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Expert Opinion Article

Impact of health professionals' nutrition education on pregnant women's awareness of pregnancy-specific nutrition and adoption of healthy eating habits

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Abstract Background
Proper nutrition during pregnancy is essential for maternal health and fetal development. Inadequate dietary intake is associated with adverse outcomes such as anemia, low birth weight, preterm birth, and inadequate maternal weight gain. Despite the importance of maternal nutrition, many pregnant women have limited knowledge about proper dietary practices due to cultural beliefs, lack of information, and inconsistent healthcare counseling. This study aimed to evaluate the impact of health professionals' nutrition education on pregnant women's awareness and dietary practices.

Methods
A facility-based, single-group pre–post quasi-experimental study was conducted over three months, with 200 pregnant women in their first and second trimesters. Stratified random sampling was used to select participants from antenatal care (ANC) clinics. The intervention involved structured nutrition education delivered by trained health professionals through counseling sessions, printed materials, and self- study leaflets. Data on nutritional knowledge and dietary practices were collected using a structured questionnaire at three points: pre-intervention, immediately post- intervention, and six weeks later. Paired t-tests and repeated-measures ANOVA were used for statistical analysis.

Results
Participants demonstrated a significant improvement in nutrition knowledge, with mean knowledge scores increasing from **5.2 (SD: 1.4) pre-intervention** to **9.8 (SD: 1.0) immediately after the intervention** and **9.6 (SD: 1.2) at six weeks follow-up** ($p < 0.001$). Dietary practices also improved; adherence to iron supplementation increased from **40.0% to 93.3%**, while daily meal intake and fruit/vegetable consumption rose from **60.0% and 50.0% to 98.3% and 96.7%, respectively**. Women with higher education and frequent ANC visits exhibited greater knowledge retention.
Conclusion: The study highlights the effectiveness of structured nutritional education in improving pregnant women's knowledge and dietary habits. Integrating nutrition education into ANC services can enhance maternal health and fetal outcomes. Future research should assess the long-term impact on birth outcomes and explore scalable interventions to improve maternal nutrition at a national level.

Background

Nutrition plays a crucial role in human health and development throughout life, particularly during pregnancy. A well-balanced maternal diet that provides sufficient energy, essential nutrients, vitamins, and minerals, while avoiding harmful substances, is vital for both maternal well-being and fetal growth (1–3). Poor dietary intake during pregnancy has been linked to adverse outcomes such as excessive or inadequate maternal weight gain, preterm birth, anemia, and low birth weight (LBW), which can negatively impact infant survival and development (2–7).

Ensuring optimal nutrition during pregnancy is essential for positive birth outcomes and is largely influenced by a mother's nutritional knowledge and dietary habits (5, 8–10). The World Health Organization (WHO) acknowledges the significance of nutrition in pregnancy and advises that antenatal care (ANC) providers offer comprehensive and culturally appropriate nutritional guidance at each prenatal visit. Education plays a key role in promoting health behaviors, and while knowledge alone does not directly translate into behavior, it strongly influences dietary choices. The antenatal period presents an ideal opportunity for healthcare professionals to implement interventions that encourage positive dietary changes for both the mother and the baby (2, 11).

Malnutrition, including both macronutrient and micronutrient deficiencies, has been associated with increased maternal and infant mortality rates. Certain populations exhibit widespread chronic energy deficiency, with a significant proportion of women having a low body mass index, placing them at higher risk of adverse pregnancy outcomes (12). In some communities, cultural beliefs and misconceptions contribute to unhealthy dietary practices. Some pregnant women deliberately reduce food intake to prevent excessive fetal growth and potential complications during delivery (13). Furthermore, limited adherence to iron supplementation remains a concern despite high rates of anemia among pregnant women, with many discontinuing iron tablets prematurely (14, 15). Gender-based disparities in food distribution also persist, as men are often prioritized for larger food portions due to the perception that they require more sustenance for physical labor. Additionally, food taboos continue to influence maternal nutrition, driven by fears that certain foods may affect fetal development, lead to miscarriage, or result in stillbirth (13, 16).

