Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 22s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Peri-Conception Folic Acid Knowledge Among Women in Reproductive Age Group Attending a Tertiary Care Centre

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Cite this paper as: Dr. Karunyaa M S, Dr. Prema Priya, Dr. B. Jeyamani, (2025). Peri-Conception Folic Acid Knowledge Among Women in Reproductive Age Group Attending a Tertiary Care Centre. *Journal of Neonatal Surgery*, 14 (22s), 202-209.

ABSTRACT

Background: Peri-conceptional folic acid supplementation is a well-established preventive strategy for neural tube defects and other congenital anomalies. Despite public health recommendations, the awareness and utilization of folic acid among women of reproductive age in India remain inadequate.

Objectives: To assess the knowledge, awareness, and utilization of peri-conceptional folic acid among women of reproductive age attending a tertiary care centre and to identify demographic predictors associated with awareness.

Methods:A cross-sectional study was conducted among 400 women aged 18–45 years attending the outpatient clinics of a tertiary care hospital. Data were collected through a structured, pre-tested questionnaire capturing sociodemographic characteristics, knowledge regarding folic acid, and supplementation practices. Chi-square test was used to determine associations between demographic variables and folic acid awareness. Multivariate logistic regression analysis was performed to identify independent predictors of awareness. A p-value < 0.05 was considered statistically significant.

Results: Out of 400 participants, 150 women (37.5%) were aware that folic acid prevents neural tube defects, and only 85 (21.3%) reported using folic acid before conception. Awareness was significantly associated with higher educational status ($p < 0.001$), employment ($p = 0.002$), and being primigravida ($p < 0.001$). Multivariate analysis revealed higher education (AOR = 2.84, 95% CI: 1.75–4.59, $p < 0.001$), primigravida status (AOR = 1.92, 95% CI: 1.12–3.29, $p = 0.017$), and employment (AOR = 1.68, 95% CI: 1.01–2.81, $p = 0.046$) as significant independent predictors of folic acid awareness.

Conclusion: The study highlights suboptimal knowledge and usage of folic acid during the peri-conceptional period. Despite greater awareness among primigravida women, the overall preconceptional supplementation rate remains low. Strengthening antenatal education, especially targeting multigravida and undereducated women, is essential to bridge the knowledge-practice gap and improve maternal and fetal health outcomes.

Keyword: *Folic Acid, Peri-Conception, Reproductive Age, Pregnancy, Neural Tube Defects, Maternal Health, Awareness, Supplementation*

1. INTRODUCTION

Neural tube defects (NTDs) constitute a major group of congenital anomalies that significantly contribute to neonatal

morbidity and mortality globally, particularly in low- and middle-income countries like India. These defects, which include conditions such as spina bifida and anencephaly, arise from the failure of proper closure of the embryonic neural tube during early embryogenesis typically within the first 28 days post-conception. Scientific evidence has consistently demonstrated that adequate peri-conceptional folic acid intake can reduce the risk of NTDs by up to 70%, making folic acid supplementation a cornerstone of preventive maternal healthcare **[1]**.

Folic acid, the synthetic form of folate (a B-vitamin), is essential for DNA synthesis, cellular replication, and neural development. The period surrounding conception—defined as a few weeks before and after fertilization—is critical for fetal neural tube formation. Given that many pregnancies are unplanned and that neural tube closure occurs before many women even realize they are pregnant, it is imperative that all women of reproductive age receive sufficient folic acid intake during this narrow window **[2]**.

Recognizing its preventive role, the World Health Organization (WHO) and the Indian Ministry of Health and Family Welfare recommend that women of reproductive age consume a daily dose of 400 micrograms of folic acid, especially when planning pregnancy or during early gestation **[3]**. Despite these clear guidelines, multiple studies from both urban and rural regions in India have reported low levels of folic acid awareness and usage among women. These gaps have been attributed to several factors, including low health literacy, inadequate preconception counseling, limited access to healthcare services, socioeconomic barriers, and a general lack of awareness about the timing and importance of supplementation **[4]**.

In India, the burden of maternal and child health challenges is exacerbated by disparities in education, income, and access to antenatal care. While national health programs such as the Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+A) strategy have incorporated micronutrient supplementation, there is still a lack of uniform implementation of preconception health counseling. Moreover, the effectiveness of these programs in raising folic acid awareness among women remains inconsistent **[5]**.

