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Women's awareness regarding the importance of folic acid uptake and personal hygiene in preventing neural tube defects

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Abstract
Background: Serious congenital brain and spinal cord abnormalities known as neural tube defects (NTDs) are caused by the neural tube's inadequate closure during the early stages of fetal development. They can be mainly avoided by ensuring that mothers consume enough folic acid both before and throughout pregnancy, as well as by maintaining good personal cleanliness to lower the chance of infection. However, women of reproductive age in many rural and semi urban communities are not well-informed about the role that folic acid supplements and good hygiene habits play in preventing these malformations. This study is to enhance health education in the community and gauge women's awareness of the importance of folic acid and good personal hygiene in preventing NTDs.
Methodology: Community-based awareness survey was conducted among women of reproductive age (21–45 years) in Bisrakh village, Greater Noida. Data were collected using two standardized tools:
1. **Folic Acid Awareness Questionnaire (FAA-Q):** a validated 15-item instrument designed to assess knowledge and awareness about folic acid intake, timing, sources, and its role in preventing neural tube defects (Cronbach's $\alpha = 0.89$).
2. **Personal Hygiene Practice Scale (PHPS):** a structured and reliable checklist that evaluates hygiene-related behaviors among women, including handwashing, bathing, and menstrual hygiene practices (Cronbach's $\alpha = 0.84$).

After the survey, an interactive health education session was conducted using visual aids and discussions to enhance understanding. Data were analyzed descriptively and presented in percentages.
Result: Out of 20 participants, 4 women had prior knowledge about folic acid and its role in preventing birth defects. After the educational intervention, 17 women demonstrated good awareness about folic acid intake, sources, and timing. Similarly, 18 women showed improvement in their personal hygiene practices, such as regular handwashing, proper menstrual hygiene, and cleanliness during pregnancy.
Conclusion: The study revealed low baseline awareness among women regarding folic acid and hygiene practices. However, the post-intervention findings showed a marked improvement in both knowledge and behavior. Community-based health education using standardized questionnaires proved effective in increasing awareness and can play a significant role in preventing neural tube defects and promoting maternal health in rural settings.

Keywords: Folic acid, personal hygiene, neural tube defects, women's awareness, health education, maternal health

Introduction
Neural tube defects (NTDs) are severe congenital malformations involving the brain and spinal cord that arise from the incomplete closure of the neural tube during early embryonic development. Common forms of NTDs include spina bifida and anencephaly, which contribute significantly to neonatal morbidity and mortality worldwide (Wald, Morris and Blakemore, 2018; Garrett *et al*., 2018) [8, 9]. Despite their serious implications, these conditions are largely preventable through appropriate maternal health practices, particularly adequate nutrition during the preconceptional and early gestational periods (Garrett *et al*., 2018) [9].
Folic acid, a synthetic form of vitamin B9, plays a crucial role in cellular processes such as DNA synthesis and cell division, making it indispensable for proper fetal neural development (Garrett *et al*., 2018) [9]. Sufficient intake of folic acid, either through supplementation or consumption of folate-rich foods, has been shown to markedly reduce the incidence of neural tube defects (Amaresan and Sadiqunnisa, 2022; Medawar, Wehbe and Abou Jaoude, 2019) [2, 6]. However, awareness regarding the importance of folic acid supplementation remains suboptimal, especially among women residing in rural and underserved areas (Amaresan and Sadiqunnisa, 2022; Köken *et al*., 2018; Alblowi and Alomayri, 2017) [2, 3, 4].
In addition to nutritional factors, maintaining appropriate personal hygiene during pregnancy is essential to minimize the risk of maternal infections that may adversely affect fetal health. Poor hygienic practices, when combined with nutritional deficiencies, can increase the likelihood of pregnancy-related complications (Mida, Della Zazzera and Fontaine-Bisson, 2021) [7]. Therefore, improving awareness about both folic acid intake and personal hygiene is critical for promoting better maternal and neonatal outcomes (Kadam *et al*., 2024[1]; Kour, Kour and Sharma, 2021) [10].
The present study aims to assess the level of awareness among women regarding the role of folic acid and personal hygiene in the prevention of neural tube defects and to promote health education through community-based engagement (Kadam *et al*., 2024) [1].

Review of Literature
Several studies have explored the level of awareness and utilization of folic acid supplementation among women of

reproductive age, highlighting a consistent gap between knowledge and actual practice.

