Determinants of Adolescent Childbearing in Bangladesh: A Multilevel Logistic Regression Analysis

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Abstract

Background: In South Asian region particularly in Bangladesh, adolescent pregnancy is still a major public concern. Therefore, identification of potential risk factors of adolescent pregnancy and childbearing may help to formulate policy to prevent premature delivery, death and disability.

Objectives: The main objective of this study was to identity the determinants factors of adolescent pregnancy in Bangladesh.

Study design: Retrospective two-stage stratified sample design.

Methods: Data were extracted from nationally representative Bangladesh Demographic and Health Survey conducted in 2011. In this study, age of childbearing was considered as dependent variable and classified as adolescent (≤19 years) and adult (>19 years). Several individual, household and community level factors were considered as the independent variables. Multilevel logistic regression model with household and community random intercept was used to identify the association between dependent and independent variable.

Results: The study found that about 28% adolescent had given birth in Bangladesh. Higher educated women (OR=0.65, 95% CI, 0.49-0.96), husband with higher education (OR=0.69, 95% CI, 0.56-0.84) and age at first marriage after age 15 years (OR=0.50, 95% CI, 0.45-0.55) were found to be protective for adolescent pregnancy. Secondary educated women (OR, 1.21; 95% CI, 1.03-1.39) showing the higher adolescent pregnancy than women with no education. The risk is high among women in Rangpur (OR=1.19; 95% CI, 1.12 1.25), followed by Khulna (OR=1.16; 95% CI, 1.09 1.23), Rajshahi (OR=1.16; 95% CI, 1.09 1.23) division showing among in Barisal division.

Conclusion: Around one fourth of the total pregnancy occurred adolescent age in Bangladesh which is caused by various individual, household and community-level factors. Proper education and increase awareness about the adverse effect of adolescent pregnancy are necessary to reduce occurrence of adolescent pregnancy in Bangladesh.

Introduction

Approximately 17 million adolescent pregnancies occur annually worldwide, accounting for 11% of all births [1]. Among adolescent pregnancies, 95% occur in low- and middle income countries, perpetuating cycles of ill-health and poverty. The burden is particularly high in Southeast Asia region, which account for 35.5% (6 million) of adolescent pregnancies. Among Southeast Asia, countries with highest reported rates of are Bangladesh (35%), followed by India (21%) and Nepal (21%) [2]. The key reasons contributing to high rates in such countries are due to social pressure and expectations for early marriage and pregnancy [3]. Additionally, lack of reproductive health knowledge and inability to access reproductive services in a timely manner influence adolescent's behavior to safe sex practices [4].

Adolescent pregnancy is a public health challenge that is associated with greater risks of maternal and child health complications [5]. It is the second highest cause of death for girls aged between 15 and 19 years, causing approximately 529,000 deaths annually worldwide [6]. In addition, 3 million adolescents undergo unsafe abortions. Early childbearing has reported to cause complications. These include low birth weight which poses risk for development impairment, and increased rate of stillbirth and newborn death by 50% compared to mothers aged 20-29 years [7]. Furthermore, the negative socioeconomic effects of adolescent pregnancy impact girls, their family and communities. Adolescent pregnancy has reported to cause higher dropout rates in education, hindered employment

opportunities, and increased economic and social dependency, which are all factors contributing to the cycle of poverty [8].

Exploring socioeconomic determinants of adolescent pregnancy is essential to identifying areas of intervention to reducing the risk of early pregnancy and improves provision of health services to adolescent mothers. A 2015 study conducted in Sylhet district of Bangladesh by Henry and colleagues found that social pressure and stigma were determinants of early childbirth [9]. However, there have been no nationally representative studies in Bangladesh which investigate the determinants of risks factors in adolescent pregnancy. Therefore, we conducted this study to identify the socioeconomic determinants of adolescent pregnancy in Bangladesh using a nationally representative survey through multi-level logistic regression model.