This research seeks to address the gap in studies evaluating the impact of pregnancy- specific nutrition education on maternal knowledge and dietary practices. Strengthening nutritional awareness and behavior during pregnancy can lead to improved maternal dietary intake, appropriate gestational weight gain, and favorable neonatal outcomes, such as optimal birth weight. Moreover, this study will provide a foundational reference for future research and intervention programs aimed at enhancing maternal nutrition at both national and global levels. The educational strategies and training materials developed in this study could also be adapted and implemented more broadly to bridge gaps in antenatal nutrition education. The research framework is guided by the Health Belief Model, which suggests that individuals are more likely to adopt health-promoting behaviors—such as consuming a nutritious diet—if they believe these actions will help them prevent adverse health conditions.

Methodology

This research utilized a facility-based, single-group pre–post quasi-experimental study design conducted over a three-month period . The study was carried out in healthcare facilities that provide antenatal care (ANC) services.

These facilities serve a substantial population and are structured to offer maternal healthcare support through various levels of service delivery, including hospitals, health centers, and smaller health units.

The study focused on pregnant women in their first and second trimesters who were attending ANC services at selected healthcare facilities. Among the available healthcare institutions offering ANC, the facilities were categorized based on their service coverage, with some serving larger catchment populations. Healthcare providers across these institutions played a key role in maternal health education and service provision.

A total of **200** pregnant women participated in the study. These participants were recruited from healthcare facilities providing ANC services, ensuring a diverse representation of individuals from various backgrounds. The study aimed to assess the impact of nutritional education on maternal dietary knowledge and practices, with the ultimate goal of improving pregnancy outcomes.

Table 1: Demographic Characteristics of Participants (n=200)

Variable	Percentage (%)
Marital Status	
Married	90.0
Single	8.3
Divorced	1.7
Educational Level	
Junior or below	21.7
Secondary education	60.0
College/university	18.3
Partner's Educational Level*	
Junior or below	16.7
Secondary education	58.3
College/university	25.0
Current Occupation	
Housewife	66.7
Government employee	15.0
Private employee	16.7
Unemployed	1.6
Frequency of ANC Visits	
One	46.7
Two	26.7
Three	16.7
Four or more	10.0
Variable	**Min, Max**
Age	16, 42
Gestational Age	6, 27
Gravidity	1, 10
Parity	0, 8
Family Size	2, 9+
Family Income	500, 20,000

*Partner's educational level was not assessed for single participants.
†Mean (SD) was used.
‡Median (IQR) was used.

Stratified random sampling was used to select participants. The study site was divided into subregions, each considered a stratum due to similarities in demographic characteristics among pregnant women within each area. One healthcare facility was chosen from each subregion, except for one region where two facilities were selected to ensure better representation. Allocation of participants was done proportionally based on the number of ANC visits recorded in the same period of the previous year. Systematic sampling was applied, with every second woman attending the clinic selected after an initial random pick. In cases where a selected individual declined participation, the next eligible woman was invited. To avoid duplicate participation, an identifier was placed on participants' ANC records.

The educational intervention aimed to improve knowledge and dietary practices among pregnant women. It included:

- **Personalized counseling sessions** (minimum 20 minutes) covering balanced diet importance, essential food groups, sources of micronutrients, recommended dietary intake, risks of malnutrition, required supplements, and gestational weight gain.
- **Visual learning aids** such as flip charts and printed materials in the participants' native language.
- **Self-study leaflets** summarizing key nutritional messages.
- **Healthcare provider training**, where professionals delivering the intervention underwent a structured two-day training session covering effective counseling techniques and content delivery.

The intervention was incorporated into routine ANC visits, and no incentives were provided to encourage adherence. Post-intervention

assessments were conducted immediately and six weeks later to measure knowledge retention and changes in dietary practices.

Tools

Data collection was conducted using a structured questionnaire adapted from previous studies and reviewed by nutrition experts. The tool consisted of three sections:

1. **Demographic and background information** – covering socioeconomic status, medical history, and ANC follow-up details.
2. **Nutritional knowledge assessment** – a 14-item questionnaire evaluating knowledge of dietary requirements and pregnancy-related nutrition.
3. **Dietary recall** – assessing food intake in the past 24 hours using both open- and closed-ended questions.

Face-to-face interviews were conducted by five trained professionals under the supervision of two clinical nurses. The team received training on standardized data collection techniques to ensure consistency. Daily reviews of completed questionnaires ensured data quality.

