# Title: Impact of child marriage on nutritional status of mothers and their under-five children in Bangladesh: a cross sectional study with a nationally representative sample

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# ABSTRACT

**Background:** Child marriage is an indicator of under nutrition among mothers and their under-five children. This important issue is rarely studied with Bangladeshi population. This paper used a nationally representative data to examine the impact of child marriage on nutritional status of Bangladeshi mothers and their under-five children.

**Methods:** Secondary data was used for this study that was extracted from Bangladesh Demographic and Health Survey (BDHS) 2017-18. The sample consisted of 7235 mothers current aged 18-49 years and their under-five children. Marriage at <18 years was considered as child marriage. Nutritional status of mothers was measured by body mass index (BMI), and under-five children’s nutritional status was measured by (i) height-for-age (z-score) (stunting), (ii) weight-for-age (z-score) (underweight) and (iii) weight-for-height (z-score) (wasting). Chi-square test and logistic regression models were used for data analysis, the analyses were carried out using SPSS software (version IBM 20) and significance was accepted at p<0.05.

**Results:** The prevalence of child marriage among women in Bangladesh was 69.0% with mean and median of 16.57±2.83 years and 16 years respectively. 15.2% of mothers suffered from chronic energy deficiency (underweight); of them, 72.8% married at <18 years. The prevalence of stunting, underweight and wasting of under-five children in Bangladesh was 31.0%, 22.0% and 8.5% respectively. As compared to women who married at ages of ≥18, there was a significantly higher likelihood of chronic energy deficiency among women who married at <18 years [crude OR=1.637, 95 CI: 1.392-1.925; p<0.001 & adjusted OR=1.289, CI: 1.450-1.630; p<0.001]. Under-five children of mothers who got marriage before the age of 18 were more likely to have stunting [crude OR= OR= 1.339, CI: 1.199-1.495; p<0.001 & adjusted OR=1.251, CI: 1.121-1.406; p<0.001] and underweight [crude OR=1.185, CI: 1.048-1.339; p<0.01 & adjusted OR=1.135, CI: 1.014-1.280; p<0.05] compared to children of mothers who married at age ≥18.

**Conclusion:** Child marriage among Bangladeshi women is very high which impacts on vicious cycle of malnutrition among mothers and their under-five children. This study suggests increasing women education, women empowerment and well-being for preventing child marriage. This study can help Bangladesh government address an important social problem to take corrective actions for achieving sustainable development goals by 2030.

**Keywords:** Maternal child marriage; Nutritional status; Under-five children; Logistic regression model

**INTRODUCTION**

A marriage before the age 18 is considered as child marriage [1]. Child marriage occurs in almost all nations covering common population, ethnic or racial groups [2]. However, it is recognized as a social problem particularly in low- and middle-income countries (LMICs) [1]. It threatens life, wellbeing and fundamental human rights of girls thus causing a key barrier to sustainable development [3]. Though both the boys and girls face the consequences of child marriage, girls are the worst sufferers [1]. They mostly face poor health and nutritional problems due to their specific biology and reproductive role [4]. Moreover, it has an unequal impact on girls’ education, their health, exposes them to violence, undermining their prospects and potential, and traps them in poverty [1]. Global policy makers agreed to promote among women who married at <18 years all over the world for addressing such a social problem and its consequences [5].

Child marriage is more prevalent in the South Asia region which increases the risk of violence, violation of human rights, and deterioration of general, sexual, and reproductive health of early married women. In some societies, girls are forced to discontinue education and marry, and once married, child girls are forced to bear and rear children [3, 6]. Some studies mentioned that child marriage is linked to poor education levels, less economic opportunities, and poor health among young women [7, 8, 9, 10]. Bangladesh is one of the South Asian countries with similar social problems that have impacts on women who married at the age of <18 years and their offspring.

In 2013, United Nations Children's Fund (UNICEF) reported that 65% of Bangladeshi women married before the age of 18; among them, 29% married before the age of 15. Though a gradual improvement was observed (around 1% per year), in 2020, 59% married before 18 and 22% married before 15 years, such social problem is not yet eliminated [11]. Bangladesh is still within the top ten countries for child marriage in the world [11]. It was already found that main causes of child marriage in Bangladesh were dowry, social pressure, poverty, and parents’ illiteracy [12], and the socioeconomic and demographic factors [13-15]. Several studies in South Asia investigated the factors associated with the age at the first marriage of women and the age at the first birth. They found child marriage was associated with a lower age at the first birth and higher fertility with inadequate birth spacing [16, 17]. Over time, the risks are being aggravated for weak social protection mechanisms and some natural factors such as flood, drought, and COVID-19. The UNICEF estimated that about 10 million of girls will be at risk of becoming child brides as a result of the COVID-19 pandemic [18].

