

# Women's Decision-making Autonomy and Some Demographic Factors Associated With Higher Dietary Diversity in Bangladesh

Jahid Hasan Shourove

Shahjalal University of Science and Technology

Md. Mustafizur Rahman

Shahjalal University of Science and Technology

G. M. Rabiul Islam (✉ [rabi-ttc@sust.edu](mailto:rabi-ttc@sust.edu))

Shahjalal University of Science and Technology

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## Research Article

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# Abstract

**Background:** Consumption of diverse nutrient-rich diets is vital for maintaining a healthy life. A low-quality monotonous diet dominated by starchy staple foods is common in Bangladesh, which leads to the development of diseases associated with micronutrient deficiencies, particularly in women and their offspring. This research aims to validate the association between women's decision-making autonomy and their attainment of higher dietary diversity (DD), as well as identify the sociodemographic factors that can independently predict higher DD.

**Methods:** This study was conducted using the data selected from the Bangladesh Demographic and Health Survey, 2014. Women (n = 17,842) aged 15–49 years, with their complete dietary details, were selected as the participants. The DDS was obtained from a 24-h recall of dietary intake from nine food groups and was categorized into lower DDS ( $DD \leq 4$ ) and higher DDS ( $DD \geq 5$ ). The relationship between the decision-making independence of women and DDS was studied using logistic regression.

**Results:** It was observed that almost all women consumed starchy foods, followed by flesh (meat or fish) (83.86%) and fruits (67.30%). The involvement of women in decision-making for household purchases was significantly correlated with higher dietary diversity. The odds were higher among women who participated in household purchases compared to women who did not (OR 2.40; 95% CI: 0.52–9.83;  $p = 0.022$ ). Women who had higher and secondary education were 2.72 (95% CI: 0.49–15.02;  $p = 0.025$ ) and 1.31 (95% CI: 0.28–6.18;  $p = 0.029$ ) times more likely to achieve higher DD compared to those with no education. Women in the richer wealth quintiles were 6.49 (OR 6.49; 95% CI: 1.12–37.5;  $p = 0.037$ ) times more likely to achieve higher DD compared to women in poorer wealth quintiles.

**Conclusion:** The research findings suggested that the socioeconomic status, empowerment, and higher education of women may contribute to the purchase of nutritious foods and higher dietary diversity.

## Introduction

Adequate nutrient intake is vital for the maintenance of good health, which is the foundation of stable and prosperous livelihoods and the economic development of any nation. Malnutrition is a major global issue that is prevalent in developing countries, notably in Africa and Asia [1]. Food insecurity and malnutrition are strongly associated with gender in Bangladesh. About 54% of Bangladeshi women of reproductive age (10–49 years) consume an insufficient variety of diets [2]. Chronic child malnutrition and food insecurity are prevalent in South Asia [3], especially in Bangladesh, due to women's low status and gender disparities in health and education. Micronutrient deficiency has adverse health outcomes such as congenital disabilities, growth suppression, diminished memory, as well as increased morbidity and mortality for themselves and their offspring [4, 5].

Anemia is a common disorder in Bangladesh, affecting approximately 42.4% of women ( $Hb < 12$  g/dL). The incidence of this disease is significantly higher among pregnant women (49.6%) [6]. Non-pregnant non-lactating (NPNL) women aged 15–49 years are critically deficient in the micronutrient zinc (S. zinc

level < 10.1 mmol/l) [6]. Deficiency of iodine, vitamin A, folate, and vitamin B<sub>12</sub> was noticed among 42.1%, 5.4%, 9.1%, and 22% Bangladeshi women, respectively [6, 7]. Different socioeconomic statuses such as the maternal education level, place of residence, and wealth index influenced the micronutrient status of the women in Bangladesh [6, 8]. Generally, the monotonous consumption of starchy staple foods and other foods with lower nutritional quality is one of the main reasons for the micronutrient deficiency in individuals, especially in pregnant women and lactating mothers [5, 9]. Acute scarcity of micronutrients increases the death rate of the childbearing mother as well as the child [9]. Nutrient-dense foods and a diverse diet are vital components of effective complementary eating habits to satisfy the nutrient requirements and promote sufficient development. According to international standards, supplementary items, including a range of foods from various categories such as nutrient-rich flesh foods or fortified foods, should be consumed in limited doses several times a day.

