Research Article

Are adolescents more vulnerable to reproductive health problems than young adults or adults in Bangladesh? Evidence from a nationwide survey

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Abstract

Keywords

Adolescents**,** reproductive health problems, multilevel regression analysis, Bangladesh.

Objectives: The aim of this study is to investigate the multiple reproductive health issues regarding those of adolescents compared to young adult and adult women.
Methods: The present study was based on the data from the Bangladesh Demographic Health Survey-2011. A total of 17,231 married adolescents (10-19 years), young adult (20-34 years) and adult (35-49 years) were analyzed. Infecundity, anemia, chronic undernutrition, sexually transmitted infections (STIs), pregnancy complications, and reproductive health problems index (RHPI) were used as a proxy indicator of reproductive health problems. Multilevel logistic regression analyses were used to analyze reproductive health problems for three intergenerational age group of women.
Results: This study found that a large proportion of married adolescents (12.4%) reported having suffered from any reproductive health problems. From multilevel logistic regression analyses, adolescent's women were less likely to suffer from infecundity (adjusted odds ratio [AOR]: 0.12; 95% confidence interval [CI]: 0.07, 0.21) but more likely to suffer from chronic undernutrition (AOR 2.24; 95% CI: 1.75,2.86), pregnancy-related complications (AOR: 5.04; 95% CI: 3.58, 7.10), as well as any kind of reproductive health-related problems (AOR 1.62; 95% CI: 1.31, 2.00) as compared to the young adult women (20-34 years).
Conclusions: Based on the fact that adolescence is a crucial development stage which reflects both childhood health status and sets the foundation for adult health status, it is particularly important to protect adolescent women against many reproductive health problems that emerged from early marriage and pregnancy. We recommend future longitudinal research to provide clarity regarding these concerns.

Introduction

Adolescents defined as the age group 10–19,[1] marks a time of rapid and intense emotional and physical changes.Of the estimated 1.2 billion adolescents in the world today, nearly half live in Asia, and nearly one in four (282 million) live in South Asia. Adolescents aged 10–19 comprise over one-fifth of South Asia's population.[2] Within the region, Bangladesh and Pakistan have the greatest proportion of adolescents, while India has the greatest absolute number.[2]Adolescent girls are considered a vulnerable group globally and more so in Bangladesh, where gender discrimination makes the situation still worse for them.[3] Reproductive health issues are considered a taboo subject and this attitude of the society adds to the woes of young adolescent girls. They are deprived of quality education and information regarding reproductive health, rendering them to be more prone to teenage pregnancies and STIs.

Approximately 15 million young females ages 1519 give birth each year, accounting for more than 10 percent of all babies born worldwide.[4] Only about 17 percent of them use contraception. Young mothers, especially those under 20, have increased the likelihood of severe reproductive health risks. The risk of death in childbirth is five times higher among 10-14-year-olds than among 15-19-year-olds and, in turn, twice as high among 15-19-year-olds as among 20-24-year-olds.[4] When adolescents bear children, their offspring also suffer higher levels of morbidity and mortality. The incidence of sexually transmitted diseases (STDs) is also disproportionately high among adolescents: 1 in 20 adolescents contracts a sexually transmitted disease each year.[4]

As a group, however, adolescents have sexual and reproductive health needs that differ from those of adults in important ways and which remain poorly understood or served. Adolescent aged 10-19 years constitute a large proportion of the Bangladeshi population. With a total population of about 160 million, adolescents comprised 22% and projected to increase to 35 million by 2020.[5] This important growing population, together with urbanization and the explosion of information across frontiers, has increased the exposure of Bangladeshi adolescent people to the risks related to reproductive health. Despite the growing awareness of the importance of adolescent reproductive health in Bangladesh, there is no clear Government policy. During the past decade, significant improvement observed in reducing reproductive health problems and increasing healthcare-seeking behavior among the adolescent girls; however, it is still beyond the expectation. Again, a large number of adolescents suffer from reproductive health problems.

Until recently, several studies[6-14] have been conducted to assess the association between various reproductive health problems among adolescents. However, most of these studies have considered single or one or more determinants of reproductive health problems. Besides, most of these earlier studies did not compare intergenerational reproductive health problems (adolescents compared to young adult or adults). Based on this consideration, this study investigates the multiple reproductive health issues regarding those of adolescents compared to young adult and adult women.

