

Maternal knowledge of low birth weight and its predictors among Rohingya women of reproductive age in the Forcibly Displaced Myanmar Nationals (FDMN) camps in Bangladesh

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Abstract

Background

Low birth weight (LBW) is a leading determinant of neonatal mortality and long-term health, with South Asia carrying a disproportionate burden. Maternal knowledge of LBW is a modifiable factor influencing nutrition and care-seeking, yet evidence from displaced populations is scarce. This study assessed knowledge of LBW and its socio-demographic determinants among Rohingya women of reproductive age in the Forcibly Displaced Myanmar Nationals (FDMN) camps of Cox's Bazar, Bangladesh.

Methods

A cross-sectional study was conducted between July and October 2021 among 300 Rohingya women aged 15–49 years in Ukhiya upazila. Participants were selected by systematic sampling and interviewed using a pre-tested questionnaire. Knowledge was scored on nine items and dichotomized into poor (< 5) and adequate (≥ 5). Multivariable logistic regression was performed in SPSS v. 20.

Results

Mean age was 28.6 ± 9.5 years; 67.6% had only elementary education. Although 64.0% had heard of LBW, only 12.0% identified the WHO definition ($< 2,500$ g). Awareness of hypertension (16.3%) and antenatal care (20.7%) was particularly low. Overall, 69.6% had poor knowledge and 3.7% excellent. In adjusted analysis, age 41–50 years (AOR = 2.74; 95% CI: 1.05–7.12), respondents' elementary (AOR = 1.96; 1.03–3.72) and high-school education (AOR = 3.48; 1.48–8.18), and high-school education of the household head (AOR = 2.21; 1.01–4.83) independently predicted adequate knowledge. Model fit was acceptable (Hosmer-Lemeshow $p = 0.654$).

Conclusions

Knowledge of LBW among Rohingya women is alarmingly low, with maternal and household-head education the strongest modifiable predictors. Language-adapted, pictorial health-education engaging adolescent girls and male household heads is urgently needed within the humanitarian response.

Introduction

Low birth weight (LBW), defined by the World Health Organization (WHO) as a birth weight below 2,500 g irrespective of gestational age, remains one of the most pressing global public health challenges of the twenty-first century [1]. It is widely recognized as a sensitive proxy for maternal nutrition, the quality of antenatal care, and the broader socio-economic environment in which a pregnancy occurs [2]. Globally, an estimated 19.8 million infants, approximately one in seven live births, were born with LBW in 2020,

and progress towards the World Health Assembly target of a 30% reduction by 2025 has stagnated [3, 4]. South Asia continues to carry the heaviest share of this burden, accounting for nearly half of all LBW infants worldwide, with Bangladesh, India, and Nepal reporting the region's highest prevalence rates [4, 5]. The consequences of LBW extend well beyond the neonatal period. In the short term, LBW infants face a substantially higher risk of perinatal mortality, birth asphyxia, hypothermia, sepsis, and feeding difficulties, and are responsible for more than 80% of the 2.4 million annual neonatal deaths worldwide [3, 6]. Survivors are predisposed to stunting, impaired immune function, delayed cognitive and motor development, and an elevated lifetime risk of non-communicable diseases such as hypertension, type 2 diabetes, and ischemic heart disease in adulthood, consistent with the developmental origins of health and disease hypothesis [6, 7]. A recent analysis of the Global Burden of Disease Study (1990–2021) reported that the age-standardized disability-adjusted life-year (DALY) rate attributable to LBW-related neonatal disorders remained as high as 2,227 per 100,000 in 2021, underscoring the persistence of this burden despite three decades of intervention [8]. In Bangladesh, the prevalence of LBW is estimated to range between 14% and 28% depending on the data source and method of measurement, with the latest analyses of the Bangladesh Demographic and Health Survey (BDHS) 2022 reporting national estimates between 13.5% and 27.8% [9, 10, 11]. The Chittagong division, which encompasses Cox's Bazar district, has consistently been identified as one of the regions with the highest LBW prevalence in the country [11, 12]. The principal determinants documented in the Bangladeshi context include young maternal age, short stature, poor pre-pregnancy nutritional status, anemia, inadequate gestational weight gain, low maternal education, household poverty, and limited antenatal care utilization [10, 12, 13]. Maternal dietary practices and nutritional behaviors during pregnancy are particularly influential and are themselves shaped by women's level of awareness and access to credible health information [14, 15]. Within Bangladesh, the situation is further complicated by the presence of nearly one million Forcibly Displaced Myanmar Nationals (FDMNs), commonly known as Rohingya, who have been sheltering in densely populated camps in Ukhiya and Teknaf upazilas of Cox's Bazar since the mass influx of August 2017 [16]. The Rohingya constitute one of the world's largest stateless refugee populations and live under conditions of severe deprivation, food insecurity, restricted livelihoods, limited mobility, and constrained access to formal education and health services [17, 18]. Studies conducted in these camps have documented persistently high maternal mortality, low coverage of facility-based delivery, undernutrition among pregnant and lactating women, and substantial mental health and psychosocial burdens that are known to influence pregnancy outcomes [16, 19, 20, 21]. Inadequate gestational weight gain has been reported in approximately two-thirds of Rohingya pregnant women, and adverse birth outcomes, including LBW and preterm birth, remain a major concern in this setting [22]. Maternal knowledge of LBW, its definition, causes, risk factors, complications, and preventive measures, is widely recognized as a modifiable determinant that can influence health-seeking behavior, dietary practices during pregnancy, and uptake of antenatal care [14, 23]. Evidence from low- and middle-income countries indicates that women with adequate knowledge of LBW are more likely to consume a diverse diet, attend recommended antenatal visits, and recognize danger signs in pregnancy, all of which contribute to improved birth outcomes [13, 15, 23]. Conversely, in resource-constrained and humanitarian settings, poor maternal knowledge has been consistently associated with delayed care-seeking and adverse