Dietary diversity (DD), an essential component of dietary quality, is one of the benchmarks of the World Health Organization (WHO, 2009) for assessing an individual's feeding habits [10]. DD is characterized as the simple count of foods and food groups eaten during the previous 24 h, which is a good indicator of the improved nutritional adequacy of the diet [4, 11, 12]. In broad surveys and other data collection activities, DD is primarily used as a surrogate measure of micronutrient density or dietary adequacy [1]. In developed countries, a higher DD score is associated with the enhanced nutritional status of infants [11]. Increasing the intake of diverse diets (more food groups) may fulfill the nutritional requirement, especially among women [12, 13]. Women's decision-making autonomy is an important aspect of women's empowerment, increasing the chance of purchasing various foods to meet their nutritional requirements [1].

Women's empowerment, a fundamental issue of life, is the foundation of the population and development program of a country. Each year, more than 222 thousand deaths occur among mothers, of which at least 30% suffer from serious diseases and debilitating injuries [14]. Researchers have used various approaches and indicators to assess empowerment. It is usually measured by six different dimensions, economic, socio-cultural, familial, interpersonal, legal, political, and psychological [14]. In 2020, Coates et al. suggested that the access to and control of household resources, household-level decision-making, and freedom of movement were the important factors that determined the empowerment of women [15]. Sharma and Kader reported that decision-making autonomy was an important indicator of women's empowerment, which significantly influenced the child nutrition status in the rural areas of Bangladesh [16]. Other relevant studies emphasized the relationship between woman empowerment and child nutrition [17–20]. Women's decision-making autonomy is often an indicator of empowerment in several situations and was shown to affect the use of contraception by women [21], infant birth weight [16], negotiation for safer sex [22], and health care [18], among others.

To the best of our knowledge, no previous study has examined the relationship of women empowerment and their demographic conditions with the achievement of higher dietary diversity, using data representative of the country. One previous study reported a promising relationship between woman empowerment and household dietary diversity, although it was limited to the participants of the Habiganj

district of Bangladesh [2]. This study aimed to examine the relationship between women's decision-making autonomy and their attainment of higher DD, as well as confirm the sociodemographic variables that can independently predict women's attainment of higher DD using the country representative data collected by the Bangladesh Demographic and Health Survey.

## Methods

### Data overview

The data used in this analysis were collected from the 2014 Bangladesh Demographic and Health Surveys (BDHS, 2014) [23]. This survey was conducted in collaboration with the authority of the "National Institute of Population Research and Training (NIPORT)" and "ICF International" from June to November 2014. The "United States Agency for International Development (USAID)/Bangladesh" financed the survey. The BDHS was a nationally representative health survey that was performed using a stratified two-stage sampling design. It was a cross-sectional survey undertaken in Bangladesh to collect data on the primary health factors such as nutrition, dietary diversity, family planning, maternal and child health, as well as men's and women's health. A secondary data assessment was performed to examine the dietary diversity and differentials. The participants in this sample were women aged 15 to 49-years-old ( $n = 17,842$ ) with their complete dietary details. The following parameters were used in bivariate and multivariate analysis to assess population characteristics and analyze correlations between dietary diversity and educational qualification or place of residence.

### Outcomes

In this study, the dietary diversity of women was used as the outcome. The Dietary Diversity Score (DDS) was measured by recalling the food consumption during the previous 24 h before the in-home survey. According to the USAID (2012) recommendation, 14 types of foods included in the survey were regrouped into the following nine main food groups: (i) grain, tubers, roots; (ii) flesh/meat (beef, chicken, fish, etc.); (iii) dairy products (milk, cheese, yogurt, etc.); (iv) legumes (food made from beans, peas, lentils, nuts); (v) eggs; (vi) organ meat (liver, heart, kidney, etc.); (vii) dark green vitamin A-rich leafy vegetables; (viii) vitamin A-rich fruits and vegetables; (ix) other fruits [24]. The women were asked whether they had eaten any of the above food classes on the previous day. The score recorded for a "yes" response was "1" and "0" for a "no." The scores were then added together to calculate the women's DD ranking, which ranged from 0 to 9. The DDS was then calculated using a 24-hour recall of the dietary consumption from the above nine food classes and divided into two categories: lower DDS ( $DD \leq 4$ ) and higher DDS ( $DD \geq 5$ ) [9].