Early marriage is linked to poorer nutritional status among early pregnant women (≤15 years) compared to late pregnant (≥19 years) [19]. In both South Asia and East Africa, child bride has been identified as a strong risk factor for under-five children stunting [20-23]. This important issue is poorly documented in Bangladesh. However, to the best of our knowledge, three studies are available related to our present study: (i) regarding child marriage and morbidity and mortality of under-5 children [24], (ii) adolescent birth and child undernutrition [25] and (iii) early childbirth and under-five malnutrition in Bangladesh [26]. Researchers also investigated child marriage and adolescent motherhood among Bangladeshi women [27]. In study (i), authors tried to find out the mortality trend of children and the impact of child marriage on under-5 children morbidity and mortality [24]. In study (ii), authors investigated trends in adolescent birth and examined its associations with child undernutrition [25]. In study (iii), authors studied early childbirth and under-five malnutrition [26]. Now it is essential to investigate the impact of Bangladeshi mother’s child marriage on their and their under-five children nutritional status. This type of study can help to the Government of Bangladesh for achieving maternal and child health related indicators of sustainable development goals (SDGs) by 2030.

The present authors felt the necessity to identify the association between child marriage and malnutrition of mothers and their under-five children in Bangladesh.

**METHODS**

**Study design and data:** We used secondary data that was extracted from Bangladesh Demographic and Health Survey (BDHS) 2017-2018. It was the latest cross-sectional household survey throughout the country. In the present study, we used 7235 Bangladeshi adult women aged 18-49 years and their last-born under-five children as sample. BDHS collected households, socio-demographic, lifestyle and health related information of mothers and their under-five children from October 2017 to March 2018. Moreover, BDHS 2017-18 measured height and weight of the selected women and their under-five children. The study population, sample, study design, questionnaire, instruments, data collection procedure, data reliability were described elsewhere [28].

**Inclusion criteria:** Bangladeshi non-pregnant married women living in Bangladesh current aged 18-49 years having at least one under-five child living with mothers (who were eligible for height and weight measurements) were considered as sample for the analysis.

**Sampling and sample selection procedure:** BDHS 2017-18 used two-stage stratified cluster sampling for selecting households from Bangladesh. In the first stage, 675 enumeration areas (EAs) (250 in urban and 425 in rural areas) were selected by stratified sampling with proportional allocation. In the second stage, 30 households were selected from each selected EA using systematic sampling. BDHS 2017-18 eliminated three EAs due to communication problem, finally they considered 672 EAs, and 20160 households for the survey. They mentioned the sampling weights were not expected to lead to any significant differences in the overall survey indicators [28]. For the present study, we first considered 8,653 women having at least one under-five children who were eligible for height and weight measurements. BDHS 2017-18 considered one child if a woman had twin babies. According to our exclusion criteria, we excluded some women and their under-five children. Data were checked and the outliers of dataset, missing values and incomplete data were excluded; finally, 7235 women and their last-born under-five children were considered for the present study.

**Outcome variable:** There were two outcome variables for the study: (i) nutritional status of mothers, measured by their body mass index (BMI), where BMI= Weight (kg)/((height (m))2. Mothers were defined as under nutrition (chronic energy deficiency) if their BMI was <18.5 kg/m2, normal weight if BMI was ≥18.5 to <25 kg/m2, and over nutrition if BMI was ≥25kg/m2. (ii) The nutritional status of under-five children was measured by three indicators: (i) stunting (height-for-age; z-score), (ii) underweight (weight-for-age; z-score) and (iii) wasting (weight-for-height; z-score). Each indicator was classified into two classes according to the cut-off point suggested by WHO; stunting (z-score<-2; code 1) and not stunting (z-score≥-2; code 0); underweight (z-score<-2; code 1) and not underweight (z-score≥-2; code 0); wasting (z-score<-2; code 1) and not wasting (z-score≥-2; code 0).