Methods

Data was extracted from the nationally representative Bangladesh Demographic and Health Survey (BDHS) conducted in 2011. A detailed method used in BDHS to conduct a two-stage stratified cross-sectional household survey can be found in an additional source [10]. A total of 7,641 out of 17,842 adolescent girls from BDHS data were eligible for analysis in this study. Dependent Variable The dependent variable was maternal age at birth. For analytical purposes, we classified maternal age of childbearing into two categories: adolescent (≤19 years) and adult (>20 years). Independent Variables In this study, we included a range of individual-, household, and community level factors as the independent variables. Individual-level variables include maternal and husband's education level (none, primary, secondary, or higher education), religion (Muslim or Non-Muslim), maternal age at first marriage (≤15 or >15 years), maternal working status (currently working or not working), and the number of previous antenatal visits (none, 1-3, or 4+ visits). Place of residence (rural or urban), and region of residence (Barisal, Chittagong, Dhaka, Khulna, Rajshahi, Rangpur,

and Sylhet) were treated as community level variables. Finally, subjective reported household food security (never, sometimes or often), household economic status (poorest, poorer, average, rich, or richest) was considered as the household-level variables. Household food security was calculated using the average response of five different questions regarding availability of the foods in the 12 months prior to the survey. Household Food Insecurity Access Scale, developed by United States Agency for International Development, was used to estimate the average of the polled responses. In addition, we considered responses regarding wealth index as a proxy of household socioeconomic status. BDHS calculated wealth index based on household available assets by principle component analysis and then grouped into five classes. The detailed wealth index construction procedure was described in the BDHS report [10].

Statistical Analysis

The summary statistics including mean, frequency, and percentage distribution were used to describe study characteristics. Association between pregnancy category and selected socio-demographic variables were assessed by Chi-square test. Prevalence of adolescent and adult pregnancies according predictor variables was also evaluated. Finally, multilevel binary logistic regression model with a random intercept at household and community levels were used for investigating the relationships among individual-level-, household-, and community-level variables and the risk of adolescent childbearing. In this study, four different models were used: first three models included individual-, or household-, or community-level variables respectively. The fourth model included all individual-, household- and community level variables. All analysis was conducted for probability sample design and data analysis was performed in STATA software version 13.1 SE (Stata Corporation, College Station, TX, USA).

Characteristics	Number[a]	Crude
Mean (SE)		
Maternal age, years	7641	25.52 (0.07)
Children ever born	7641	2.53 (0.02)
Age at first marriage	7641	15.94 (0.03)
Antennal care	6553	2.40 (0.03)
Education, years	7641	5.54 (0.04)
Prevalence (95% CI)		
Maternal age at birth		
Adolescent	2062	27.6 (26.3-28.9)
Young adult	5173	67.3 (65.9-68.6)
Adult	406	5.2 (4.6-5.8)
SE: standard error; CI: confidence interval. [a]Numbers shown are of household members (for all other characteristics).		

Table 1: Descriptive statistics of survey households and household members, BDHS, 2011.

Results

Study characteristics Table 1 display the summary statistics of the sample women in Bangladesh according to BDHS. The average maternal age was around 25.52 years (SE: 0.07) and each woman gave birth to an average of 2.53 children (SE: 0.02). The average age at first marriage was 15.94 years (SE: 0.03) the mean number of antenatal visits during pregnancy was 2.40 times (SE: 0.03), and average number of years in education was 5.54 (SE: 0.04). About 28% (95% CI: 26.3-28.90) of respondents delivered their baby at adolescent age, 67% (95% CI: 65.9-68.60) as young adults, and 5% (95% CI: 4.60-5.80) were adults.

Characteristics	Percent (95% confidence interval)		p-value
	Adolescent	Adult	
Maternal education			
No education	31.62 (30.7-32.55)	68.38 (67.45-69.3)	
Primary	38.77 (37.75-39.8)	61.23 (60.2-62.25)	
Secondary	40.5 (39.28-41.74)	59.5 (58.26-60.72)	
Higher	13.87 (12.17-15.77)	86.13 (84.23-87.83)	<0.01
Husband education			
No education	35.05 (34.12-36.0)	64.95 (64.0-65.88)	
Primary	37.57 (36.52-38.62)	62.43 (61.38-63.48)	
Secondary	37.38 (36.32-38.45)	62.62 (61.55-63.68)	
Higher	25.53 (24.06-27.06)	74.47 (72.94-75.94)	<0.01
Age at first marriage			
Early marriage ≤15 years	43.34 (42.68-43.99)	57.54(56.01-57.32)	
After 15 years	20.95 (20.22-21.70)	79.05 (78.3-79.78)	<0.01
Antenatal Care			
No visit	18.17 (17.37-19.05)	27.29 (25.53-29.12)	
1-3 times visit	11.03 (10.19-11.92)	29.66 (28.31-31.04)	
4 and above visit	6.67 (5.93-7.48)	17.2 (15.92-18.56)	<0.01
Religion			
Muslims	35.77 (35.15-36.41)	64.23 (63.59-64.85)	
Others	31.32 (29.16-33.56)	68.68 (66.44-70.84)	<0.01
Maternal working status			
Yes	4.13 (3.74-4.56)	7.62 (7.00-8.28)	
No	31.25 (30.66-31.85)	57.0 (56.12-57.88)	<0.01
Socioeconomic status			
Poorest	36.76 (35.47-38.08)	63.24 (61.92-64.53)	
Poorer	36.59 (35.45-37.74)	63.41 (62.26-64.55)	
Average	36.32 (35.22-37.43)	63.68 (62.57-54.78)	
Richer	35.93 (34.77-37.1)	64.07 (62.9-65.23)	<0.01