### Explanatory variables

In this study, we considered the women's decision-making autonomy based on whether they could participate in the decision-making of (i) spending money for the household, (ii) household purchases, and (iii) own health care, which may also be considered as a representative variable of woman empowerment.

We re-coded the variables “final say on deciding what to do with the money earned by the husband” and “who decides how to spend money in the household”, from the dataset of BDHS 2014, into “whether the women could participate in the decision of spending money”. We also re-coded the variable “final say on making large household purchases” and “final say on making purchases for daily needs” from the parent data set into the variable “whether the women can participate in the decision-making of household purchases”. Also, the sociodemographic factors such as education, occupation, religion, place of residence, and household wealth index were selected as the explanatory variables for women’s dietary diversity. In BDHS, the wealth index was generated using data on the possession of household assets through principal component analysis (PCA) and was used as the proxy indicator for household economic status [23]. It was represented as quintile groups in the datasets, ranging from poorest to richest. We divided the maternal occupation into two groups viz., agriculture/labor and white collar; the latter represented women having an official job.

### **Ethical consideration**

The BDHS data collection protocol was approved by the Bangladesh Medical Research Council’s National Research Ethics Committee and the macro-institutional review board of the Office of Research Compliance. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. As per BDHS guidelines, informed consent was obtained from individual respondents before the interview, and this was accompanied by an oral interpreter provided by the interviewers. Informed oral consent was taken from participants before interviewing them as more than one-third of the study population is illiterate. The survey participants were informed of the voluntary nature of the survey, the possible risks of participation, the perspective of the collected data, and the related confidentiality. Further ethical approval was not needed for this study as the data used was obtained from secondary sources.

### **Statistical analysis**

The selected data were analyzed using the statistical program STATA version 15 (Stata Corp LLC). Descriptive analysis was conducted to examine the background characteristics of the study samples. The relationship between DD and women’s decision-making autonomy (viz., spending money, making household purchases, and own health care) along with other demographic characteristics was determined using bivariate and multivariate logistic regression, and the result was reported as the odds ratio. P-values of <0.05 indicated statistically significant results.

## **Results**

The descriptive statistics of the sample are represented in Table 1. A total of 17,842 women aged 15 to 49-years-old were selected for the present study. About 86.01% of the women had lower DD ( $DDS \leq 4$ ), whereas only 13.99% of the women had higher DD ( $DDS \geq 5$ ). These results indicate that the number of Bangladeshi women who consumed five or more food groups was about six times lower than the number

of women consuming four or fewer food groups. Based on the findings, almost all the women (96.14%) in this sample consumed starchy foods such as grains, tubers, and roots. These starchy foods and carbohydrates dominated the food habit of Bangladeshi women. Among the nine food groups, consumption of protein-based flesh/meat, including beef, chicken, and fish, was also at a satisfactory level, and 83.86% of women included it in their diet. Consumption of eggs, vitamin A-rich dark green leafy vegetables, and other fruit vegetables were consumed by significantly lower women (20.08%, 16.10%, and 23.01%, respectively). On the other hand, a high number of women (67.30%) consumed other fruits that were poor in vitamin A. The least-consumed food groups were organ meat (4.35%) such as liver, heart, kidney, and others.

Table 1

Descriptive analysis of the study sample (n = 17,842): categorical and continuous variables

<b>Variables</b>	<b>Mean <math>\pm</math> SD/%</b>
Women Dietary Diversity (DD)	
DDS $\leq$ 4	86.01
DDS $\geq$ 5	13.99
Food groups used in creating women's DD	
Grains-tubers-roots (yes)	96.14
Flesh food (beef, chicken, fish, etc.) (yes)	83.86
Dairy products (milk, cheese, yogurt, etc.) (yes)	58.10
Legumes (food made from beans, peas, lentils, nuts) (yes)	38.40
Eggs (yes)	20.08
Organ meat (liver, heart, kidney, etc.) (yes)	4.35
Dark green vitamin A rich leafy vegetables (yes)	23.01
Vitamin A-rich fruits and other vitamin A vegetables (yes)	16.10
Other fruits (yes)	67.30
Women's participation in the decision making of household spending money	
Yes	39.76
Women's participation in the decision making of household purchases	
Yes	60.17
Women's participation in the decision making of own health care	
Yes	14.3
Socio-demographic factors	
Maternal Education	
No education	26.00
Primary	29.88
Secondary	35.90
Higher	8.21
Maternal Occupation	
Agriculture/ labor	80.58

