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Reproductive Health Problems of Married Adolescents in Bangladesh

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Reproductive Health Problems of Married Adolescents in Bangladesh

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Abstract

Background: Adolescent aged 10-19 years constitute a large proportion of the Bangladeshi population. With a total population of about 160 million, adolescents comprise 22% and projected to increase to 35 million by 2020. 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 health care seeking behavior among the adolescent girls however, it is still beyond the expectation. Still, a large number of adolescents suffer from reproductive health problems, a vast majority of them do not seek healthcare for these conditions. Until recently, several studies have been conducted to assess the association between various reproductive health problems and health seeking behavior among the adolescents. However, most of these studies have considered single or one or more determinants of reproductive health problems. Consequently most of the earlier studies mainly focused on limited components of health seeking behavior such as receiving antenatal care (ANC) or delivery care in their studies. In addition, most of these earlier studies did not compare intergenerational reproductive health problems and health seeking behavior (adolescents compared to young adult or adults). Based on this consideration, this study investigates the multiple reproductive health issues and accesses 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 (BDHS, 2011), which was a nationally representative survey. To investigate the reproductive health problems a total of 17,231 married adolescents (10-19 years), young adult (20-34 years) and adult (35-49 years) were analyzed. To examine the health care seeking behavior a total of 8,753 adolescent, young adult and adult women with at least one child aged less than five years were

selected. The following variables were used as outcomes variable of interest for reproductive health problems: infecundity, anemia, chronic undernutrition, sexually transmitted infections (STIs), pregnancy complications, and reproductive health problem index (RHPI). The variables which were used for health care seeking behaviors are: any contraceptive methods use, use of modern contraceptives, any ANC, sufficient ANC, assisted delivery by medically trained provider, Institutional delivery and post natal care. Multilevel logistic regression analyses were used to analyze reproductive health problems and multilevel Poisson regression models were used to analyze health care seeking behavior for intergenerational age group of women (adolescents, young adult, and adult).

Results: This study found that a large proportion of married adolescents were suffering from several of the reproductive health problems such as anemia, chronic undernutrition, and STIs. Regarding pregnancy related complications, the proportion is higher among the adolescent women (15.2%) as compared to the adult women (6.7%). Overall 12.4% adolescents were reported to have suffered from any kind of reproductive health problems. From multilevel logistic regression analyses, significantly, adolescent's women were less likely to suffer from infecundity but more likely to be chronic undernourished, and suffering from pregnancy related complications as compared to the young adult women (20-34 years). Adolescent women were also more likely to suffer from any kind of reproductive health related problems compared to young adult women. Regarding health care-seeking behavior, the proportions of receiving any contraceptive methods or modern contraceptives, receiving ANC, assisted delivery by SHP, institutional delivery and receiving post natal care from SHP is much lower than those for the young adult women. From multilevel Poisson regression analyses, we found that adolescents were less likely to have institutional delivery, assisted delivery by SHP and less likely to receive post natal care by SHP as compared to young adult women.

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. Considering the need for reducing several of the reproductive health problems and increase the health seeking behavior of the adolescents an increased networking between all relevant government organizations and NGOs working with adolescents should be encouraged to ensure the proper implementation of projects. We recommend future longitudinal research to provide clarity regarding these concerns.

Keywords: Adolescents**,** reproductive health problems, health care-seeking behavior, multilevel regression analysis, Bangladesh.

Declaration of originality

It is hereby declared that the thesis entitled "**Reproductive Health Problems of Married Adolescents in Bangladesh**" is prepared on the basis of the research work and submitted to the Department of Population Science and Human Resource Development, University of Rajshahi, Bangladesh for the degree of Doctor of Philosophy. This study has been carried out by myself and to the best of my knowledge it does not contain any material previously published or written by another person except where due reference is cited in the text. It is also declared that this thesis or any part of it has not been simultaneously submitted to any other university/institution for achieving any degree or diploma.

University of Rajshahi
May, 2017

Mahmudul Hasan

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Supervisors' Certificate

Submission of Thesis for Ph.D. Degree

The following statement is to be signed by the fellow's supervisor before the dispatch of the thesis to the approved examiners.

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The undersigned do hereby state that:

1. the above fellow's work, including the thesis, has been completed to my satisfaction and the thesis is ready for examination and
2. two oral presentation of the thesis has been made in accordance with the ordinance of the University of Rajshahi for **Ph.D. Degree.**

Supervisors' Comments: To the best of our knowledge, this work neither in part nor in full has been submitted to any other University or Institution for the award of any degree.

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In fine, I am solely responsible for the errors and shortcomings in this study if there be any.

University of Rajshahi
May, 2017

Mahmudul Hasan

Dedication

Acronyms and Abbreviations

AOR	Adjusted Odds Ratio
ARR	Adjusted Relative Risk
ASRH	Adolescent sexual and reproductive health
BDHS	Bangladesh Demographic and Health Survey
BMI	Body Mass Index
CI	Confidence Interval
DHS	Demographic and Health Survey
IQR	Inter-quartile Range
LBW	Low Birth Weight
OR	Odds Ratio
PSU	Primary Sampling Unit
RH	Reproductive Health
RHPI	Reproductive Health Problems Index
RR	Relative Risk
SBAs	Skilled Birth Attendants
SHP	Skilled Health Professionals
STI	Sexually Transmitted Infection
UNICEF	The United Nations Children's Emergency Fund
WHO	World Health Organization

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Chapter 1

General Introduction

1.1 Background

Reproductive health has been a focus of health programs worldwide since the International Conference on Population and Development (ICPD) in 1994. However, in many countries, sexual and reproductive health needs focusing specifically on adolescents are often unrecognized or even neglected to this day. Globally, almost 16 million girls aged 15-19 years give birth each year, most prevalent in low- and middle-income countries (Hindin et al. 2013) . A large number of these young women undergo unsafe abortions, where risks of dying from pregnancy-related causes are very high (WHO 2010).

Adolescent sexual and reproductive health (ASRH) has been overlooked historically despite the high risks that countries face for its negligence. Some of the challenges faced by adolescents across the world include early pregnancy and parenthood, difficulties accessing contraception and safe abortion, and high rates of HIV and sexually transmitted infections (Morris and Rushwan 2015). In most of the developing world, adolescent and child marriage continues to be a strong social norm, particularly for girls. Early female marriage is associated with a number of poor social and

physical outcomes for young women and their offspring. On average, girls who marry as adolescents attain lower schooling, have lower social status in their husbands' families, report less reproductive control, and suffer higher rates of maternal mortality and domestic violence (Field and Ambrus 2008). In addition, these individual outcomes suggest a number of larger social consequences of early marriage, including higher population growth, more rapid spread of disease, and a higher incidence of orphans (Aguilar et al. 1984).

Adolescence is a critical age for girls throughout the world. What takes place during a girl's teenage years shapes future life circumstances (Mensch et al. 2014). For many girls in the developing world, the mere commencement of puberty marks a time of increased vulnerability to early marriage (Loaiza Sr and Wong 2012) and entry into sexual life (Santhya and Jejeebhoy 2015). Health, in addition to its biomedical determinants, is influenced by many social and cultural factors. This influence is often negative with a resultant increase in the number of social hazards, which finally aggravate the already poor health status of the developing societies. One such social hazard of serious consequences on the nation as a whole is pregnancy in an adolescent girl, who herself is yet to attain her full growth potential (Pathak and Ram 1993).

Adolescents around the world face tremendous challenges to meeting their sexual and reproductive health (SRH) needs. Inadequate access to health information and services, as well as inequitable gender norms, contribute to a lack of awareness about puberty, sexuality, and basic human rights that can have serious implications on their health and welfare throughout the rest of their lives. These underlying factors lead to

high rates of early pregnancy, sexually transmitted infections (STIs), sexual violence, and early and forced marriage globally (Cortez et al. 2014).

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. Within the region, Bangladesh and Pakistan have the greatest proportion of adolescents, while India has the greatest absolute number (Bott and Jejeebhoy 2003). Adolescents aged 10–19 years constitute the largest growing segment of the world population. Globally, one in every 5 is an adolescent (UNFPA 1998). In south Asian countries, current healthcare systems scarcely address the health needs of adolescents. Furthermore, they are inadequately informed about the symptoms and consequences of reproductive health conditions (Mishra and Mukhopadhyay 2012).