Kadam *et al.* (2024) [1] reported that although women in Western India demonstrated a moderate level of awareness regarding folic acid supplementation, its actual utilization remained considerably low. The study emphasized a clear disconnect between knowledge and practice, indicating that awareness alone is insufficient to ensure behavioral change. The authors suggested that targeted health education, structured counseling, and community-based interventions are essential to translate awareness into consistent supplementation practices, ultimately contributing to the prevention of neural tube defects.

Similarly, Amaresan and Sadiqunnisa (2022) [2] observed that while a substantial proportion of women were aware of folic acid use during pregnancy, only a limited number followed the recommended periconceptional intake. The findings highlighted a critical gap in the timing and adequacy of supplementation. The study stressed the importance of strengthening public health education programs and awareness campaigns to promote timely initiation and correct usage of folic acid, which is crucial for effective prevention of neural tube defects.

Köken *et al.* (2018) [3] found that both awareness and consumption of folic acid among women of reproductive age were significantly low, particularly with respect to its preconceptional importance. The study underscored the need for improved preconception counseling and emphasized the role of healthcare professionals in educating women about the necessity of early folic acid supplementation. Enhancing awareness at the community level was identified as a key strategy to improve compliance and reduce the incidence of neural tube defects.

In line with these findings, Alblowi and Alomayri (2017) [4] reported inadequate knowledge and awareness regarding folic acid use among women of childbearing age in Tabuk City. Many participants lacked understanding about its preventive role in neural tube defects as well as the correct timing of intake. The authors recommended the implementation of comprehensive educational campaigns and integration of folic acid counseling into routine antenatal care services to improve knowledge and encourage appropriate supplementation practices.

Furthermore, Mitra *et al.* (2024) [5] highlighted that despite a gradual increase in awareness levels among women in Western India, the actual practice of folic acid supplementation remained insufficient. The study reinforced the persistent gap between knowledge and implementation and advocated for continuous health education, active involvement of healthcare providers, and community-based awareness programs. Such measures were deemed essential to ensure effective folic acid intake during the preconceptional and early stages of pregnancy, thereby reducing the risk of neural tube defects.

Aim and Objectives

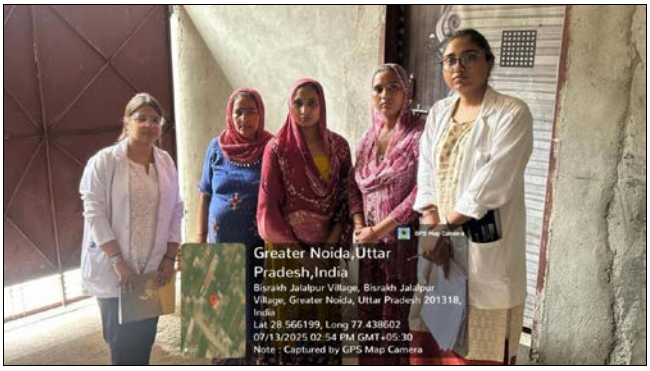
Aim

To assess and enhance women's awareness regarding the importance of folic acid intake and personal hygiene in preventing neural tube defects.

Objectives

1. To assess women's baseline knowledge on folic acid and personal hygiene.
2. To conduct educational sessions on folic acid and hygiene importance.
3. To evaluate post-intervention improvement in awareness and practices.
4. To suggest policy measures for promoting folic acid and hygiene education.

Map: Bisrakh Village, Greater Noida, Uttar Pradesh



Proof of Visit

Methodology

This study was designed as a community-based quasi-experimental pre–post interventional study without a control group, conducted to assess and improve awareness regarding folic acid supplementation and personal hygiene among women of reproductive age.

The study was carried out from 13 July 2025 to 24 July 2025 in Bisrakh village, Greater Noida, Gautam Buddha Nagar, Uttar Pradesh (201306). A total of five visits were conducted during this period. The first visit involved community entry, rapport building, obtaining permission from local authorities, and participant recruitment. During the second visit, baseline data including demographic details and pre-intervention assessment were collected. The third visit included the first structured health education session. The fourth visit consisted of reinforcement of educational content, interactive discussion, and distribution of informational leaflets. The fifth visit involved post-intervention assessment and collection of participant feedback.

The study population comprised women of reproductive age (21–45 years) residing in the selected community. A total of 20 participants were included in the study. The sample size was determined based on feasibility and the exploratory nature of this pilot community-based study. Participants were recruited using purposive sampling with the assistance of a local health worker. Women who were residents of the study area, aged between 21 and 45 years, and willing to provide informed consent were included. Those who were seriously ill or unable to participate in group activities were excluded.