<b>Variables</b>	<b>Mean ± SD/%</b>
White-collar	19.42
Maternal Religion	
Islam	88.81
Others	11.19
Place of residence	
Rural	65.27
Urban	34.73
Wealth index	
Poorer	36.1
Middle	19.21
Richer	21.17
Richest	23.52
Continuous Variables	
Maternal age	32.07 ± 5.05
Number of children under 5 years	0.8 ± 0.27
Number of household members	5.76 ± 2.86

The findings of this research indicate that 60.17% of these women are empowered to give their opinion in the final decision-making for household purchases. Furthermore, a comparatively lower number of participants (39.76%) are empowered to give their opinion on spending the money. Moreover, only 14.3% of the women can make decisions regarding their health care. It was observed that 26% of the women who had participated in the survey did not have any schooling, and only 8.21% pursued higher education. The occupation of 80.58% of the women was related to agriculture or physical labor, whereas only 19.42% had white-collar jobs. Most of the participants (65.26%) lived in rural areas. A considerably lower number of participants was in the richer (21.17%) and richest (23.52%) wealth quintiles.

The result of bivariate and multivariate regression reporting odds between the diet diversity and the covariates associated with the women's decision-making autonomy and their sociodemographic condition is presented in Table 2. According to the bivariate analysis, decision-making autonomy was significantly associated with higher DD of women. Women taking decisions in household purchases were almost twice more likely to achieve higher DD (OR 1.74; 95% CI: 1.41–2.15;  $p = 0.001$ ) compared to those who had no contribution to the final decision-making. Among the sociodemographic factors, maternal education level, occupation, place of residence, and wealth index were significantly associated with the

achievement of a higher DDS. The odds of having a higher dietary diversity among women with higher education were almost twice (OR 1.75; 95% CI: 1.54–1.99;  $p < 0.001$ ) those having no education. In the case of maternal occupation, the chances of attaining higher diversity of diets were more than twice among women with white-collar jobs (OR 2.10; 95% CI: 1.00–4.40;  $p = 0.045$ ), compared to women engaged in agriculture or another laborious work. The odds of attaining significantly higher dietary diversity were more (OR:1.69; 95% CI: 1.37–2.08;  $p = 0.002$ ) among women living in the urban region compared to those living in the rural areas of Bangladesh. Regarding wealth index, the bivariate analysis demonstrated that the odds of having higher dietary diversity were 1.34-times (95% CI: 1.25–1.44;  $p = 0.010$ ) among the richest women compared to the poorest ones.

Table 2

Bivariate and multivariate logistic regression analysis to determine the association of women's dietary diversity (DD), women's empowerment, and some socio-demographic factors (n = 17,842)

Variables	Bivariate			Multivariate		
	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value
Women's participation in the decision making of household spending money						
No (ref.)	-	-	-	-	-	-
Yes	0.78	0.36–1.69	0.522	0.57	0.21–1.52	0.264
Women's participation in the decision making of household purchases						
No (ref.)	-	-	-	-	-	-
Yes	1.74**	1.41–2.15	0.001	2.40*	0.52–9.83	0.022
Women's participation in the decision making of own health care						
No (ref.)	-	-	-	-	-	-
Yes	1.11	0.79–1.55	0.533	0.92	0.25–3.30	0.901
Maternal Educational level						
No education (ref.)	-	-	-	-	-	-
Primary	0.78	0.56–1.188	0.735	0.53	0.08–3.48	0.504
Secondary	1.11	0.80–1.35	0.682	1.31*	0.28–6.18	0.029
Higher	1.75**	1.54–1.99	< 0.001	2.72*	0.49–15.02	0.025
Maternal Occupation						
Agriculture/ labor (ref.)	-	-	-	-	-	-
White collar	2.10*	1.00–4.40	0.045	0.79	0.26–2.43	0.684
Maternal Religion						
Islam (ref.)	-	-	-	-	-	-
Significant value * $p < 0.05$ , ** $p < 0.01$						