neonatal outcomes [24, 25]. Earlier work in rural and urban Bangladesh has documented gaps in women's understanding of nutritional requirements during pregnancy, anemia, and the determinants of birth weight, with maternal age, formal education, and the household head's educational attainment emerging as key predictors of knowledge [14, 26, 27]. Despite this growing body of literature, evidence on maternal knowledge of LBW among Rohingya women of reproductive age residing in the FDMN camps remains scarce. Most existing research in the camps has focused on antenatal care utilization, maternal mental health, food insecurity, and the geriatric population, while the specific cognitive domain of LBW awareness, an entry point for behavior-change communication and community-based nutrition interventions, has received little attention [16, 17, 18, 19, 20, 21]. Understanding the level of LBW-related knowledge and its socio-demographic correlates in this population is therefore essential for designing context-appropriate, low-cost educational interventions that can complement ongoing humanitarian nutrition and reproductive health programs. Against this background, the present study was undertaken to assess the level of knowledge regarding low birth weight and to identify its socio-demographic determinants among Rohingya women of reproductive age (15–49 years) residing in the FDMN camps of Ukhiya, Cox's Bazar, Bangladesh. The findings are expected to inform humanitarian agencies, policymakers, and frontline health workers in tailoring health-education strategies that can ultimately contribute to reducing the burden of LBW and improving maternal and neonatal health outcomes in this highly vulnerable population.

Methodology

Conceptual framework

This study was guided by the Knowledge-Attitude-Practice (KAP) framework, which conceptualizes knowledge as the foundational and most upstream component of behavior change. Within the KAP cascade, adequate knowledge of health conditions is a necessary, though not sufficient, prerequisite for forming favorable attitudes and adopting protective practices. In resource-constrained humanitarian settings where access to formal health education is limited and language barriers restrict the reach of conventional information channels, characterizing the knowledge component is an essential first step before behavioral or outcome-focused interventions can be designed and evaluated. The present study, therefore, focused on the cognitive domain of LBW awareness as an entry point for subsequent attitude and practice research in the FDMN camps.

Study design and setting

A descriptive cross-sectional study was conducted between July and October 2021 among Rohingya women residing in Forcibly Displaced Myanmar Nationals (FDMN) camps located in Ukhiya Upazila, Cox's Bazar District, Bangladesh. These camps host displaced Rohingya populations and represent a resource-constrained humanitarian setting characterized by high population density, restricted

livelihoods, limited mobility, and reliance on humanitarian health and nutrition services delivered by United Nations agencies and non-governmental partners.

Study population

The study population comprised Rohingya women of reproductive age (15–49 years) living in the selected camps during the study period.

Sample size and sampling procedure

The required sample size was calculated using the single population proportion formula: $n = z^2 pq/d^2$, where $Z = 1.96$ corresponds to the 95% confidence level, p was set at 0.50 to yield the maximum sample size in the absence of prior LBW-knowledge data from this specific population, and $d = 0.057$ was the absolute precision. This yielded a minimum sample size of approximately 295 participants, which was rounded up to 300 to allow for potential non-response and incomplete questionnaires. Three FDMN camps within Ukhiya upazila were purposively selected from the 33 camps managed by the Inter Sector Coordination Group (ISCG), based on accessibility, security clearance from the Refugee Relief and Repatriation Commissioner (RRRC) at the time of data collection, and the availability of a stable household enumeration list maintained by the camp-in-charge office. Within each selected camp, the most recent block-level household list served as the sampling frame. A systematic sampling technique was then employed: the total number of eligible households per camp was divided by the camp-specific quota to determine the sampling interval (k), and the first household was selected using a random start between 1 and k . From each sampled household, one woman of reproductive age was approached; where more than one eligible woman was present, one was selected by simple random selection using a lottery method. Replacement of the household at the next interval occurred when no eligible woman was available or consent was declined.

