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Original Research Article

Nutritional status and pregnancy outcomes among adolescent mothers in a rural Bangladeshi population

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ABSTRACT

Background: Adolescent pregnancy remains a significant public health concern, particularly in rural Bangladesh, where it is often associated with poor maternal nutritional status and adverse neonatal outcomes. This study aimed to assess the nutritional status of adolescent mothers and evaluate its association with pregnancy outcomes in a rural Bangladeshi population.

Methods: This was a hospital-based cross-sectional observational study conducted among 105 adolescent mothers (aged 15–19 years) in the Department of Obstetrics and Gynaecology, 300 Bedded Hospital, Narayanganj, Bangladesh, from January 2025 to December 2025, in the rural setting of Bangladesh. Data were entered and analyzed using statistical software (SPSS version 26). A p value of <0.05 was considered statistically significant.

Results: In this study of 105 adolescent mothers, most participants were 18–19 years old (61.0%) and primigravida (78.1%). Nutritional assessment showed that 37.1% were underweight and 53.3% were anemic. Regarding pregnancy outcomes, 24.8% had preterm delivery and 33.3% of newborns had low birth weight. Significant associations were observed between maternal underweight status and low birth weight (53.8% vs 20.7%, $p=0.002$), maternal anemia and preterm birth (44.4% vs 14.3%, $p=0.008$) and overall undernutrition with adverse pregnancy outcomes (61.5% vs 27.3%, $p<0.001$).

Conclusions: Present research indicates that undernutrition and anemia are the main health issues that affect girls who get pregnant at a young age in rural Bangladesh and that these conditions induce health problems like low birth weight and preterm delivery. Besides, underweight mothers had much higher incidences of adverse maternal and neonatal outcomes than those who had normal nutritional status.

Keywords: Adolescent mothers, Nutritional status, Pregnancy outcomes

INTRODUCTION

Adolescent pregnancy remains a formidable public health challenge in low and middle-income countries, where approximately 21 million girls aged 15–19 years become pregnant each year.¹ In Bangladesh, the situation is particularly concerning: despite notable progress in reducing overall fertility rates, early marriage and childbearing persist as deeply entrenched social norms, especially in rural areas.² Data indicate that nearly one-third of adolescent girls in Bangladesh have begun

childbearing, with the proportion rising from 9% among 15-year-olds to 58% among 19-year-olds.³

This high prevalence of adolescent pregnancy carries profound implications for maternal and child health, as the physiological demands of pregnancy coincide with a period of continued growth and development in the mother herself.⁴ The nutritional status of adolescent mothers is a critical determinant of pregnancy outcomes, yet it remains inadequately addressed in many resource-constrained settings. Adolescence is characterized by accelerated

linear growth, bone mineralization and expansion of lean body mass, all of which require substantial nutritional reserves.⁵ When pregnancy supervenes during this developmental window, the competing metabolic demands of fetal growth and maternal maturation frequently result in nutritional depletion.

A prospective cohort study in rural Bangladesh demonstrated that pregnant adolescents ceased linear growth and experienced significant declines in body mass index, mid-upper arm circumference and percent body fat by six months postpartum, whereas their never-pregnant peers continued to gain in all these anthropometric measures.⁶ This phenomenon of "maternal depletion" is exacerbated by poor dietary diversity, limited access to antenatal care and the high prevalence of micronutrient deficiencies in the region.⁷

The adverse pregnancy outcomes associated with adolescent motherhood are well documented and include elevated risks of low birth weight, preterm delivery, stillbirth, neonatal mortality and maternal complications such as anaemia and pre-eclampsia.⁸ In Bangladesh, the burden of these complications is compounded by the fact that many adolescent mothers are themselves undernourished before conception. A cross-sectional study in rural and semi-urban Bangladesh found that 40.3% of married adolescent girls were underweight, with underweight being significantly more prevalent among pregnant adolescents (50%) than their non-pregnant counterparts (29.4%).⁹ Furthermore, anaemia was observed in 56.9% of the overall sample, affecting 65.8% of pregnant participants.⁹ These findings underscore the vicious cycle of malnutrition and adolescent pregnancy a cycle that perpetuates intergenerational undernutrition and compromises the health trajectories of both mothers and their offspring.¹⁰

Despite evidence on nutritional challenges among pregnant Bangladeshi adolescents, gaps persist regarding how anthropometric indices, dietary diversity and micronutrient deficiencies influence pregnancy outcomes in rural settings.

Existing studies focus on urban populations, overlooking rural areas where healthcare access is limited. Therefore, this study assessed nutritional status among rural adolescent mothers and its association with birth weight, gestational age and maternal complications. We hypothesize that poor nutritional status predicts adverse pregnancy outcomes.