**Independent variable:** First the main independent variable age at first marriage (year) (AAFM) was divided into five groups; (i) AAFM≤15, (ii) 16≤AAFM<18, (iii) 18≤AAFM≤20, (iv) 21≤AAFM≤24 and (v) AAFM≥25. Finally, it was divided into two groups according to the rule of Bangladesh government: (i) child marriage (AAFM<18 years; code, 1) and (ii) not child marriage (AAFM ≥18years; code, 0) [28]. Some socioeconomic, demographic, household factors were also considered as independent variables in this study which were mentioned in Table 1.

**Statistical analysis:** The background characteristics of the samples were summarized using frequency distribution. We determined the proportion of each category of outcome variables and women child marriage using frequency distribution, and descriptive statistics was used to calculate mean±SD and median of AAFM of women, and mean±SD of women and their under-five children age. Chi-square (χ2) test was utilized to examine the significance of association between women child marriage and nutritional status of women and their under-five children. Analysis of variance (ANOVA) also used to find the variation in mean BMI among AAFM groups. As we mentioned, BDHS 2017-2018 collected data from overall Bangladesh using two stages stratified cluster sampling; data came from different levels of hierarchy. There was possibility of clustering effect of outcome variables. We checked the existence of clustering effect in outcome variables using median odds ratio (MOR) [MOR=exp{0.6745=exp(0.95, where is the cluster variance [29]. We found there was no cluster variation of outcome variables. A single-level logistic model was used to analyze the data. One of our outcome variables (women’s nutritional status) was ordinal where ordinal logistic regression was more appropriate to analyze the data. However, the test of Parallel Lines showed that the assumption of the model was not satisfied. Alternatively, multinomial logistic regression model was used to find the impact of child marriage on mothers’ nutritional status uncontrolling/controlling the effect of selected socio-economic, demographic and other factors. We also used binary logistic regression model to examine the impact of mothers’ child marriage on nutritional status of their under-five children uncontrolling/controlling the effect of selected socio-economic, demographic and other factors. For the multiple model (controlled the effect of other selected independent variables), it was possible to get multicollinearity problem among the independent variables; the magnitude of the standard error (SE) was used for detecting the problem; it was judged that there was no evidence of multicollinearity if the SE lies between 0.001 and 0.5 [30]. We did not get any multicollinearity problem among the independent variables for multinomial and binary logistic models. Statistical significance was accepted at p<0.05. Statistical analyses were carried out using SPSS software (version IBM 20).

**RESULTS**

In this study, we considered 7235 non-pregnant women having at least one under-five child. The mean age of women was 26.11±5.53 years, and under-five children were 1.94±1.44 years. The highest number of women was selected from Chittagong division while the distribution of other divisions was almost the same. More than 65% of women were living in rural environment, 17.2% of were higher educated while the number of women with no education was 7.3% and 16.4% women’s husbands were uneducated. Still 42.8% of women were living in poor family, near to 70% of women delivered their first child before reaching 20 years, and more than 60% provided initial breast milk to the new born. Near to 70% of women’s husbands were doing hard work while more than 40% of women were currently working (Table 1).

**Table 1:** The characteristics of selected (7235) samples (women aged 18-49 years) in Bangladesh

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **Group** | **N (%)** | **Variable** | **Group** | **N (%)** |
| Division | Barisal | 761(10.5) | Mothers’ education level | No education | 529 (7.3) |
|  | Chittagong | 1181(16.3) |  | Primary | 2064(28.5) |
|  | Dhaka | 1031(14.3) |  | Secondary | 3399(47.0) |
|  | Khulna | 786(10.9) |  | Higher | 1,243(17.2) |
|  | Mymensingh | 850(11.7) | Husbands’ education level | No education | 1189 (16.4) |
|  | Rajshahi | 752(10.4) |  | Primary | 2411(33.4) |
|  | Rangpur | 829(11.5) |  | Secondary | 2311 (31.9) |
|  | Sylhet | 1,045(14.4) |  | Higher | 1324 (18.3) |
| Type of place of residence | Urban | 2,482(34.3) | Religion | Muslim | 6606(91.3) |
|  | Rural | 4753(65.7) |  | Others | 629(8.7) |
| Wealth Index | Poor | 3022(41.8) | Total ever born children | One | 2141(29.6) |
|  | Middle | 1307(18.1) |  | Two | 2,649(36.6) |
|  | Rich | 2906(40.1) |  | Three or more | 2,445(33.8) |
| Age at first birth (AAFB) (Year) | Early child bearing (AAFB<20 years) | 5005 (69.2) | Initial breastfeeding | Yes (within one hour of delivery) | 3079(60.8) |
|  | Normal (AAFB≥20 years) | 2230 (30.8) |  | No | 1982(39.2) |
| Husbands’ occupation | Hard working | 5040(69.7) | Respondent currently working | No | 4262(58.9) |
|  | Service holder | 447(6.2) |  | Yes | 2973(41.1) |
|  | Businessman | 1552(21.5) | Sex of child | Boy | 3782(52.3) |
|  | Unemployed | 196(2.7) |  | Girl | 3453(47.7) |