Methods

Data sources and sample

This study used data from the 2011 Bangladesh Demographic Health Survey (BDHS).[16] The 2011 BDHS is a countrywide representative household-based survey. The survey is allotted on a two-stage stratified sample. In the 1st stage, 600 primary sampling units (PSU) were created (urban areas: 207; rural areas: 393). The PSU was adopted from the 2001 Bangladeshi census frame. In the second stage, a systematic sample of 30 households on average was chosen per PSU. Five questionnaires were used in this survey: (i) household; (ii) women; (iii) men; (iv) community; and (v) a facilities questionnaire.[16] The questionnaires were drawn up in English and then translated into the national and official language of Bangladesh, Bangla.

Reliability of the questionnaire was conveyed using a pilot study. The goal of the household questionnaire is to determine women and men eligible for individual interviews and gather data on sociodemographic and household characteristics. To assemble information from ever-married men aged 15–54 years, the men's questionnaire was used. Community and facilities questionnaire was used to capture information about the existence of development organizations and the availability and accessibility of health services and other facilities in the community [5]. The survey had a 98% response rate for face-to-face interviews of the total of 17,964 selected households. Of the 18,222 ever-married women aged 12–49 years deemed eligible to complete the women's questionnaire on maternal and child health behaviors and outcomes,

17,842 did so (response rate 98%). In our study, we enrolled 17, 231 women of 15–49 years having a child younger than 5 years (Fig. 1).

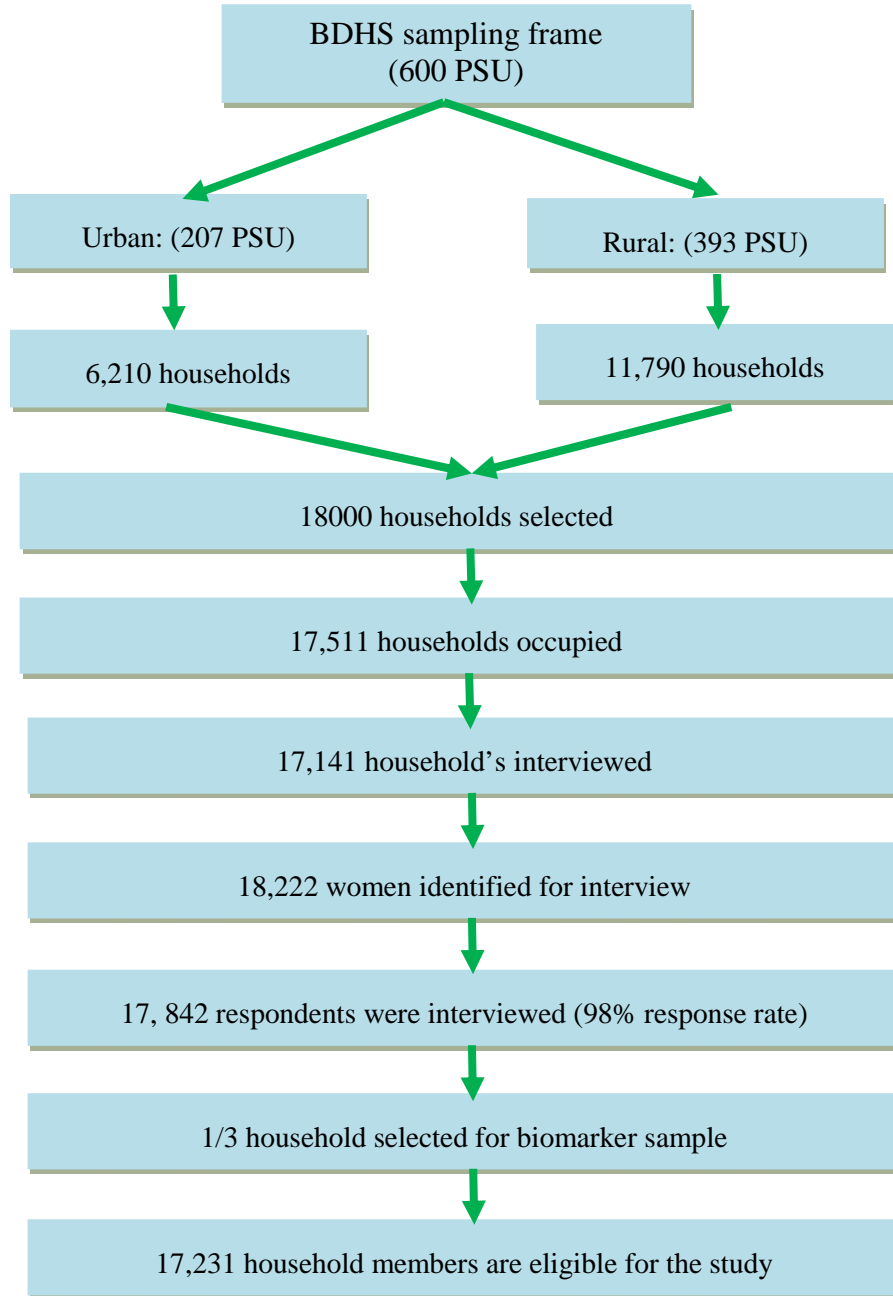Figure 1: **Study design and sampling procedure**

