Folic acid usage and its associated factors among antenatal attendees in a tertiary health facility: Implications for child health

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Abstract

Globally, an estimated two billion people are affected by deficiencies of essential vitamins and minerals, notably folic acid, which negatively impacts on health and economic development. Maternal folate deficiency is associated with neural tube defects. Thus, getting enough folic acid is important for the rapid cell growth of the placenta and the developing fetus. The objective of this study is to assess the practice of folic acid and its associated factors among pregnant women in University of Benin Teaching Hospital (UBTH). A descriptive cross-sectional study was carried out among 400 pregnant women attending the antenatal clinic at UBTH, selected using a systematic sampling technique. Data was obtained using a structured interviewer-administered questionnaire and analyzed with IBM SPSS version 21.0 software. The level of significance was set at P<0.05. The mean age of the respondents was 28.7 (4.2) years. Majority 348 (87.0%) of the respondents had a good practice score of folic acid usage. The factors associated with the practice of folic acid were age (P<0.01), socioeconomic status (P<0.01), and parity, (P<0.01). The determinants of folic acid intake were spouse's level of education (P<0.001), and planned pregnancy (P<0.001). The majority of the respondents had a good practice of folic acid usage, and the determinants of practice were spouse's level of education and planned pregnancy. Health education is encouraged to sustain the good practice of folic acid use to prevent neural tube defects.

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Introduction

Globally, an estimated two billion people are affected by a deficiency of essential vitamins such as folic acid. This condition negatively impacts on health and economic development.[1] The need for folic acid increases especially during periods of rapid cell growth and development. One of such critical periods is pregnancy.[2] Deficiency of folic acid during pregnancy is associated with several neonatal abnormalities, most especially Neural Tube Defects (NTDs). Worldwide, the prevalence of NTDs is approximately 1.5 per 1000 live births, and the risk of its occurrence is 2–3%. The prevalence of neural tube defect is 2.75-7 per 1000 births in Nigeria.[3] Despite this, the utilization of folic acid by pregnant women is not optimal. Evidence from research, have shown that women attending various antenatal clinics do not take folic acid as recommended and this leads to poor outcomes for both the mother and the neonate.[1,4,5]

Overall, the goal of folic acid utilization in pregnancy is to increase red blood cell folate concentrations to more than 905 nmol/L, a level associated with a low risk of having a child with an NTD. In women, a 400-ug daily dose of folic acid raises the red blood cell concentration to 1053 nmol/L from a baseline of 615 nmol/L after 12 weeks. Also a once-a-week folic acid supplement (2800ug) raises red blood cell folate concentrations, but not as effectively as daily supplement.[6]

A study carried out on compliance with Iron-Folic Acid (IFA) therapy among190 pregnant women seeking antenatal care in Mangalore City South India revealed that the overall compliance with IFA intake among the subjects was 64.7%. Cost of the tablets had the highest contribution towards compliance, as compliance was higher in instances where the medications were free. Compliance also increased with increase in age of the respondents as well as the number of previous pregnancies. It was also higher among subjects from lower socioeconomic class. These were found to be statistically significant.[7]

A study carried out in 2012 in Uganda on the role of folic acid intake during pregnancy in the prevention of spinal bifida among women attending Antenatal Care (ANC), revealed that 50.5% of the women took folic acid. None of the women took the vitamin before pregnancy; only 8.1% took it during the first trimester of

pregnancy while 42.4% took it in late pregnancy.[8]

An Ethiopian study in 2014 revealed that 48.4% of the women took a folic acid supplement at different periods during pregnancy, but, only 1.9% of women took the supplement at a protective period against neural tube defects. Age, the early timing of antenatal registration, consultation for preconception, previous unsuccessful pregnancies and level of folic acid awareness were significantly associated with folic acid usage for prevention of neural tube defects.[6]

Folic acid awareness and its usage for the prevention of neural tube defects among pregnant women was also assessed in Jos, Nigeria. Findings showed that out of 543 pregnant women surveyed, only 7.4% consistently took the vitamin during the protective peri-conceptional period. Only 40% of women with a baby with NTD, took folic acid before pregnancy to prevent a recurrence of the disorder.[5]

