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Nutritional intake among mothers' delivered pre-term babies in a tertiary care hospital

Shahina Akther[1], Rukshana Khan[1], Rebeka Sultana[1], Tahmina Sharmin[2], Yeasmin Akter[2]

[1]Department of Obstetrics and Gynaecology, Jalalabad Ragib-Rabeya Medical College, Sylhet, Bangladesh, [2]Department of Obstetrics and Gynaecology, Jalalabad Ragib-Rabeya Medical College Hospital, Sylhet, Bangladesh

Address for correspondence: Dr. Shahina Akther, Associate Professor, Department of Obstetrics and Gynaecology, Jalalabad Ragib-Rabeya Medical College, Sylhet, Bangladesh. E-mail: rumi7384@gmail.com

Abstract

Introduction: Pre-term birth remains a major cause of neonatal morbidity and mortality in Bangladesh. Maternal nutrition is a key determinant of pregnancy outcomes, yet dietary practices and supplement adherence remain inadequately addressed in many settings. The present study aimed to evaluate the dietary diversity, micronutrient supplementation, and nutritional status of pregnant women with pre-term births at a tertiary hospital in Bangladesh.

Methods: This prospective observational study included 357 pregnant women in their third trimester (29 to <37 weeks) who delivered pre-term at Jalalabad Ragib-Rabeya Medical College Hospital, Sylhet, from July 2023 to June 2024. Data on demographic characteristics, dietary intake (using the minimum dietary diversity for women-W method), and supplement use were collected through structured interviews. Maternal nutritional status was assessed through body mass index and mid-upper arm circumference.

Results and Discussion: Among the participants, moderate to late pre-term births (33–36 weeks) accounted for 64.1% of cases, while 35.9% were early pre-term (29–32 weeks). Less than half of the participants reported adequate intake of fruits (40.9%), vegetables (40.6%), or protein-rich foods (43.7%). However, supplement adherence was relatively high, with over 78% of women reporting regular use of folic acid, iron, calcium, and multivitamins.

Conclusion: A significant portion of participants came from low-income households, reflecting the socioeconomic challenges influencing maternal nutrition. Despite strong compliance with antenatal supplementation, maternal dietary diversity remained suboptimal. Improved dietary counseling, better food access, and socioeconomic support are essential to reduce the burden of pre-term births in Bangladesh.

Keywords: Calcium intake, dietary diversity, folic acid, iron supplementation, maternal nutrition, pre-term birth

Introduction

Preterm birth, defined as birth occurring before 37 completed weeks of gestation, remains one of the most significant public health challenges worldwide, contributing to substantial neonatal morbidity, mortality, and long-term health complications.[1] Globally, an estimated 15 million infants are born pre-maturely each year, accounting for approximately one-third of neonatal deaths.[2] The burden of pre-term births is particularly severe in low- and middle-income countries (LMICs), where inadequate maternal healthcare, nutritional deficiencies, and socioeconomic disparities exacerbate the risk of adverse birth outcomes.[3] Bangladesh, with its high prevalence of pre-term births, faces a considerable neonatal health crisis, with recent data indicating a pre-term birth rate of