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┌─────────────────────────────┐
│   BDHS sampling frame       │
│        (600 PSU)            │
└─────────────────────────────┘
        ↙           ↘
┌──────────────────┐   ┌──────────────────┐
│ Urban: (207 PSU) │   │ Rural: (393 PSU) │
└──────────────────┘   └──────────────────┘
        ↓                      ↓
┌──────────────────┐   ┌──────────────────┐
│ 6,210 households │   │ 11,790 households│
└──────────────────┘   └──────────────────┘
        ↘                    ↙
┌─────────────────────────────────────────┐
│       18000 households selected          │
└─────────────────────────────────────────┘
                   ↓
┌─────────────────────────────────────────┐
│      17,511 households occupied          │
└─────────────────────────────────────────┘
                   ↓
┌─────────────────────────────────────────┐
│      17,141 household's interviewed      │
└─────────────────────────────────────────┘
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┌─────────────────────────────────────────┐
│   18,222 women identified for interview  │
└─────────────────────────────────────────┘
                   ↓
┌─────────────────────────────────────────┐
│ 17, 842 respondents were interviewed     │
│         (98% response rate)              │
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┌─────────────────────────────────────────┐
│ 1/3 household selected for biomarker sample │
└─────────────────────────────────────────┘
                   ↓
┌─────────────────────────────────────────┐
│ 17,231 household members are eligible for the study │
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Figure 1: Sampling structure of BDHS 2011 data used in the study

Measures

Outcomes

We used six outcomes as proxy indicators of reproductive health problems: 1) infecundity; 2) anemia; 3) chronic undernutrition; 4) STI symptoms; 5) pregnancy complication, and 6) reproductive health problem index (RHPI). To measure infecundity, in the BDHS 2011, women were asked whether they were physiologically unable to have children. A binary variable was created to define whether a woman suffered from infecundity or not. Anemia (Hb) level was measured in g/dl, operationalized as a categorical variable by predefined cut-off points for mild, moderate, and severe anemia recommended by the WHO.[16] For non-pregnant women, any anemia was defined as Hb< 12 g/dl, and for pregnant women as <11 g/dl. Mild anemia was defining as 10-11.9 g/dl for non-pregnant women 10-10.9 g/dl for pregnant women.[16]Moderate/severe anemia was defined as Hb<10 g/dl. Both nonpregnant and pregnant women were included in the analysis. A binary variable was created to identify any anemia (compositevariable of mild, moderate, and severe anemia). Anemia testing was conducted by specially trained personnel who were part of the survey team. The finger-prick tests were carried out in the homes of the respondents, and blood samples were tested immediately using a portable hand-held HemoCue testing system.

The body mass index (BMI), calculated as weight in kilograms divided by height squared in meters, was used to assess chronic undernutrition in this study. We choose BMI to assess undernutrition of mothers because it does not require a reference table from a well-nourished population. A cutoff point in the BMI of $18.5 \, kg/m^2$is used to define chronic undernutrition as recommended by the World Health Organization (WHO)[17] for populations from the Indian subcontinent. To provide an assessment of STI symptoms, we analyzed genital sores or ulcer and abnormal genital discharge as proxy outcome variables. The 2011 BDHS included questions on self-reported symptoms of STI in the 12 months prior to the survey.

The 2011 BDHS asked women who had a live birth in the five years preceding the survey about health problems they experienced around the time of their most recent live birth. Prolonged labor of over 12 hours, excessive bleeding that was so profuse they thought they might die, high fever with foul-smelling discharge, convulsions, breech delivery, and retained placenta were considered to have been complications around delivery in this survey. A binary outcome variable was created, dichotomized as experience any complications (1; combined prolonged labor, excessive bleeding, high fever with foul-smelling discharge, convulsions, breech delivery or retained placenta) or non-experience (0) to assess the overall level of complications around delivery. A composite index of RHPI was also constructed based on the presence of any of these conditions, namely infecundity, anemia, chronic undernutrition, STIs or pregnancy complications.