In Ibadan Nigeria, a study assessed the knowledge and uptake of folic acid among 300 pregnant women attending antenatal clinics in a secondary health facility. Almost all the women 295 (98.3%) reported using folic acid in their current pregnancy with 160 (54.2%) of them reported using it as prescribed. Only 9 (3%) started to use folic acid before the current pregnancy. Employment status of the women was significantly associated with the uptake of folic acid.[2]

Folic acid intake during preconception as well as by pregnant women attending antenatal care is of immense value with substantial health implication for the wellbeing of every child. This practice is in pursuant of its evident role in the prevention of neural tube defects. Prior studies have identified factors associated with antenatal women's compliance to its intake, and these variously included ethnic group, socioeconomic status, age, educational status and planning of pregnancy.[2,6,7,9]

Unlike in the preconception period, pregnant women attending antenatal clinics are likely to have access to folic acid tablets, thus the need to assess their practice of folic acid use. Findings from this study will add to the existing body of knowledge on the topic and aid in the organization of advocacy programs to promote the use of folic acid by pregnant women. This study ascertained the usage of folic acid and its associated factors among pregnant women attending antenatal clinic in a tertiary health facility in Benin City, Edo State, to reduce the risk of fetal neural tube defects.

Materials and Methods

This descriptive cross-sectional study was carried out among pregnant women attending the Antenatal Care Clinic at the University of Benin Teaching Hospital (UBTH), Benin City, a tertiary healthcare facility in Edo State. The University of Benin Teaching Hospital is a tertiary institution founded in 1973.[10] It is located on the Benin-Lagos expressway. Its boundaries are the University of Benin, the Federal Government Girls' College road, and the Benin-Lagos express road.[10] In addition to providing healthcare services, the institution provides necessary facilities for training high and middle-level health practitioners, offers research opportunities for staff and interested persons.[11] It comprises of many departments among which is the Obstetrics and Gynaecology department, where respondents for this study were gotten. The Obstetrics and Gynaecology department contain 124 hospital beds and has a nurse staff strength of 199.[12]

This study was carried out from January to May 2018. Women undergoing treatment for anaemia in pregnancy were excluded from the study. The minimum sample size of 368 was calculated using the Cochrane formula for simple proportion[13] using 40.0% as prevalence with a personal history of a baby with NTD from a previous study carried out in Jos, Nigeria.[5] However, 400 pregnant women participated in this study.

Systematic sampling technique was used to select respondents for this study. The nurses' register served as the sampling frame. The antenatal clinic is run four times a week and the total number of patients who visit per month averages 1520. The number of patients visiting per day was 95. Sampling fraction / sample size/total number of clinic attendees = 0.28. Number of respondents selected per day = sampling fraction × number of antenatal attendees per antenatal clinic day= $0.28 \times 95 = 26.6 \approx 27$. Hence, 27 questionnaires were administered per antenatal clinic day. The sampling interval was calculated as $95 \div 27 = 3.52 \approx 4$. Every 4th patient on the list for the day was selected until 27 respondents were obtained. This selection was done on every antenatal clinic day until the sample size was attained**.**

Data was obtained using a pre-tested structured interviewer-administered questionnaire, which comprised of open and close-ended questions. The questionnaire was divided into two sections. Section A sought to find the sociodemographic characteristics of the respondents. In contrast, Section B ascertained the practice of folic acid intake as well as associated factors among participants.

A pre-test of the questionnaire was conducted among 40 antenatal attendees at Irrua Specialist Teaching Hospital, Irrua, Edo State. Pre-testing was done to enhance clarity, validity and reliability of the questionnaires and errors noted were corrected before the commencement of the study.

Data analysis

The questionnaires were collated, screened for completeness and numbered serially. Data was entered into and analyzed using IBM Statistical Package for Scientific Solution (SPSS) version 21 spreadsheet.

Occupation of patients was classified into skill levels according to a modified ILO classification:[14] i) Skill level 0: Unemployed persons and students; ii) Skill level 1: Office Cleaners, Gardeners, Labourers, Kitchen Assistants; iii) Skill Level 2: Bus Drivers, Secretary, Butchers, Tailors, Sale Assistants, Police Officers, Hairdresser, Mechanics, Electricians; iv) Skill Level 3: Shop Managers, Medical Radiographers, Legal Secretaries, Medical Lab Technicians; v) Skill Level 4: Medical Practitioners, Civil Engineers, Secondary School Teachers, Musicians and Marketing Managers.

