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Peri-conceptional folic acid supplementation: A Cross-Sectional Study to Assess the Awareness, Knowledge, Use and Associated Factors Among Pregnant Women Attending Antenatal Care in Two Secondary Health Care Facilities, Southwest Region, Cameroon

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Abstract

Background: Neural tube defects(NTDs) are among the most common birth defects, contributing to miscarriages, infant mortality, severe congenital abnormalities, and serious disabilities. The protective effect of peri-conceptional folic acid (PFA) supplementation in reducing the risk of NTDs and other adverse pregnancy outcomes has been scientifically confirmed.

Methods: A cross-sectional study was conducted using a structured questionnaire administered to 393 pregnant women seeking routine antenatal care between February to April 2020. Multivariate logistic regression was used to model factors associated with awareness, knowledge, and use of PFA.

Results: Approximately 55% of women reported that they had heard of folic acid and only 6.1% had knowledge of folic acid (its benefit in preventing birth defects and the appropriate time to start using it). However, only 5.1% reported that they started using folic acid before pregnancy. Folic acid awareness showed a significant relationship with university education and above (OR=4.30, 95% CI [2.60, 7.30], P<0.001). There was also a significant difference in the odds of knowledge among those with a university education and above (OR=5.06, 95% CI [1.65, 19.0], P=0.0076). There was a statistically significant difference in the odds of awareness and knowledge of folic acid among women who had a history of folic acid education from a healthcare provider before pregnancy compared to those who did not, (OR=23.7, 95% CI [4.84, 430], P=0.002), (OR=12.0, 95% CI [4.31, 35.1], P<0.001) respectively. Even though women who planned their pregnancy (OR=4.89, 95% CI [0.84, 93.9]), received pre-conceptional folic acid education (OR=5.11, 95% CI [1.47, 18.7], and had a history of an unsuccessful pregnancy (OR=2.61, 95% CI [0.86, 8.65], had higher odds of the folic acid use, these relationships were not statistically significant.

Conclusion: These results support the fact that women with a high level of education and those with pre-conceptional folic acid education from a healthcare provider are more likely to be aware and have knowledge of folic acid, though this does not translate into use. Antenatal and population-based health education strategies and campaigns by health care providers targeting pregnant and women of childbearing age, especially those with low levels of education may improve use.

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Keywords: Awareness; knowledge; Use of folic acid; peri-conceptional folic acid; neural tube defects; pregnant women

List of abbreviations: NTD- Neural Tube Defects; PFA- Peri-conceptional Folic Acid Supplementation

Introduction:

Worldwide, more than 10% of infant deaths resulting from congenital anomalies are due to nervous system anomalies.[1] Neural tube defects (NTDs) are one of the most common presenting birth defects, and they develop due to the incomplete closure of the brain or spinal cord in the 3rd and/or 4th week of pregnancy, posing a crucial public health dilemma in terms of mortality, morbidity, societal cost, and human suffering.[1], [2] They constitute an important cause of mortality and morbidity globally with studies reporting an estimated incidence of more than 300 000 new cases a year which results in about 41000 deaths and 2.3 million disability-adjusted life years.[3] In the case of Yaounde-Cameroon Djientcheu, et al recorded an incidence of 1.99 per 1000 live births[4]

NTDs have a diverse and multifactorial etiology, which includes genetic and environmental factors as well as predisposing maternal factors.[5] The most widely evidence-based known risk factor for fetal NTD is a maternal folic acid deficiency, which arises from low levels of vitamin B9 (folic acid).[2] The existence of evidence that consuming folic acid, a B vitamin, before conception and during early pregnancy (the peri-conceptional period) can reduce the number of NTDs has been extensively studied and continues to accumulate. The use of folic acid during this period not only prevents NTDs but plays a role in preventing other birth defects that are sensitive to folic acids such as heart defects, urinary tract anomalies, oral facial clefts, and limb defects [6].

One of the most rigorously conducted studies to provide evidence for the use of folic acid to prevent neural tube defects was a randomized controlled trial sponsored by the British Medical Research Council (MRC).[7] The study showed that high-dose folic acid supplement use (4.0 mg per day) by women who had prior NTD-affected pregnancies reduced the risk of having a subsequent NTD-affected pregnancy by 70%. These findings were revolutionary and still remain true to the present day, and it is one of few preventive public health interventions effective in reducing the risk of NTDs, especially in low-income communities. The World Health Organization (WHO) therefore recommends that all women, from the moment they begin trying to conceive until 12 weeks of gestation should take a folic acid supplement. High-income countries have reported large reductions in NTDs associated with folic acid supplementation or fortification, and this is in contrast to low-income countries where the burden of NTDs, as well as the effectiveness of folic acid fortification /supplementation, are unclear [3].