Explanatory variable

Women's current age was the explanatory variable of interest. We defined women's age into three specified groups: 1) adolescence; 2) young adult; and 3) adult. We defined adolescent, young adult, and adult as any person between ages 10 -19, 20-34, and 35 years and over. We followed these definitions according to the review of the literature and the definition provided by the World Health Organization (WHO).[18-20]

Covariates

We included several individuals, households, and community-level variables theoretically and empirically linked to reproductive health problems and health-seeking behavior among adolescents. [14-22] The women's educational level was defined in terms of the formal education system of Bangladesh: no education (0 years), primary (1–5 years) or secondary or higher (6 years or more).Place of residence was categorized as rural versus urban. Religion was categorized as Muslim or non-Muslim and age at first cohabitation as 15 years or >15 years. Tertiles were used in classifying the total number of children ever born (1, 2, 3or more). Contraceptive use was categorized as yes versus no. Since access to media seems an important component to raise awareness toward reproductive health problems and health-seeking behaviors, a variable was created whether the respondents had access to mass media (if they listened to the radio, watched television, or read newspapers or magazines at least once a week) versus no. A variable was created to define the household food insecurity. In the BDHS 2011, Household Food Insecurity Access Scale (HFIAS) was developed by USAID.[16] Five items were used for measuring food insecurity indicators, and it was classified in three broad categories: never, sometimes, or few often.

The BDHS wealth index was constructed from data on household assets, including ownership of durable goods (such as televisions and bicycles) and dwelling characteristics (such as source of drinking water, sanitation facilities, and construction materials). Each asset was assigned a weight (factor score) generated through principal components analysis, and the resulting asset scores were standardized in relation to a standard normal distribution with a mean of zero and a standard deviation of one.[16] Each household was then assigned a score for each asset, and the scores were summed by household. The sample was then divided into population quintiles; each quintile has designated a rank, from one (poorest) to five (wealthiest), and individuals were ranked according to the total score of the household in which they lived.

Statistical analysis

Descriptive statistics were presented first to show different individual, households, and community-level characteristics according to three age groups of women (adolescents, young adults, and adults). We used contingency analysis to show the differences between those variables among the three groups of ever-married women. We also calculated the prevalence of reproductive health problems according to three intergenerational age groups of women. Because of multiple hierarchies in 2011 BDHS survey, we fitted multilevel logistic regression models to observe the association between infecundity, anemia, chronic undernutrition, sexually transmitted infections, any pregnancy complication, RHPI in relation with three age groups of women. We estimated three-level logistic regression models for individual i living in household j in cluster k for our six outcome variables. Analyses were performed using Stata version 14.0 (Stata Corp., College Station, TX, USA) to allow for adjustments for the cluster sampling design, sampling weights, and the calculation of standard errors.

Human participation protection

Data collection procedures for the BDHS were approved by the ORC Macro institutional review board. The protocol of the survey was reviewed and approved by the National Ethics Review Committee of the Bangladesh Ministry of Health and Family Welfare. Before participating, all participants were asked to provide verbal informed consent after being read a document emphasizing the voluntary nature of this project, outlining potential risks, and explaining that the information gathered would be used to assess health needs and to plan health services.

Results

Table 1 shows the background characteristics of the study participants' according to three intergenerational age group of women (adolescents [10-19 years age group], young adults [20-34 years age group], and adults [35 years and above age group]). A total of 17,231 ever-married women aged 10-49 years were included in this study. Among the study participants the proportion of adolescents, young adults, and adults are 11.3% (n=1,938), 53.4% (n=9,195), and 35.4% (n=6,098) respectively,

Around 12.0% of adolescent women were married under 16 years of age, and the corresponding figure for young adults and adults are 49.2% and 38.9% respectively. Regarding the level of education, 3.3% of adolescents didn't have any education while more than three-fifths adult women had no education (60.3%). The proportion of Muslims among adolescents, young adults and adults are 11.4%, 54.2%, and 34.4% respectively. Among the study participants, 1,720 participants from all these three categories didn't have any children. About 10.2% of adolescent women were from the least bands of wealth, whereas the corresponding figure for young adults and adults are 56.3% and 33.4%. It is evident that 12.1% of adolescent women didn't face any kind of food crisis, whereas their 55.0% of young adults didn't face this crisis in the last 12 months before this survey. The study reveals that approximately 10.0% of adolescents, 55.0% of young adults, and 36.0% of adults were from urban areas.