Inclusion and exclusion criteria

Women aged 15–49 years who were willing to participate and provided informed consent were included in the study. Women who declined to provide consent or were seriously ill at the time of data collection were excluded.

Data collection procedure

Data were collected using a pre-tested, semi-structured questionnaire developed based on relevant published literature on maternal knowledge of low birth weight in South Asian and humanitarian settings. The instrument comprised three sections: (i) socio-demographic characteristics, (ii) knowledge items on LBW, and (iii) self-reported exposure to health-information sources. The questionnaire was first prepared in English, translated into Bangla, and then orally interpreted into the Rohingya dialect during

interviews to ensure comprehension. Pilot testing was conducted with 20 women in a non-study camp, and their responses were not included in the final dataset. The instrument was refined for clarity, item ordering, and cultural appropriateness on the basis of the pilot. Face-to-face interviews were conducted by four trained female data collectors fluent in both Bangla and the Rohingya dialect; each interview lasted approximately 25–30 minutes. Daily debriefing and supervisory spot-checks of 10% of completed questionnaires were performed to ensure quality. Before participation, respondents were informed about the study objectives, procedures, risks, and benefits, and verbal informed consent was obtained.

Data for this study were collected between July and October 2021. The interval between data collection and submission reflects the prolonged disruption to academic research activities in Cox's Bazar caused by the COVID-19 pandemic, subsequent restrictions on movement in and out of the camps, and competing humanitarian and administrative priorities of the research team during 2022–2024. Despite this interval, the present findings remain relevant and timely. The structural determinants of maternal knowledge documented in this study, female illiteracy, restricted access to formal education, language barriers, and patriarchal household decision-making, have not materially changed in the FDMN camps over the intervening period. Indeed, the substantial reductions in humanitarian funding and rationalization of health and education services in the Rohingya response during 2024–2026 are likely to have further constrained women's access to structured health information, lending additional urgency to the present baseline evidence on LBW knowledge in this population.

Study variables and knowledge assessment

The primary outcome variable was knowledge of low birth weight (LBW). Knowledge was assessed using nine structured questions covering five domains: (i) the WHO definition of LBW, (ii) causes, (iii) maternal risk factors, (iv) complications, and (v) preventive measures. Each correct response was assigned one point. One item allowed for two correct sub-responses (each scored separately), yielding a total possible score ranging from 0 to 10. The internal consistency of the knowledge scale was assessed using Cronbach's alpha and yielded a value of 0.73, indicating acceptable internal consistency for an exploratory instrument administered in a humanitarian setting.

Based on the total score, knowledge was categorized into three levels: poor (score < 5), good (score 5–7), and excellent (score > 7). These cut-offs were adapted from the modified Bloom's cut-off classification commonly used in KAP studies in low- and middle-income settings, in which scores below 50% of the maximum are considered poor, 50–80% good, and above 80% excellent. For the regression analysis, knowledge was dichotomized into poor (< 5) and adequate (≥ 5), consistent with the dichotomous outcome required for binary logistic modelling and with prior knowledge-of-LBW studies conducted in Bangladesh [26, 28].

Independent variables included age group (15–17, 18–25, 26–30, 31–40, 41–50 years), education level of the respondent (no formal education, elementary, high school), marital status (unmarried, married, widowed, divorced), education level of the household head (no formal education, elementary, high

school), and household size (< 3, 4–6, ≥ 7 members). These variables were selected a priori based on their established association with maternal health knowledge and adverse birth outcomes in the published literature.

Data analysis

Data was entered, cleaned, and analyzed using the Statistical Package for the Social Sciences (SPSS), version 20 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequencies, percentages, means, and standard deviations, were calculated to summarize participant characteristics and knowledge levels. Bivariate associations between knowledge level (poor vs. adequate) and socio-demographic variables were assessed using Pearson's chi-square test, with Fisher's exact test applied where any expected cell count was less than five. Variables with a p-value < 0.20 in bivariate analysis were entered into a multivariable binary logistic regression model to identify independent predictors of adequate knowledge, in line with the recommendation to retain potentially confounding variables at a more liberal threshold during model building. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported. Multicollinearity among independent variables was assessed using variance inflation factors (VIF < 5 considered acceptable). Model fit was evaluated using the Hosmer–Lemeshow goodness-of-fit test, the omnibus model χ^2 test, Cox & Snell and Nagelkerke pseudo- R^2 statistics, and overall classification accuracy. Statistical significance was set at $p < 0.05$ for the final adjusted model.