Data on the true prevalence of NTDs in Cameroon is lacking but, in a study[9] to assess the patterns and management of NTDs in a tertiary care facility in Cameroon an annual incidence of 4.9 NTD cases per 1000 live births were reported and investigators identified as major risk factors; low socioeconomic status and the fact that none of the women took PFA supplementation. These were attributed to several reasons; ANC consultation (most patients showed up for ANC for the first time only after the first trimester), and most of the time, women did not even know they were pregnant during the critical period. Moreover, a study in the Northwest Region-Cameroon reported that the knowledge of health providers on peri-conceptional folate was low (39%) and participants believed almost no one used peri-conceptional folate supplementation to prevent NTD [10].

Studies on the influence of socioeconomic factors have indicated that mothers with higher education and higher social status are less likely to have children with NTDs, but this finding may be partially explained by the fact that these mothers are more likely to use folic acid during the pre-conception period, before neural tube closure.[11] Another study further confirmed that NTDs were elevated among women who did not graduate from high school and lived in a predominantly less educated neighborhood [12].

Therefore, although folic acid use for the prevention of NTDs has been studied internationally, there are no published reports that indicate the use of folic acid at the recommended time among pregnant women in Cameroon to prevent neural tube defects, despite the relatively high incidence of NTD in few published studies. Therefore, this study was taken up to determine the awareness, knowledge, and use of folic acid among pregnant women during the peri-conceptional period. This would help provide necessary recommendations to increase its consumption and in the long run reduce the burden of NTDs.

Research objectives

1) To assess the level of awareness, knowledge, and use of folic acid among pregnant women.
2) To find out factors associated with awareness, knowledge, and use of PFA among pregnant women.

Methods

Study participants and survey

This was a hospital-based cross-sectional descriptive and analytic study to evaluate the awareness, knowledge, and use of folic acid among pregnant women attending antenatal care and to determine associated factors. An anonymous interviewer-administered questionnaire was used by the primary investigator to collect data at the antenatal care clinic within a period of 3 months, from February to April 2020 at

Alemajo CA et al., Obstet Gynecol Res 2022
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the Buea and Limbe Regional Hospitals. These two Regional Hospitals are the main referral hospitals in the South West Region of Cameroon where pregnant women obtain antenatal care starting at any time during pregnancy. Antenatal care covers a wide range of services, including immunization, health education, and vitamin supplementation.

Sample size determination and sampling procedure

A consecutive sampling method was used, where every pregnant woman irrespective of the time of booking and gestational age who came in for antenatal care and gave informed consent was approached by the primary investigator as they were waiting in line to receive antenatal care services. The minimum sample size (385 pregnant women after accounting for 10% non-response) was calculated using the Lorenz formula and the prevalence of awareness of folic acid of 64.6% which was reported in a similar study in neighboring Nigeria [13]. A total of 393 pregnant women completed the survey (100% response rate) and were included in the analysis.

Measurements

The questionnaire was divided into four sections: Socio-demographic characteristics(age, marital status, educational level, occupation, religion), obstetric characteristics (parity, gestational age at booking visit, numbers of ANC visits, preconception consultation, whether pregnancy was planned, history of previous miscarriage, history of baby with an NTD), folic acid awareness and knowledge (ever heard of folic acid, sources of information, benefits of taking folic acid, recommended period to take folic acid, food sources of folic acid) and use of folic acid (whether they took folic acid before pregnancy, during the current pregnancy or both before and during the current pregnancy, timing, and frequency of use, frequency of consumption of natural food sources of folic acid).

Respondent's awareness of peri-conceptional folic acid supplementation was assessed using a one-item question that asked if they have “heard” or “read” about folic acid. Knowledge of folic acid was assessed using a two-item question developed by Ren et al[14] and adopted by a similar study[15], [16], which inquired about the correct time to start taking folic acid and the benefits of taking the supplement. Knowledge was then defined as knowing that folic acid can prevent birth defects (neural tube defects) and knowing the right time to start the use of folic acid (before pregnancy). Those who answered both questions correctly were considered to be knowledgeable. Knowledge was then dichotomized into a “yes”, and “no” response. Use of folic acid was defined as women who took folic acid consistently at least one month before pregnancy or within the first three months after pregnancy.

Statistical analyses

Data collected were coded, entered into Epi-info version 7, and then exported into R version 4.1.1 (R Foundation for Statistical Computing, Vienna, Austria)[17] for statistical analyses. Categorical variables were presented as frequencies and percentages. For analysis, the age variable was dichotomized into “<30 years” and “>=30 years”. The chi-square test was performed to evaluate differences in the proportions of categorical variables among two or three groups. Multivariate logistic regression analyses were performed to determine the variables associated with awareness, knowledge, and use of folic acid. The dependent variables were awareness, knowledge, and use of folic acid. Age, education, and marital status reported to be factors associated with awareness and knowledge of folic acid in previous studies[14], [16] were added to the model as independent factors. Women who planned their pregnancies, which has been shown to be associated with awareness and knowledge of folic acid were also included in the model.[15] Gravidity and history of preconception folic acid education from a health care provider were also added to the model. In addition to the above variables, a history of unsuccessful pregnancy reported in another study[18] was used to model the use of folic acid. Gravidity was excluded since primigravid women would generally have no such history. The results of the logistic analyses are presented as odds ratio (OR), at a 95% confidence interval (CI). A P-value of < 0.05 was considered statistically significant in univariable analysis. In multivariate analysis, a more conservative p-value <0.0083 was used to account for multiple comparison adjustments.