Table 1 Characteristics of study participants (n=17,231) according to adolescents, young adults, and adults: Bangladesh Demography and Health Survey 2011

Variables	Age group of women n (%)			
	Adolescents	Young adults	Adults	*P*-value
Study participants	1938 (11.3)	9195 (53.4)	6098 (35.4)	
Age at first marriage (in years)				
15	1177 (11.8)	4571 (49.2)	3669 (38.9)	<0.01
>15	761 (10.2)	4624 (59.6)	2429 (30.2)	
Educational level[1]				
No education	142 (3.3)	1649 (36.4)	2715 (60.3)	
Primary	532 (10.0)	2796 (55.7)	1836 (34.3)	<0.01
Secondary	1138 (18.7)	3862 (63.9)	1186 (17.5)	
Higher	126 (9.5)	888 (63.5)	361 (27.0)	
Religion[2]				
Islam	1763 (11.4)	8217 (54.2)	5306 (34.4)	<0.01
Others	175 (8.8)	978 (50.0)	792 (41.2)	
Children ever born				
No child	916 (52.9)	676 (39.4)	128 (7.7)	
1-2 children	1010 (13.0)	5554 (70.3)	1369 (16.7)	<0.01
>2 children	12 (0.2)	2965 (39.9)	4601 (59.9)	
Contraceptive use[3]				
Not using	997 (14.1)	3462 (48.2)	2805 (37.7)	
Pill	523 (11.1)	2824 (65.2)	1030 (23.7)	<0.01
Others	418 (7.3)	2909 (51.9)	2263 (40.8)	
Household's socio-economic status[4]				
Poorest	332 (10.2)	1683 (56.3)	985 (33.4)	
Poorer	467 (13.5)	1629 (51.4)	1141 (35.1)	
Middle	429 (12.7)	1719 (51.6)	1175 (35.7)	<0.01
Richer	424 (11.8)	1957 (54.1)	1267 (34.1)	
Richest	286 (7.5)	2207 (55.4)	1530 (37.1)	
Food insecurity[5]				
Never	1599 (12.1)	7164 (55.0)	4372 (32.9)	
Sometimes	271 (8.9)	1478 (49.6)	1237 (41.5)	<0.01
Few often	68 (6.0)	553 (49.5)	489 (44.6)	

Table 1 continued…

Table 1 Characteristics of study participants (n=17,231) according to adolescents, young adults, and adults: Bangladesh Demography and Health Survey 2011

Variables	Age group of women n (%)			P-value
	Adolescents	**Young adults**	**Adults**	
Place of residence				
Urban	590 (9.7)	3223 (54.6)	2163 (35.7)	<0.05
Rural	1348 (11.6)	5972 (53.5)	3935 (34.9)	
Region				
Barisal	229 (11.7)	1003 (52.6)	684 (35.7)	
Chittagong	301 (10.6)	1556 (56.5)	906 (32.9)	
Dhaka	345 (11.1)	1592 (53.7)	1044 (35.2)	
Khulna	306 (11.4)	1309 (50.8)	986 (37.8)	<0.05
Rajshahi	279 (11.0)	1319 (53.5)	915 (35.5)	
Rangpur	319 (12.9)	1276 (52.5)	843 (34.6)	
Sylhet	159 (8.2)	1140 (56.4)	720 (35.5)	

Note:
All analysis are adjusted for probability weight
n; number of event
Number is shown in outside the parenthesis and percent are shown in to the parenthesis
[1]**Educational level for primary** completed is defined as completing grade 5, secondary completed is defined as completing grade 10, higher is defined as completing grade 12 or over
[2]**Religion as others include** Hinduism, Buddhism and Christianity
[3]**Contraceptive use others include** IUD, injections, condom, female sterilization, male sterilization, periodic abstinence, withdrawal, implants/Norplant
[4]**Socio economic status** is used instead of wealth index
[5]**Food insecurity** for never means participants never faced food crisis in last 12 months, sometimes means participants those who faced food crisis occasionally in last 12 months and few often means participants those who faced food crisis frequently in last 12 months