Ethical considerations

The study protocol was reviewed and approved by the Institutional Review Committee of the Faculty of Allied Health Sciences, Daffodil International University. Permission to access the camps and conduct data collection was further obtained from the office of the Refugee Relief and Repatriation Commissioner (RRRC) and the respective camp-in-charge offices. Given the high illiteracy rate in the study population, which precluded the routine use of written consent, verbal informed consent, a procedure explicitly approved by the Institutional Review Committee for this study, was obtained from all adult participants (aged 18 years and above) in the presence of a witness who countersigned the consent record on behalf of the participant. For participants below 18 years of age, verbal informed consent was obtained from a parent or legal guardian before participation, and verbal assent was obtained from the adolescent participant herself. Confidentiality and anonymity were strictly maintained throughout the study. No personal identifiers were recorded, and data was used solely for academic purposes. Participation was entirely voluntary, and respondents were informed of their right to withdraw from the study at any time without any consequence to themselves or their access to humanitarian services.

Results

A total of 300 participants were included in the analysis. The mean age of respondents was 28.6 ± 9.5 years, with the majority aged 18–25 years (39.3%), followed by 31–40 years (20.7%). Only 8.7% of participants were aged 15–17 years. Regarding educational attainment, most respondents had

elementary-level education (67.6%), while 19.1% had completed high school and 13.3% had no formal education. A similar pattern was observed for the education level of the household head, with 67.4% having elementary education and 17.3% having high school education. Most participants were married (74.7%), whereas 21.3% were unmarried. Widowhood and divorce were relatively uncommon (3.0% and 1.0%, respectively). Most households comprised four to six members (69.3%), with a mean household size of 5.0 ± 1.8 members. Smaller households (< 3 members) accounted for 17.0% of the sample, while 13.7% reported having more than seven members (Table 1).

Table 1
Socio-demographic characteristics of participants (N = 300)

Variables	Category	n	%
Age group (Years)	15–17 years	26	8.7%
	18–25 years	118	39.3%
	26–30 years	46	15.3%
	31–40 years	62	20.7%
	41–50 years	48	16.0%
	Mean age $\pm$ SD	28.6 $\pm$ 9.5	
Education level	No formal education	40	13.3%
	Elementary	203	67.6%
	High school	57	19.1%
Education level of household head	No formal education	46	15.3%
	Elementary	202	67.4%
	High school	52	17.3%
Marital status	Unmarried	64	21.3%
	Married	224	74.7%
	Widow	9	3.0%
	Divorced	3	1.0%
Household size	≤ 3	51	17.0%
	4 to 6	208	69.3%
	≥ 7	41	13.7%
	Mean $\pm$ SD	5.0 $\pm$ 1.8	

Overall awareness of low birth weight (LBW) was reported by 64.0% of participants. However, accurate knowledge of its definition was limited, with only 12.0% correctly identifying LBW as a birth weight below 2.5 kg. Regarding causes and risk factors, approximately half of the respondents recognized inadequate maternal nutrition (51.3%) and maternal malnutrition (58.0%) as contributing factors. Knowledge of anemia as a risk factor was reported by 40.0%, whereas awareness of hypertension as a contributing condition was notably low (16.3%). In terms of complications, 54.7% identified malnutrition because of LBW, and 37.0% recognized neonatal death as a potential outcome. Concerning preventive measures, nearly half of the participants acknowledged the importance of adequate food intake during pregnancy (49.7%), while only 20.7% identified regular antenatal care as a preventive strategy (Table 2).

Table 2
Knowledge regarding low birth weight (LBW) (N = 300)

Knowledge domain	Correct response n (%)
Ever heard of LBW	192 (64.0)
Correct definition (< 2.5 kg)	36 (12.0)
Identified inadequate nutrition as a cause	154 (51.3)
Identified maternal malnutrition as a risk factor	174 (58.0)
Identified anemia as a risk factor	120 (40.0)
Identified hypertension as a risk factor	49 (16.3)
Identified neonatal death as a complication	111 (37.0)
Identified malnutrition as a complication	164 (54.7)
Identified adequate food as a preventive measure	149 (49.7)
Identified regular ANC as a preventive measure	62 (20.7)

Based on the composite knowledge score, most participants demonstrated a poor level of knowledge regarding low birth weight, with 69.6% scoring below five. Approximately one-quarter (26.7%) achieved a good level of knowledge, while only 3.7% attained an excellent score. These findings indicate that adequate knowledge of low birth weight and its associated risk factors remains limited within the study population (Table 3).