Scoring systems

Scoring method for socioeconomic status

Socioeconomic index score was obtained from the addition of the educational score, occupational skill level score and household income.[15]

Scoring method for the practice of folic acid intake

A total of six questions were used to assess the practice of folic acid intake among the participants. Correct practice was assessed follows; a prescription folic acid in the current pregnancy, regular intake of folic acid, compliance to the timing of intake as prescribed, adherence to dosage, the onset of intake before pregnancy or during the first trimester of pregnancy, and having a history of folic acid intake in previous pregnancies. A score of 1 was given for each correct answer and 0 for each wrong answer, giving a maximum possible score of 6 and a minimum score of 0. Absolute scores were converted to percentages. Scores <50% were adjudged

as a poor practice of folic acid intake, and scores ≥50 were adjudged as good practice of folic acid intake.

The distribution of the variables was done using univariate analysis. Bivariate analysis was done using Chi-square and Fisher's exact tests. The level of statistical significance was set at P<0.05. Results were presented in prose, frequency tables, and bar charts.

Ethical clearance was obtained from the Ethics Committee, University of Benin Teaching Hospital (ADM/E 22/A/VII14614). Permission was also sought from the Head of Department, Obstetrics and Gynaecology, UBTH. Written informed consent was obtained from clients at the antenatal clinic willing to participate in the study. Confidentiality was assured.

Results

Table 1 shows the sociodemographic characteristics of respondents and their spouses. A total of 400 respondents with mean age 28.7 ± 4.2 years participated in this study. A higher proportion of the respondents, 153 (38.2%) and 136 (34.0%) respondents, were within the age group 25–29 and 30–34 years, respectively. Three hundred and eighty-six (96.5%) were from monogamous families, and 388 (97%) were Christians. The majority, 345 (86.1%) had spouses with a tertiary level of education, while a few 25(6.3%), 21 (5.3%) and 9 (2.3%) had spouses with a secondary, primary and no formal education respectively. Two thirds, 243 (60.8%), had a spouse in skill level 4.

Table 2 shows the socioeconomic status of respondents. The majority, 319 (79.7%) respondents, had a tertiary level of education, while 11 (2.8%) had a primary level of education. One hundred and eighty-seven (46.8%) and 137 (34.3%) respondents had skill level 4 and skill level 2, respectively. In comparison, 31 (7.8%) and 36 (6.5%) had skill level 1 and skill level 3, respectively, and 19 (4.6%) respondents were unemployed or were students. Three hundred and thirty-nine (84.7%) respondents had a household income of >100,000 while 26 (6.5%) and 32 (8.0%) had a household income of 50,000-100,000 and <50,000 respectively. Three (0.8%) respondents did not disclose their household income. Overall, 196 (49.4%) respondents belonged to high socioeconomic class, 166 (41.8%) belonged to middle socioeconomic class, and 35 (8.8%) belonged to low socioeconomic class.

Table 3 shows the obstetric history of respondents. The majority, 300 (75.0%) respondents, have had 2-4 previous pregnancies. In comparison, 94 (23.5%) have had just one pregnancy in the past, and 6 (1.5%) have had five or more pregnancies. Three hundred (75.0%) respondents were currently carrying their second to fourth pregnancy, 94 (23.5%) were currently carrying their first pregnancy, while 6 (1.5%) respondents were currently carrying their fifth pregnancy.

Two hundred and ninety-two (73.0%) respondents have had 1-4 children in the past, 105 (26.2%) have not had a child before, while 3 (0.8%) have had five or more children.

Two hundred and seventy (67.5%) respondents planned their current pregnancy, while 130 (32.5%) did not plan their current pregnancy.

Three hundred and ninety-two (98.0%) respondents had never given birth to a child with neural tube defects. In comparison, 8 (2.0%) respondents had a history of a child with neural tube defects.

Three hundred and ninety-eight (99.5%) respondents did not know any woman who had a baby with neural tube defects. In comparison, 2 (0.5%) knew a woman who had a baby with neural tube defects.