Data were collected using standardized tools. Awareness regarding folic acid was assessed using the Folic Acid Awareness Questionnaire (FAA-Q), a 15-item validated instrument with a scoring range of 0–15 and good internal consistency (Cronbach's $\alpha = 0.89$). Personal hygiene practices were evaluated using the Personal Hygiene Practice Scale (PHPS), a checklist assessing behaviors such as handwashing, bathing, menstrual hygiene, and hygiene during pregnancy (Cronbach's $\alpha = 0.84$). A demographic data sheet was used to collect information on age, education, occupation, parity, and source of health information. An attendance and feedback register was maintained to document participation and qualitative responses.

The intervention consisted of two structured health education sessions, each lasting approximately 30–45 minutes, delivered during the third and fourth visits. The sessions included information on neural tube defects, the importance of folic acid supplementation, recommended timing and dosage, and dietary sources of folate. Additional components focused on personal hygiene practices relevant to maternal health, including proper handwashing techniques, menstrual hygiene, safe food handling, and infection prevention during pregnancy. Educational materials such as flipcharts, posters, and leaflets in Hindi and English were used to enhance understanding. Demonstrations and interactive question-and-answer sessions were conducted to encourage participant engagement and clarify misconceptions. Reinforcement was provided through follow-up discussions and distribution of educational materials.

Data collection was carried out in three phases: baseline assessment (pre-test), intervention, and post-intervention assessment. During the second visit, participants completed the demographic form, FAA-Q (pre-test), and PHPS (pre-test). Following the intervention sessions, the same tools were re-administered during the fifth visit to assess changes in awareness and practices.

Participation in the study was voluntary. Informed consent was obtained from all participants prior to data collection, and confidentiality of the collected information was maintained throughout the study.

Data Description

A total of 20 women of reproductive age (21–45 years) participated in the study, with a mean age of 30.2 ± 6.8 years. All participants completed both pre- and post-intervention assessments with no dropouts. Baseline findings indicated low to moderate awareness regarding folic acid supplementation and personal hygiene practices, with scope for improvement.

The study utilized two assessment tools to evaluate awareness and practices among participants. The Folic Acid Awareness Questionnaire (FAA-Q) consisted of 15 items, with each correct response scored as 1 and incorrect response as 0, yielding a total score range of 0 to 15. Higher scores indicated better awareness. Based on the total score, participants were categorized as having poor (0–5), moderate (6–10), or good (11–15) awareness.

The Personal Hygiene Practice Scale (PHPS) comprised 22 items based on a three-point Likert scale with response options "Always," "Sometimes," and "Never," scored as 2, 1, and 0 respectively. The total score ranged from 0 to 44, with higher scores indicating better hygiene practices. Participants were classified into poor (0–14), moderate (15–29), and good (30–44) hygiene practice levels based on their total scores.

Table 1: Participant-wise Pre- and Post-Intervention Scores
(n = 20)

S. No.	Age	Gender	FAA-Q Pre	FAA-Q Post	PHPS Pre	PHPS Post
1	22	Female	4	12	18	34
2	38	Female	5	13	20	36
3	35	Female	3	11	17	33
4	21	Female	4	12	16	32
5	27	Female	5	13	19	35
6	22	Female	4	12	18	34
7	29	Female	6	14	22	38
8	30	Female	5	13	20	36
9	42	Female	3	11	16	31
10	37	Female	4	12	18	34
11	29	Female	5	13	19	35
12	28	Female	4	12	18	34
13	28	Female	5	13	20	36
14	45	Female	3	10	15	30
15	22	Female	4	12	18	34
16	38	Female	5	13	20	36
17	23	Female	4	12	18	34
18	27	Female	5	13	19	35
19	30	Female	6	14	22	38
20	31	Female	4	12	18	34

