	6–8	39(86.7%)	6(13.3%)					
Cues to action	Media, articles and friends	10(34.5%)	19(65.5%)	32.896	< 0.001*	0.095	0.040	0.227
	H/W and family members	144(84.7%)	26(15.3%)					
Perceived risk	Yes	128(88.3%)	17(11.7%)	30.657	< 0.001*	7.529	3.583	15.822
	No	26(50.0%)	26(50.0%)					
Challenges faced in accessing FA	Out of stock and expenses	83 (76.1)	26 (23.9)	0.000	0.995	1.101	0.474	2.557
	Long distances & insufficient instructions	29 (74.4)	10 (25.6)					

*Significant value, ** fisher's exact test

Table 9 Showing relationship between knowledge and practice

Variable		Overall practice		Chi-square	P-value	OR	CI
		Best practice	Poor practice				
Overall knowledge	Adequate knowledge	106 (90.6)	11 (9.4)	26.517	< 0.001	6.826	3.190–14.604.190.604
	Inadequate knowledge	48 (58.5%)	34(41.5%)				

S.B [20]. The findings of this study indicated that 70.1% of the mothers said that FA increases blood in the body which agrees with the findings of Greenberg and others who reported that FA has been proven to reduce anemia [28]. In the present study, the practice regarding FAS was good (77.4%). However, of the majority (83.9%) of mothers who were taking FA, only 18.0% took it before pregnancy while 63.5% and 18.6% took during the first and second trimester respectively. These findings are lower compared to those reported in Durham County, Northern Carolina where it was indicated that 51% and 66% took FA before and during pregnancy respectively [29]. Meanwhile, these findings are in line with results reported in the United Arab Emirates and Libya where only 7.8% and 6% took FAS pre-conception respectively, while 65.3% took during the first trimester [17, 30]. Further, the study revealed that the majority (64.3%) of the pregnant mothers were taking FA daily and in its recommended doses. This finding agrees with a study in the United Arab Emirates that reported 78.2% taking FA daily with 76.7% in its recommended doses while in Libya, 27% did not take FA at all [17, 19]. There is a perceived lack

of information regarding the pre-conception benefits of FAS. In the present study, the mother's occupation greatly influenced FAS ($p=0.001$), which did agree with related studies which depicted that employment status greatly impacted FAS knowledge [31–34]. Findings of this study showed that the mother's age ($p=0.099$), previous pregnancies ($p=1.000$), the level of education ($p=0.413$), physical address (urban/rural) ($p=0.643$), time and distance to reach the nearest health facility ($p=0.394$) had no association with FAS. These findings contradicted with related studies [31, 34, 35] which indicated that age < 35, parity < 3, and physical address, level of education positively influenced FAS. Although Riazi and others reported that mothers who are educated get more information regarding FAS from reading literature [27]; the present findings indicated that mothers got information from health workers ($p<0.001$). According to the current study, the income level of the mother had no significant relationship with knowledge regarding FAS ($p=0.808$). This finding is in disagreement with Kim and others whose findings revealed that low household income had a negative impact on FAS [36]. This variation could be due

to the fact that most mothers in this study got their free FA tablets from government health facilities. Furthermore, reports from studies indicated that the fear of the risk of health problems when FA is not taken during pregnancy had a significant relation with FAS ($p < 0.001$) [34]. The present findings also revealed that cues to action/source of information ($p < 0.001$) and perceived risk had a significant relationship with practice ($p < 0.001$). In this study, factors that negatively impacted FAS were forgetfulness, drug stock outs, long distances, expenses, the insufficient instructions from health workers. This observation corresponded to the findings of a related study in India where forgetfulness and inadequate counseling from health workers affected FAS [37]. In addition, fluctuation in supplies and failure to distribute drugs are also barriers to FAS [38]. The findings of this study however, demonstrated that these challenges had no significant relationship on FAS ($p = 0.099$). Lastly, this study found that knowledge has a significant association with practice regarding FAS ($p < 0.001$). The mothers who had access to FAS information practiced it. Therefore, health workers and governments should endeavor to provide detailed FAS information to mothers to enable good practices. Sadly, majority of the mothers in the present study did not know the role of folic acid in averting NTDs.

Conclusions and recommendations

There was limited knowledge of the role of FA in preventing NTDs in the study area as well as poor pre-conception FAS in-take. Knowledge and practice of FAS depended on occupation, cues to action and perceived risk. Moreover, knowledge influenced practice. Health care providers should educate all potential mothers regarding the role folic acid in the prevention of NTDs and the importance of pre-conception FAS. The government of Uganda should consider food fortification with Folic acid.

Strength and limitations of the study

The study was conducted among pregnant mothers who were at risk of the negative pregnancy outcomes such as NTD. Unfortunately, the study was conducted using a cross-sectional design at only one health facility employing a consecutive sampling technique limiting the generalizability of the findings. An observational cohort study with random sampling would yield different results especially with multiple health facilities in the region for inference. Moreover, self-report could have introduced bias in the study due to forgetfulness.

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12884-026-08668-3>.

Supplementary Material 1

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Authors' contributions

MM-conception, methods, data collection, analysis; RN- methods, supervision, manuscript draft and review. All authors approved the final submission.

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Data availability

Available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the faculty of nursing and midwifery and consent to participate was sought from each participant and they were required to sign a consent form before recruitment. Only adult participants (18 years and above) were recruited in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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