Table 4 presents the practice of folic acid intake and associated factors among respondents. The majority, 366 (91.5%) had folic acid prescribed in their current pregnancy. Of those that had folic acid prescribed in their current pregnancy, 352 (96.2%) took the vitamin while 14 (3.8%) did not take it. Three hundred and fourteen (89.2%) took it as prescribed, 30 (8.5%) took it as soon as they remembered while 8 (2.3%) took it once in a while.

Three hundred and forty-four (98.0%) of the respondents that took folic acid has never had any side effects from its usage. In

Table 1. Sociodemographic characteristics of respondents and their spouses.

Variable	Frequency (N = 400)	Percent
Age group (years)		
15 – 19	3	0.8
20 – 24	68	17.0
25 – 29	153	38.2
30 – 34	136	34.0
>35 years	40	10.0
Mean age (SD)	28.7 (±4.2)	
Family type		
Monogamy	386	96.5
Polygamy	14	3.5
Religion		
Christian	388	97.0
Muslim	12	3.0
Spouse level of education		
No formal education	9	2.3
Primary	21	5.3
Secondary	25	6.3
Tertiary	345	86.1
Spouse skill level		
Unemployed, students		
Skill level 1	17	4.2
Skill level 2	120	30.0
Skill level 3	20	5.0
Skill level 4	243	60.8

Table 2. Socioeconomic status of respondents.

Variable	Frequency (N = 400)	Percent
Level of education		
No formal education	12	3.0
Primary	11	2.8
Secondary	58	14.5
Tertiary	319	79.7
Skill level		
Unemployed, students	19	4.6
Skill level 1	31	7.8
Skill level 2	137	34.3
Skill level 3	36	6.5
Skill level 4	187	46.8
Household income		
<50,000	32	8.0
50,000-100,000	26	6.5
>100,000	339	84.7
Not disclosed	3	0.8
Socioeconomic status (n=397)		
Low socioeconomic class	35	8.8
Middle socioeconomic class	166	41.8
High socioeconomic class	196	49.4

comparison, 8 (2.0%) has had side effects following folic acid usage. Of the respondents that have had side effects following folic acid usage, 7 (87.5%) experienced nausea following intake, while 1 (12.5%) experienced abdominal cramps following intake.

Three hundred and sixteen (90.0%) respondents that took folic acid also took it in their previous pregnancy. In comparison, 36 (10.0%) did not take it in their previous pregnancy.

Overall, 348 (87.0%) respondents had a good practice of folic acid usage in pregnancy, while 52 (13.0%) had a poor practice of folic acid usage in pregnancy.

Concerning factors associated with the practice of folic acid intake, (Table 5) age (P=<0.001), family type (P=0.001), spouses level of education (P<0.001), spouse skill level (P<0.01) and socioeconomic status (P<0.01) were identified as significant factors.

Table 6 shows the association between obstetric history and practice of folic acid intake among respondents. An increasing number of pregnancies, (P=0.021), the order of index pregnancy, (P<0.001), number of children (P<0.001) and planned pregnancy (P<0.001) were identified as significant obstetric factors associated with the practice of folic acid intake among respondents. Table 7 shows the Logistic regression model for determinants of practice of folic acid intake among respondents. The variables in the model accounted for between 20.3% - 37.7% of the variation observed in the outcome variable (level of good practice).

Respondents whose husbands had a secondary level of education and above were 6.970 (95% Cl=2.229-21.791) times likely, to have good practice than respondents whose husbands had a primary level of education and below. This finding was statistically significant (P= 0.001).

Respondents who planned their pregnancy were 3.866 (95% Cl=1.844-8.103,) times likely to have good practice than respondents who did not plan their pregnancy; and this was statistically significant (P<0.001).

Table 3. Obstetric history of respondents.