Results

Characteristics of the study participants

Table 1 show the socio-demographic and obstetrics characteristics of the participants. In total, 32.3% of women were aged 24 years and below and 33.8% were aged 25-29 years. More than one-third of women (65.1%) had received a high school education and below with about a third (34.9%) having attained a university education and above. Most of the women were married (62.1%) and employed (61.3%). Most of the women were Christians (97.2%). The mean gestation age was 26 weeks ranging from 20-32 weeks. About two-thirds of women (64.4%) started antenatal care in the second trimester and more than half (54.5%) had attended 2-4 antenatal visits. One-third of women (33.6%) in this study were primigravid, and about two-thirds (63.1%) had planned the current pregnancy. A very small proportion of women (9,9%) reported a history of folic acid education from a healthcare provider before pregnancy.

Awareness, knowledge, and use of folic acid

The awareness and knowledge among the participants are shown in table 2. Approximately 55% of pregnant women had heard of folic acid and the most common source of information was from doctors, nurses, and midwives (54.4%). The proportions of women who knew the roles of

Alemajo CA et al., Obstet Gynecol Res 2022
DOI:10.26502/ogr098

Table1: Sociodemographic and Obstetric Characteristics of the study participants

Characteristic	N = 393[1]
Age(yrs)	
≤24	127 (32.3%)
25-29	133 (33.8%)
30-34	77 (19.6%)
≥35	56 (14.2%)
Level of education	
High school and below	256 (65.1%)
University and above	137 (34.9%)
Marital status	
Not Married	149 (37.9%)
Married	244 (62.1%)
Employment status	
Unemployed	152 (38.7%)
Employed	241 (61.3%)
Religion	
Christian	382 (97.2%)
Islam	11 (2.8%)
Gestational age (weeks)	26 (20, 32)
Gestational Age at booking	
<13	129 (32.8%)
13-24	253 (64.4%)
25	11 (2.8%)
Number of ANC visits	
1st	135 (34.5%)
2nd-4th	213 (54.5%)
≥4	43 (11.0%)
Parity	
0	132 (33.6%)
1	100 (25.4%)
2	78 (19.8%)
≥3	83 (21.1%)
Did you plan this pregnancy	
No	145 (36.9%)
Yes	248 (63.1%)
Periconceptional folic acid education	
No	354(90.1%)
Yes	39(9.9%)

Table 1[1]n(%)

folic acid in preventing birth defects, preventing anemia, increasing blood, and improving the growth and development of embryos were 12.5%, 2.8%, 15%, and 8.1% respectively. About 15% of pregnant women knew that folic acid should be taken before pregnancy to prevent birth defects. However, 22.6% indicated that it should be taken during pregnancy. Overall, 6.1% of women had knowledge about the role of folic acid in preventing birth defects as well as the appropriate time to start its consumption. About two-thirds of women (62.7%) knew natural food sources of folic acid with the most common sources indicated being vegetables (29.5%) and fruits (26.7%).

The use of folic acid is shown in table 3. A very low proportion of women (5.1%) started taking folic acid before the current pregnancy. In contrast, almost all the women (93.6%) were taking folic acid during the current pregnancy, with about two-thirds of women (63.2%) starting in the second trimester of pregnancy.

Awareness, knowledge, and use of folic acid by selected characteristics

Table 4 shows the distribution of women who had heard of folic acid (awareness), who knew both the birth defect-

Table 2: Awareness and Knowledge of Folic Acid

Characteristic	N = 393[1]
Ever heard of folic acid?	217 (55.2%)
Source of information	
Doctor/nurse/midwife	118 (54.4%)
Family/friends	13 (6.0%)
Internet/Media (TV, radio, press)	33 (15.2%)
School, Drug label	45 (20.7%)
Don't remember	8 (3.7%)
Benefits of taking folic acid	
Decreases risk of Abnormal baby (birthefect)	49 (12.5%)
Bones development	26 (6.6%)
Growth and Development of Embryo	32 (8.1%)
Increases blood	59 (15.0%)
Improves fertility	6 (1.5%)
Protects against anemia	11 (2.8%)
Don't know	59 (15.0%)
When to start taking folic acid	
Before getting pregnant	59 (15.0%)
During pregnancy	89 (22.6%)
After delivery	5 (1.3%)
I don't know	64 (16.3%)
Know food and drinks rich in folic acid[a)]	136 (62.7%)
Fruits	105 (26.7%)
Vegetables	116 (29.5%)
Grains	0 (0.0%)
Bread	1 (0.3%)
Fish	2 (0.5%)
Liver	5 (1.3%)
Knowledge of folic acid	24 (6.1%)