Table 2 shows the intergenerational differential of reproductive health problems A total of 2,530 ever-married women were infecund at the time of the survey; 2.3%, 29.4%, and 68.3% comprise adolescents, young adult, and the adult women. Regarding chronic undernutrition, 15.6% adolescents, 51.2% young adults, and 33.2% of adults were undernourished. Regarding STIs symptoms, 7.6% of adolescents reported having STIs symptoms, while 57.3% of young adults and 35.1% of adults reported that they had STIs symptoms. Regarding anemia, 11.0% adolescence, 51.6% young adult, and 37.4% adult women were suffering from anemia. This study reported that 10.3% of adolescents didn't suffer from any types of pregnancy complications and the corresponding figure for young adults and adults are 48.5% and 41.2% respectively. The findings revealed that 2.0% of adolescents, 29.3% of young adults, and 68.7% of adults didn't have any kinds of reproductive health problems.

Table 2 Reproductive health problems among adolescents, young adults, and adults: Bangladesh Demography and Health Survey 2011(n=17,231)

Variables	Age group of women (years.) n (%)			
	Adolescents	Young adults	Adult	p-value
Study participants	1938 (11.3)	9195 (53.4)	6098 (35.4)	
Infecundity[1]				
Infecund	59 (2.3)	745 (29.4)	1726 (68.3)	p<0.01
Fecund	1829 (13.3)	8099 (59.8)	3684 (26.9)	
Anemia[2]				
Non anemic	358 (11.0)	1761 (52.4)	1188 (36.6)	
Anemic	279 (11.0)	1198 (51.6)	896 (37.4)	p=0.86
Chronic Undernutrition[3]				
No	1300 (9.8)	7171 (54.5)	4794 (35.7)	p<0.01
Yes	638 (15.6)	2024 (51.2)	1304 (33.2)	
Symptoms of STIs[4]				
No	1891 (11.2)	8900 (53.7)	5908 (35.1)	
Yes	46 (7.6)	293 (57.3)	186 (35.1)	p=0.05
Pregnancy complications[5]				
No	1451 (10.3)	6716 (48.5)	5884 (41.2)	p<0.01
Yes	487 (15.2)	2479 (78.1)	214 (6.7)	
Reproductive health problems index (RHPI)[6]				
No diseases	44 (2.0)	640 (29.3)	1487 (68.7)	p<0.01
Reproductive diseases	1894 (12.4)	8555 (57.2)	4611 (30.4)	

All analysis are adjusted for probability weight

n; number of event

Number is shown in outside the parenthesis and percent are shown in to the parenthesis

[1]**Infecundity**; Physiological inability of individuals or couples to have children

[2]**Anemia**; Lacks of enough healthy red blood cells or hemoglobin <120 g/L

[3]**Chronic undernutrition**; BMI<18.5 kg/m^2

[4]**Symptoms of STIs**; Infections that are spread through sexual contact and the secretions from the vagina

[5]**Pregnancy complications**; Health problems that occur during pregnancy

[6]**Reproductive health problems index (RHPI)**; Presence of any outcomes: infecundity, anemia, undernutrition, genital problems or pregnancy complication

Table 3 shows unadjusted and adjusted odds ratios of the association between our desired six outcomes with three specified intergenerational age groups. Adolescent women were less likely suffer from infecundity (unadjusted odds ratio [UOR]: 0.23; 95% confidence interval [CI]: 0.15, 0.35 and adjusted odds ratio [AOR]: 0.12; 95% CI: 0.07, 0.21) compared to young adult women. On the other hand, adult women were more likely to suffer from infecundity (UOR: 14.90; 95% CI: 10.33, 21.50 and AOR: 11.04; 95% CI: 7.74, 15.74) compared with young adults. After the adjustment of the confounding factors, the result shows that adolescents women had 1.29 times (AOR: 1.29; 95% CI: 0.89, 1.88) higher risk of having anemia but the adult women had 0.83 times (AOR: 0.83; 95% CI: 0.66, 1.05) lower risk of having anemia as compared to the young adult women.