Variables	Bivariate			Multivariate		
	Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value
Others	1.04	0.74–1.43	0.835	1.91	0.61–5.95	0.266
Place of residence						
Rural (ref.)	-	-	-	-	-	-
Urban	1.69**	1.37–2.08	0.002	1.52	0.51–4.58	0.455
Wealth index						
Poorer (ref.)	-	-	-	-	-	-
Middle	0.68	0.48–1.18	0.756	0.37	0.03–4.55	0.439
Richer	1.21	0.98–1.56	0.058	6.49*	1.12–37.5	0.037
Richest	1.34*	1.25–1.44	0.010	5.62	0.81–39.23	0.081
Significant value * $p < 0.05$ , ** $p < 0.01$						

Based on the multivariate regression, the attainment of higher DD was significantly associated with women who participated in decision-making for household purchases, maternal education and had a higher wealth index. Dietary diversity was significantly higher in the case of women who had participated in household purchases (OR: 2.40; 95% CI: 0.52–9.83;  $p = 0.022$ ), compared to those who had no role in household purchases. Maternal education level was a significant influencer of women's dietary diversity. The odds of having higher dietary diversity among the women who attained secondary and higher education were OR 1.31 (95% CI: 0.28–6.18;  $p = 0.029$ ) and OR 2.72 (95% CI: 0.49–15.02;  $p = 0.025$ ), respectively, compared to those having no schooling. Besides, the wealth index also appeared to influence DD, and the results indicated that richer women were more likely to achieve more than 6.5 times higher dietary diversity compared to poorer women in Bangladesh (OR 6.49; 95% CI: 1.12–37.5;  $p = 0.037$ ).

## Discussion

Our results indicate that women who took decisions in making household purchases could attain higher DD compared to those who did not. The findings of this study indicate a positive relationship between women's participation in decision-making for household purchases and a higher DD. These results are in line with those of previous research on the women of Bangladesh and Iran [2, 14, 18, 25]. Previous studies of Ali et al. and Ghose et al. from Bangladesh reported that the role of women in household decision-

making and the capability to purchase food positively influence the availability of a diverse diet in the home, which increased the consumption of a diversified diet among women and children [18, 25]. This suggests that attempts to improve women's nutrition may be successful by increasing focus on women's decision-making capability. Similarly, the study of Sinharoy et al. reported strong associations between women's decision-making autonomy and dietary diversity in the rural areas of Bangladesh [2]. A similar result was observed among Iranian women in another study by Kiani et al. [14]. Thus, it is evident that the involvement of women in any kind of household decision-making can improve the DD and thereby their nutritional status [4, 15, 26].

Our research has revealed several sociodemographic factors that are closely linked to women's DD. Maternal education is one of the most important influencing factors that are related to the other socioeconomic conditions of women. Both the bivariate and multivariate analyses highlight the importance of maternal education in the achievement of a higher DDS. In this study, the odds of higher DD were observed to increase with the uplift of education level. Mothers who had an education were more likely to understand and know healthy diet patterns [25]. As a result, they were willing to purchase a large variety of foods to meet their nutritional requirement. Furthermore, education may raise awareness regarding the nutritional requirement of women and their families [27, 28]. It may also provide women autonomy in making decisions about how to spend money and what to purchase for the family, as well as give access to the household resources [29]. According to our findings, a high degree of education increases the chances of attaining a higher DD. This is attributed to the fact that women with a high level of education are more likely to earn their income and thereby become financially independent. Financial independence has been shown to have a favorable impact on women's diet [30]. This is because greater financial autonomy provides women more bargaining capacity when it comes to food purchases. In Vietnam and Bangladesh, a significantly positive association was observed between maternal education and maternal dietary diversity [17, 20].

The maternal occupation was also observed to influence women's DD. Again, the education level of women directly or indirectly determines their occupation. The findings of this study reveal that Bangladeshi women with white-collar jobs were twice more likely to achieve higher DD than those involved in agriculture or labor work (Table 2). White-collar employees are expected to be well-educated and thus receive respectable wages. Employed women earn a guaranteed income that they could use to buy healthy foods for the family [31]. Women involved in agricultural work were reported to have poor nutritional status in Ghana [29].