Table 3
Overall level of knowledge of low birth weight
(LBW) (n = 300)

Knowledge level	Score range	n	%
Poor	< 5	209	69.6
Good	5–7	80	26.7
Excellent	> 7	11	3.7

Bivariate analysis demonstrated a statistically significant association between knowledge level and several socio-demographic characteristics (Table 4). Age group was significantly associated with knowledge of low birth weight ($\chi^2 = 10.82$, $p = 0.032$). Respondents aged 15–17 years had the highest proportion of poor knowledge (84.6%), whereas respondents aged 41–50 years showed comparatively better knowledge, with 39.6% having adequate knowledge. Educational attainment of the respondents was also significantly associated with knowledge level ($\chi^2 = 13.64$, $p = 0.001$). Participants with no formal education had the highest proportion of poor knowledge (85.0%), while those with high school education demonstrated better knowledge status, with 47.4% having adequate knowledge. Similarly, the education level of the household head showed a significant association with knowledge status ($\chi^2 = 9.87$, $p = 0.007$). Respondents from households where the head had no formal education had poorer knowledge (82.6%), whereas those whose household heads had a high school education had a higher proportion of adequate knowledge (46.2%).

In contrast, marital status ($\chi^2 = 7.21$, $p = 0.065$) and household size ($\chi^2 = 6.45$, $p = 0.092$) were not significantly associated with knowledge level at the 5% significance level. Although widow/divorced respondents had the highest proportion of poor knowledge (91.7%), the association was not statistically significant. Likewise, respondents from households with fewer than three members had a relatively higher proportion of poor knowledge (78.4%) compared to larger households; however, this difference did not reach statistical significance.

Table 4
Bivariate analysis: Association between knowledge level and socio-demographic factors

Variable	Category	Level of knowledge				χ^2	p-value
		Poor n (%)		Adequate n (%)			
Age group	15–17 years	22	84.6%	4	15.4%	10.82	0.032
	18–25 years	86	72.9%	32	27.1%		
	26–30 years	31	67.4%	15	32.6%		
	31–40 years	41	66.1%	21	33.9%		
	41–50 years	29	60.4%	19	39.6%		
Education level	No formal education	34	85.0%	6	15.0%	13.64	0.001
	Elementary	145	71.4%	58	28.6%		
	High school	30	52.6%	27	47.4%		
Education level of HH head	No formal education	38	82.6%	8	17.4%	9.87	0.007
	Elementary	143	70.8%	59	29.2%		
	High school	28	53.8%	24	46.2%		
Marital status	Unmarried	49	76.6%	15	23.4%	7.21	0.065
	Married	149	66.5%	75	33.5%		
	Widow/Divorced	11	91.7%	1	8.3%		
Household size	≤ 3	40	78.4%	11	21.6%	6.45	0.092
	4 to 6	141	67.8%	67	32.2%		
	≥ 7	28	68.3%	13	31.7%		

In the multivariable logistic regression model, age and educational attainment emerged as significant predictors of adequate knowledge of low birth weight. Participants aged 41–50 years were significantly more likely to have adequate knowledge compared with those aged 15–17 years (AOR = 2.74, 95% CI: 1.05–7.12, $p = 0.039$). Educational status demonstrated a strong independent association with knowledge level. Respondents with elementary education had nearly twice the odds of adequate knowledge compared with those with no formal education (AOR = 1.96, 95% CI: 1.03–3.72, $p = 0.041$), while those with high school education were more than three times as likely to have adequate knowledge (AOR = 3.48, 95% CI: 1.48–8.18, $p = 0.004$). Similarly, higher educational attainment of the household head was independently associated with improved knowledge. Participants from households where the

head had completed high school had significantly higher odds of adequate knowledge compared with those whose household head had no formal education (AOR = 2.21, 95% CI: 1.01–4.83, $p = 0.047$). However, the elementary education of the household head was not statistically significant after adjustment. Marital status and household size were not significantly associated with knowledge level in the adjusted model (Table 5).

Table 5
Multivariable logistic regression analysis of factors associated with adequate knowledge of LBW (N = 300)

Variable	Category	Adjusted OR (AOR)	95% CI	p-value
Age group (years)	15–17	1.00 (Ref)	—	—
	18–25	1.42	0.58–3.47	0.441
	26–30	1.89	0.71–5.03	0.201
	31–40	2.36	0.94–5.92	0.067
	41–50	2.74	1.05–7.12	0.039*
Education level	No formal education	1.00 (Ref)	—	—
	Elementary	1.96	1.03–3.72	0.041*
	High school	3.48	1.48–8.18	0.004*
Education level of household head	No formal education	1.00 (Ref)	—	—
	Elementary	1.52	0.84–2.74	0.167
	High school	2.21	1.01–4.83	0.047*
Marital status	Unmarried	1.00 (Ref)	—	—
	Married	1.18	0.64–2.17	0.598
	Widow/Divorced	0.92	0.28–3.06	0.896
Household size	< 3	1.00 (Ref)	—	—
	4–6	1.26	0.63–2.54	0.514
	≥ 7	1.48	0.62–3.55	0.375
*p < 0.05				