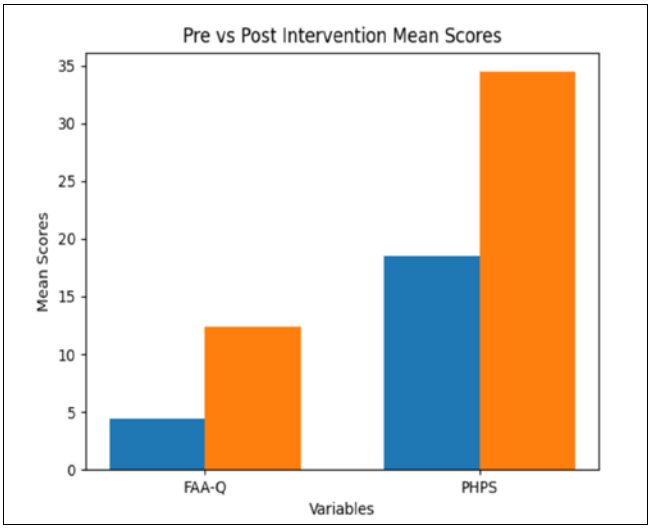
Result

The results of the study demonstrated a marked improvement in both awareness and hygiene practices following the intervention. The mean FAA-Q score increased from 4.40 in the pre-intervention phase to 12.35 post-intervention, indicating enhanced awareness regarding folic acid. Similarly, the mean PHPS score improved from 18.55 to 34.45, reflecting better hygiene practices among participants. The mean differences of 7.95 and 15.90 for FAA-Q and PHPS respectively indicate a substantial positive impact of the educational program. Overall, the findings suggest that the intervention was effective in improving knowledge and practices among the study participants.

Variable	Pre-Intervention Mean	Post-Intervention Mean	Mean Difference
FAA-Q (Awareness)	4.40	12.35	7.95
PHPS (Hygiene Practices)	18.55	34.45	15.90

Interpretation

The results show a clear improvement in both awareness and hygiene practices after the intervention. The increase in mean FAA-Q and PHPS scores indicates that the educational program was effective in enhancing knowledge and promoting better health practices among participants.



Discussion

The present community-based awareness program demonstrated a positive impact on improving knowledge and practices related to folic acid supplementation and personal hygiene among women of reproductive age in Bisrakh village, Greater Noida. The findings indicate that structured, interactive educational interventions can effectively address gaps in maternal health awareness, particularly in rural and semi-urban settings.

A key strength of this program was the use of interactive teaching methods and visual aids, which facilitated better understanding and active participation among participants. Delivering information in simple, locally understandable language further enhanced comprehension, especially among women with low literacy levels. Additionally, the involvement of the local community and repeated follow-up visits contributed significantly to improved engagement, retention of information, and reinforcement of healthy practices.

Despite these positive outcomes, certain limitations were observed. The relatively small sample size and short duration of the program restricted the generalizability and long-term impact assessment of the findings. Furthermore, cultural hesitations and taboos surrounding personal and menstrual hygiene posed initial challenges in open discussion, highlighting the need for culturally sensitive communication strategies.

The results of this study are consistent with global public health recommendations, including those of the World Health Organization and the Centers for Disease Control and Prevention, which emphasize the importance of folic

acid supplementation and hygiene practices in preventing neural tube defects and improving maternal health outcomes. Moreover, the program aligns with Sustainable Development Goal 3, reinforcing the role of community-based interventions in achieving broader health targets.

Based on the findings, it is recommended that similar awareness programs be expanded to nearby communities and educational institutions. Integration of such health education initiatives into routine maternal healthcare services delivered by frontline workers, such as ANMs and ASHAs, could further enhance outreach and sustainability.

Conclusion

The community awareness program on the importance of folic acid supplementation and personal hygiene proved to be effective in improving both knowledge and practices among women of reproductive age in Bisrakh village, Greater Noida. The intervention resulted in a measurable enhancement in participants' understanding of the role of folic acid in preventing neural tube defects, including its correct timing and dietary sources, along with improved personal and menstrual hygiene behaviors.

The study highlights that culturally appropriate, interactive, and community-oriented health education strategies can bring about meaningful behavioral changes even within a short duration. However, the presence of limitations such as small sample size, time constraints, and socio-cultural barriers underscores the need for larger-scale and long-term interventions.

In conclusion, the program successfully achieved its objectives of raising awareness and promoting preventive health practices, while aligning with global maternal health priorities set by the World Health Organization and the Sustainable Development Goal 3. Sustained efforts through continuous education, community engagement, and integration with existing healthcare services are essential to maintain and expand the positive outcomes observed in this study.

Summary

This community-based study aimed to assess and improve awareness among women of reproductive age regarding the importance of folic acid supplementation and personal hygiene in preventing neural tube defects in Bisrakh village, Greater Noida. A structured educational intervention was conducted using interactive sessions, visual aids, and simple local language to ensure better understanding among participants.

Baseline assessment revealed limited knowledge about the role, timing, and sources of folic acid, along with gaps in personal and menstrual hygiene practices. Following the intervention and subsequent follow-up visits, a noticeable improvement was observed in participants' knowledge and health-related behaviors. Women demonstrated better awareness of folic acid intake before and during early pregnancy, as well as improved hygiene practices.

The study highlights the effectiveness of community-based health education in promoting maternal health awareness, even within a short duration and resource-limited setting. It also reinforces the importance of culturally appropriate communication and community involvement in achieving positive behavioral change. The findings align with global recommendations by the World Health Organization and support the objectives of Sustainable Development Goal 3.

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