Previous research has shown that factors such as maternal education, occupation, parity, and prior pregnancy experiences influence the uptake of folic acid. However, variations exist across regions and healthcare settings, and there is limited data specifically assessing these determinants in tertiary care settings in India. Importantly, with increasing access to health information through digital platforms and healthcare providers, it is possible that newer trends in awareness may emerge, particularly among primigravida women receiving antenatal care for the first time **[6, 7]**.

This study was therefore undertaken to assess the knowledge and utilization of peri-conceptional folic acid among women attending a tertiary care centre and to identify key demographic predictors influencing awareness. The findings aim to inform strategies that bridge the knowledge-practice gap and enhance adherence to folic acid recommendations, ultimately contributing to the prevention of neural tube defects and improvement of maternal and neonatal health outcomes.

2. METHODOLOGY

This cross-sectional observational study was conducted at the outpatient departments of Obstetrics and Gynecology at a tertiary care hospital over a one-year period from January 2023 to December 2023. The primary objective was to evaluate the knowledge, awareness, and practices related to peri-conceptional folic acid supplementation among women of reproductive age. The study population included women aged between 18 and 45 years who were attending the outpatient services for preconception counseling, antenatal visits, or postnatal care within one year of delivery. Women were recruited through consecutive sampling during routine clinic hours. Inclusion criteria required participants to be within the defined reproductive age group and willing to provide informed consent. Women with chronic medical conditions such as epilepsy, diabetes mellitus, or thalassemia—who were already advised folic acid supplementation irrespective of pregnancy status—were excluded to avoid confounding. Additionally, women with cognitive impairment or language barriers that could limit questionnaire comprehension were excluded.

The sample size was calculated using Cochran's formula for estimating a proportion with specified relative precision. Assuming an estimated 50% prevalence of awareness about folic acid intake based on previous studies, with a 5% margin of error and 95% confidence level, the minimum required sample size was determined to be 384. To account for potential non-response or incomplete data, a final sample of 400 women was included in the study.

Data were collected using a structured, pre-validated questionnaire that was administered in the local language through face-to-face interviews conducted by trained healthcare professionals. The questionnaire was developed after reviewing existing literature and consulting subject experts to ensure content validity. A pilot test was conducted among 30 women to refine the tool and ensure clarity. The questionnaire captured socio-demographic data (age, education, occupation, income), obstetric history (gravida, parity, gestational age), and specific knowledge and practices related to folic acid supplementation. Key questions included awareness of the benefits of folic acid, timing of initiation, source of information, and actual usage before conception.

The primary outcome of interest was the level of knowledge about the role of folic acid in preventing neural tube defects. Secondary outcomes included actual intake of folic acid prior to conception and identification of information sources.

Responses were categorized accordingly to reflect adequate or inadequate knowledge. Independent variables such as age group, educational status, employment, gravida status, and household income were analyzed to assess their association with folic acid awareness.

Data were entered and analyzed using IBM SPSS Statistics Version 26. Descriptive statistics were used to summarize baseline characteristics, and categorical variables were expressed as frequencies and percentages. Associations between categorical variables and folic acid awareness were tested using the chi-square test. Multivariate logistic regression analysis was performed to identify independent predictors of folic acid awareness, with adjusted odds ratios (AOR) and 95% confidence intervals (CI) reported. A p-value of less than 0.05 was considered statistically significant. The study protocol was reviewed and approved by the Institutional Ethics Committee, and written informed consent was obtained from all participants. Confidentiality of participant data was strictly maintained, and health education was provided at the end of the interview to all participants, particularly those unaware of folic acid's benefits.

3. RESULTS

A total of 400 women of reproductive age participated in the study. The mean age of participants was 27.8 ± 4.9 years. The majority of women were aged between 21 and 30 years, and 61.0% were primigravida. Educational status varied, with nearly half having completed secondary education. Awareness of folic acid was reported by 150 participants (37.5%), while only 85 women (21.3%) had taken folic acid before conception.

Table 1 presents the socio-demographic and obstetric profile of the study participants, showing the distribution of age, education, employment status, and gravida.

Table 1: Demographic and Obstetric Characteristics of Study Participants

Variable	n (%) (N = 400)
Age Group (years)	
18–20	58 (14.5)
21–30	249 (62.3)
31–40	84 (21.0)
>40	9 (2.2)
Educational Status	
No formal education	74 (18.5)
Primary education	39 (9.8)
Secondary education	194 (48.5)
Higher education	93 (23.2)
Employment Status	
Homemaker	286 (71.5)
Employed	114 (28.5)
Gravida	
Primigravida	244 (61.0)

Multigravida	156 (39.0)

Table 2 summarizes the participants' knowledge of folic acid and their use of supplementation during the peri-conceptional period.