Variable	Frequency (N = 400)	Percent
Number of previous pregnancies		
1	94	23.5
2-4	300	75.0
5 and above	6	1.5
Order of index pregnancy		
First	94	23.5
Second to fourth	300	75.0
Fifth and above	6	1.5
Number of children		
0	105	26.2
1-5	295	73.8
Planned pregnancy		
Yes	270	67.5
No	130	32.5
Had a baby with neural tube defects		
Yes	8	2.0
No	392	98.0
Know someone who had a baby with neural tube defects		
Yes	2	0.5
No	398	99.5

Discussion

One-third of the respondents were aged 25–29 (28.7±4.2) years. This mean age is within the age bracket for women of reproductive years (15–49 years). The finding is similar to findings from a study carried out in the United Arab Emirates, where about one-third of the women were aged 25–29 years.[16] However, it differs from findings from the studies conducted in 2013 in Northern Uganda where the mean age of the respondents was 29 years[8] and in 2013 in Jos Nigeria where the mean age of the women was 29.9 ± 4.7 years.[5]

Age was a significant factor in folic acid use in this study. The age range of 25-29 years reflects women who are actively procreating, thus more exposed, from experiences, on the benefits taking folic acid. This finding is important because the good practice of folic acid intake amongst higher proportion childbearing women will translate to having more children born without the burden of neural tube defects.

About half of the respondents had a high socioeconomic status, in comparison to middle and low socioeconomic statuses. Women with high socioeconomic statuses are likely to have the financial power in addition to knowledge, thus adopting better health-seeking behaviours and seeking safer pregnancies and healthier children. This finding is similar to findings from the study done in 2012 in Ibadan Nigeria.[17]

As regards the practice of folic acid intake among the respondents, the majority had an overall good practice of folic acid intake. The finding is similar to findings from the studies done in 2017 in South Africa,[18] and Jos,[5] and Ibadan,[17] Nigeria. This finding is not far-fetched from expectations for a populace in an urban setting with easy access to both secondary and tertiary health facilities well equipped for the provision of maternal and child health services. This finding may be due to the predominance tertiary level of education among the respondents as well as their high socioeconomic status. Good practice of folic acid intake will be advantageous for the health of every child preventing the incidence of neural tube defects. A little above one-tenth of the respondents had a poor practice of folic acid intake, and this is very significant. Hence, measures aimed at continued advocacy of the importance of the vitamin should be intensified by relevant authorities to encourage the good practice of folic acid intake in every peri-con-

Table 4. Practice of folic acid intake and associated factors among respondents.

Variable	Frequency (N = 400)	Percent
Take folic acid in current pregnancy (n=366)		
Yes	352	96.2
No	14	3.8
Ever had side effects following folic acid (n= 52)		
Yes	8	2.0
No	344	98.0
Side effects following folic acid intake (n=8)		
Nausea	7	87.5
Abdominal cramp	1	12.5
History of folic acid intake in the previous pregnancy (n=352)		
Yes	316	90.0
No	36	10.0
Overall practice score		
Good practice	348	87.0
Poor practice	52	13.0

Table 5. Association between sociodemographic characteristics and practice of folic acid intake among respondents.

Variable	Practice		Test statistics	P-value
	Good (n=348) Freq (%)	Poor (n=52) Freq (%)		
Age group (years)				
15-19	1 (33.3)	2 (66.7)	Fisher's = 16.743	0.001*
20-24	60 (88.2)	8 (11.8)		
25-29	143 (93.5)	10 (6.5)		
30-34	113 (83.1)	23 (16.9)		
>35	31 (77.5)	9 (22.5)		
Family type				
Monogamy	340 (88.1)	46 (11.9)	$\chi^2 = 11.435$	0.001*
Polygamy	8 (57.1)	6 (42.9)		
Spouse level of education				
No formal education	6 (66.7)	4 (33.3)	Fisher's = 52.128	<0.001*
Primary	6 (28.6)	15 (71.4)		
Secondary	19 (76.0)	6 (24.0)		
Tertiary	317 (91.9)	28 (8.1)		
Spouse skill level				
Skill level 1	8 (47.1)	9 (52.9)	Fisher's = 21.683	<0.001*
Skill level 2	101 (84.2)	19 (15.8)		
Skill level 3	17 (85.0)	3 (15.0)		
Skill level 4	222 (91.4)	21 (8.6)		
Socioeconomic status				
Low socioeconomic status	21 (60.0)	14 (40.0)	$\chi^2 = 35.335$	<0.001*
Middle socioeconomic status	138 (83.1)	28 (16.9)		
High socioeconomic status	186 (94.9)	10 (5.1)		

*Statistically significant.