Table 2 [1]n(%)
a) Multiple responses (a percentage was calculated out of a total of participants, N=393)

Alemajo CA et al., Obstet Gynecol Res 2022
DOI:10.26502/ogr098

Table 3: Use of Folic Acid

Characteristic	N = 393[1]
Used folic acid before pregnancy	20 (5.1%)
How long started use before pregnancy	**N= 20**
1 month	9 (45.0%)
2 months	3 (15.0%)
3 months	8 (40.0%)
Current folic acid use	307 (93.6%)
Trimester of starting	**n=307**
First	97 (31.6%)
Second	194 (63.2%)
Third	16 (5.2%)

Table 3 [1]n(%)

preventive role of folic acid and the appropriate time to take folic acid (knowledge), and who took folic acid supplements before pregnancy (use) based on selected demographic characteristics. Those who had attained a university level of education and above were more aware, knowledgeable, and more likely to use folic acid 50.2%,83.3%, and 70.0% respectively and the relationship was statistically significant. Even though women who were employed, multiparous, and planned current pregnancies were more likely to be aware and have the knowledge, this was not statistically significant. Significantly higher proportions of pregnant women who had attended two to four and greater than four antenatal care visits were aware of folic acid compared to women who had attended just one visit. Among women who planned their

Table 4: Awareness, knowledge, and use of folic acid by selected characteristics

Characteristic		Awareness[1)]	Knowledge[2)]	Use[3)]
		N (%)	N (%)	N (%)
	Overall, N = 393	217 (55.2%)[4)]	24 (6.1%)	**20 (5.1%)**
Age(yrs)				
<30	284	154 (71.0%)[4)]	15 (62.5%)	11 (55.0%)
>=30	109	63 (29.0%)	9 (37.5%)	9 (45.0%)
Level of education				
High school and below	256	108 (49.8%)***	4 (16.7%)***	6 (30.0%)***
University and above	137	109 (50.2%)	20 (83.3%)	14 (70.0%)
Marital status				
Not Married	149	80 (36.9%)	6 (25.0%)	4 (20.0%)
Married	244	137 (63.1%)	18 (75.0%)	16 (80.0%)
Employment status				
Unemployed	152	85 (39.2%)	13 (54.2%)	4 (20.0%)
Employed	241	132 (60.8%)	11 (45.8%)	16 (80.0%)
Gestational Age at booking				
<13	129	69 (31.8%)	13 (54.2%)	10 (50.0%)
13-24	253	142 (65.4%)	11 (45.8%)	10 (50.0%)
>=25	11	6 (2.8%)	0 (0.0%)	0 (0.0%)
Gravidity				
Primigravida	132	76 (35.0%)	8 (33.3%)	3 (15.0%)
Multigravida	261	141 (65.0%)	16 (66.7%)	17 (85.0%)
Number of ANC visits				
1st	135	71 (33.0%)*	5 (20.8%)	8 (40.0%)
2nd-4th	213	112 (52.1%)	11 (45.8%)	11 (55.0%)
>=4	43	32 (14.9%)	8 (33.3%)	1 (5.0%)
Plan of pregnancy				
No	145	76 (35.0%)	5 (20.8%)	2 (10.0%)*
Yes	248	141 (65.0%)	19 (79.2%)	18 (90.0%)
Preconceptual folic acid education				
No	354	179 (82.5%)***	10 (41.7%)***	11 (55.0%)***
Yes	39	38 (17.5%)	14 (58.3%)	9 (45.0%)

1) Having heard of folic acid.
2) Knowing both the role of folic acid in preventing birth defects and appropriate time to take folic acid.
3) Taking folic acid supplements before pregnancy.
4) A percentage was calculated out of the women in the subgroup.
** P<0.05, *** P<0.001 by Pearson Chi-squared test; Fisher's exact test*

Alemajo CA et al., Obstet Gynecol Res 2022
DOI:10.26502/ogr098

pregnancies, 90.0% used folic acid before pregnancy, and this was statistically significant. Pregnant women who had received pre-conceptional folic acid education from a health care provider were more likely to be aware, knowledgeable, and use folic acid and this was also statistically significant.