Richest	30.56 (29.31-31.84)	69.44 (68.16-70.69)	
Food security			
Never	35.25 (34.53-35.99)	64.75 (64.01-65.47)	
Sometime	35.95 (34.85-37.07)	64.05 (62.93-65.15)	
Few option	34.78 (33.36-36.24)	65.22 (63.76-66.64)	0.3
Place of residence			
Rural	35.56 (34.88-36.25)	64.44 (63.75-65.12)	
Urban	34.78 (33.58-36.0)	65.22 (64.0-66.42)	0.27
Region			
Barisal	34.62 (33.12-36.16)	65.38 (63.84-66.88)	
Chittagong	30.16 (28.91-31.44)	69.84 (68.56-71.09)	
Dhaka	35.39 (34.13-36.68)	64.61 (63.32-65.87)	
Khulna	40.04 (38.44-41.66)	58.34 (57.34-61.56)	
Rajshahi	40.12 (38.44-41.66)	59.88 (58.39-61.56)	
Rangpur	41.15 (39.79-42.52)	58.85 (57.48-60.21)	
Sylhet	25.02 (34.79-35.98)	74.98 (73.16-76.71)	<0.01

Table 2: Percentage distribution of maternal age at childbearing by selected socio-demographic characteristics, BDHS 2011.

Proportion of adolescent childbearing by different characteristics

The proportions of adolescent and adult childbearing by selected characteristics are presented in Table 2. We observed that maternal education, husband's education, religion, current working status, economic status, age at first marriage, and the number of antenatal care visits were significantly associated with age at childbearing. There was no association between maternal childbearing age and place of residence or household food security status. Proportion of adolescent pregnancy was higher among women with secondary education (40.5%, 95% CI: 39.3-41.7) and primary education (38.8%, 95% CI: 37.7-39.8) compared to women with no education (32.1%, 95% CI: 30.7-32.5). Similar pattern was observed with husband's education, where the proportion of adolescent pregnancy was higher when husband had primary education (37.6%, 95% CI: 36.5-38.6) and secondary education (37.4%, 95% CI: 36.3-38.4) compared to no education (35.1%, 95% CI: 34.1- 36.0). Women who were not working presented nearly 8-fold increased prevalence of adolescent childbearing compared to those who were working (31.3%, 95% CI: 30.6-31.8 and 4.13%, 95% CI: 3.7-4.6 respectively). A 2-fold increase in adolescent pregnancy was 15 years (43.3%, 95% CI: 42.7-44.0) compared to overseen in women who married at 15 years of age (21.0%, 95% CI: 20.2-21.7). The prevalence of adolescent pregnancy was decreased for women who attended four or more antenatal care visits (6.7%, 95% CI: 5.93-7.48) compared to no visits (18.2%, 95% CI: 42.7-44.0). Muslim women reported slightly higher prevalence of adolescent pregnancy (35.8%, 95% CI: 35.1-36.4) compared to non-Muslim counterparts (31.3%, 95% CI: 29.16-33.56). Proportion of adolescent pregnancy was highest in women who lived in Rangpur

region (41.15%, 95% CI: 39.8-42.5) and lowest in Sylhet region (25.02%, 95% CI: 34.8-36.0).