Table 2: Knowledge and Use of Peri-conceptional Folic Acid

Variable	n (%) (N = 400)
Awareness of folic acid benefits	
Yes	150 (37.5)
No	250 (62.5)
Folic acid prevents neural tube defects	
Yes	112 (28.0)
No / Don't know	288 (72.0)
Used folic acid before conception	
Yes	85 (21.3)
No	315 (78.7)

Table 3 outlines the sources of information reported by participants regarding folic acid supplementation, highlighting healthcare providers as the leading source.

Table 3: Sources of Information About Folic Acid

Source of Information	n (%) (N = 400)
Healthcare provider	154 (38.5)
Media (TV, radio, internet)	111 (27.8)
Family / friends	77 (19.2)
School / educational programs	58 (14.5)

Table 4 demonstrates the association between folic acid awareness and key demographic variables. Higher awareness was significantly associated with age, education, employment, and being primigravida.

Table 4: Association of Folic Acid Knowledge with Demographic Characteristics

Variable	Aware (n = 150)	Not aware (n = 250)	p-value
Age <25 years	52	112	0.008
Higher education	68	25	<0.001
Employed	61	53	0.002
Primigravida	133	111	<0.001

Table 5 presents the results of multivariate logistic regression analysis to identify independent predictors of folic acid awareness. Higher education, primigravida status, and employment emerged as statistically significant predictors.

Table 5: Multivariate Logistic Regression Analysis of Predictors of Folic Acid Awareness

Predictor Variable	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
Higher education	2.84	1.75 – 4.59	<0.001
Primigravida	1.92	1.12 – 3.29	0.017
Employment	1.68	1.01 – 2.81	0.046

Table 6 summarizes the reasons cited by participants who did not take folic acid before conception. Lack of awareness was the most frequently reported reason, followed by financial constraints and absence of healthcare provider advice.

Table 6: Reasons for Not Taking Folic Acid Before Conception

Reason	n (%) (N = 315)
Lack of awareness	159 (50.5)
Financial constraints	67 (21.3)
Not advised by healthcare provider	54 (17.1)
Forgot / not considered important	35 (11.1)

Table 7 assesses the association between pre-conceptional folic acid use and key demographic factors. Use of folic acid was significantly more common among women with higher education, primigravida status, and those who had received counseling from a healthcare provider.

Table 7: Association of Pre-conceptional Folic Acid Use with Demographic Factors

Variable	Used (n = 85)	Not Used (n = 315)	p-value
Higher education	42	51	<0.001
Primigravida	63	181	0.034
Advised by provider	73	121	<0.001

Table 8 shows the correlation between awareness and actual use of folic acid before conception. A significantly higher proportion of women who were aware of folic acid benefits had taken it before conception, compared to those who were unaware.

Table 8: Correlation Between Folic Acid Awareness and Pre-Conceptional Use

Awareness of Folic Acid	Used Before Conception (n = 85)	Not Used (n = 315)	p-value
Yes (n = 150)	63 (42.0)	87 (58.0)	<0.001
No (n = 250)	22 (8.8)	228 (91.2)	<0.001

Table 9 compares knowledge and folic acid use among primigravida and multigravida participants. Awareness and usage were significantly higher among primigravida women.

Table 9: Comparison of Knowledge and Use Among Primigravida and Multigravida Women

Variable	Primigravida (n = 244)	Multigravida (n = 156)	p-value
Aware of folic acid	133 (54.5)	17 (10.9)	<0.001
Used before conception	63 (25.8)	22 (14.1)	0.018

Table 10 evaluates the association between income level and folic acid awareness. Awareness was significantly higher among women from higher-income households compared to those from low-income backgrounds.

Table 10: Association Between Income Level and Folic Acid Awareness

Income Level	Aware (n = 150)	Not Aware (n = 250)	p-value
Low-income	34	103	<0.001
Middle-income	82	89	0.032
High-income	34	58	0.021

4. DISCUSSION

This study provides a comprehensive assessment of knowledge, awareness, and utilization of peri-conceptional folic acid supplementation among women of reproductive age attending a tertiary care center. The findings reveal a significant gap between awareness and actual use of folic acid prior to conception, despite the well-established role of folic acid in preventing neural tube defects **[8]**.