Although a large number of adolescents suffer from reproductive health problems, a vast majority of them do not seek healthcare for these conditions (Kulkarni and Durge 2011). Every third young woman in the developing countries excluding China continues to marry as a child that is before age 18. Recent studies reiterates the adverse health consequences of early marriage among young women and their children even after a host of confounding factors are controlled. The current evidence is conclusive with regard to many indicators: unintended pregnancy, pregnancy-related complications, preterm delivery, delivery of low birth weight babies, fetal mortality and violence within marriage (Santhya 2011).

Teenage pregnancy is often referred to as 'at-risk pregnancy' and is of great concern. Teenage women face a greater risk of obstetric complications than women in their

twenties. The risks are greatest for the very poor who have worse diets and the least opportunity for prenatal care. Social problems like illiteracy, poverty, and low socio-economic conditions aggravate the situation (Park 1970).

Bangladesh has one of the highest population densities in the world, with a population of more than 150 million and a land size of 144,000 km^2. Recent economic growth of the country has been robust, averaging 7% annually between 2001 and 2015 despite periods of political turmoil and frequent natural disasters; income per head reached US$1,314 per year in 2014 (Programme 2015). There were significant improvements in women's dietary diversity score (increase of 0.2 (95% CI 0.1 to 0.3)) and participation in healthcare decision-making (proportion increase 14.0%; 95% CI: 10.6%-17.4%. There were also increases in knowledge about: contraception (4.2%; 95% CI: 2.0%-6.3%), ways to treat (55.4%; 95% CI: 52.2% -58.5%) and prevent (71.0%; 95% CI: 68.0% -74.1%) sexually transmitted infections, nutrition (46.6%; 95% CI: 43.6% - 49.6%) and anemia prevention (62.8%; 95% CI: 60.9% - 64.6%) (Harris-Fry et al. 2016).

The incidence of maternal mortality in Bangladesh is recently decreasing; however though, it is still beyond the expectation as compared to that of the developed countries. Majority of married women in Bangladesh are poorly educated and lacking from their childbearing and its related knowledge significantly (Hasan 2005). Adolescents appear to be poorly informed with regard to their own sexuality, physical well-being, health, and bodies. Whatever knowledge they have, moreover, is incomplete and confused. Low rates of educational attainment, limited sex education

activities, and inhibited attitudes toward sex contribute to this ignorance (Jejeebhoy 1998).

In Bangladesh, most intercourse between teenagers occurs without the use of condoms or consistent condom use. Few teenage pregnancies are planned. Adolescents are particularly prone to peers influences to take risks and often have false beliefs about what peers are doing. Thus, adolescence is a vulnerable period when young adults are exposed to new experiences relating to sexuality and reproduction (Nahar and Min 2008). It is a complicated point in time for both the female adolescents and young adults here in Bangladesh as they are to deal with a number of decisions concerning education, work, marriage, fertility, and establishment and overall many roles they are to play in family and society as well. Though Bangladesh population program has made substantial progress over the last thirty-eight years but still 5.2 % infants die before reaching their first birthday while 6.8% are of child mortality (ESCAP 2008). The abortion scenario varies considerably within South Asia.

In Bangladesh, abortion has been available since 1999 for up to 12 weeks of gestational age in the form of “menstrual regulation”, and large proportions of women use these services. Akhter et al. (2012) reported that while adolescents constituted 9% of women who received services from “menstrual regulation” clinics, they constituted 15% of those rejected by the clinics, presumably because their pregnancies were too far along. As a result, many adolescent girls were hospitalized for complications of induced abortion after undergoing an abortion by traditional birth attendants or after attempting to self-induce. About half of these girls resorted to unsafe methods such as

inserting a solid stick or rubber catheter, or ingesting medicines (Akhter et al. 2012). Currently married women of reproductive age group constitute 51.7% of total female population (BBS 2004). More than 500,000 women die in pregnancy or childbirth every year in the developing world due to lack of proper care (Katrina and Manson 2009).

Early marriage is customary for females in Bangladesh. Like early marriage, early pregnancy is common among females in Bangladesh (MOHFW 1998a). Utilization of reproductive healthcare services such as antenatal care (ANC), delivery place facilities and delivery attendant facility is essential and a basic need for mothers around the globe. In our country, antenatal care coverage (at least one visit) is 48.7% (PRB 2002) and most of the deliveries (about 87.7%) take place at home, only 11.2% deliveries occur in hospitals or clinics (CIRDAP 1998). The number of births attended by skilled health personnel is 13% (Children 2008). In Bangladesh inequalities in many forms affect the health care utilization of married women. These inequalities include socio-economic status, age, education, family size, existence of living children, occupation and household location (Zaman 2013).

According to the current reproductive health status of Bangladesh TFR (total fertility rate) is 2.7 children per woman, contraceptive use among married woman aged 15-49 is 48% (modern method), percentage of females aged 15 to 19 who are ever been married 48%, percentage of females who have given birth by age 18 is 46%, literacy rate among women aged 15-24 is 41% (PRB 2006). Pregnant mothers receiving antenatal care is 31%, home deliveries are 92%, percentage of birth attended by skilled health personnel are 20% (Children 2008).

Adolescents represent a large and rising proportion of the population of Bangladesh. While youth are generally among the healthiest of any age group, they have special biological needs and other vulnerabilities to reproductive health problems. These issues are a widely discussed phenomenon in the world but the socio-demographic wellbeing of married female adolescents' reproductive problems in Bangladesh are largely remained to be studied.

1.2 Review of existing literature

This study was performed by reviewing many literatures related to reproductive health problems and health needs of adolescents and their successors. This section is divided into two sub-sections. First, search strategy and existing literature regarding reproductive health problems among the adolescents was discussed and in the second sub-section we reviewed the literature concerning health care-seeking behavior.

1.2.1 Reproductive health problems among the adolescent women

Process of searching existing literature on reproductive health problems:

Panel: Research in Context	**Interpretation**
Search literature This study performed a systematic search on PubMed, Google, and hand search for original paper published up to March 12, 2016. To maximize the sensitivity, we did not use any methodological and language restriction in the initial search. We first searched participant using the following keywords: We first searched participant using the following keywords: (adolescent [MeSH] OR adolescent [tw]) OR early motherhood [tw] OR early childbearing [tw] OR teenage [tw] OR women [MesH] OR women [tw]	Firstly searched recognized 648 papers. Of these 620 papers were excluded after reviewing the title and abstract. We then had reviewed full-text of 28 papers and identified 4 papers related to reproductive health problems of ever married women of Bangladesh. **What is known?** Three papers considered hemoglobin, underweight and anemia as their outcome variables respectively. One paper identified that hemoglobin had positive impact in relation with age as continuous variable and this study performed with a few number of

We then performed another search to pickup reproductive health problems related papers and then combined with study participants: health problem [tw] OR reproductive health [MeSH] OR reproductive health [tw] OR reproductive health problems [tw] OR reproductive adverse health [tw] OR infecund* [tw] OR (Anaemia [MeSH] OR anaemia [tw] OR anemia [tw] OR haemoglobin [tw] OR hemoglobin [tw] OR haematocrit [tw] OR hematocrit [tw]) OR (Body Mass Index [MeSH] OR body mass index [tw] OR Body Weight [MeSH] OR underweight [MeSH] OR underweight [tw] OR body weight [tw] OR nutrition status [MeSH] OR nutrition status [tw]) OR genital problem [tw] Finally, we had a broader search that includes the Bangladeshi adolescents and the successors of them who had health problems and that settings are given below: Bangladesh [MeSH] OR Bangladesh [tw]	respondents from a city only. The measurement of hemoglobin (Hb) is the standardized method of screening for anemia. Though the other two studies attempted based on country level data but their outcome variable was underweight in one paper and anemia in another paper, and identified positive and negative association with age category respectively. The fourth paper attempted a regional study with anemia, unitary tract infection and genital infection as their outcome variables and found all through positive association for adolescent as compared to adults. **What is unknown?** Appropriate reproductive health problems in connection with current age particularly among adolescent is unclear using population-based survey data. **Added interests to this study** Like with other countries, reproductive health problems are endless troubles in Bangladesh. In this settings, identifying its effect of health problems related to participants' age will be helpful to reduce its horrible impacts. In this perspective, this study was conducted to identify the broader range of health problems among adolescents.

1.2.1.1 Pregnancy complications

United Nations Fund for Populating Activities (UNFPA) reports showed that complications during pregnancy and childbearing are the leading causes of death for girls aged 15–19 years in developing countries (UNFPA 2009). A case–control study of adolescent girls (<18 years) and adult women (20–34 years) delivered in a tertiary hospital in Nigeria observed that adolescents were twice as likely as adult women to have experienced at least one pregnancy related complication, namely preeclampsia,

eclampsia, premature rupture of membrane, antepartum haemorrhage and postpartum haemorrhage (44% vs. 22%, respectively); incidence of such conditions as eclampsia and preeclampsia was six times higher among adolescents than adult women (20% vs. 3%, respectively) (Adeyinka et al. 2010).