It was found that the rate of child marriage among Bangladeshi mothers was about 69% with the mean and median of age at first marriage was 16.57±2.83 and 16 years respectively. It was noted that 37.6% of mothers married at ≤15 years, 31.4% of women married between ages of 16 to 18, and only 2.1% married at the age of ≥25. Analysis of variance (ANOVA) demonstrated that the variations of mean BMI among the groups of age at first marriage was significant (p<0.01), and we observed that the mean of BMI increased with increasing age at first marriage (Table 2).

**Table 2:** Mean of age at first marriage (AAFM), and mean BMI of the category of AAFM among women

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Mean | SD | 95% CI for Mean | | Minimum | Maximum |
| Lower bound | Upper bound |
| Age at first marriage (years) | 16.57 | 2.83 | 16.50 | 16.63 | 10 | 36 |
| Mean of BMI for each category of AAFM | | | | | | |
| Child marriage (AAFM<18 year) (4991(69.0%) | 22.46 | 3.86 | 22.35 | 22.57 | 15.01 | 39.45 |
| Not-child marriage (AAFM≥18 year) (2244, 31.0%) | 23.27 | 4.19 | 23.10 | 23.44 | 15.12 | 38.78 |
| AAFM≤15 (2723, 37.6%) | 22.45 | 3.85 | 22.35 | 22.63 | 15.01 | 38.14 |
| 16≤AAFM<18 (2268, 31.4%) | 22.47 | 3.88 | 22.27 | 22.58 | 15.01 | 39.45 |
| 18≤AAFM≤20, (1670, 23.1%) | 22.98 | 4.19 | 22.78 | 23.17 | 15.12 | 38.78 |
| 21≤AAFM≤24 (422, 5.8%) | 24.01 | 4.03 | 23.63 | 24.40 | 15.42 | 35.68 |
| AAFM≥25 (152, 2.1%) | 24.59 | 4.09 | 23.93 | 25.24 | 15.83 | 34.92 |
| Total, 7235 | 22.71 | 3.98 | 22.62 | 22.80 | 15.01 | 39.45 |

It was noted that 15.2% of mothers were suffering from chronic energy deficiency; of them, 72.8% got marriage before the age 18 while the prevalence of over nourished was 26.1%. Decreasing tendency of rate of child marriage was observed with the increase in the nutritional status of mothers in Bangladesh, and Chi-square test showed that the association between these two factors was highly significant (p<0.001). We found that the current prevalence of stunting, underweight and wasting of under-five children in Bangladesh were 31%, 22% and 8.5% respectively; among them, 73.2%, 71.8% and 69.8% of children’s mothers got marriage before the age <18. The association between maternal child marriage and their under-five children’s stunting and underweight were highly significant (p<0.001) while wasting was not significant (p>0.05) (Table 3).

**Table 3:** Association between women’s child marriage and nutritional status of mothers and their under-five children

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Nutritional status of mothers & Under-five children** | **Group,**  **N(%)** | **Not-child marriage (AAFM≥18 years),** 2244(31.0%) | **Child marriage (AAFM<18 years),** 4991(69.0) | **Chi-square value** |  |
| Mothers’ nutritional status | Under nutrition (BMI<18.5 kg/m2), 1097(15.2) | 298(27.2%) | 799(72.8%) |  |  |
|  | Normal (18.5≤BMI<25kg/m2), 4244(58.7) | 1228(28.9%) | 3016(71.1%) | 58.255\*\* |  |
|  | Over nutrition (BMI≥25 kg/m2), 1894(26.1) | 718(37.9%) | 1176(62.1%) |  |  |
| **Child’s nutritional status** |  |  |  |  |  |
| Stunting | Yes (Z-score<-2), 2245(31.0%) | 602(26.8%) | 1643(73.2%) | 26.846\*\* |  |
|  | No (Z-score≥-2), 4990(69.0%) | 1642(32.9%) | 3348(67.1%) |  |  |
| Underweight | Yes (Z-score<-2), 1590(22.0%) | 449(28.2%) | 1141(71.8%) | 7.344\*\* |  |
|  | No (Z-score≥-2), 5645(78.0%) | 1795(31.8%) | 3850(68.2%) |  |  |
| Wasting | Yes (Z-score<-2), 612(8.5%) | 185(30.2%) | 427(69.8%) | 0.194 |  |
|  | No (Z-score≥-2), 6623(91.5%) | 2059(31.1%) | 4564(68.9%) |  |  |

N.B.: \*\*: 1% level of significance (p<0.01).