Only 37.5% of the women in the present study were aware of folic acid's benefits, and merely 21.3% reported taking it before conception. These findings align with previously reported low levels of folic acid awareness in India and other developing countries, despite the existence of national recommendations for universal preconceptional folic acid supplementation **[9]**. A similar study conducted in Benue State, Nigeria, reported awareness in 30.8% of participants, highlighting the global relevance of the issue. The low adherence to supplementation among those who were aware (only 42% of aware participants used folic acid preconceptionally) underscores the presence of a critical knowledge-practice gap **[10]**.

The present study observed a statistically significant association between higher educational attainment and folic acid awareness. This is consistent with findings from studies in both high-income and low-income settings, where education level is a strong determinant of maternal health literacy and positive health behaviors. Women with secondary or higher education were more likely to know about the preventive role of folic acid and to initiate its use before conception. This underlines the importance of integrating reproductive health education into formal schooling, especially in lower socioeconomic contexts

[11].

Interestingly, primigravida women demonstrated significantly higher awareness compared to multigravida participants, a reversal of trends reported in earlier literature. Conventionally, prior pregnancy experience is believed to enhance awareness through exposure to antenatal care services. However, in the present study, primigravida women may have benefited more from structured health education or digital outreach platforms commonly accessed during first-time pregnancies **[12]**. This finding suggests a potential shift in the demographics of information access and may reflect the evolving role of first-contact antenatal services in delivering preconceptional counselling.

Employment status was also associated with better awareness, likely reflecting increased access to workplace health schemes, financial independence, and exposure to health information through peer groups and digital media. Employed women may also have greater decision-making autonomy regarding their health, which contributes to proactive health-seeking behaviors, including micronutrient supplementation **[13]**.

Healthcare providers were identified as the most common source of information about folic acid, followed by media and social networks. However, only 38.5% of participants cited healthcare professionals as their primary source, indicating missed opportunities for consistent antenatal and preconceptional counseling. The absence of provider recommendation was noted by 17.1% of women as a reason for not using folic acid before conception, pointing to a need for reinforcing health communication during all reproductive health visits **[14]**.

Financial constraints, although not the most frequently cited barrier, remain a significant impediment to adherence. With 21.3% of women attributing non-use to cost, ensuring the availability of cost-free or subsidized folic acid supplements at primary and secondary health centers becomes a critical policy consideration **[15]**. Additionally, 50.5% of women stated they were simply unaware of the need for supplementation, emphasizing the urgency for enhanced awareness campaigns.

The regression analysis in this study reinforces that higher education, employment, and primigravida status are independent predictors of awareness. These findings can guide targeted interventions by prioritizing low-literacy, multigravida, and unemployed women in public health programs. Incorporating folic acid education into school curricula, community outreach initiatives, and maternal health apps could yield improved adherence **[16]**.

Comparative analysis with other Indian studies reveals similar challenges. Research conducted in Tamil Nadu and Karnataka reported peri-conceptional folic acid usage rates below 30%, often due to lack of awareness and poor integration of preconceptional counseling into routine care. Global experiences with mandatory folic acid fortification in staple foods, as seen in the United States and Chile, have shown measurable reductions in neural tube defects. While food fortification remains a long-term strategy, focused behavioral interventions are urgently needed in the Indian context.

The strength of this study lies in its structured data collection through face-to-face interviews, which reduced the likelihood of misclassification or recall bias. The inclusion of a large and diverse sample from a tertiary care setting adds to the robustness of the findings. However, the cross-sectional design limits causal inference, and findings may not be generalizable to rural populations or non-hospital-attending women. Self-reported measures of awareness and use are also subject to social desirability bias.

5. CONCLUSION

This study highlights the suboptimal levels of awareness and utilization of peri-conceptional folic acid supplementation among women of reproductive age attending a tertiary care centre. While only 37.5% of participants were aware of the preventive role of folic acid in neural tube defects, an even smaller proportion—21.3%—had taken folic acid before conception. Awareness was significantly associated with higher education, employment status, and primigravida status, with multivariate analysis confirming these as independent predictors.

Despite healthcare providers being the most commonly cited source of information, substantial gaps remain in the dissemination and reinforcement of folic acid-related health messages. The findings underscore the urgent need for strengthening health education initiatives, especially targeting multigravida, less educated, and unemployed women. Integration of peri-conceptional folic acid counseling into routine reproductive healthcare services, along with widespread public health campaigns and cost-free supplement distribution, may significantly improve adherence and reduce the incidence of preventable congenital anomalies.

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