approximately 19% – one of the highest in South Asia.[4] The economic and healthcare burden of preterm births in Bangladesh is immense, straining healthcare resources and leading to increased hospitalizations, neonatal intensive care unit admissions, and long-term developmental impairments among affected infants.[5] Addressing this issue necessitates a multifaceted approach, particularly through nutritional interventions during pregnancy, which have shown promise in reducing pre-term birth rates and improving maternal and fetal health outcomes.[6] Maternal nutrition plays a critical role in fetal development, influencing pregnancy outcomes through its impact on placental function, fetal growth, and gestational duration.[7] Deficiencies in key nutrients, such as folic acid, iron, calcium, omega-3 fatty acids, and protein, have been associated with an increased risk of placental insufficiency, inflammation, oxidative stress, and early labor.[8] For instance, iron and folic acid supplementation has been shown to reduce the incidence of pre-term births by improving maternal hemoglobin levels and reducing the risk of anemia-related complications.[4] Similarly, omega-3 fatty acid supplementation has been found to prolong gestational duration by 4–4.5 days on average, thereby reducing the likelihood of early pre-term birth (Harris *et al*., 2015). Furthermore, maternal zinc and calcium intake have been linked to lower risks of hypertensive disorders, a common contributor to pre-term labor.[9] Despite this growing body of evidence, nutritional deficiencies remain widespread among pregnant women in Bangladesh, largely due to food insecurity, poverty, and cultural dietary restrictions.[10] Bangladesh presents a unique set of challenges in maternal nutrition, which directly contribute to adverse pregnancy outcomes, including pre-term births. Household food insecurity, dietary deficiencies, and socio-cultural food taboos significantly restrict the availability and consumption of nutrient-rich foods among pregnant women.[11] A qualitative study on food taboos in Bangladesh found that pregnant women commonly avoid essential animal-source foods, such as fish, duck meat, and mutton, as well as certain fruits, such as papayas and pineapples, due to traditional beliefs associating them with fetal abnormalities and miscarriage.[11] These restrictive dietary practices, combined with inadequate access to diverse foods, contribute to micronutrient deficiencies, worsening maternal health, and increasing the likelihood of pre-term labor.[10] In addition, limited access to maternal healthcare and inadequate antenatal nutrition counseling further compound the problem, as many pregnant women remain unaware of the importance of balanced nutrition in preventing pre-term births.[12] The high prevalence of maternal anemia, underweight status, and poor gestational weight gain in Bangladesh underscores the urgent need for effective, culturally sensitive nutritional interventions.[4] In response to these challenges, various maternal nutrition programs and policies have been implemented in Bangladesh, yet significant gaps remain in their coverage and effectiveness. The national nutrition programme and Health Sector Support Project have aimed to improve maternal and child health through micronutrient supplementation and dietary counseling, but their reach remains limited due to financial constraints and implementation barriers.[13] A community-based maternal nutrition intervention in Bangladesh demonstrated that integrating nutrition-focused counseling, providing free micronutrient supplements, and ensuring weight-gain monitoring significantly improved maternal dietary diversity and micronutrient intake.[4] However, exclusive breastfeeding and dietary adherence post-intervention remained suboptimal, suggesting the need for more sustainable, behavior-focused strategies.[14] Mobile-based nutrition interventions and cash transfer programs have also been piloted to encourage maternal dietary improvements, with promising results showing increased food expenditure and improved pregnancy outcomes.[15] Despite these efforts, persistent nutritional gaps in rural and low-income urban communities highlight the need for further research to optimize and scale these interventions. Given the high burden of pre-term births in Bangladesh and the strong association between maternal nutrition and pregnancy outcomes, this study aims to evaluate the effectiveness of specific nutritional interventions in reducing pre-term birth rates in Bangladesh.

By identifying key maternal dietary deficiencies, assessing the impact of present nutrition programs, and exploring culturally appropriate strategies to enhance dietary practices, this research seeks to provide evidence-based recommendations for improving maternal nutrition policies and reducing the incidence of pre-term births. The study is particularly relevant in the Bangladeshi context, where maternal nutrition remains a largely overlooked determinant of pregnancy outcomes, despite clear global evidence supporting the role of dietary interventions in preventing pre-term labor.[16] This study aims to evaluate the impact of maternal nutrition on the risk of pre-term birth among pregnant women in Bangladesh. By assessing dietary diversity, micronutrient supplementation, and maternal body mass index (BMI), the study seeks to identify key nutritional determinants of pre-term birth and provide evidence-based recommendations for improving maternal health interventions.

Methods

This prospective observational study was conducted at the Maternity Department of Jalalabad Ragib-Rabeya Medical College Hospital, Sylhet, Bangladesh, over a 12-month period from July 2023 to June 2024. The primary objective was to assess the impact of maternal nutrition on the risk of pre-term birth. A total of 357 pregnant women in their third trimester (29 to <37 completed weeks of gestation) were enrolled. All participants presented with pre-term labor and subsequently delivered at the study hospital. Inclusion criteria comprised women in their third trimester with a confirmed diagnosis of pre-term labor (gestational age between 29 and <37 weeks), singleton pregnancy, and willingness to provide informed consent. Women with chronic illnesses that could independently influence pre-term birth risk – such as diabetes mellitus, chronic hypertension, renal disease – as well as those with fetal anomalies or multiple gestations, were excluded. Data collection was performed using a structured and pre-validated questionnaire to obtain information on demographic and socioeconomic characteristics, dietary intake patterns, and supplementation history. Gestational age at delivery was obtained from medical records, confirmed by early ultrasound or last menstrual period. Nutritional assessment included dietary diversity scoring using the minimum dietary diversity for women (MDD-W) tool, based on the number of food groups consumed in the previous 24 h. The MDD-W scoring encompassed ten food groups: (1) Grains, roots, and tubers; (2) legumes and pulses; (3) nuts and seeds; (4) dairy; (5) meat, poultry, and fish; (6) eggs; (7) dark green leafy vegetables; (8) vitamin A-rich fruits and vegetables; (9) other vegetables; and (10) other fruits. A dietary diversity score of at least five indicated adequate dietary diversity, while scores below five were categorized as low diversity. Micronutrient supplementation data were collected for folic acid, iron, calcium, and multivitamin use. Maternal nutritional status was assessed through BMI, calculated from either early pregnancy records or recalled pre-pregnancy weight and height. Mid-upper arm circumference (MUAC) was also measured at enrollment. Descriptive statistics were used to summarize participant characteristics, nutritional indicators, and pregnancy outcomes. Correlation analyses (Pearson or Spearman, as appropriate) were conducted to explore the association between nutritional factors and pre-term birth risk. Multivariate logistic regression analysis was applied to identify independent nutritional and sociodemographic predictors of pre-term birth. Statistical analyses were performed using the Statistical Package for the Social Sciences version 26.0, and a $P < 0.05$ was considered statistically significant.