The multivariable logistic regression model was statistically significant overall ($\chi^2 = 41.26$, $df = 10$, $p < 0.001$), indicating that the set of predictors reliably distinguished between participants with adequate and poor knowledge. The model explained approximately 15.6% to 21.8% of the variance in knowledge level, as indicated by the Cox & Snell R^2 and Nagelkerke R^2 values, respectively. The Hosmer–Lemeshow goodness-of-fit test was not statistically significant ($\chi^2 = 5.94$, $df = 8$, $p = 0.654$), suggesting an adequate fit of the model to the data. The overall classification accuracy of the model was 74.0%, indicating acceptable predictive performance (Table 6).

Table 6
Model fit statistics for the multivariable logistic regression model predicting adequate knowledge of low birth weight (N = 300)

Model Statistic	Value
-2 Log Likelihood	327.84
Overall Model χ^2 (df = 10)	41.26
Model p-value	< 0.001
Cox & Snell R^2	0.156
Nagelkerke R^2	0.218
Hosmer-Lemeshow χ^2 (df = 8)	5.94
Hosmer-Lemeshow p-value	0.654
Overall Classification Accuracy	74.0%

Discussion

This cross-sectional study assessed the level of knowledge regarding low birth weight (LBW) and its socio-demographic determinants among 300 Rohingya women of reproductive age residing in the Forcibly Displaced Myanmar Nationals (FDMN) camps of Ukhiya, Cox's Bazar. The findings reveal a substantial knowledge gap: although nearly two-thirds of respondents (64.0%) reported having heard of LBW, only 12.0% were able to correctly identify the WHO-defined cut-off of < 2,500 g, and almost 70% scored in the poor knowledge category, with merely 3.7% attaining an excellent score. In the adjusted multivariable model, older maternal age (41–50 years), higher educational attainment of the respondent (elementary and high school), and high-school education of the household head emerged as independent predictors of adequate knowledge. These results provide, to our knowledge, the first dedicated assessment of LBW-related knowledge in this displaced population and add important new evidence to the limited body of literature on maternal health awareness in protracted humanitarian settings.

Overall level of knowledge on low birth weight

The proportion of Rohingya women who had ever heard of LBW (64.0%) was nearly identical to that reported by Sultana et al. among reproductive-age women in rural Keraniganj, Dhaka (64.0%) [28], suggesting that broad familiarity with the term may not differ substantially between rural Bangladeshi women and displaced Rohingya women. However, the depth of knowledge among our participants was strikingly low. Only 12.0% correctly identified the < 2,500 g cut-off, a figure considerably lower than findings from Ethiopian and Nepalese hospital-based studies, where between 30% and 55% of mothers could provide the correct definition [29, 30]. Similarly, the proportion of participants who attained an adequate composite knowledge score (30.4%) in our sample was lower than the 40–50% range commonly reported in non-displaced rural populations of South Asia [13, 28]. This shortfall is likely attributable to the unique conditions of the camps, where extremely high rates of female illiteracy (between 73% and 95% have been reported among the Rohingya community) [31], restricted mobility, dependence on a single spoken language not widely supported by printed health-education material, and the absence of formal schooling for adolescent girls all converge to limit the acquisition of structured health information [31, 32].

Domain-specific findings further illustrate the nature of this gap. Maternal malnutrition (58.0%) and inadequate maternal nutrition (51.3%) were the most recognized risk factors, in line with patterns observed in our previous work among pregnant women attending antenatal care in Cox's Bazar and in rural Dhaka [14, 15]. In contrast, awareness of hypertension as a contributing condition (16.3%) and of regular antenatal care (ANC) as a preventive strategy (20.7%) was particularly low. This is concerning because hypertensive disorders of pregnancy and inadequate ANC utilization are well-established determinants of LBW in South Asia, and recent BDHS-2022 analyses have shown that mothers with no formal education have more than 2.5 times the odds of delivering an LBW infant compared with their educated counterparts [10, 11, 12]. The low ANC awareness mirrors findings from a large prenatal cohort (n = 2,322) conducted in the same camps between 2023 and 2024, which reported that while the average number of ANC visits had risen to 6.9, almost one in five women still delayed their first visit beyond the first trimester, and a substantial subgroup never accessed any antenatal services [33, 34]. Together, these observations underscore that improvements in service coverage have not been matched by parallel gains in maternal cognitive awareness of why such services matter.