Table 3 Odds ratios (ORs) of reproductive health problems among adolescents, young adults, and adults (n=17,231): Bangladesh Demography and Health Survey 2011[*]

Variables	Age group of women 19 years		Age group of women 35 years	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Infecundity				
Unadjusted OR	0.23 (0.15-0.35)	<0.001	14.90 (10.33-21.50)	<0.001
Adjusted OR	0.12 (0.07-0.21)	<0.001	11.04 (7.74-15.74)	<0.001
Anemia				
Unadjusted OR	1.09 (0.78-1.52)	0.90	1.14 (0.92-1.41)	0.59
Adjusted OR	1.29 (0.89-1.88)	0.34	0.83 (0.66-1.05)	0.08
Chronic undernutrition				
Unadjusted OR	2.14 (1.72-2.68)	<0.001	0.95 (0.82-1.09)	0.82
Adjusted OR	2.24 (1.75-2.86)	<0.001	0.84 (0.71-0.92)	0.04
Symptoms of STIs				
Unadjusted OR	0.56 (0.35-0.90)	0.01	0.93 (0.71-1.23)	0.54
Adjusted OR	0.64 (0.37-1.09)	0.11	0.81 (0.58-1.13)	0.24
Pregnancy complications				
Unadjusted OR	0.97 (0.79-1.19)	0.23	0.03 (0.02-0.04)	<0.001
Adjusted OR	5.04 (3.58-7.10)	<0.001	0.03 (0.02-0.04)	<0.001
Reproductive health problems index (RHPI)				
Unadjusted OR	1.05 (0.88-1.26)	0.38	0.90 (0.80-1.03)	0.25
Adjusted OR	1.62 (1.31-2.00)	<0.001	0.78 (0.67-0.90)	0.01

[*]Reference category group: aged **20-34** years
All analysis are adjusted for probability weight
n; number of event
Odds ratios (OR) are shown in outside the parenthesis and confidence intervals (CI) are shown in to the parenthesis
The proportion (percent) and the result of multilevel logistic regression analysis (odds ratio (95% confidence interval)), are tabulated for each variable according to study participants' current age.
All multilevel logistic regression analysis includes current age, age at first marriage, religion, children ever born, contraceptive use, respondents' education, wealth index, food insecurity, region and place of residence as confounding factors.

Table 3 also shows that both in the unadjusted and adjusted models of adolescent's women were more likely to suffer from chronic undernutrition as compared with young adult women. Regarding STI symptoms, in the unadjusted model, adolescents were less likely to report symptoms of STIs (UOR: 0.56; 95% CI: 0.35, 0.90) as compared to the young adult women. However, the significance was lost after adjusting the potential covariates. In the adjusted model, adolescents had 5.04 times (AOR: 5.04; 95% CI: 3.58, 7.10) more risk to have pregnancy complications but the older women (35-49 years) were lower risk (AOR: 0.03; 95% CI: 0.02, 0.04) to have

pregnancy complications as compared to younger married women (20-34 years).

In the unadjusted model, adolescents were 1.05 times (95% CI: 0.88, 1.26) more likely to suffer from any types of reproductive health problems as compared to the young adult. After adjusting the relevant covariate, the association between adolescent's age group and RHPI was found to be statistically significant. In the adjusted model, adolescents had 1.62 times higher chance of suffering from any types of reproductive health problems (95% CI: 1.31, 2.00) as compared to young adults. However, in the adjusted model,

adult women were 0.78 times (95% CI: 0.67, 0.90) less likely to suffer from any types of reproductive health problems as compared with young adult women.

Discussion

Findings from this large nationally representative survey indicate that adolescents were more likely to suffer from chronic undernutrition, pregnancy complications, as well as any types of reproductive health problems as compared to young adult women. Findings, therefore, indicate that policymakers should pay special focus on the adolescent's reproductive health problems in Bangladesh.

Adolescence is considered a crucial stage in physical development as it is the last stage in which interventions can alter outcomes of nutritional deficiencies.Fulfill of nutrition demands of adolescents could be the important step towards breaking the cycle of intergenerational malnutrition, chronic diseases, and poverty as well. The higher risk of chronic undernutrition among adolescents in our study really indicates a crucial public health concern for Bangladesh. The higher risk of undernutrition among the adolescent in our study is consistent with previous some studies conducted in Bangladesh[9,10] as well as studies conducted in other developing countries.[11-13] The underlying causes of undernutrition among the adolescents may be attributed to inadequacy of dietary patterns, lack of the key micronutrients, poor knowledge about long-term consequences of undernutrition, quantity, and quality of food and access to health and nutrition services.[9]

Another important finding is that adolescents were more likely to suffer from pregnancy-related complications as compared to young adults. Evidence shows that adolescent pregnancy as a high-risk pregnancy with an increased risk for the development of pregnancy-induced hypertension, preterm labor and delivery, LBW infants, cephalo-pelvic disproportion, operative vaginal delivery, cesarean delivery, and increased perinatal morbidity or mortality.[6] Satin et al., in their study found significant differences in pregnancy complications among adolescents younger than 15 years.[6] Another study investigates the relationship between teenage childbearing and labor and delivery complications using a panel of confidential birth certificate data over the period from 1994 to 2003 from the state of Texas.[7] Findings show that compared to mothers aged 25 to 29 having their

first child, teenage mothers appear to have more labor and delivery outcomes.