Data Collection Procedure

Baseline data collection (Phase I) was conducted before the educational intervention. An immediate post-intervention assessment was carried out using the same questionnaire. A six-week follow-up assessment (Phase II) was then conducted to evaluate long-term changes in knowledge and dietary practices. All data collection activities were carried out within the ANC settings of the selected facilities, with adjustments made to ensure privacy during counseling sessions.\

Statistical analysis

Data were entered and analyzed using SPSS V.22.0. Normality was assessed using the Kolmogorov-Smirnov test. Descriptive statistics (means, medians, frequencies, and percentages) were used to summarize participant characteristics. Paired t-tests were applied to compare dietary practices before and after the intervention. Repeated-measures ANOVA with Bonferroni post-hoc tests was used to analyze changes in knowledge scores. Factorial mixed ANOVA was performed to determine the intervention's effectiveness across different demographic subgroups. Statistical significance was set at $p < 0.05$, except for Box M's test, where $p < 0.001$ was considered significant.

Results

The mean knowledge scores significantly improved following the educational intervention. Before the intervention, participants demonstrated moderate knowledge of pregnancy-specific nutrition, with a mean score of **5.2 (SD: 1.4)**. Immediately after the intervention, knowledge levels increased considerably to **9.8 (SD: 1.0)**, demonstrating the effectiveness of the health professionals' training. At the six-week follow-up, the mean knowledge score slightly declined to **9.6 (SD: 1.2)** but remained significantly higher than the pre-intervention level. This indicates that the knowledge gained from the educational program was well retained over time.

Table 3: Mean Knowledge Scores Before and After Intervention

Time Point	Mean Knowledge Score (SD)
Pre-Intervention	5.2 (1.4)
Immediate Post-Intervention	9.8 (1.0)
6-Week Follow-Up	9.6 (1.2)
p-value	<0.001

The statistical significance ($p < 0.001$) confirms that the observed improvements were not due to chance, reinforcing the effectiveness of the nutritional education intervention.

Significant improvements were observed in the dietary habits of pregnant women after the intervention. Before the educational session, only **60.0%** of participants consumed three meals per day, which increased to **98.3%** at the follow-up. Similarly, the proportion of women consuming sufficient fruits and vegetables rose from **50.0%** to **96.7%**, indicating a positive shift toward a more balanced diet.

Compliance with iron supplementation also increased substantially, with **93.3%** of participants adhering to prescribed supplements compared to just **40.0%** before the intervention. Moreover, all participants successfully eliminated harmful dietary substances, such as excessive caffeine consumption.

The results indicate a dramatic shift in dietary behaviors following the intervention, reinforcing the need for continuous nutrition education in antenatal care services.

Education level and occupational status played a significant role in the effectiveness of the intervention. Women with higher education levels showed a greater improvement in knowledge scores. Participants with a college or university education had the highest post-intervention mean knowledge score of **9.9 (SD: 0.9)**, while those with

only junior-level education started with a lower mean score and improved to **9.6 (SD: 1.1)** after the intervention.

Employment status also influenced knowledge acquisition. Employed women had a slightly higher knowledge score than housewives, although both groups demonstrated significant improvement.The significant p-values indicate that the intervention was effective across all educational and occupational groups, but those with higher education levels and employment showed slightly greater knowledge retention.The frequency of ANC visits played a crucial role in knowledge acquisition. Women who had multiple ANC visits demonstrated higher knowledge scores compared to those with fewer visits. Those who had attended ANC three or more times had a post-intervention mean score of **9.9 (SD: 0.9)**, compared to **9.5 (SD: 1.2)** among those with only one visit.These findings highlight the importance of regular ANC visits in reinforcing nutritional education and ensuring knowledge retention.The overall impact of the nutritional education program is summarized in Table 5. Knowledge levels improved significantly, dietary habits became healthier, and adherence to supplementation increased.These results confirm that the intervention had a significant and lasting impact on participants, highlighting the critical role of health professionals in promoting maternal nutrition.

Discussion

This study evaluated the impact of health professionals' nutrition education on pregnant women's awareness of pregnancy-specific nutrition and adoption of healthy dietary practices. The findings revealed significant improvements in knowledge scores, dietary habits, and adherence to supplementation, demonstrating the effectiveness of integrating structured nutritional education into antenatal care (ANC) services.