In another study conducted by Ganchimeg et al. (2014) showed that although adolescent mothers had a lower risk of pre-eclampsia, the risk of eclampsia was 1.85, 1.88 and 1.55 times higher among adolescent mothers aged ≤ 15, 16–17 and 18–19 years, respectively, compared with adult mothers. A high risk of stillbirth was found among all adolescent age groups, but the risk was significant only among adolescent mothers aged 16–17 years (AOR = 1.32; 95% CI, 1.11–1.57) (Ganchimeg et al. 2014).

Raj *et al.* (2009) found that in India, adolescent's early marriage is associated with increased risk of fetal mortality as well. This study also showed that young women who married early were 1.5 times more likely to have ever experienced fetal loss, as defined by ever having experienced miscarriage, induced abortion or still birth, even after controlling for confounding factors (Raj et al. 2009). Chen *et al*. (2007) reported that risk of very pre-term delivery, pre-term delivery, very LBW, LBW, SGA and neonatal mortality increased with decreasing maternal age. The risks of very low Apgar score and low Apgar score were significantly higher in infants born to mothers ≤17 years old than infants born to mothers 20–24 years old. The association between teenage pregnancy and neonatal mortality became non-significant when it was further adjusted for birth weight and gestational age (Chen et al. 2007).

A large population based study suggested that the risk of neonatal mortality was increased in infants born to teenage mothers, even after adjustment for potential

confounders. The effect of teenage pregnancy on neonatal mortality disappeared after further adjustment for birth weight and gestational age, suggesting the increased risk of neonatal mortality in teenage pregnancy could largely be explained by the higher rates of pre-term delivery and LBW in teenage mothers, which was consistent with previous study (Conde-Agudelo et al. 2005).

Rahman *et al.* (2010) in their study reported that adolescent aged under 20 years have been observed to have the highest proportions of delivery complications and pregnancy wastage due to insufficient intake of foods and possible biological immaturity. Age at first conception had significant positive effect on abortion or stillbirth among adolescents. Adolescents who were pregnant under age 15 years are found to have 39.68 times higher risk of abortion compared to the relative younger group (15 years and later). The relative risks of pregnancy wastage were 83 percent lower among adolescent who did not have any pregnancy complication than those had pregnancy complications like anemia, itching and others. Adolescents who took nutritious food during pregnancy time had significant lower risk of pregnancy ended in abortion or stillbirth than those who took nutritious food.

1.2.1.2 Infecundity

A Brazilian study performed by Da Silva *et al*. (2013) indicate a general reduction of 25.7% in fecundity rate during the study period for all maternal age groups (P<0.001). The largest reduction in fecundity rate occurred in the intermediate age groups, and the smallest changes occurred among the older groups. There was an increase in the proportion of women older than 25 years giving birth, except for the group between 30 and 34 years (Da Silva et al. 2013). In another study, Nahar *et al*. (2013) shows that if the age at first marriage of adolescents is increased by 1 year, the age at first

birth is postponed by 0.728 years. With the increase in age at first marriage, the fecundability of women sharply rises, whereas the proportion of temporary sterility decreases.

In a study conducted by Hoque *et al.* (2012) on levels, trends and determinants of fecundability in Bangladesh showed that women with infecundity are badly mistreated by their family as well as by the society in Bangladesh. These women are physically and mentally abused for their inefficiency to be mother. So rising fecundability indicates that number of infecundity caused by socio-economic, nutritional or medical factors are going to reduce. Women with early age at marriage usually experienced a longer first birth interval than their counterparts with higher age at marriage. This analysis found that late marrying women are attempting to catch up for the years lost in the single state and hence having shorter birth interval. From life table estimate the median marriage to first birth interval for rural population is found 22.0 months while this value is little shorter (21.0 months) for urban population. This study provides a higher fecundability (0.047) for urban area compared to rural area (0.045). The low fecundability in rural area is attributed to the low nutritional status, low average age at marriage and low socio-economic condition compared to urban area.

A slightly increasing trend in fecundability was noticed in recent years in Bangladesh. But compared to other developed and developing countries, the fecundability in Bangladesh is very low. Age at marriage was the most important factor explaining fecundability for every sub-group of the study population. Women marrying at higher age have a tendency to conceive quickly than those who marry at a lower age. The direct and life table approach of estimation procedure give closer estimate of

fecundability. Logistic regression analysis identified age at marriage, age at first birth and marital duration were important significant factors which influence marriage to first birth interval positively and thus fecundability negatively (Hoque et al. 2012).

1.2.1.3 Anemia

Iron status at the beginning of adolescence may be important for ensuring adequate growth during this period, because iron deficiency can decrease appetite, and thus food and energy intake. Kavitha (2011) in her study concluded that in urban areas, adolescents aged 19 years or younger are significantly more likely than women aged 20 years and above to suffer from anemia. Women from wealthier households, non-Hindus, women with higher BMI and working women face lower risk of anemia than women in the respective reference categories. Maternal age has not had any significant influence on the prevalence of anemia in rural areas. Educated women, working women, women from wealthier households, non-Hindu women, women of OBC and other caste groups, women who have exposure to mass media and women with higher BMI are less likely to be anemic than illiterate, non-working, poor, Hindu, SC/ST women, women who had no exposure to mass media and women with low BMI (Kavitha 2011). In another study Joshi *et al*. (2006) showed that 93.5% of the adolescent girls were anemic and mean hemoglobin was 9.6 gms. (S.D ± 1.7) (Kavitha 2011).

1.2.1.4 STIs

Joshi *et al.* (2006) had a study on reproductive health problems and help seeking behaviour among urban school going adolescents between 11 and 14 years in India. They found that adolescents mainly reported problems related to menstruation, excessive vaginal discharge, itching of genitals and urinary complaints. Few girls reported minor problems like acne, height and weight concerns, skin and general health problems.

Mani (2014) had a community study in India and she observed that there was a statistically significant association between duration of marriage and the prevalence of STIs, with women married for less than 1 year showing highest prevalence (56%). Moreover, Kavitha (2011) wrote that in urban areas, the multivariate findings of the prevalence of STIs show significant differences between adolescent and adult mothers. Odds of prevalence of STIs are lower for adult mothers than those for adolescent mothers. Being a non-Hindu, belonging to OBC, using contraception, experiencing termination of pregnancy and awareness of STIs increases the odds of reporting STIs. Higher wealth status decreases the risk of STIs. As seen in urban areas, in rural areas too, maternal age has a significant relationship with the reporting of STIs. Adolescent mothers are almost 1.1 times more likely to report STIs than adult mothers.

Researchers in Bangladesh set out to evaluate the accuracy of two algorithms for syndromic management of women complaining of abnormal vaginal discharge. Over a five-month period during 1997, all women in Matlab who visited a reproductive health center of them 94% reported at least any of these problem (such as genital

itching, lower abdominal pain or pain during sex) were asked if they would participate in the study (Klitsch 2000).

Prusty and Unisa (2012) reported that about 15% of adolescent women reported having any symptoms of STI. The main symptoms reported were low backache, pain in the lower abdomen, pain during intercourse and itching or irritation around the vulva region. Factor analysis showed the concentration of diseases in three clusters - infection around the vulva, other reproductive infection and abnormal discharge; and intercourse related problems. Major predictors of both symptoms of reproductive infections and treatment seeking behavior from multivariate analysis are age, education, wealth, region and awareness about RTI/STI. Knowledge and treatment seeking behavior is poor among adolescent women in India.

1.2.1.5 Chronic undernutrition

In a study Joshi *et al.* (2006) showed that about 14.8% of girls were below 5th percentile and 4 percent of girls were above 95th percentile for BMI in comparison to the WHO recommended standards (Organization 2011) and mean Body Mass Index (BMI) was 19.08 (SD± 4.9).