Factors associated with awareness, knowledge, and use of folic acid

Table 5 shows the results of the multivariate logistic regression analysis of awareness, knowledge, and use of folic acid. Pregnant women who had attained a university level of education and above had about 4 times the odds of being aware of folic acid compared to those who had a secondary level of education and below, and this was statistically significant (OR=4.30, 95% CI [2.60, 7.30], P<0.001). There was also a significant difference in the odds of knowledge across levels of education (OR=5.06, 95% CI [1.65, 19.0], P=0.0076). There was a statistically significant difference in the odds of being aware and having knowledge of folic acid between women who had a history of folic acid education from a healthcare provider before pregnancy compared to those who did not, (OR=23.7, 95% CI [4.84, 430], P=0.002), (OR=12.0, 95% CI [4.31, 35.1], P<0.001) respectively. Even though women who planned their pregnancies (OR=4.89, 95% CI [0.84, 93.9]), received pre-conceptional folic acid education (OR=5.11, 95% CI [1.47, 18.7], and those who had a history of an unsuccessful pregnancy (OR=2.61, 95% CI [0.86, 8.65], had higher odds of the folic acid use, these relationships were not statistically significant.

Women who were aged 30 years and below had lower odds of awareness, knowledge, and use of folic acid and there were no significant differences in these odds compared to those aged less than 30 years. The higher odds of knowledge among women who were married and planned their current pregnancy compared to women who were not married and did not plan their pregnancy respectively was not significant.

Discussion

The overall prevalence of birth defects in sub-Saharan African countries among newborn infants is 20.4 per 1000 including neural tube defects and lack of maternal folic acid

Table 5: Multivariate logistic regression result for awareness, knowledge, and use of folic acid

Multivariate logistic regression result for awareness, knowledge, and use of folic acid									
Characteristic	**Awareness**			**Knowledge**			**Use**		
	OR[1]	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**
Age									
<30	—	—		—	—		—	—	
>=30	0.91	0.54, 1.55	0.7	0.84	0.27, 2.44	0.8	0.72	0.21, 2.28	0.6
Level of Education									
High school and below	—	—		—	—		—	—	
University and above	**4.30**	2.60, 7.30	**<0.001**	**5.06**	1.65, 19.0	**0.0076**	2.75	0.79, 10.1	0.11
Marital Status									
Not Married	—	—		—	—		—	—	
Married	1.11	0.65, 1.89	0.7	1.71	0.54, 5.89	0.4	0.67	0.19, 2.71	0.5
Plan of Pregnancy									
No	—	—		—	—		—	—	
Yes	0.89	0.55, 1.44	0.6	1.32	0.41, 4.76	0.7	4.89	0.84, 93.9	0.15
Gravidity									
Primigravida	—	—		—	—				
Multigravida	0.96	0.55, 1.67	0.9	0.61	0.19, 1.96	0.4			
Preconceptual folic acid education									
No	—	—		—	—		—	—	
Yes	**23.7**	4.84, 430	**0.002**	**12.0**	4.31, 35.1	**<0.001**	5.11	1.47, 18.7	0.011
History of unsuccessful pregnancy									
No							—	—	
Yes							2.61	0.86, 8.65	0.10

Table 5 [1] OR = Odds Ratio, CI = Confidence Interval

Alemajo CA et al., Obstet Gynecol Res 2022
DOI:10.26502/ogr098

supplementation is one of the factors that has been shown to be associated with this high prevalence.[19] Neural tube defects are the most frequent and disabling malformations in neonates in the Sub-Saharan African pediatric environment and prenatal management and outcome at birth are limited by poverty and cultural beliefs.[4] Prevention is therefore possible and may offer a better option than palliative care in developing countries where resources are limited. The high prevalence, coupled with poor socioeconomic determinants of health and the lack of preventive programs and strategies to reduce the occurrence of neural tube defects is of great concern and reflects the ignorance of stakeholders about neural tubes and other birth defects.

The results of our study showed that the awareness of folic acid is 55.2%. This finding is comparable to studies in Nigeria [13] and Egypt[20] where 64.6% and 62.4% respectively of pregnant women were aware of folic acid. However, similar studies [15], [18], [21] in other developing countries have revealed higher awareness levels of 73.6%, 81.3%, and 100% respectively. This could be because most of the respondents were literate and had been informed about folic acid in the hospital and a high proportion started antenatal care clinics in the first trimester through which they must have been informed about folic acid earlier because health care providers were the main source of information. Studies in developed countries[22], [23] conducted more than a decade ago such as in the United States and Canada are very contrasting and have consistently reported higher awareness levels of 88% and 95% respectively. It is important to note that most of these countries have targeted women of childbearing age through national health awareness programs that have been implemented since the mid-1990s, but it is not yet practiced in Cameroon. In many countries, educational campaigns aimed at promoting the use of folic acid as well as increasing awareness and knowledge of folic acid have been carried out. In the US, national and state-wide folic acid campaigns have been implemented since the mid-1990s and this may explain this vast discrepancy.