In this study, women's DD was observed to be significantly associated with household wealth representing socioeconomic status. Compared to those in the poorest wealth quintiles, women in the richest wealth quintile had a 6.5 times higher chance of attaining higher DD. Wealthier families are more likely to spend extra money on non-essential foods, thereby diversifying their diets [25]. Amugsi et al. also reported a higher dietary diversity in the case of the richest women in Ghana, and the odds were observed to increase with their wealth [9]. Women in the richest quintile had more money or other resources, which could increase their ability to buy a wider variety of foods [9, 32]. The wealth index is a measure of

socioeconomic status, which was observed to be positively correlated with women's dietary intake in previous studies [33, 34]. In Bangladesh, the household wealth index was observed to be a significant influencing factor, with wealthier households having improved dietary diversity [25].

Furthermore, several other studies [13, 20, 35] have reported that higher socioeconomic status is linked to a more regular intake of most food classes, including seasonal fruits and vegetables, diet quality, and diversity. These findings suggest that the wealth index is an important factor that significantly influences the attainment of a more diversified diet among women. Women's dietary diversity may be enhanced by interventions aimed at improving their socioeconomic status in Bangladesh. The place of residence also contributes to a higher dietary diversity of women in Bangladesh. Based on the bivariate analysis, the DD among women living in urban areas of Bangladesh was higher compared to those living in rural areas. This particular association was not significant for the women in Ghana [9]. A contradictory result was observed among children in Bangladesh, wherein the dietary diversity for children was 1.5 times higher in rural areas compared to the urban areas due to more accessibility to natural foods in those areas [26]. Maternal education is lower in rural areas of Bangladesh, which may negatively influence the nutritional knowledge of women. This may affect the dietary diversity among women living in rural areas.

## Conclusion

Consumption of diverse diets is not at a satisfactory level among Bangladeshi women. Only 14% of the participants showed a higher DD score, which is alarming for the nutritional status of the entire nation. Women's participation in household decision-making, maternal education, and economic status is associated with higher DD. This study adds to the literature on the role of women's decision-making autonomy in changing the nutritional status of themselves and their family members. Improving household economic status and promoting female education could have a considerable impact on women's dietary intake in Bangladesh. The Government of Bangladesh may consider these issues in their future policy-making process to improve the maternal nutritional status.

## Abbreviations

DD: Dietary Diversity; DDS: Dietary Diversity Score; OR: Odd Ratio; CI: Confidence Interval; WHO: World Health Organization; NPNL: Non-pregnant Non-lactating; BDHS: Bangladesh Demographic and Health Surveys. NIPORT: National Institute of Population Research and Training; USAID: United States Agency for International Development.

## Declarations

### Acknowledgment

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## **Author's contribution**

JHS drafted the manuscript, and MR performed the data analysis, and GMRI designed and revised the manuscript. The authors revised and approved the final manuscript.

## **Author's information**

Jahid Hasan Shourove is an MSc student in food engineering and tea Technology, Shahjalal University of Science and Technology, Sylhet, Bangladesh. He also accomplished BSc Engineering degree from the same department.

Mustafizur Rahman is an MSc student in food engineering and tea Technology, Shahjalal University of Science and Technology, Sylhet, Bangladesh. He also accomplished BSc Engineering degree from the same department.

Dr. Islam is an epidemiologist in the field of nutrition, food safety, and value chain research. He received his Ph.D. from Tokyo Medical and Dental University in Japan under the Monbukagakusho/MEXT scholarship, in the field of public health. He also holds an MSc in Nutrition and Rural Development from Ghent University, Belgium under the VLIR scholarship program, and a BSc in Agriculture from Khulna University, Bangladesh. Dr. Islam is now serving as a faculty member at Shahjalal University of Science and Technology (SUST), Sylhet, Bangladesh.

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## **Availability of data and materials**

The data that support the results of this research are available from the DHS website (<https://www.dhsprogram.com/>), but they are subject to restrictions since they were utilized under license for the present study and are thus not publicly available. Data are however available upon reasonable request.

## **Ethics approval and consent to participate**

The Bangladesh Medical Research Council (BMRC) and ICF Macro International approved BDHS. The dataset was requested for access to the DHS program website. Informed oral consent was taken from participants before interviewing them as more than one-third of the study population is illiterate and the ethics committee of BMRC and ICF Macro International approved it. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

## **Consent for publication**

Before each interview, the survey team verbally explained the purpose of the BDHS and ensured that no personal information will be included in the publication.

## Competing interests

None.

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