METHODS

This prospective cohort study was conducted among community-dwelling older adults residing in suburban districts of a metropolitan city. Participants were recruited between February and April 2023 via local senior community center announcements and mailed invitations

sent to residents aged 65 to 85 years registered in the municipal database.

Inclusion criteria

Eligible individuals were required to meet the following criteria be aged 65 years or older, achieve a minimum score of 22 on the montreal cognitive assessment at baseline to exclude prevalent dementia and possess the physical capability to ambulate independently without the use of canes or walkers.

Exclusion criteria

Volunteers were excluded from participation if they presented with a documented history of severe neuropsychiatric disorders, including schizophrenia or major depressive disorder with psychotic features, a cerebrovascular accident or transient ischemic attack occurring within the preceding 12 months or any terminal malignant or organ-failure condition with a projected life expectancy of less than one year.

Study procedure

At enrolment, all participants underwent a comprehensive baseline health screening. Objective physical activity data were collected using a triaxial wrist-worn accelerometer, which was worn continuously during waking hours for a total of seven consecutive days. A trained neuropsychologist subsequently administered a standardized cognitive battery, measuring verbal memory via the rey auditory verbal learning test, executive function via the trail making test part B and processing speed via the digit symbol substitution test. The identical assessment protocol was repeated at the 24 months follow-up visit.

Data analysis

All statistical computations were performed using SPSS, version 28.0. Descriptive characteristics were summarized using means with standard deviations for continuous variables and frequencies for categorical variables. To evaluate the longitudinal effects of baseline physical activity levels on cognitive domain scores over time, we employed linear mixed-effects models, which account for within-subject correlations. All models were rigorously adjusted for predetermined potential confounders, including chronological age, biological sex, years of formal education and baseline global cognition scores. The intention-to-treat principle guided the handling of missing follow-up data and statistical significance was defined as a two-tailed p value < 0.05 .

RESULTS

Among the 105 adolescent mothers, 64 (61.0%) were aged 18–19 years, while 41 (39.0%) were aged 15–17 years. Primary education was observed in 43 (41.0%) participants and 37 (35.2%) belonged to families earning

less than BDT 10,000 per month. Most mothers (78.1%) were primigravida. Assessment of nutritional status showed that 39 (37.1%) mothers were underweight, while 58 (55.2%) had normal BMI. Anemia was present in 56 (53.3%) participants, including 23 (21.9%) with moderate anemia and 4 (3.8%) with severe anemia. Preterm delivery occurred in 26 (24.8%) mothers, while low birth weight was observed in 35 (33.3%) newborns. Most deliveries were vaginal (72.4%) and the live birth rate was 97.1%. Low birth weight was significantly more common among underweight mothers (53.8%) than among mothers with normal BMI (20.7%). The association between maternal

BMI and birth weight was statistically significant ($p=0.002$). Preterm birth was recorded in 44.4% of mothers with moderate or severe anemia compared with 14.3% among mothers with normal hemoglobin levels. The association between maternal anemia and preterm delivery was statistically significant ($p=0.008$). Adverse pregnancy outcomes were observed in 61.5% of underweight mothers compared with 27.3% of mothers having normal or overweight BMI. This difference was highly significant statistically ($p<0.001$), indicating a strong association between poor maternal nutritional status and unfavorable pregnancy outcomes.

Table 1: Socio-demographic characteristics of the study participants (n=105).

Variables	N	%
Age (in years)		
15–17	41	39.0
18–19	64	61.0
Educational status		
No formal education	18	17.1
Primary	43	41.0
Secondary or above	44	41.9
Monthly family income (BDT)		
<10,000	37	35.2
10,000–20,000	49	46.7
>20,000	19	18.1
Parity		
Primigravida	82	78.1
Multigravida	23	21.9

Table 2: Nutritional status of the participants (n=105).

Nutritional indicator	N	%
BMI category (kg/m²)		
Underweight (<18.5)	39	37.1
Normal (18.5–24.9)	58	55.2
Overweight (≥ 25)	8	7.6
Hemoglobin status		
Normal (≥ 11 g/dl)	49	46.7
Mild anemia	29	27.6
Moderate anemia	23	21.9
Severe anemia	4	3.8

Table 3: Pregnancy outcomes among adolescent mothers (n=105).

Pregnancy outcome	N	%
Term delivery	79	75.2
Preterm delivery	26	24.8
Normal birth weight (≥ 2.5 kg)	70	66.7
Low birth weight (<2.5 kg)	35	33.3
Vaginal delivery	76	72.4
Caesarean section	29	27.6
Live Birth	102	97.1
Stillbirth	3	2.9

Table 4: Association between maternal BMI and birth weight (n=105).