Although awareness was relatively high, it did not translate into knowledge as only 6.1% of pregnant women knew both the role of folic acid in preventing birth defects and the appropriate time to start taking folic acid. This is low compared to a similar study[16] conducted among women of childbearing age in Korea where 23.7% of the respondents knew both roles. A further breakdown of questions about knowledge showed that only 12.5% knew about the role of folic acid in preventing birth defects. This is comparable to similar studies [15], [18] in Sudan and Nigeria where 8.9% and 11.8% of pregnant women respectively knew that folic acid can prevent birth defects. This finding is, however lower than that reported in Nigeria [13] (26.9%) and Egypt [20] (39.2%). Higher knowledge levels, 88.7% have been reported in China [14]. This low level of knowledge about the role of folic acid in preventing birth defects may be because most of the respondents (15%) knew folic acid as a supplement that increases blood. This is because in Cameroon pregnant women are often prescribed folic acid supplements during pregnancy in combination with Iron to prevent anemia. This poor knowledge may also reflect insufficient education on the part of the health care providers who were the main source of information about folic acid. A low percentage of women (15%) in this study were also aware of the right time to start using folic acid compared to similar studies where a higher proportion of women knew the correct timing. [16], [24] Therefore, there is a need for in-service training and continuing education of health care providers to reemphasize to pregnant women and women of childbearing age the significant role of folic acid in preventing birth defects during every well visit. Therefore, public health education targeting women of reproductive age on the importance of folic acid, not limited to its role as a blood supplement but also as an important reproductive health supplement is needed.

Our study revealed majority (78.1%) of pregnant women had taken folic acid at some point during the current pregnancy which is comparable to a similar study.[15]Although most women were taking folic acid in the current pregnancy, about two-thirds started in the second trimester, at which time the protective effect of folic acid against birth defects is reduced. Despite this high overall intake of the supplement during pregnancy, a very small proportion of interviewed women (5.1%) started using folic acid before pregnancy (pre-conception use), consistent with WHO recommendations. This low usage was also noted in similar studies in Nigeria. [13], [15], [25] Findings in developed nations such as Canada and USA, reports 25-45% of women take folic acid during the peri-conceptional period.[26], [27] This worryingly low-intake rate of folic acid during the protective period, despite the high awareness levels may be attributed to an information gap as only 10% of pregnant women had a history of education from a health care provider about the importance of taking folic acid supplementation before pregnancy It may also be attributed to the relatively high rate of unplanned pregnancies among pregnant women in our study compared to developed countries. Surprisingly, none of the women who planned their pregnancy reported having done so with a healthcare provider. Furthermore, pre-conceptional care for women that are planning to become pregnant is virtually non-existent in Cameroon. This is a pointer for more efforts by the public health sector to develop policies that would enlighten the general populace on the importance of periconceptional folic acid intake by women of childbearing age so as to bring about a positive attitudinal change. Similar public health interventions in developed countries have resulted in increased knowledge and use of folic acid supplements. [28], [29] About one-third of women could correctly identify a general natural food source rich in folic acid. This high awareness of natural food sources may be because pregnant

Alemajo CA et al., Obstet Gynecol Res 2022
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women who come for ANC in Cameroon are usually advised by healthcare providers to increase their intake of vegetables and fruits as a general nutritional guide.

Multivariate analysis investigating the factors associated with awareness, knowledge, and use of folic acid showed that women who had attained a university level of education and above and those who had received pre-conceptional folic acid education were more likely to be aware and have knowledge of folic acid. Similar associations have been reported in related studies.[13], [15], [18], [20] The highest odds were related to pre-conceptional folic acid education, highlighting the important role health care providers play in educating clients and their central role in future interventions in a low income setting where pre-conception clinics are absent. A low level of maternal education has been identified as a possible risk factor for NTDs during pregnancy[12] due in part to poor knowledge about the importance of folic acid among women with low education. In contrast, women with a higher level of education are more likely to have access to information, health facilities and services. Even though women who were married were more likely to be aware and those who were married and planned their current pregnancy were more likely to have knowledge, the associations were not significant compared to other studies.

This study showed no significant association between selected factors and the use of folic acid even though those with a university education and above, women who planned their pregnancy, pre-conceptional folic acid education, and a history of an unsuccessful pregnancy had higher odds of using folic acid compared to those with high school education and below, those who did not plan their pregnancy, did not receive any pre-conceptional education and never had a history of an unsuccessful pregnancy respectively. However, other studies have reported associations[5], [13], [18] This may be because most of the women who did not take folic acid pre-conceptionally reported as the main barrier the fact that they did not think it was important or they did not know about it. Moreover, our study used a more conservative p-value as a cut-off for statistical significance and this may explain the differences. Therefore, more effort is needed by public health authorities to increase awareness and knowledge which would go a long way to increase folic acid use. The likelihood of taking recommended preventative health action is dependent on many factors and the use of the health belief model to develop interventions would make individuals know about the seriousness of NTDs and increase their perceived susceptibility. Cues to action (from media campaigns and advice from healthcare professionals) would increase the overall knowledge and perceived threats. One study[30] found that participants who had heard of folic acid (awareness) were more likely to believe in its benefits than those who had not and patient knowledge was also linked to beliefs, which ultimately influenced consumption. In general, folic acid consumption rose between 12.4 and 25.3% after public health campaigns, and the percentage of women taking PFA as prescribed ranged from 13 to 57%.