A significantly higher likelihood of chronic energy deficiency was found among mothers who married at <18 compared to mothers who married at ≥18 (Table 4).

**Table 4:** Impact of child marriage on women nutritional status

|  |  |  |  |
| --- | --- | --- | --- |
| Women’s nutritional status (UndernutritionR) | Mothers’ first marriage (Independent variable) | OR (95% CI: lower-upper) | AOR (95% CI: lower-upper) |
| Normal | Non-child marriage Vs  Child marriageR | 1.092 (0. .941-1.267); p>0.05 | 1.049(0.918-1.309); p>0.05 |
| Over | Non-child marriage Vs  Child marriageR | 1.637 (1.392-1.925); p<0.001 | 1.289(1.450-1.630); p<0.001 |

**N.B:** R: Reference category, OR: Odds ratio, AOR: Adjusted odds ratio (Selected socio-economic, demographic and other variables were adjusted); CI: Confidence interval

Mothers who married before 18  were more likely to get stunting and underweight children respectively compared to mothers who married at the age of ≥ 18 (Table 5).

**Table 5:** The impact of maternal child marriage on nutritional status of their under-five children

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Group | Stunting | | Wasting | | Underweight | |
| Age at first marriage | Child marriage Vs  Not-child marriageR | OR= 1.339  (1.199-1.495); p<0.001 | AOR=1.251  (1.121-1.406); p<0.001 | OR=1.041  (0.870-1.247); p>0.05 | AOR=1.033  (0.870-1.239); p>0.05 | OR= 1.185  (1.048-1.339); p<0.01 | AOR= 1.135  (1.014-1.280); p<0.05 |

# N.B.: R: Reference category, OR: Odds ratio, AOR: Adjusted odds ratio (Selected socio-economic, demographic and other variables were adjusted). Statistical significance was accepted at 5% level.

**DISCUSSION**

We investigated the impact of child marriage on nutritional status among mothers and their under-five children, controlling and uncontrolling the effect of some associated factors of child marriage and nutritional status.

The mean and median age at the first marriage among Bangladeshi women was 16.57±2.83 years and 16 years respectively. 69% of women aged 18-49 years married before the age of 18. Child marriage was more than twice times higher in rural area compared to urban area. However, BDHS 2017-18 reported that the percentage was 59% among women aged 20-24 years in the country [28]. The proportion of child marriage had been decreasing during the last two decades in Bangladesh due to increasing women education [28]. Still the rate of child marriage in Bangladesh had the third highest in the world [31]. In Bangladeshi culture, marriage of aged girls is comparatively difficult, and parents here usually favor child marriage due to poverty and lack of security. Crisis of employment for educated women is also an important reason behind it. All these factors contribute to a significantly higher rate of child marriage in the country [32]. On the other hand, our study showed that the prevalence of chronic energy deficiency among married women aged 18-49 years having at least one under-five children was 15.2% while 26.1% over nourished. However, the overall prevalence of under nutrition and over nutrition was 12% and 32% respectively among the same age group irrespective of having under-five children. The child marriage of Bangladeshi women steadily has been decreasing during the last two decades. During the same time, the prevalence of women’s chronic energy deficiency has been decreasing while the prevalence of over nutrition sharply increasing. The prevalence of stunting, underweight and wasting of under-five children in Bangladesh have also been improving during last two decades [28]. This may be due to increase in the women education and household wealth index in the country during the period [28]. Timing and circumstances of age at first marriage have profound consequences on women’s and men’s life, and its effects on their health outcome are significant. In the present study, we found a greater number of women who married at <18 suffered from chronic energy deficiency compared to their counterparts [33]. Child marriage was one of the most important indicators of being chronic energy deficiency among married women in Bangladesh. Same finding was found in different countries in the world [33].