Adolescents are at high risk of iron deficiency and anemia. This is due to rapid pubertal growth with the sharp increase in lean body mass, blood volume, and red cell mass, which increases iron requirements for myoglobin in muscles and Hb in the blood.[23] Anemia in adolescence has serious implications for a wide range of outcomes, and nearly all of the functional consequences of iron deficiency are strongly related to the severity of anemia. It causes reduced resistance to infection, impaired physical growth and mental development, and reduced physical fitness, work capacity, and school performance. The unadjusted analysis shows adolescents were more likely to suffer from anemia as compared with young adults. The similar findings have been observed in other developing countries such as in Ethiopia,[14] India,[15], and in Eastern Sudan.[16]

The study should be considered in light of some limitations. First, the study was based on self-reported outcomes and might have caused a response bias. However, BDHS 2011 stated that respondents were informed about the importance of their giving accurate responses and also assured the confidentiality of their responses. Moreover, according to the BDHS, interviewers were provided training for implementing the survey based on a training manual especially developed to enable the field staff to collect data in a friendly, secure, and ethical manner. Moreover, to increase response rates, interviewers were trained to maintain motivation with longer questionnaires, probe for responses, clarify ambiguous questions, use memory jogging techniques for aiding recall of events and behavior, and control the order of the questions. Second; information about the reproductive health-related problems such as pregnancy complication was obtained from the respondents, and not from medical records; therefore, bias could have occurred that may have affected the reliability of the data. However, in developing countries like Bangladesh, where more than eighty percent of women deliver at home, there is no better way of obtaining the information. Third, this study involved reporting of past behaviors; therefore, recall bias is possible. However, we chose a five-year recall period to minimize this bias. Finally, our study was cross-sectional and, thus, does not allow for assessment of the chronology of the associated events or inferences regarding causality. Longitudinal research is needed to provide clarity regarding these concerns.

Despite these limitations, the findings from the study might be relevant to neighboring low-income countries. The reproductive health problems and healthcare-seeking behavior of the adolescent women exist and are probably relevant in other countries where a large segment of the population is adolescents. This study is population-based, and efforts ensured that the samples were representative of the populations studied. The study area covered both urban and rural Bangladesh. Since this is a nationally representative study sample, therefore, the findings in general, were consistent between the culturally and ethnically different study populations in Bangladesh, which increase the external validity.

Conclusion

In conclusions, adolescents were more likely to suffer from chronic undernutrition, pregnancy complications, as well as any types of reproductive health problems as compared to young adult women. Based on the fact that adolescence is a crucial development stage which reflects both childhood health status and sets the foundation for adult health status, it is particularly important to protect adolescent women against many reproductive health problems that emerged from early marriage and pregnancy. Considering the need for reducing several of the reproductive health problems and improve the health-seeking behavior of the adolescent's several policy implications may be formulated. It is recommended that reproductive and sexual education be incorporated into the education system, and continued emphasis put on encouraging females to attend school through at least primary level, not only to delay marriage and increase economic output prospects but also to expose them to reproductive education.

The government needs to explore different strategies to address sexual health concerns of adolescents. One possibility would be to start and implement *Health Promoting Schools* programs. To do this, research is needed to explore the applicability and acceptability of a *Health Promoting Schools* concept/ program in the Bangladeshi context. The concept modeled along the European Network of Health-promoting schools is used in European settings to improve school health services. However, its suitability needs to be assessed, taking into consideration Bangladeshi socio-cultural contexts and environment.Since our study is based on preexisting BDHS data, therefore several important factors such as information on husbands (presence or absence in daily household life,), types of family, and structure of health facilities were not available in this present study. Future studies should certainly consider these factors.

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

Data availability The study is based on publicly available secondary data. The data are available on the website:https://dhsprogram.com/data/available-datasets.cfm

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