This study has several limitations, one of them being that it was conducted in a secondary healthcare facility where most of the women were relatively more likely to be educated. Therefore, these results may not be representative of the general population from which the sample was drawn. Moreover, the sampling method used, and the small sample size may have introduced bias, so the results should be interpreted with caution considering a very small proportion of pregnant women were using folic acid. Future studies should build on this study to use a larger sample size. Future studies should also explore the knowledge and prescribing practice of healthcare professionals regarding folic acid supplements to better understand the knowledge and use gap. The study also relied on the information that was provided by pregnant women, so there is a possibility for recall and social desirability bias since the questions were asked while the women were attending ANC. However, this was minimized by making sure the questions were asked in a safe space where the woman could speak freely. Considering that this was a cross-sectional study, we cannot infer causation due to a lack of temporality and there is also a possibility for reverse causality.

Conclusion

The awareness of folic acid among pregnant women was relatively high. However, while an increase in awareness is clearly important, knowledge about the importance of folic acid in preventing birth defects and the correct timing to start the use of folic acid supplements was poor despite the main source of information being health care providers. Also, the level of folic acid awareness and knowledge was poor among women with low educational status and those who did not receive any education from a healthcare provider. Therefore, interventions should be directed toward women with low levels of education. Programs and guidelines should be put at the disposal of healthcare providers to educate both women of reproductive age and pregnant women about the importance of folic acid and its role in preventing NTDs. Media campaigns would also help to achieve wider coverage.

Even though peri-conceptional folic acid use is a simple measure to prevent many severe birth defects, particularly neural tube defects, use among pregnant women with this aim was very low. Given the low rates of use of folic acid found in our study and the relatively high prevalence of neural tube defects in Cameroon, interventions to promote folic acid use by encouraging women to start ANC early with consequent early supplementation would be an important first step.

Declarations

Ethical Approval And Consent To Participate

Ethical approval was obtained from the Faculty of Health

Sciences, University of Buea Institutional Review Board (Ref: 2020/1120-01/UB/SG/IRB/FHS), and all methods, and procedures were carried out in accordance with relevant guidelines and regulations. Administrative approvals were obtained from the Faculty of Health Sciences, University of Buea, and the Buea and Limbe Regional Hospitals. The respondents provided informed consent by signing the informed consent form.

Consent for publication

Not applicable

Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Competing Interest

The authors declare that they have no competing interests

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The research was self-funded by the corresponding author.

Author's contribution

1. CAA was the principal investigator and conceived the study, wrote the proposal, participated in data collection, analyzed, and participated in the write-up and review of the manuscript.
2. GEH contributed to the conception of the study, proposal corrections, substantially revised the manuscript and approved the submitted version
3. EAN participated in data collection, writeup and review of the manuscript and approved the submitted version.
4. EAA contributed to the conception of the study, proposal corrections, substantially revised the manuscript and approved the submitted version

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References

1 S. Gomes, C Lopes, and E Pinto, "Folate and folic acid in the periconceptional period: Recommendations from official health organizations in thirty-six countries worldwide and WHO," Public Health Nutrition, 19 (1); 2016.

2. A Lo, D Polšek, and S Sidhu, "Estimating the burden of neural tube defects in low- and middle-income countries," Journal of Global Health, 4 (1); 2014.

3. H Blencowe, S Cousens, B Modell, and J Lawn, "Folic acid to reduce neonatal mortality from neural tube disorders," International Journal of Epidemiology, 39 (1); 2010.

4. V de P Djientcheu et al., "Management of neural tube defects in a Sub-Saharan African country: The situation in Yaounde, Cameroon," Journal of the Neurological Sciences, 275 (2); 2008.

5. M A Dessie, E G Zeleke, S B Workie, and A W Berihun, "Folic acid usage and associated factors in the prevention of neural tube defects among pregnant women in Ethiopia: Cross-sectional study," BMC Pregnancy and Childbirth, 17 (1); 2017.

6. R Douglas Wilson et al., "Pre-conception Folic Acid and Multivitamin Supplementation for the Primary and Secondary Prevention of Neural Tube Defects and Other Folic Acid-Sensitive Congenital Anomalies," Journal of Obstetrics and Gynaecology Canada, 37 (6) (2015); 30230-30239.

7. "Recommendations for the use of folic acid to reduce the number of cases of spina bifida and other neural tube defects.," MMWR. Recommendations and reports : Morbidity and mortality weekly report. Recommendations and reports / Centers for Disease Control, vol. 41 (14) 1992.

8. V Saxena, M Naithani, R Kumari, et al., "Peri-conceptional supplementation of folic acid-knowledge and practices of pregnant women and health providers," Journal of Family Medicine and Primary Care, 5 (2); 2016.