In the present study, we found that maternal child marriage was an important predictor of stunting and underweight of under-five children. Same results were found in sub-Saharan Africa study [21], in Indian studies [23, 24]. Stunting is the chronic consequence of energy deficiency from pregnancy to under-five with inappropriate feeding practice. This chronic deficiency even can cause some non-communicable diseases such as heart diseases in late ages of today’s children [34]. Child marriage mostly happens in families of low socio-economic status where health awareness, adequate nutrition and medical facilities are scarce. This contributes to malnutrition in both child-married mothers and their under-five children [35].

In Bangladesh, only 18.2% of women are higher educated, and education is an important factor of women’s age at the first marriage. The educated mothers are usually more conscious about their and their child’s health and wellbeing, and understand well the importance of antenatal (ANC) and post-natal care (PNC) which can prevent chronic energy deficiency among under-five children. Subsequently, more than 67% of women are of poor and middle-income groups who are at risk of getting inadequate nutritious food and fruits thus augmenting the vicious cycle of malnutrition among mothers and under-five children [28]. Though Bangladesh has a law against child marriage, still it is an important social problem all over the country due to poor implementation of law.

**Strength and limitations of the study**: This was the first time we attempted to investigate the association of maternal child marriage and maternal and their under-five children nutritional status in Bangladesh. As this study covers all divisions of Bangladesh with sufficient sample size, it demands a strong scientific strength. In addition, appropriate steps, process, and measurements were taken by a group of skilled data collectors who were properly trained on data ethics, avoidance of bias and transparent survey through sharing survey objectives. However, there were some limitations of our study. Firstly, due to the cross-sectional study, we could not make causal relationship between the child marriage and nutritional status of mothers and their under-five children. Secondly, we could not include all the factors for multivariable model known to be related to child marriage and nutritional status of mothers and their under-five children due to the secondary analysis of the data. Clearly, more researches are required regarding child marriage and health and nutritional status of mothers and their under-five children in Bangladesh.

**Conclusions and recommendations/policy implication:** In this study we find that still the rate of child marriage among Bangladeshi women is very high, and it has a higher impact on nutritional status of mothers and their under-five children. At least 12 indicators of SDGs are directly or indirectly related to nutritional status of maternal and under-five children. Our present study appears that child marriage is an important barrier in achieving SDG by 2030 in Bangladesh. The government health authorities, as well as non-government social and cultural organizations should play an important role in undertaking interventions to reduce adverse consequences of child marriage. This study recommends for reducing/ending child marriage; (i) it is necessary to make awareness among people about the disadvantage of child marriage, (ii) government should take initiative for increasing women education level, women empowerment and their well-being.

**Abbreviations:** AAFM: Age at first marriage; AOR- Adjusted Odds Ratio; ANC-Antenatal care; BDHS- Bangladesh Demographic and Health Survey; BMI: Body mass index; COVID-19; Coronavirus disease-19; IBM- International Business Machines; LMICs: Low- and middle-income countries; MOR: Median odds ratio; OR: Odds ratio; PNC: Postnatal care; SE- Standard error; SPSS- Statistical Package for the Social Sciences; UNICEF: United Nations Children's Fund.

**DECLARATIONS**

**Ethics approval and consent to participate:** This study used secondary data that was extracted from the Bangladesh Demographic and Health Surveys (BDHS), 2017-18 and is available in the public domain. The National Institute of Population Research and Training (NIPORT), Medical Education and Family Welfare Division, Ministry of Health and Family Welfare of Bangladesh have reviewed, and the ICF Institutional Review Board (IRB) have reviewed and approved the survey protocols and participant confidentiality. Regarding the confidentiality of participants and the protection of human subjects, the ICF IRB abides by the standards set forth by the US Department of Health and Human Services. Therefore, the DHS data was ethically acceptable, and no additional ethical approval was necessary. BDHS, 2017-18 have received written consent from each individual in the study.

**Consent for publication:** Not applicable to this study.

**Availability of data and materials:** Data are freely available at https://dhsprogram.com/data/dataset/Bangladesh\_Standard-DHS\_2017.cfm?flag=0

**Competing interests:** The authors declare that they have no competing interests.

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**Authors' contributions:** SAM, MGH designed the experiment. SAM, ASMAM, MAS performed the experiment. SAM, MGH, MAS drafted the manuscript. SAM, ASMAM, MGH, MAS, MAW were involved in data interpretation and statistical analysis. ASMAM, MGH, MAS, MAW critically revised the manuscript. All the authors read and approved the manuscript.

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