Results

The study included 357 pregnant women in their third trimester who delivered at the study hospital. Most participants (57.3%) were between 20 and 30 years of age, followed by 22.5% who were below 20 years and 20.2% above 30 years. In terms of educational background, 37.5% had completed secondary education, 32.3% had primary education, 21.2% had higher education, while 9.0% had no formal education. Socioeconomic status was skewed toward the lower-income group (40.0%),

with 38.3% in the middle-income category and 21.7% in the high-income group. Employment status was nearly balanced, with 50.8% of women being employed and 49.2% unemployed. These findings highlight the diverse sociodemographic background of the study population and underscore the influence of educational and economic disparities on maternal health [Table 1].

The present BMI showed a mean of 28.98 kg/m^2 (standard deviation [SD] = 5.16), ranging from 20.03 to 37.92 kg/m^2, reflecting gestational weight gain. In addition, the mean MUAC was 28.44 cm (SD = 3.82), with values ranging from 22.00 cm to 34.97 cm, indicating variations in maternal nutritional reserves [Table 2].

Table 1: Sociodemographic characteristics of the study population (*n*=357)

Sociodemographic characteristics	Frequency (*n*)	Percentage
Maternal age		
<20	80	22.5
20–30	205	57.3
>30	72	20.2
Education level		
No education	32	9.0
Primary	115	32.3
Secondary	134	37.5
Higher	76	21.2
Socioeconomic status		
Low	143	40.0
Middle	137	38.3
High	77	21.7
Employment status		
Employed	181	50.8
Unemployed	176	49.2

Table 3 presents the proportion of participants who reported adequate consumption of key dietary components and adherence to antenatal supplement use. Among the 357 pregnant women assessed, dietary diversity was suboptimal across all food groups. Only 40.9% of participants reported adequate fruit intake, while 40.6% consumed sufficient vegetables. Protein intake, primarily from meat and legumes, was adequate in 43.7% of participants, whereas 45.1% met the recommended levels for dairy products. Grains and cereals were adequately consumed by 44.3% of the study population. In terms of micronutrient supplementation, adherence was relatively higher: 79.0% of women reported regular use of folic acid and calcium supplements, while 80.4% adhered to iron supplementation. Multivitamin use was reported by 78.2% of participants. These findings indicate a clear gap in achieving minimum dietary diversity, despite moderately high compliance with prescribed antenatal supplements. This highlights the need for comprehensive nutritional counseling in addition to supplement distribution in antenatal care settings.

Among the 357 participants, 64.1% delivered between 33 and 36 weeks of gestation, corresponding to moderate to late pre-term births. The remaining 35.9% delivered between 29 and 32 weeks, representing early pre-term births. This distribution highlights that a majority of pre-term deliveries in the study population occurred in the later third trimester, which may offer a greater window of opportunity for nutritional and clinical interventions to improve neonatal outcomes [Table 4].

Discussion

The findings of this study underscore the importance of maternal nutrition in shaping pregnancy

Table 2: Nutritional status of participants (*n*=357)

Parameter	Mean	Standard deviation	Minimum	25%	Median	75%	Maximum
Present BMI (kg/m^2)	28.98	5.16	20.03	24.65	29.18	33.33	37.92
MUAC (cm)	28.44	3.82	22.00	25.43	28.29	31.90	34.97

BMI: Body mass index, MUAC: Mean mid-upper arm circumference

Table 3: Dietary diversity and supplement use (*n*=357)

Factor	Adequate consumption (*n*)	Adequate consumption (%)
Fruits	146	40.9
Vegetables	145	40.6
Proteins (meat/legumes)	156	43.7
Dairy products	161	45.1
Grains/cereals	158	44.3
Folic acid supplementation	282	79.0
Iron supplementation	287	80.4
Calcium supplementation	282	79.0
Multivitamin use	279	78.2

Table 4: Gestational age of participants (*n*=357)

Gestational age at birth (weeks)	Frequency (*n*)	Percentage
33–36	229	64.1
29–32	128	35.9

outcomes, particularly in relation to pre-term birth. Among the study population of 357 women in their third trimester who experienced pre-term delivery, a notable 64.1% gave birth between 33 and 36 weeks of gestation, while 35.9% delivered between 29 and 32 weeks. This pattern highlights the predominance of moderate to late pre-term births in this population, reflecting a critical window during which nutritional and antenatal interventions could be most impactful.