9. M Motah, M Moumi, A Ndoumbe, et al., "Pattern and Management of Neural Tube Defect in Cameroon," Open Journal of Modern Neurosurgery, 07 (3) 2017.

10. A T N Tita, B J Selwyn, D K Waller, et al., "Evidence-based reproductive health care in Cameroon: Population-based study of awareness, use and barriers," Bulletin of the World Health Organization, 83 (12); 2005.

11. L Brough, G A Rees, M A Crawford, et al., "Social and ethnic differences in folic acid use preconception and during early pregnancy in the UK: Effect on maternal folate status," Journal of Human Nutrition and Dietetics, vol. 22 (2); 2009.

12. J Grewal, S L Carmichael, J Song, et al., "Neural tube defects: An analysis of neighbourhood- and individual-level socio-economic characteristics," Paediatric and Perinatal Epidemiology, 23 (2); 2009.

13. A Anzaku, "Assessing folic acid awareness and its usage for the prevention of neural tube defects among pregnant women in Jos, Nigeria," Journal of Basic and Clinical Reproductive Sciences, 2 (2013); 13-14.

14. A Ren, L Zhang, Z Li, et al., "Awareness and use of folic

Alemajo CA et al., Obstet Gynecol Res 2022
DOI:10.26502/ogr098

acid, and blood folate concentrations among pregnant women in northern China-An area with a high prevalence of neural tube defects," Reproductive Toxicology, 22 (3) (2006); 431-436.

15. O O Adebo, D M Dairo, C M Ndikom, et al., "Knowledge and uptake of folic acid among pregnant women attending a secondary health facility in Nigeria," British Journal of Midwifery, vol. 25 (6) (2017); 358-364.
16. M J Kim, J Kim, E J Hwang, et al., "Awareness, knowledge, and use of folic acid among non-pregnant korean women of childbearing age," Nutrition Research and Practice, vol. 12 (1) (2018); 78-84.
17. "R Core Team (2020). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria." URL https://www.R-project.org/.
18. M A Alsammani, A Kunna, and E M Adam, "Factors associated with folic acid knowledge and intake among pregnant women in Sudan الفوليك محض تناول وحمددات معلومات السودان، درمان أم يف احلوامل النساء بني," Eastern Mediterranean Health Journal, 23 (10); 2017
19. F Adane, M Afework, G Seyoum, and A Gebrie, "Prevalence and associated factors of birth defects among newborns in sub-saharan african countries: A systematic review and meta-analysis," Pan African Medical Journal, 36, (2020) 1-22.
20. W Al-Darzi, F Al-Mudares, A Farah, et al., "Knowledge of periconceptional folic acid use among pregnant women at Ain Shams University hospital, Cairo, Egypt," Eastern Mediterranean Health Journal, 20 (9); 2014.
21. H Riazi, S. Bashirian, L. Amini, et al., "Awareness of Pregnant Women about Folic Acid Supplementation in Iran," Journal of Family and Reproductive Health, 6 (4); 2012.
22. G F Sharp, L A Naylor, J Cai, et al., "Assessing awareness, knowledge and use of folic acid in Kansas women between the ages of 18 and 44 years," Maternal and Child Health Journal, 13 (6); 2009.
23. M R French, S I Barr, and R Levy-Milne, "Folate intakes and awareness of folate to prevent neural tube defects: A survey of women living in Vancouver, Canada," J Am Diet Assoc, 103 (2), 2003.
24. M Maher and R Keriakos, "Women's Awareness of Periconceptional Use of Folic Acid before and after Their Antenatal Visits," Clinical Medicine Insights: Women's Health, 7; 2014.
25. T A Lawal and A O Adeleye, "Determinants of folic acid intake during preconception and in early pregnancy by mothers in Ibadan, Nigeria," Pan African Medical Journal, 19; 2014.
26. A S Kloeblen, "Folate knowledge, intake from fortified grain products, and periconceptional supplementation patterns of a sample of low-income pregnant women according to the Health Belief Model," J Am Diet Assoc, vol. 99 (1) (1999); 5-11.
27. P Morin, P de Wals, D St-Cyr-Tribble, et al., "Pregnancy planning: A determinant of folic acid supplements use for the primary prevention of neural tube defects," Canadian Journal of Public Health, vol. 93 (4); 2002.
28. A C Chan et al., "Folate awareness and the prevalence of neural tube defects in South Australia, 1966-2007," Medical Journal of Australia, vol. 189 (10); 2008.
29. K Green-Raleigh, H Carter, J Mulinare, et al., "Trends in folic acid awareness and behavior in the United States: The gallup organization for the March of dimes foundation surveys, 1995-2005," Maternal and Child Health Journal, 10 (1); 2006.
30. D Rofail, A Colligs, L Abetz, et al., "Factors contributing to the success of folic acid public health campaigns".