Determinants of adolescent childbearing: a multilevel analysis

The risk factors of adolescent childbearing examined by multilevel logistic regression models are presented in Table 3. The result indicated that secondary educated women were 22% more likely to experience adolescent pregnancy (aOR=1.22, 95% CI: 1.05- 1.43) as compared to women with no education. Additionally, the likelihood of adolescent pregnancy was reduced for higher educated women (aOR: 0.73; 95% CI, 0.52- 1.01). Higher risk of adolescent pregnancy was reported among the women whose husband had primary (aOR=1.12, 95% CI: 1.00-1.24) and secondary level of education (aOR=1.13, 95% CI:

1.01-1.27) compared to no education. Similarly, husbands with higher education also had a protective effect for adolescent pregnancy (aOR=0.75, 95% CI: 0.61-0.92). Age at first marriage after 15 years was also provided a protective effect for the risk of adolescent pregnancy (aOR=0.51, 95% CI: 0.46-0.56) compared to early age at marriage. Improved socio-economic status was an important predictor of adolescent pregnancy where the role of richest (aOR=0.76, 95% CI: 0.65-0.90) and richer (aOR=0.87, 95% CI: 0.76-0.99) found to reduce the rate of adolescent pregnancy as compared to poorest group. Women living in Khulna (aOR=1.16, 95% CI: 1.09 -1.23), Rajshahi (aOR=1.16, 95% CI: 1.09-1.23) and Rangpur divisions (aOR=1.16, 95% CI: 1.09-1.25) reported higher risk of adolescent pregnancy than women who lived in Barisal division (aOR=0.88, 95% CI: 0.82-0.93). However, when adjusted for other potential confounding factors, the effect size became insignificant.

Characteristics	Odds ratio (95% Confidence interval)			
	Individual level	Household level	Community level	All adjusted
Respondents education				
No education	1.00			1.00
Primary	1.14 (0.98-1.32)			1.14 (0.98-1.33)
Secondary	1.21 (1.03-1.39)			1.22 (1.05-1.43)
Higher	0.65 (0.49-0.96)			0.73 (0.52-1.01)
Husband education				
No education	1.00			1.00
Primary	1.10 (0.98-1.22)			1.12 (1.00-1.24)
Secondary	1.08 (0.97-1.19)			1.13 (1.01-1.27)
Higher	0.69 (0.56-0.84)			0.75 (0.61-0.92)
Religion				
Islam	1.00			1.00
Non-Muslim	0.94 (0.82-1.07)			0.95 (0.81-1.05)
Age at first cohabitation				
≤15 years	1.00			1.00
>15 years	0.50 (0.45-0.55)			0.51 (0.46-0.56)
Number of antenatal visit				
No visit	1.00			1.00
1-4	0.95 (0.87-1.04)			.97 (0.89-1.07)
>4	0.92 (0.86-1.08)			0.95 (0.89-1.12)
Household characteristics				
Socioeconomic status				
Poorest		1.00		1.00
Poorer		0.98 (0.94-1.03)		1.02 (0.91-1.14)
Middle		0.97 (0.92-1.01)		0.92 (0.82-1.04)

Richer		0.95 (0.90-0.99)		0.87 (0.76-0.99)
Richest		0.80 (0.75-0.85)		0.76 (0.65-0.90)
Food security				
Never		1.00		1.00
Sometimes		0.97 (0.94-1.01)		0.99 (0.91-1.08)
Few often		0.94 (0.90-0.98)		0.91 (0.77-1.08)
Place of Residence				
Urban			1.00	1.00
Rural			1.02 (0.98-1.06)	.96 (0.87-1.05)
Region of residence				
Barisal			1.00	1.00
Chittagong			0.88 (0.82-0.93)	1.02 (0.89-1.17)
Dhaka			1.03 (0.97-1.09)	1.04 (0.92-1.19)
Khulna			1.16 (1.09-1.23)	0.97 (0.86-1.11)
Rajshahi			1.16 (1.09-1.23)	0.87 (0.75-1.02)
Rangpur			1.19 (1.12-1.25)	1.10 (0.97-1.25)
Sylhet			0.72 (0.67-0.78)	0.92 (0.78-1.09)

Table 3: Results of multilevel logistic regression analysis for adolescent child bearing by selected characteristics, BDHS 2011.

Discussion

In this paper we have investigated socioeconomic determinants of adolescent pregnancy using multilevel logistic regression model using nationally representative data. We have shown that around 28% of the total pregnancies occurred in adolescent girls in Bangladesh. By analyzing the determinants, we discovered that maternal and husband's 15 years of age, non-working education being primary or secondary level, marriage at status, and lower socioeconomic status, and receiving less than four antenatal visits were significantly associated with increased risk of adolescent pregnancy in Bangladesh.