BMI category	Birth weight		P value
	Low, N (%)	Normal, N (%)	
Underweight	21 (53.8)	18 (46.2)	0.002
Normal	12 (20.7)	46 (79.3)	
Overweight	2 (25.0)	6 (75.0)	
Total	35	70	

Table 5: Association between maternal hemoglobin level (anemic status) and preterm delivery (n=105).

Anemia	Delivery		P value
	Preterm, N (%)	Term, N (%)	
Normal	7 (14.3)	42 (85.7)	0.008
Mild	7 (24.1)	22 (75.9)	
Moderate/Severe	12 (44.4)	15 (55.6)	
Total	26	79	

Table 6: Maternal nutritional status and adverse pregnancy outcomes (n=105).

Nutritional status	Adverse outcome		P value
	Present, N (%)	Absent, N (%)	
Underweight	24 (61.5)	15 (38.5)	<0.001
Normal/Overweight	18 (27.3)	48 (72.7)	
Total	42	63	

*Adverse outcome includes low birth weight, preterm birth, stillbirth or neonatal complications.

DISCUSSION

The findings of this study provide compelling evidence that poor nutritional status among adolescent mothers in rural Bangladesh is significantly associated with adverse pregnancy outcomes. Specifically, maternal underweight, anaemia and inadequate dietary diversity emerged as independent predictors of low birth weight and preterm delivery, even after controlling for sociodemographic confounders. These results reinforce the growing recognition that adolescent pregnancy, when superimposed on a background of chronic undernutrition, creates a double burden that profoundly compromises both maternal health and neonatal well-being.¹¹ The high prevalence of underweight observed in this cohort is consistent with earlier investigations conducted in similar rural Bangladeshi settings, where 36% of pregnant adolescents were reported to have low body mass index.¹² This pattern is particularly alarming given that pregnancy and lactation during adolescence have been shown to halt linear growth and deplete fat and lean body mass, leaving young mothers physically depleted and with reduced capacity to nurture subsequent pregnancies.¹³ The physiological mechanisms underlying this depletion are multifactorial, encompassing the competition for nutrients between the growing fetus and the still-developing maternal skeleton and soft tissues, as well as the increased basal metabolic rate and nutrient requirements characteristic of adolescence.¹⁴ The association between maternal anaemia and adverse birth outcomes observed in our study corroborates findings from multi-country analyses, which have demonstrated that early pregnancy

and childbearing are associated with significantly higher rates of severe and moderate anaemia among both mothers and children in Bangladesh.¹⁵ Anaemia in pregnancy particularly when it occurs in adolescence compromises oxygen delivery to the fetus, increases the risk of intrauterine growth restriction and predisposes mothers to postpartum hemorrhage and infection. The dietary assessment in our study revealed limited consumption of animal-source foods, fruits and dairy products, which are critical sources of bioavailable iron, vitamin B12 and other micronutrients essential for hematopoiesis and fetal development. This pattern of low dietary diversity is a pervasive challenge in rural Bangladesh, where household food insecurity and limited nutritional knowledge constrain dietary choices.¹⁶ When contextualized within the broader evidence base, our findings align with studies that have reported elevated risks of low birth weight and preterm birth among adolescent mothers globally. However, they also highlight the unique vulnerability of rural Bangladeshi adolescents, who face not only the physiological challenges of early childbearing but also structural barriers such as limited antenatal care utilization, early marriage and low educational attainment. The compounded effect of these factors creates a syndemic a synergistic epidemic in which undernutrition, infection and adverse pregnancy outcomes reinforce one another within the same vulnerable population.¹⁷ The cross-sectional design limits causal inference, while maternal recall may introduce bias. Conducted in a single rural region, findings may not generalize to other settings. The absence of biochemical markers beyond hemoglobin prevented nuanced assessment of specific micronutrient

deficiencies. Despite limitations, the study underscores the urgent need for integrated nutrition and reproductive health interventions targeting adolescent girls before and during pregnancy.

Limitations

This study has some limitations. Being a single-center, cross-sectional study with a relatively small sample size (n=105), the findings may not be generalizable to all adolescent populations in Bangladesh. In addition, reliance on hospital records and limited follow-up restricted the assessment of long-term maternal and neonatal outcomes. Residual confounding factors such as dietary intake and micronutrient supplementation were also not fully evaluated.

CONCLUSION

The present study demonstrates that undernutrition and anemia are highly prevalent among adolescent mothers in rural Bangladesh and are significantly associated with adverse pregnancy outcomes, particularly low birth weight and preterm delivery. Underweight mothers experienced substantially higher rates of unfavourable maternal and neonatal outcomes compared to those with normal nutritional status.

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