Khan and Kramer (2009) reported that age, education, region of residence, marital status, current use of contraception and type of occupation were significantly associated with BMI categories among the adolescents. Adjusted multinomial logistic regression analysis indicated that women with a high socioeconomic status were significantly negatively associated with being underweight (odds ratio [OR] 0.55, 95 percent confidence interval [CI] 0.48–0.63) but positively associated with being overweight (OR 1.70, 95 percent CI 1.48–1.96) and obese (OR 2.48, 95 percent CI

1.89–3.26), as compared to the women with normal BMI. In their study Kamal *et al.* (2015) found that the prevalence of underweight was found to be highest among the teenagers 15-19 (35.4%) and the lowest among women aged 30-34 years (23.5%). The unadjusted odds of underweight was 13.0% (OR=1.13, 95% CI=0.95-1.35), higher among the married adolescents and 37.0% (OR=0.63, 95% CI=0.53-0.75), lower among those of aged 30-34 years as compared to the women aged 45-49. The unadjusted odds ratios reveal that the risk of being underweight was 34.0% higher (OR=1.34, 95% CI=1.14-1.57) among women of Sylhet division, while the risk of underweight was 29.0% lower (OR=0.71, 95% CI=0.60-0.84) among women of Khulna division as compared to those of Barisal division (Islam 2010).

Rahman *et al.* (2015) found that urban women aged 25-34 years and 35-49 years were 0.427 times (OR: 0.427, 95% CI: 0.348-0.525) and 0.304 times (OR: 0.304, 95% CI: 0.238-0.387) lower risk to have underweight as compared to the women aged 15-24 years respectively. On the other hand, rural women aged 25-34 years and 35-49 years have 0.561 times (OR: 0.561, 95% CI: 0.495-0.636) and 0.542 times (OR: 0.542, 95% CI: 0.470-0.625) lower risk to be underweight compared to the women aged 15-24 years respectively.

1.2.2 Health care-seeking behavior among the adolescent women

Process of searching existing literature on health care-seeking behavior:

Panel: Research in Context	**Interpretation**
Search literature This study performed a systematic search on PubMed, Google, and hand search for original paper published up to March 18, 2016. To maximize the sensitivity, we did not use any methodological and language restriction in the initial search. We first searched participant using the following keywords:(adolescent [MeSH] OR adolescent [tw]) AND (pregnancy [MeSH] OR pregnancy [tw] OR adolescent pregnancy [MeSH]adolescent pregnancy [tw] OR pregnancy in adolescence [MeSH] OR pregnancy in adolescence [tw] OR adolescent mother [tw] OR young mother [tw] OR teenage pregnancy [tw] OR early motherhood [tw] OR early childbearing [tw] OR early motherhood [tw] OR early childbearing [tw] We then performed another search to pickup health care related papers and then combined with study participants: contraceptive use [tw] OR modern contraceptive use [tw] OR patient acceptance of health care [tw] OR health care utilisation [tw] OR health services accessibility [tw] OR health service utilization [tw] OR antenatal health care [tw] OR maternal health services [tw] OR perinatal health care [MeSH] OR perinatal health care [tw] OR reproductive health care [tw] OR reproductive care [tw] OR delivery care [tw] OR place of delivery [tw] Finally, we had a broader search that includes the Bangladeshi adolescents who had intension of care seeking behavior and that settings are given below: Bangladesh [MeSH] OR Bangladesh [tw]	Initially searched identified 86 papers. Of these 71 papers were excluded after reviewing the title and abstract. We then had reviewed full-text of 15 papers and identified 12 papers related to utilization of health seeking behavior in Bangladesh. **What is known?** Nine papers suggested that poor maternal health care services (both antenatal and postnatal) among less educated, poor and rural women. Another three papers indicated that contraception use among adolescents and adults are universal. **What is unknown?** Utilization of maternal health care services in connection to age at birth particularly among adolescent is unclear using population-based survey data. **Added interests to this study** Like other countries, health care seeking behavior is unending troubles in Bangladesh. In these settings, identifying its effect of health care-seeking behavior related to maternal age at birth will helpful to condense its unpleasant consequences. In this perspective, this study was conducted to identify the broader range of health care seeking behavior among adolescents and health outcomes.

Prusty and Unisa (2012) found that treatment seeking among adolescent women is poor. Only 62% of the adolescent women discuss the infections with their husbands/partner whereas only one out of four of them go for treatment. Comparing between different age groups, the treatment seeking behavior is much higher among older women (25+ years) as compared to the adolescents. This may be due to the fact that older women enjoy better status in households than younger and newly married women. More than three-fifths of the women preferred private hospitals/clinics as compared to only a little more than one-fourth going to government hospitals for treatment. This may be attributed to privacy, better quality of care as well as lack of special treatment division for RTIs in government hospitals. Even more than half the poorest and poorer section of the control prefers to private hospitals or clinics. This shows that going to private hospitals is a compulsion than choice. The older adolescent women (aged 19 years) are two times more likely to seek treatment than the younger adolescent (aged 15 years). Muslims (OR=1.45, $p<0.05$) and other (OR=1.29, $p<0.1$) religious adolescents women are more likely to seek treatment than the Hindu adolescents.

Rahman *et al.* (2013) in Bangladeshi study found that most of the deliveries (52%) were conducted at home by skilled birth attendant (30%) and untrained birth attendant (22%). About 31% had problems during last pregnancy. Among them adverse outcomes were abortion (21%), PPH (22%) and obstructed labor (28%). Reproductive health problems faced by the women included menstrual disturbance (52%), leucorrhoea (41%) and urinary tract infections (35%). The study shows that 75.6% respondents received antenatal visit and about 24.3% respondents did not receive any antenatal visit during the last delivery. However, 50.74% respondents received 1-3

numbers of antenatal visits and 33.17%, 16.09% received 4-6; 7-10 times of antenatal visit respectively. But the annual report of BDHS showed 48.7% (Rahman et al. 2013).

Haque *et al.* (2012) studied on reproductive health care and observed that approximately one third (31%) of the currently married young women in Bangladesh had a higher level of overall decision-making autonomy. Only 24.0% of the sampled women received sufficient ANC; 54% and 18% received ANC and assisted deliveries from a medically trained provider respectively. In adjusted models, young women who had a higher level of overall autonomy were more likely to receive sufficient ANC (adjusted odds ratio [AOR], 1.64; 95% confidence interval [CI], 1.17–2.23) and receiving ANC from medically trained provider (AOR, 1.91; 95% CI, 1.42–2.45). Women who had medium overall autonomy were 1.40 times more likely (95% CI, 1.03–1.98) to have deliveries assisted by a medically trained provider than women who had low autonomy (Haque et al. 2012).

Reynolds *et al.* (2006) had a study among ever married young women aged 15–23 years at the time of the interview with a birth in the previous 3 or 5 years in Bangladesh, India, Indonesia and Nepal reports that those who were aged 18 years or younger at last birth were less likely than those who were aged 19–23 years at last birth to have sought antenatal care (OR 0.55–0.87) and delivery care (OR 0.54–0.78) (Reynolds et al. 2006).

1.3 Overview of Adolescent Reproductive Health Status in Bangladesh

Bangladesh is one of the most populous countries in South Asia. It also has a very young population. With a total population of about 160 million, adolescents comprise 22% of the total population. Due to the effect of population momentum—through which populations can continue to grow even as the rate of growth is declining (since ever more people are added to the base population each year)—and other effects, this age group will contribute significantly to the incremental population size of Bangladesh during the next 20 years to reach 35 million by 2020.

Early marriage and childbearing among girls is often associated with a wide range of negative social and health consequences for young mothers and their infants, and contributes to rapid population growth (Schuler et al. 2006). In Bangladesh early marriage is common among the adolescents. According to a recent estimate around 45% of the girls married before the reach at age 15. Physical health problems occurring during adolescence can often complicate adolescent development. Illness, injury, medical treatments, hospitalization, and surgery can all intensify concerns about physical appearance, interfere with efforts to gain independence, and disrupt changing relationships with parents and friends. Also, adolescent developmental issues may complicate a teenager's ability to cope with illness and response to treatment. While some of these youth have to cope with additional physical and mental disabilities as a result of their primary illness, all of them have to deal with the psychological consequences of their condition (Health 2016).

The heterogeneity of the healthcare system infrastructure across rural and urban settings of Bangladesh must also be considered when addressing reproductive health problems for adolescents. National-level community-based surveys in Bangladesh revealed that there are variations in choices and utilization of specific types of health-care services by population groups (Cockcroft et al. 2007). Youth health care-seeking from existing healthcare facilities for RH conditions was considerably lower compared to healthcare-seeking for other general health problems in Bangladesh (Moore et al. 2007). Teenage pregnancy is coming up as one of the most important social and public health problems (Atwood and Hussein 1997).

Investing in the human capital of its adolescents, including their health, is important for boosting Bangladesh's long-term prosperity. This includes a focus on adolescent reproductive health– choices made at this point in their lives, such as early marriage, pregnancies, or risky sexual behavior, will affect their future.