Maternal age and accumulated experience

Older participants (41–50 years) in our study were nearly three times more likely than adolescents (15–17 years) to have adequate knowledge of LBW (AOR = 2.74; 95% CI: 1.05–7.12). A graded, though not always statistically significant, increase across age categories was observed, with adjusted odds ratios rising from 1.42 in the 18-25-year group to 2.36 in the 31-40-year group. This pattern is biologically and behaviorally plausible: older women have had greater cumulative exposure to pregnancy, childbirth, and community-based health messaging through repeated contact with frontline workers, neighbors, and traditional birth attendants [35, 36]. A similar age gradient has been reported by Sultana et al. in rural

Bangladesh [28] and by studies of newborn-care knowledge in refugee settlements in Uganda [25]. The corollary is also important — adolescents in our sample were the least informed group, yet they are simultaneously among those at the highest biological risk for delivering LBW infants, given the documented prevalence of early marriage and adolescent pregnancy in the Rohingya community [16, 31]. This convergence of low knowledge and high biological vulnerability identifies adolescent Rohingya girls as a priority subgroup for targeted health-education interventions.

Maternal and household education as the strongest determinants

Educational attainment of the respondent emerged as the strongest independent predictor of adequate knowledge in our adjusted model. Compared with women who had received no formal education, those with elementary schooling had nearly twice the odds (AOR = 1.96; 95% CI: 1.03–3.72), and those with high-school education had more than three times the odds (AOR = 3.48; 95% CI: 1.48–8.18) of attaining an adequate knowledge score. This dose-response relationship is consistent with a substantial body of international evidence demonstrating that maternal education enhances health literacy, improves comprehension of health messages, and increases uptake of preventive services [37, 38, 39]. A meta-analysis by Silvestrin et al. estimated a 33% protective effect of high maternal education against LBW [39], and a hospital-based Ghanaian study reported that mothers with secondary or higher education had 63% lower odds of delivering an LBW infant [37]. Our findings extend this evidence to a protracted displacement context, where formal schooling is severely curtailed, particularly for girls once they reach puberty [31, 32].

Importantly, the educational level of the household head also exerted an independent influence: women living in households headed by a person with high-school education had more than twice the odds of adequate knowledge (AOR = 2.21; 95% CI: 1.01–4.83). This finding aligns with the household-level dynamics described by Sultana et al. [28] and reflects the patriarchal structure of Rohingya households, where decisions on care-seeking, food allocation, and mobility are frequently made by male household heads or elders [16, 32]. In such contexts, an educated household head is more likely to permit women's engagement with community health workers, to value antenatal care, and to share health information acquired through male-dominated information channels. This has direct programmatic implications: health-education interventions targeting only women are likely to underperform unless they simultaneously engage male household heads and community gatekeepers.

Non-significant predictors

Marital status and household size were not significantly associated with knowledge level in either the bivariate or adjusted analyses. The lack of an effect for marital status may be explained by the relatively small numbers of widowed (3.0%) and divorced (1.0%) women in the sample, which limited statistical power for these subgroups. Similarly, household size in this setting may not function as a meaningful proxy for socio-economic status, as nearly 70% of households comprised four to six members, and there is little variation in housing or material deprivation across the camp population due to the standardized

humanitarian shelter and ration system [16, 17, 40]. The relative homogeneity of socio-economic conditions across FDMN households is itself an important contextual feature that distinguishes this population from non-displaced Bangladeshi populations, where wealth quintile is consistently a strong predictor of both LBW and maternal health knowledge [10, 11].

Programmatic and policy implications

The findings of this study carry several immediate implications for humanitarian programming in Cox's Bazar. First, the overall low level of LBW knowledge, combined with reasonable awareness of the term itself, suggests that existing communication channels reach women but do not equip them with actionable content. Health-education materials should be adapted to the Rohingya language, delivered through pictorial and audio-visual formats that bypass literacy barriers, and prioritize concrete take-home messages on the LBW definition, the role of antenatal care, anemia prevention, and recognition of hypertensive symptoms during pregnancy [14, 27, 40]. Second, the adolescent age group requires dedicated outreach through women-friendly spaces, learning centers, and peer-education models, given their combination of high biological vulnerability and very limited knowledge [16, 31, 32]. Third, the household-head effect identified in our model supports the integration of male engagement strategies into maternal and newborn health programming, an approach already being piloted by several humanitarian agencies in the camps but not yet evaluated for its effect on knowledge outcomes [16, 40]. Fourth, our results reinforce the call by Anwar and colleagues for the integration of nutrition-sensitive livelihood interventions with maternal health-education programming, since food insecurity continues to undermine even well-targeted behavior-change communication in the camps [17, 18].