Table 6. Association between obstetric history and practice of folic acid intake among respondents.

Variable	Practice		Test statistics	P-value
	Good (n=348) Freq (%)	Poor (n=52) Freq (%)		
Number of previous pregnancies				
One	88 (93.6)	6 (6.4)	Fisher's = 10.375	0.021*
Two	131 (85.1)	23 (14.9)		
Three	93 (86.9)	14 (13.1)		
Four	33 (84.6)	6 (15.4)		
Five and above	3 (50.0)	3 (50.0)		
Order of index pregnancy				
First	88 (93.6)	6 (6.4)	Fisher's = 21.990	<0.001*
Second	128 (92.8)	10 (7.2)		
Third	96 (81.4)	22 (18.6)		
Fourth	33 (75.0)	11 (25.0)		
Fifth and above	3 (50.0)	3 (50.0)		
Number of children				
0 – 3	315 (89.5)	37 (10.5)	$\chi^2 = 16.023$	<0.001*
>3	33 (68.8)	15 (31.3)		
Planned current pregnancy				
Yes	253 (93.7)	17 (6.3)	$\chi^2 = 33.010$	<0.001*
No	95 (73.1)	35 (26.9)		

*Statistically significant.

Table 7. Logistics regression model for determinants of practice of folic acid intake among respondents.

Predictors	B (regression coefficient)	Odds ratio	95% CI for OR		P-value
			Lower	Upper	
Spouse level of education					
≤Primary*		1			
≥Secondary	1.942	6.970	2.229	21.791	0.001**
Planned current pregnancy					
Yes	1.352	3.866	1.844	8.103	<0.001**
No*		1			

R^2 = 20.3% - 37.7%, CI = confidence interval, OR = Odds ratio. *Reference category. **Statistically significant.

ceptional woman.

In this study, planned pregnancy was found to be a determinant of folic acid use. This finding is similar to results obtained by researchers in Portugal, Ireland and Canada, respectively. They independently assessed the determinants of folic acid use in pregnancy and found that planned pregnancy was an important predictor of folic acid use.[19-21] Women who plan their pregnancies are more likely to seek prenatal care and commence folic acid supplementation and have better pregnancy outcomes.[22-23] Pregnancy planning is an ideal time to adopt behaviours that could improve the health of both mother and foetus. Planned pregnancy also allows efficient use of meagre resources in reducing infant and child mortality through quality health care, including immunization services, access to adequate nutrition, water and sanitation facilities. These child survival strategies increase the life expectancy in children.

Also, higher spousal level of education was a predictor of folic acid use among participants. This similarity was observed in China.[24] On the contrary, it was observed that the husband's educational status reduced the odds of good folic acid supplementation among pregnant women in Ethopia.[25,26] This observation underscores the importance of male involvement in pregnancy. Education increases knowledge and uptake of folic acid supplementation, and informed spouses can boost supplementation by providing reminders and other support to help with pill taking. Partners are encouraged to assist in promoting compliance with folic acid supplementation in pregnant women.

Limitations of the study/opportunities for further research

There was the possibility of information bias because of conservativeness amongst some respondents, which made them unwilling to answer questions or discuss issues relating to reproductive health. This bias was reduced by reassuring the respondents of the confidentiality of the information obtained. However, this calls for qualitative studies on the subject to further explore the topic and provide direct correspondence of respondents' opinions.

This study focused on pregnant women attending antenatal clinics. However, the importance of folic acid in the prevention of neural tube defects stretch beyond the period of pregnancy to the preconception period among all women of reproductive age group. Hence community-based studies are required on the importance of folic acid intake among this population of women.

Conclusions

The majority of the respondents had a good practice of folic acid usage. The factors found to be significantly associated with the practice of folic acid intake included: age, family type, socioeconomic status, spouse's level of education and skill level, number of previous pregnancies, and planned pregnancy.

There should be regular health education of women attending antenatal care on the importance of folic acid supplementation in pregnancy as this will reinforce good practice. Planned pregnancies should be encouraged to sustain the good practice of folic acid supplementation.

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