The important health aspects of the adolescents in Bangladesh are given below:

- In 2011, the prevalence of infecundity among the adolescents was around 16% (Mitra and Associates 2013).
- The prevalence of anemia among non-pregnant, ever-married women was 41.3 % (urban: 37.2 % and rural: 43.5 %). Among anemic women, 35.5 % had mild anemia, 5.6 % had moderate anemia, and 0.2 % had severe anemia (Kamruzzaman et al. 2015).
- Around 24% of women of reproductive age are suffering from undernutrition and 42% are anemic (Mitra and Associates 2013).
- Thirty-one percent of ever-married women aged 15-19 are undernourished (BMI <18.5). However, women's nutritional status has improved considerably

in the last 10 years. The percentage of women undernourished (BMI<18.5) has declined from 34 to 19 between 2004 and 2014 (Mitra and Associates 2016).

- Findings reveal that around eight percent (7.6%) adolescents had genital problems (Mitra and Associates 2013).
- BDHS 2011 highlights that around 15% adolescents faced pregnancy related complications (Mitra and Associates 2013).

1.4 Conceptual framework regarding adolescent health

We hypothesized that socio-demographic factors have influence on reproductive health problems among the adolescents as well as their health seeking behavior. In addition a bi-directional relationship exists between health care-seeking behavior and reproductive health problems among the adolescents.

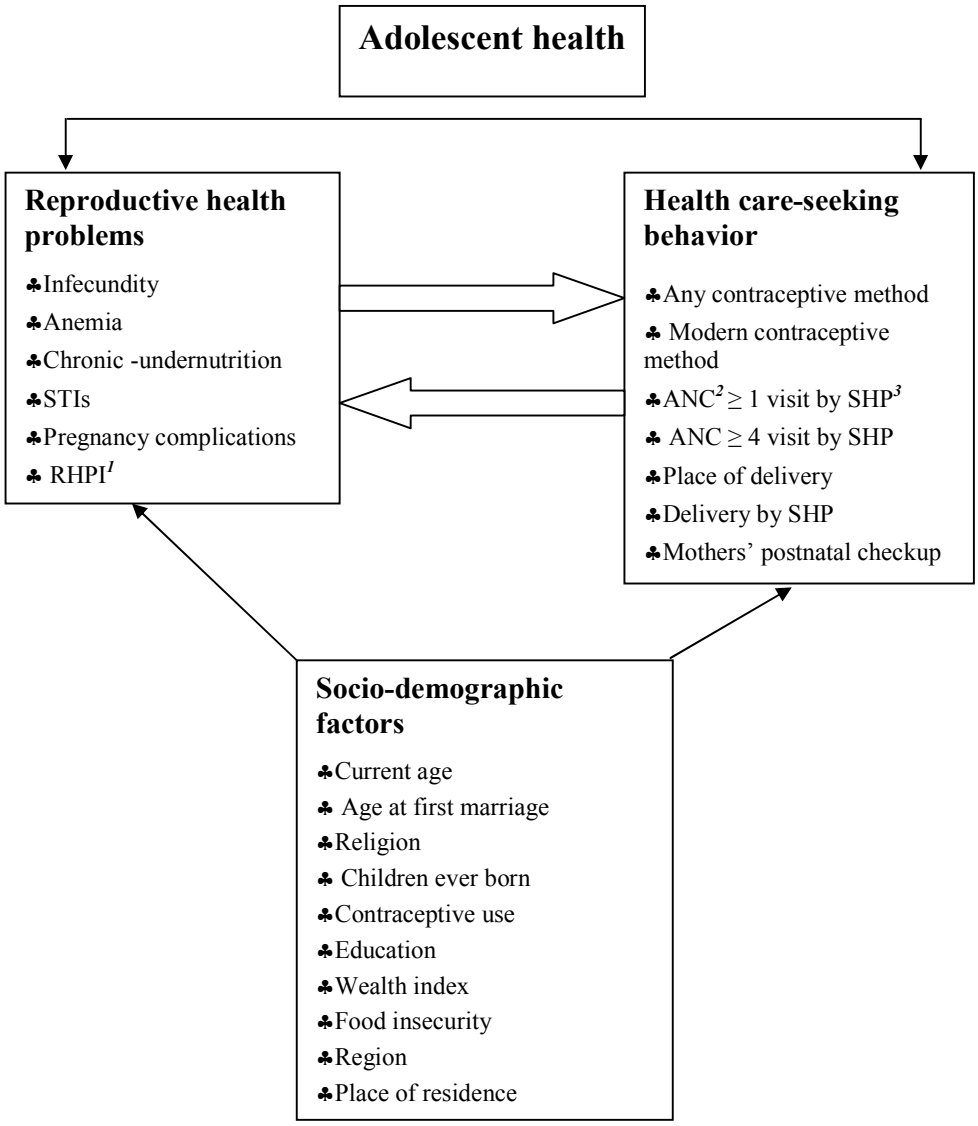


Figure 1.1 Framework of adolescent women's bi-directional health issues

[1]**RHP: Reproductive health problems index**; Presence of any outcomes: infecundity, anemia, undernutrition, genital problems or pregnancy complications;
[2]**ANC: Antenatal care**
[3]**SHP: Skilled health professionals**

1.5 Significance of the Study

The reproductive and sexual health needs of adolescents differ from those of adults (Schwarz 2010). During adolescence, the body undergoes significant developmental changes, most notably puberty, the bodily changes of sexual maturation, and the formation of sexual identity (WHO 2010). Achieving reproductive and sexual health requires more than preventing unwanted pregnancy and sexually transmitted infections, it includes developing the ability to form and maintain meaningful relationships with others and with one's own body (Health 2007). Psychological, social, educational, environmental, and economic factors, among others, all play a role. In addition, adolescents are more likely to engage in risk-taking behaviors than either younger children or adults (Tolman et al. 2003). These significant factors underline the importance of meeting the reproductive and sexual health needs of this age group (Steinberg et al. 2006).

It is evident that the reproductive health matters play crucial role in empowering of women life hood to achieve a happy society. Until recently, several studies have been conducted to assess the association between various reproductive health problems and health seeking behavior among the adolescents. However, most of these studies have considered single or one or more determinants of reproductive health problems. Consequently most of the earlier studies mainly focused on receiving ANC or delivery care in their studies. In addition, most of these earlier studies did not compare intergenerational reproductive health problems and health seeking behavior (adolescents compared to young adult or adults). It is therefore imperative to investigate the multiple reproductive health issues and accesses regarding those of

adolescents compared to young adult and adult women. The findings of this study may help in fine-tuning suitable national strategies in Bangladesh and in South Asia in general.

1.6 Aims of this study

The general objective of this study is to investigate the situation of reproductive health problems and health care seeking behavior among the adolescents as compared to young adults and adults in Bangladesh. The specific objectives are:

1) To investigate the socio-demographic characteristics of the adolescents

2) To examine the adolescents' current health situations as compared to young adults and adults for the following phenomena:

    i) Pregnancy complications

    ii) Anemia

    iii) Infecundity

    iv) STIs and

    v) Chronic undernutrtion

3) To investigate the adolescent mothers' health care- seeking behavior as compared to young adults and adults for the following phenomena:

    i) ANC visits

    ii) Place of delivery

    iii) Assistance during delivery and

    iv) PNC checkup.

1.7 Organization of the study

The present thesis is organized with six chapters as given below:

Chapter 1 introduces the problem and describes the specific problem addressed in the study. It also presents a review of literature and relevant research associated with the problem addressed in this study. More categorically this chapter highlights on the background, significance and specific aims of the study; and finally the organization of this thesis is also included in this chapter.

Chapter 2 presents the methodology and procedures used for data collection and analysis. It emphatically describes the overall study design and methods used in the whole thesis, which include the background of the study area, data collection, and statistical methods.

Chapter 3 and 4 contain an analysis of the data and presentation of the results. These two chapters elaborate on a conflict perspective of broad organization to explore the association between broad model design strategies and the separation of broads' decision management and decision control roles (broad independence). To formalize this approach, these two chapters present assumptions related to the relationship between broad model attributes highlighting on study participants' age and maternal age at first birth, and formal independence of reproductive health problems and health care-seeking behavior respectively as outcome variables performing a cross-sectional study based on BDHS 2011 data.

Chapter 5 further builds on chapters 3 and 4. Seen from both conflict and consensus perspectives of broad organization, this chapter suggests propositions on the

transformation and convergence of broad models. Chapter 5 concludes of this research with theoretical framework on the transformation and convergence of broad models. Actually, chapter 5 offers a summary and discussion of the researcher's findings, strengths and limitations as measuring study quality.