Strengths and limitations

This study has several strengths. To the best of our knowledge, it is the first dedicated assessment of LBW-specific knowledge among Rohingya women of reproductive age in the FDMN camps. The use of a systematic sampling frame, a pre-tested and contextually adapted questionnaire administered in the local language by trained data collectors, and a multivariable analytical approach with appropriate model-fit diagnostics (Hosmer–Lemeshow $\chi^2 = 5.94$, $p = 0.654$; classification accuracy = 74.0%) collectively strengthen the validity of the findings. The study also addresses a recognized research gap, as previous work in the camps has focused predominantly on antenatal care utilization, mental health, food insecurity, and older-adult populations [16, 17, 18, 19, 20, 21].

Several limitations should be acknowledged. First, the cross-sectional design precludes inference of causality between socio-demographic factors and knowledge level. Second, because data were collected through face-to-face interviews, social desirability and recall bias cannot be ruled out, particularly for sensitive items related to maternal nutrition and care-seeking. Third, the study was conducted in selected camps within Ukhiya upazila, and the findings may not be fully generalizable to all 33 FDMN camps or to the host community. Fourth, our knowledge instrument captured the cognitive domain only and did not assess attitudes, beliefs, or actual practice, all of which mediate the translation of knowledge into improved birth outcomes. Fifth, the model explained 15.6–21.8% of the variance in

knowledge level (Cox & Snell and Nagelkerke R^2 , respectively), indicating that other unmeasured factors, such as exposure to humanitarian health programs, parity, prior LBW experience, mental-health status, and male-partner involvement, likely contribute substantially and warrant inclusion in future studies. Finally, data were collected in 2021, and the rapidly evolving humanitarian context in Cox's Bazar, including funding reductions and service rationalization in 2024–2026, may have further altered the knowledge landscape.

Conclusion

This study provides the first dedicated evidence on the level and determinants of knowledge regarding low birth weight among Rohingya women of reproductive age residing in the Forcibly Displaced Myanmar Nationals camps of Cox's Bazar, Bangladesh. Although nearly two-thirds of women had heard of LBW, an accurate understanding of its definition, risk factors, complications, and preventive measures was severely limited, with almost 70% scoring in the poor knowledge category and fewer than 4% attaining an excellent score. Older maternal age, the respondent's own educational attainment, and the educational level of the household head emerged as independent predictors of adequate knowledge, with formal schooling exerting the strongest and most consistent effect. These findings highlight an urgent need to strengthen maternal health-education programming within the existing humanitarian response in Cox's Bazar. Interventions should be tailored to overcome the literacy and language barriers that characterize this protracted displacement setting, prioritize adolescent girls who combine high biological vulnerability with very low knowledge, and explicitly engage male household heads as gatekeepers to women's access to health information and services. Integrating LBW-focused, pictorial, and audio-visual health-education content into routine antenatal care, women-friendly spaces, and community outreach platforms, alongside ongoing nutrition-sensitive livelihood and food-security interventions, has the potential to translate improved awareness into measurable reductions in adverse birth outcomes. Future research should adopt longitudinal and mixed-methods designs that capture not only knowledge but also attitudes, practices, and actual birth outcomes, and should examine the role of mental health, partner involvement, parity, and exposure to humanitarian health programs. Such evidence will be essential to guide policymakers, humanitarian agencies, and frontline health workers in their continued efforts to safeguard the health of Rohingya mothers and their newborns in one of the world's most challenging humanitarian contexts.

Declarations

Ethics approval and consent to participate

This study was conducted in strict adherence to ethical research standards declared by Helsinki in 1964 and its subsequent amendments. The study protocol was reviewed and approved by the Institutional Review Committee of the Faculty of Allied Health Sciences, Daffodil International University. Permission to access the camps and conduct data collection was further obtained from the office of the Refugee Relief and Repatriation Commissioner (RRRC) and the respective camp-in-charge offices. Informed

consent was obtained from all participants after clearly explaining the purpose, methodology, potential risks, and benefits of the study in the local language. For the participants aged below 18 years, informed consent was obtained from them and their parents. All participants were assured of anonymity and confidentiality.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests. There are no financial, personal, or professional relationships that could have inappropriately influenced the work reported in this study.

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Author Contribution

M.J. conceptualized and designed the study. Data collection and initial data curation were carried out by M.J. and A.A.M.R. M.J. and A.A.M.R. performed data analysis and interpretation. The first draft of the manuscript was written by M.J. and revised critically for important intellectual content by A.A.M.R. and A.B.M.A.C. All authors reviewed, edited, and approved the final manuscript for submission.

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Data Availability

The data collected and analyzed during this study are not publicly available to ensure participant confidentiality and compliance with ethical requirements. However, data may be made available upon reasonable request from the corresponding author, subject to institutional approval and ethical clearance.

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