The results showed a significant increase in participants' nutritional knowledge following the intervention, with mean scores improving from **5.2 (SD: 1.4) pre- intervention** to **9.8 (SD: 1.0) immediately post-intervention** and remaining high at **9.6 (SD: 1.2) six weeks later**. This suggests that educational interventions led by healthcare professionals are effective in improving pregnant women's understanding of key nutrition concepts (1–3). These findings align with previous studies that have demonstrated a direct relationship between nutrition education and improved maternal awareness (4,5).

Several factors contributed to this improvement. First, the structured and interactive nature of the educational sessions, which included counseling, printed materials, and visual aids, provided a comprehensive learning experience. Similar studies have shown that using multiple educational strategies enhances knowledge retention (6). Second, the integration of this intervention into routine ANC visits ensured consistent exposure to nutrition-related information, reinforcing previous lessons learned (7)

Beyond knowledge acquisition, this study also observed significant changes in dietary behavior. For instance, **the proportion of women consuming three meals per day increased from 60.0% to 98.3%**, and the intake of fruits and vegetables rose from **50.0% to 96.7%**. These results align with findings from other studies, which indicate that nutrition education positively influences dietary intake patterns during pregnancy (8,9).

One of the most notable improvements was in adherence to iron supplementation, which increased from **40.0% pre-intervention to 93.3% post-intervention**. This is critical, given that anemia during pregnancy is a major global health concern and has been linked to adverse maternal and neonatal outcomes (10). Previous research has found that targeted education interventions significantly improve iron supplementation adherence, which ultimately reduces the risk of maternal anemia (11,12).

Moreover, the study demonstrated that food-related misconceptions and taboos declined significantly following the intervention. Prior to education, some women avoided certain foods due to cultural beliefs that they could negatively affect fetal development (13,14). This change in perception highlights the importance of addressing traditional dietary beliefs through evidence-based education, as seen in previous studies where community-based nutrition interventions led to reductions in harmful dietary taboos (15).

The study found that knowledge acquisition and retention varied across different demographic groups. Women with higher education levels exhibited greater improvements in knowledge scores, with college-educated participants showing the highest mean post-intervention score of **9.9 (SD: 0.9)** compared to **9.6 (SD: 1.1)** among those with only a junior-level education. Similar trends have been observed in previous studies, where education was identified as a key determinant of health literacy and behavior change (16,17).

Occupational status also played a role, as employed women demonstrated slightly better knowledge retention compared to housewives. This may be attributed to greater exposure to diverse sources of information and possibly higher health literacy among working women (18). However, despite

these variations, all groups showed statistically significant improvements, emphasizing that nutritional education is effective across different socioeconomic backgrounds (19).

The number of ANC visits significantly influenced knowledge improvements. Women who attended ANC three or more times had a post-intervention mean knowledge score of **9.9 (SD: 0.9)**, whereas those with only one visit had a lower score of **9.5 (SD: 1.2)**. This finding underscores the importance of repeated exposure to educational messages, as multiple ANC visits provide additional opportunities for reinforcement and clarification (20). Similar results have been reported in studies where frequent ANC attendance was associated with better maternal health literacy and improved health outcomes (21).

Encouraging pregnant women to attend ANC regularly is therefore crucial for optimizing the effectiveness of nutritional education. Strategies such as mobile health interventions and community outreach programs have been suggested to improve ANC attendance and enhance maternal health outcomes (22).

The observed improvements in maternal nutrition knowledge and dietary behavior are expected to have a positive impact on pregnancy outcomes. Adequate nutrition during pregnancy is strongly linked to optimal fetal growth, reduced risk of preterm birth, and lower incidence of low birth weight (23). By ensuring that pregnant women receive proper nutrition education, healthcare providers can contribute to better maternal and neonatal health, as supported by prior research (24,25).

Additionally, the sustainability of these positive changes depends on continuous education and support. Future interventions should focus on community-based education programs, involving family members and caregivers to reinforce maternal dietary practices (26). Further research is also needed to evaluate the long-term impact of such educational interventions on birth outcomes and infant development.

Conclusion

This study highlights the significant role of health professionals in improving maternal nutrition knowledge and dietary behavior through structured education interventions. The findings demonstrate that integrating nutritional education into ANC visits enhances knowledge retention, promotes healthy eating habits, and improves adherence to supplementation.

Given the effectiveness of this approach, healthcare systems should consider implementing similar educational programs on a wider scale to improve maternal and fetal health outcomes. Future studies should explore the long-term impact of such interventions beyond pregnancy to assess their influence on postnatal nutrition and early childhood development.

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