Chapter 6 represents the concluding chapter highlighting the policy implications conclusion, and recommendations for future research.

Chapter 2
Data Sources and Methodology

2.1 Introduction

This chapter provides information concerning data sources, study design and sampling procedure, sample size determination, variables selection and data analysis activities to answer the research questions of this study.

2.2 Data sources

The present study was based on the data from the Bangladesh Demographic Health Survey-2011 (BDHS, 2011), which was a nationally representative survey. The 2011 BDHS was conducted under the authority of the National Institute of Population Research and Training (NIPORT) of the Ministry of Health and Family Welfare (Mitra and Associates 2013). Data collection was implemented in five phases, starting on July 8, 2011 and ending on December 27, 2011. The survey was undertaken in the seven administrative regions (divisions) of Bangladesh. The divisions are Barisal, Chittagong, Dhaka, Khulna, Rajshahi, Rangpur and Sylhet which covered both rural and urban areas in this survey. The BDHS uses extensive interviewer training, standardized measurement tools and techniques, an identical core questionnaire, and

instrument pretesting to ensure standardization and comparability across diverse sites and times.

Diverse data were collected by BDHS to provide the latest information on childhood mortality, fertility preferences, use of family planning methods and maternal, child, and newborn health. Included are breastfeeding practices; nutrition levels, including the presence of anemia and iodine deficiency, knowledge and attitudes toward HIV/AIDS and other sexually transmitted infections, and community-level data on accessibility and availability of health and family planning services**.** . All ever-married women aged 12-49 years who were usual members of the selected households and those who spent the night before the survey in the selected households were eligible to be interviewed in the survey.

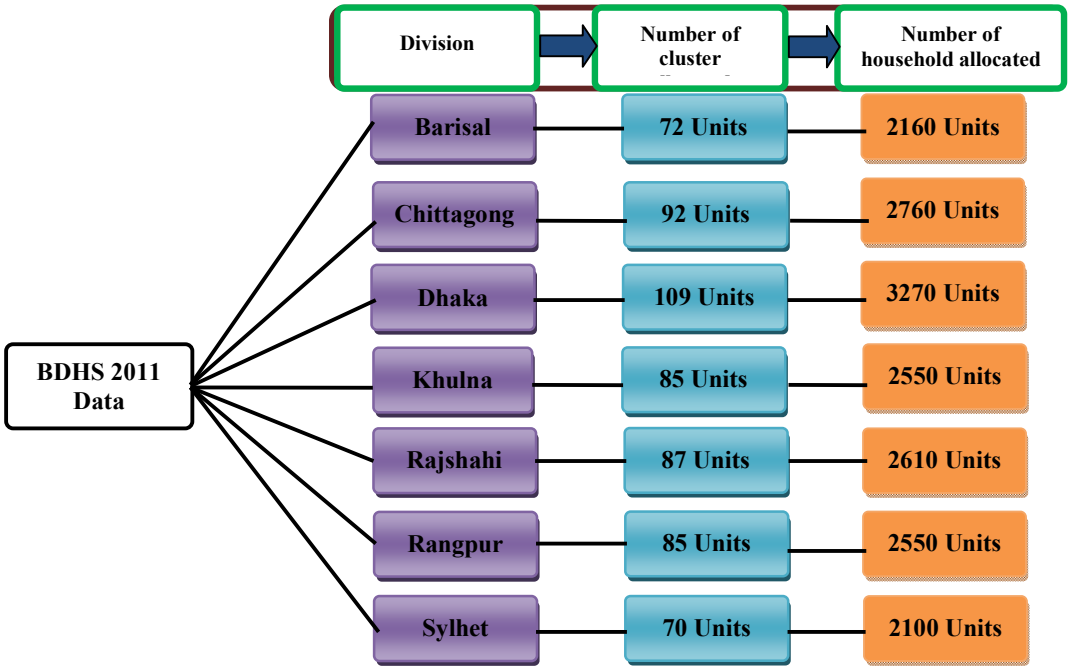


Figure 2.1: **Hierarchical data structure of the BDHS 2011**

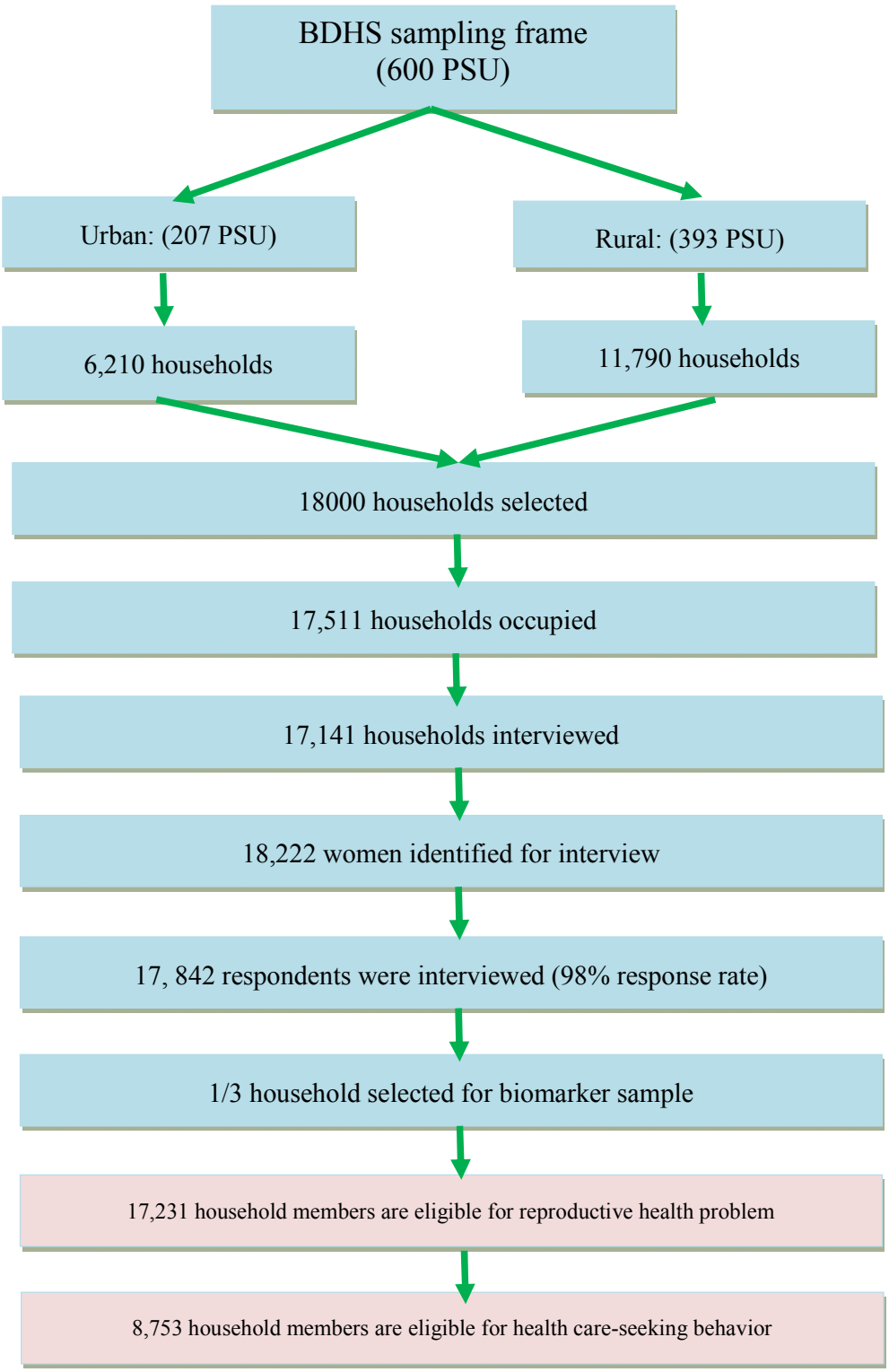
2.3 Study design and sampling procedure

The 2011 BDHS is a cross sectional study. The study survey is based on a two-stage stratified sample of households. In the first stage, 600 enumeration areas (EAs) were selected with probability proportional to the EA size, with 207 clusters in urban areas and 393 in rural areas. A complete household listing operation was then carried out in all the selected EAs to provide a sampling frame for the second-stage selection of households (Mitra and Associates 2013).In the second stage, a systematic sample of 30 households on average was selected per EA for the country as a whole, for urban and rural areas separately, and for each of the seven divisions. With this design, the survey selected 18,000 residential households (6,210 in urban areas and 11,790 in rural areas), which were expected to result in completed interviews with about 18,000 ever-married women.