Dietary diversity among participants was found to be markedly suboptimal. Less than half of the women reported adequate consumption of key food groups, including fruits (40.9%), vegetables (40.6%), and proteins (43.7%). Dairy product intake was also low, with only 45.1% meeting the minimum dietary threshold. These findings are consistent with previous literature from LMICs, where inadequate dietary intake during pregnancy has been strongly associated with adverse maternal and neonatal outcomes. A study from India, for example, linked low dietary diversity with increased risk of pre-term birth and hypertensive disorders of pregnancy.[17] Similarly, emphasized poor maternal diet quality as a key contributor to pre-term labor in Ethiopia.[18] The observed gaps in dietary practices in the present study suggest that many pregnant women in Bangladesh are unable to access or consume a varied diet rich in essential nutrients, likely due to socioeconomic constraints, food insecurity, and cultural food restrictions.

In contrast to dietary diversity, the rate of antenatal micronutrient supplementation in this study was relatively high. Most participants reported regular use of folic acid (79.0%), iron (80.4%), calcium (79.0%), and multivitamin supplements (78.2%). These rates indicate successful implementation of supplementation programs at the tertiary level and reflect efforts made by healthcare providers to ensure compliance. The global literature supports the beneficial role of micronutrients – particularly folic acid, iron, and calcium – in promoting placental function, reducing the risk of anemia, and supporting fetal growth. Several meta-analyses and observational studies have demonstrated that adherence to such supplementation can lower the risk of pre-term birth, although these relationships were not analyzed statistically in the present study.

In addition, maternal BMI and MUAC reflected varied nutritional reserves among participants. Although not disaggregated by outcome group, these metrics indicate that a proportion of women likely entered pregnancy undernourished, which has been repeatedly associated with higher risk of adverse birth outcomes. Evidence from Bangladesh and other South Asian countries has shown that low pre-pregnancy BMI correlates with low birth weight, pre-term birth, and neonatal morbidity.[19]

Socioeconomic data from the study further contextualize the nutritional challenges faced by pregnant women. A significant proportion of the sample came from low-income households (40.0%), and nearly half were unemployed. These social determinants – when combined with limited nutritional awareness and access – exert a considerable influence on dietary behavior during pregnancy. Previous studies in Bangladesh have

documented how socioeconomic status mediates both food intake and healthcare utilization among pregnant women, often determining the likelihood of timely antenatal visits, access to supplements, and the ability to follow dietary advice.[4,10]

While the study offers valuable insights, several limitations must be acknowledged. The cross-sectional design prevents causal interpretation of the relationships between dietary patterns and gestational outcomes. Furthermore, dietary intake was self-reported and may be affected by recall bias or social desirability bias. Although structured tools, such as the MDD-W were used to standardize reporting, the potential for misclassification remains. Finally, other relevant contributors to pre-term birth, such as infections, stress, and genetic or environmental factors, were beyond the scope of this study.

In conclusion, the study highlights persistent nutritional gaps among pregnant women experiencing pre-term birth, despite relatively high rates of supplement use. The findings call for targeted antenatal interventions that combine nutrition education, improved dietary access, and support for low-income families. Strengthening community-based outreach and culturally tailored nutrition counseling may further enhance the impact of existing supplementation programs, ultimately contributing to reductions in pre-term birth rates in Bangladesh.

Limitations of the study

The study was conducted in a single hospital with a small sample size. Hence, the results may not represent the whole community.

Conclusion

This study highlights the critical influence of maternal nutrition on pre-term birth outcomes in a tertiary care setting in Bangladesh. Although most women adhered to antenatal supplementation guidelines, dietary diversity remained poor, with fewer than half of the participants meeting recommended intake levels for essential food groups. Moderate to late pre-term births accounted for the majority of cases, suggesting a potential window for nutritional interventions to delay delivery and improve neonatal outcomes. The findings emphasize the need for strengthening antenatal nutrition counseling, improving dietary access, and addressing underlying socioeconomic barriers to achieve better maternal and fetal health outcomes.

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Conflict of Interest

None declared.

Ethical Approval

The study was approved by the Institutional Ethics Committee

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