Given the importance of improving maternal and child health in Bangladesh, we found continuing education and providing sexual education in primary and secondary school are likely areas of intervention. Approximately one fourth of the total pregnancies in Bangladesh occurred in adolescent girls. Bangladesh has observed rapid fertility transition after 1980s that is frequently cited as a reference of improving health care system [8-11]. However, despite this achievement, adolescent pregnancy remain at high levels and the progress in modifying their reproductive behavior remains a challenge [9,11]. Early marriage and childbearing is common in current culture of Bangladesh, hence adolescents are more likely to be exposed to sexual and reproductive activities [11,12]. The adverse outcomes of adolescent pregnancy such as low birth weight and increased risk of neonatal mortality are well documented in context of Bangladesh. Thus the Government of Bangladesh have been supporting initiatives to reduce the rate of adolescent pregnancy and improve health care services for adolescent women.

Maternal and husband's education level, age at marriage, working status, socioeconomic status, and number of antenatal visits were significantly associated with increased risk of adolescent pregnancy in Bangladesh. We found a lower risk of adolescent pregnancy among women who married at an age above 15 years old. To explain these observations, we hypothesize that the influence of adolescent girls who married before the age of 15 years are likely to have had less years of schooling and hence sexual and education. Due to lack of knowledge on proper contraception and safe sexual practices, they are more exposed to unprotected sex and risk of pregnancy. In accord with this finding, we found a higher rate of adolescent pregnancy when maternal or paternal education was primary or secondary level compared to higher education level which suggest a protective effect. Those under higher rate of poverty and from marginalized groups are reported to have higher fertility rate compared to the general population, both in Bangladesh and internationally. When considering higher age at marriage, adolescents are more likely to have higher skill set and education levels resulting in enrollment in the job market. These likelihoods improve their self-dependency, which can be a contributing factor to provide a protective effect against adolescent pregnancy. Previous studies conducted in Bangladesh [8] and in Turkey [13] have also found the similar results.

Interestingly, the husband's education level being primary and secondary has also found to be significantly associated with the adolescent pregnancy compared to higher levels. This finding is agreed with previous study in Bangladesh which also found similar results [8-19]. Higher education levels in husbands may ensure the better job opportunities and consequently socioeconomic status and lower fertility. In this study, we found wide regional variation in the rate of

adolescent pregnancy with higher rates in Khulna, Rajshahi and Rangpur divisions compared to Barisal division.

The main strength of our study was the large sample size and data derived from a nationally representative survey. We have provided the largest study exploring determinants of adolescent pregnancy to date in Bangladesh. Our method of using multilevel regression model to account clustering effects also reduced the influence of confounding factors in our results. Despite these strengths, our study has several limitations. We could not establish a causal relationship between variables and adolescent pregnancy due to the cross-sectional nature of the survey. In addition, several determinants are self-reported such as the age at birth, therefore there is a risk of recall bias.

Conclusion

Adolescent pregnancies account for more than one quarter of total pregnancies which remain a major public health challenge to improving maternal and child health. These findings imply that several associated determinants are strongly linked to cultural and social norms, which require long-term interventions to influence behavioral changes. However, maternal and paternal education levels are possible interventions to target in public health programs. Securing higher education beyond primary and secondary level provided protective effects on the risk of adolescent pregnancy by empowering girls with self-dependency and opportunities for career development. We recommend that focusing sexual education in primary and secondary schools to enable adolescents who do not continue education to be able to seek safe sex practices.

Authors Statements

Dr. Md. Rashed alam (Alam MR), Rahman MM (Dr. Md. Mizanur Rahman) and Roy TK (Dr. Tapan Kumar Roy) conceptualized the analysis plan for this study. Alam MR drafted the manuscript and performed the statistical analysis together with Rahman MM and Khan MN (Md. Nuruzzaman Khan). Jung J (Jenny Jung) and Islam MZ (Mahammad Zahidul Islam) did consistency check of the manuscript. Rahman MM, Jung J, and Roy TK provided critical revision of the manuscript. All authors have reviewed and approved the final version.

Ethical Approved

Data used in this study were obtained from MEASURE DHS Archive. The data was originally collected by the Macro, Calverton, USA. We thank MEASURE DHS for providing permission to use the BDHS 2011 data.

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