A total of 18,222 ever married women aged 12-49 were identified in these households, and 17,141 were interviewed, yielding a response rate of 98%.Theanemia module was a relatively new addition to 2011 BDHS and was administered to one-third of the eligible households. Anemia measurements were obtained from ever-married women aged 15–49 years, of which 95% of the measurements were completed.

The high response rate for the BDHS was attributed to the rigorous training of field staff and close supervision of the fieldwork. Moreover, numerous efforts were made during fieldwork to ensure high response rates: interviewers were trained to maintain motivation with longer questionnaires, probe for responses, clarify ambiguous questions, perform multiple revisits to the household, and to control the order of the

questions. Field work was monitored through visits by representatives from U.S. Agency for International Development (USAID), MEASURE DHS, and NIPORT using additional quality control teams. In addition, to achieve the target number of sample units, non-response rates for sample units were estimated from past surveys at the time of the sample design and were then used to determine the required number of units to be selected (Mitra and Associates 2013).A brief sampling framework (Framework 2.2) is presented below:



Framework 2.2: Sampling structure of BDHS 2011 data

2.4 Sample size determination

Based on our research questions, we divided our study into two sections; 1) reproductive health problems among the adolescents in Bangladesh; and 2) health care-seeking behavior among the adolescents mothers in Bangladesh. In the first section 17,231 ever married women 13 to 49 years of age were studied. In the second section 8,753 eligible ever married women aged 13 to 49 years having at least one child ever born in the last five years were studied. For comparison purposes we considered women of reproductive ages including women aged 20-49 years.

2.5 Measuring variables

2.5.1 Dependent variable

The following variables were used as outcomes variable of interest for reproductive health problems: i) infecundity, ii) anemia; iii) chronic undernutrition; iv) sexually transmitted infections (STIs); v) pregnancy complications; and vi) reproductive health problem index (RHPI). The variables which were used for health care seeking behaviors are: 1) any contraceptive methods use; 2) use of modern contraceptives; 3) any ANC; 4) sufficient ANC; 5) assisted delivery by medically trained provider; 6) Institutional delivery; and 7) post natal care. The concepts of terminology for each of the outcome variables are presented in Table 2.1.

Table 2.1: Concepts of terminology

Indicators	Definition
RH problem	
Infecundity	Self-reported physiological inability of individuals or couples to have children.
Anemia	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 (Mitra and Associates 2013). For non-pregnant women, any anemia was defined as Hb<12 g/dl, and for pregnant women as <11 g/dl. Mild anemia was defined as 10–11·9 g/dl for non-pregnant women and 10–10·9g/dl for pregnant women. Moderate/severe anemia was defined as Hb<10 g/dl. Both non-pregnant and pregnant women were included in the analysis. A binary variable was created to define any anemia (composite variable 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.

Table 2.1 continued…

Indicators	Definition
RH problem	
Chronic undernutrition	The 2011 BDHS measured the height and weight of all women aged 15–49 years who were ever married. Trained investigators weighed each woman by using a solar-powered scale with an accuracy of ±100 g, and height was measured by using an adjustable board calibrated in millimeters and theoretically accurate to 1mm. BMI, calculated as weight in kilograms divided by the square of height in meters, was used to assess chronic undernutrition. We chose BMI to assess undernutrition of mothers because it does not require a reference table from a well-nourished population. BMI <18·5kg/m2 was used to define chronic undernutrition as recommended by the WHO for populations from the Indian subcontinent(WHO 1995). BMI≥25·0kg/m2 usually indicates overweight and BMI≥30·0kg/m2 indicates obesity.

Table 2.1 continued…

Indicators	Definition
RH problem	
STIs	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.
Pregnancy complications	The 2011 BDHS asked women who had a live birth in the five years preceding the survey, whether they experienced any types of pregnancy complications around the time of their most recent live birth. Binary variable was created to define experience *any complications* (1; experienced any complications; 0; no complications).
Reproductive health problems index (RHPI)	A composite index was constructed based on the presence of any of these conditions, namely infecundity, anemia, chronic undernutrition, STIs or pregnancy complications.
Health care-seeking behavior	
Any contraceptive method	Either using modern methods or traditional methods like withdrawal, periodic abstinence or folkloric methods to delay or avoid pregnancy.

Table 2.1 continued…

Indicators	Definition
Health care-seeking behavior	
Modern contraceptive method	Modern contraceptive method refers to using pill, IUD, male condom, female sterilization, male sterilization, injection, implants.
Any ANC	At least one ANC received from a skilled health provider (SHP; qualified doctor, nurse, midwife, paramedic, family welfare visitor).
Sufficient ANC	Four or more ANC visits by SHP.
Institutional delivery	Delivery care received from govt. hospital, private hospital, private clinic, and upazilla health complex.
Delivery care	Assisted delivery by skilled birth attendants (SBAs: qualified doctor, nurse, midwife, paramedic, family welfare visitor, community skilled birth attendants).
Postnatal checkup	Post natal care by SHP within 42 days after delivery.

2.5.2 Explanatory variable

Women's current age was the explanatory variable of interest. Adolescents are the main focus study group in our study, however in order to compare this group with other age group of women, we further divided the age group into intergenerational age group, namely adolescents, young adults, and adults. The concept of terminology of adolescents, young adults, and adults considered in this study are presented in Table 2.2.

Table 2.2: Concept of terminology of adolescents, young adults, and adults in this study

Variable	Definition	Source of definition
Adolescence	Followed the definition of World health Organization (WHO) as the period in human growth and development that occurs after childhood and before adulthood, from ages 10 to19.	(WHO 2016)
	Followed the definition provided by the following studies:	
Young adult	1. Young adults between20 and 34 years old.	(Gravena et al. 2013)
	2. Office for national statistics in UK used the term young adult as those aged 20-34 years.	(UK 2016)
	3. Young adults categorized between 20 to 34 years.	(Ree et al. 2008)
Adult	Followed the definition: 35 Years and over.	(Gravena et al. 2013)

2.5.3 Covariates

We included several individuals, households, and community level variables theoretically and empirically linked to reproductive health problems and health seeking behavior among the adolescents. The women's educational level was defined in terms of the formal education system of Bangladesh: no education (0 year), 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 RH 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 (Coates et al. 2007). 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 principle 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 (Mitra and Associates 2013). 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 was 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.

2.6 Statistical analysis

2.6.1 Descriptive 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 of those variables among the three groups of ever married women. We also calculated the prevalence of reproductive health problems and health seeking behavior of women according to three intergenerational age groups of women.

2.6.2 Multilevel analysis

The key questions in this study deal with the differentials and determinants of reproductive health problem and care-seeking behavior among adolescents by considering a wide range of confounders. A multilevel Poisson regression and logistic regression models technique was used for this goal. In the case of few numbers of events, multilevel Poisson regression can provide more valid estimates than logistic regression. Just as in standard regression analysis, the purpose of multilevel modeling is to model the relationship between a response variable and a set of independent

variables. The only difference from regression modeling is that multilevel modeling involves units of observation at different levels of sample selection. Multilevel modeling is useful when data are drawn in a complex survey design involving multistage sampling. The major advantage of multilevel analysis is that it minimizes the effect of dependency between observations within sampling clusters.

To address my research objectives, we used 2011 BDHS data. The participants were selected is based on multistage stratified cluster sampling. This multistage 2011 BDHS data is of hierarchical structure. The hierarchy for our study follows individuals as ever-married women aged (10−49) who are nested within units at higher level (clusters: level-*2*) and the clusters area again nested within units at the next higher level (divisions: level-*3*) (Figure 2.2). Clusters are primary sampling units (PSU) defined by the National Census of 2011, and correspond approximately to village in rural areas. All clusters are approximately of equal size in terms of area. On the other hand, divisions are as administrative areas each of which consists of a number of sub-administrative areas called district. In such cases multilevel analysis produces more valid results when lower levels are nested within higher levels.

In the presence of multiple hierarchies, we therefore 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. In case of rare events, we estimated three level Poisson regression models for our seven outcome variables namely, any contraceptive method, modern contraceptive method, at least one antenatal care visit by skilled health professionals (SHP), at least four or more antenatal care visit by

SHP, place of delivery, delivery by SHP, and mothers' postnatal checkup by SHP) in relation with three age group of women. Odds ratios (OR) were calculated for multilevel logistic regression analysis and risk ratios (RRs) were estimated for our multilevel Poisson regression analysis. Analyses were performed using Stata version 13.1 (Stata Corp., College Station, TX, USA) to allow for adjustments for the cluster sampling design, sampling weights, and the calculation of standard errors.

2.7 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.

Chapter 3

Reproductive Health Problems among Adolescents in Bangladesh

3.1 Introduction

In this section background characteristics of the respondents by age and the reproductive health problems among adolescents as compared to young adult or adult women in Bangladesh are investigated.

3.2 Descriptive statistics

3.2.1 Characteristics of the respondents by age group

Table 3.1 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.

Table 3.1 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 3.1 continued…

Table 3.1 Characteristics of study participants (n=17,231) according to adolescents, young adults, and adults: Bangladesh Demography and Health Survey 2011

	Age group of women n (%)			
Variables	**Adolescents**	**Young adults**	**Adults**	***P*-value**
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

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. On the other hand, 10.2% adolescents were married after 15 years of age and around 60.0% young adult women were married after 15 years of age. Regarding level of

education 3.3% ever married adolescents didn't have any education while more than three fifths adult women had no education (60.3%). The proportions of primary and higher level of education among the adolescents are much lower than their counterparts.

Table 3.1 exhibits that the highest study participants' (15,286 women) religious affiliation is Islam. The proportion of Muslims among the 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 when their interviews were taken. Among them, approximately 53% of adolescents, 39.4% of young adults and approximately 8.0% of adults didn't have any children. It is clear that 15,511 study participants had at least one births. Among them, 13.0% of adolescents had given 1-2 birth whereas the corresponding figure for young adults is 70.3%. Less than one percent (0.2%) adolescents; approximately 40.0% of young adults and around 60.0% of adults had 2 or more births.

Table 3.1 also shows that among the study participants, 7,264 women didn't use any types of contraceptive methods during the survey and 9,967 women were in practice of contraceptive methods. Among the users, 11.1 % adolescents, 65.2% young adults and 16.7% adults were using pill as their contraceptive methods. On the other hand, 7.3% adolescents, 51.9% young adults and 40.8% adults were using different contraceptive methods like IUD, injections, condom, female sterilization, male sterilization, periodic abstinence, withdrawal, implants/norplant. Table 3.1 demonstrates that 10.2% adolescent women were from least bands of wealth whereas the corresponding figure for young adults and adults are 56.3% and 33.4%.

Approximately 8.0% adolescent women were from richest families and 55.4% young adults were from richest bands of wealth. It is evident that 12.1% adolescent women didn't face any kind of food crisis whereas their 55.0% immediate successor (young adults) didn't face this crisis in last 12 months before this survey. Approximately 9.0% and 50.0% adolescents and young adults and approximately 42.0% adults faced food crisis occasionally in the last 12 months preceding the survey respectively. In addition, 6.0% of adolescents, approximately 50.0% and 45.0% young adults and adults faced food crisis frequently in the last 12 months.

Among the total study participants, 5,976 women were from urban areas and the remaining numbers (11,255) were from rural areas. The study reveals that approximately 10.0% adolescents, 55.0% of young adults and 36.0% of adults were from urban areas. The rural participants were almost double than their urban counterpart. It is evident that approximately 12.0% of adolescents, 53.5% young adults and approximately 35.0% of adults were from rural areas. Table 3.1 shows that the highest percentages of adolescents were from Rangpur division (12.9%), followed by Barisal (11.7%), Khulna (11.4%), Dhaka (11.1%), Rajshahi (11.0%), Chittagong (10.6%), and Sylhet (8.2%) divisions respectively.

3.2.2 Reproductive health problems of adolescents compared to young adults and adults

To identify the intergenerational differentials of reproductive health problems of the study participants, bivariate analysis was done considering infecundity, anemia, chronic undernutrition, STIs, pregnancy complications and reproductive health

problems index (RHPI) as outcome variables of the present study. Table 3.2 shows the intergenerational differential of reproductive health problems.

Table 3.2 Reproductive health problems among adolescents, young adults, and adults: Bangladesh Demography and Health Survey 2011(n=17,231)

	Age group of women (years.) n (%)			
Variables	**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)	p=0.86
Anemic	279 (11.0)	1198 (51.6)	896 (37.4)	
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)	p=0.05
Yes	46 (7.6)	293 (57.3)	186 (35.1)	
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 complications

A total of 2,530 ever married women were infecund at the time of the survey. Among the infecund women, 2.3% comprises adolescents, 29.4% comprises young adult and the remaining 68.3% comprises adult women. Furthermore, 13.3% adolescents found as fecund whereas 59.8% young adult and 26.9% adult found as fecund women. So, the women with fecund condition are much higher than women with infecund condition.

Table 3.2 exhibits that 13,265 women were in normal and overweight condition. Among them, 9.8% adolescents, 54.5% young adults and 35.7% adults were not suffering from chronic undernutrition. Conversely, 15.6% adolescents, 51.2% young adults and 33.2% adults were undernourished. Regarding STIs symptoms, 7.6% of adolescents reported to have STIs symptoms while 57.3% young adults and 35.1% adults reported that they had STIs symptoms.

This study reported that 10.3% 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. In addition, 15.2% of adolescents noticed that they faced pregnancy related complications while 78.1% young adults and 6.7% adults faced this adverse situation. 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.

3.3 Association between reproductive health problems among the adolescents

Multilevel logistic regression analyses

The study performed likelihood test to choose preferable models. The tests compared fixed effect models against random effect models and observed statistically significant results ($p<0.05$). The observation implies that the fixed effect models are necessary for clustering data to deal with a large sample size and then this study considered multilevel logistic regression analysis for specific health troubles such as infecundity, anemia, chronic undernutrition, symptoms of STIs, pregnancy complications and reproductive health problems index (RHPI). The results of multilevel logistic regression models for study participants' current age in connection with reproductive health problems are shown in Table 3.3.

Table 3.3 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.

Infecundity among the participants

After adjusting the potential covariates, a statistically significant association observed between participants' age and infecundity for adjusted models, and the same situation observed for unadjusted models. 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.

Anemia

In the unadjusted model adolescent's women (UOR: 1.09; 95% CI: 0.78, 1.52) were more likely to suffer from anemia as compared with the young adult women. In the unadjusted model, adult women were 1.14 times (95% CI: 0.92-1.41) more likely to suffer from anemia. 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.

Chronic undernutrition

In the unadjusted model, the study found that adolescent's women were 2.14 times (95% CI: 1.72, 2.68) more likely to suffer from chronic undernutrition as compared with the young adult women. After adjusting the potential covariates, adolescents

women had 2.24 times (95% CI: 1.75, 2.86) higher chance of suffering from chronic undernutrition.

Symptoms of STIs

Table 3.3 shows the outcomes of the multilevel logistic regression analyses for whether women faced genital problems in last 12 months in the year preceding the survey. 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.

Pregnancy complications

In the unadjusted individual level variables, pregnancy complications and married adolescent women, included in the first model depict lower risk (UOR: 0.97; 95% CI: 0.79, 1.19) of having pregnancy complications and the same condition observed for adult women with statistically highly significant association (UOR: 0.03; 95% CI: 0.02, 0.04). A series of necessary variables included as confounding adjustment in the later model plays a crucial role to predict the pregnancy complications of participants' age groups. In the prediction of pregnancy complications, there were significant contributions from participants' age between 10 and 19 years, participants' age of 35 years or more (Table 3.3). It is apparent that youngest married women (10-19 years) were 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). It should be noted that the adolescent women were in higher risky position for flattering pregnancy complications than the young adult women.

Reproductive health problems index (RHPI)

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 the 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.

Chapter 4

Health Care-Seeking Behavior among Adolescents in Bangladesh

4.1 Introduction

In this section the health care-seeking behavior among adolescents as compared to young adults and adults are highlighted.

4.2 Sample characteristics

Table 4.1 shows some key indicators of the study participants, maternal age at birth. On average, participant's age was 25.57 years, age at first marriage was 15.84 years, age at first birth was 23.73 years; and mean education was 5.48 years. The median values for the same characteristics are 25, 15, 22 and 5 respectively. The inter quartile ranges for the median values are (21, 29), (14, 17), (19, 27) and (2, 9) respectively. The mean values of the study participants' sample characteristics are more or less equal to median values.

Table 4.1 Study population characteristics

Characteristics	Mean (SE)	Median (Inter quartile range)
Age, years	25.58 (0.09)	25 (21, 29)
Age at first marriage, years	15.84 (0.05)	15 (14, 17)
Age at birth, years	23.73 (0.09)	22 (19, 27)
Education, years	5.48 (0.09)	5 (2, 9)

Maternal age at first childbirth, years

Prevalence of maternal age at first childbirth is presented in figure 4.1.

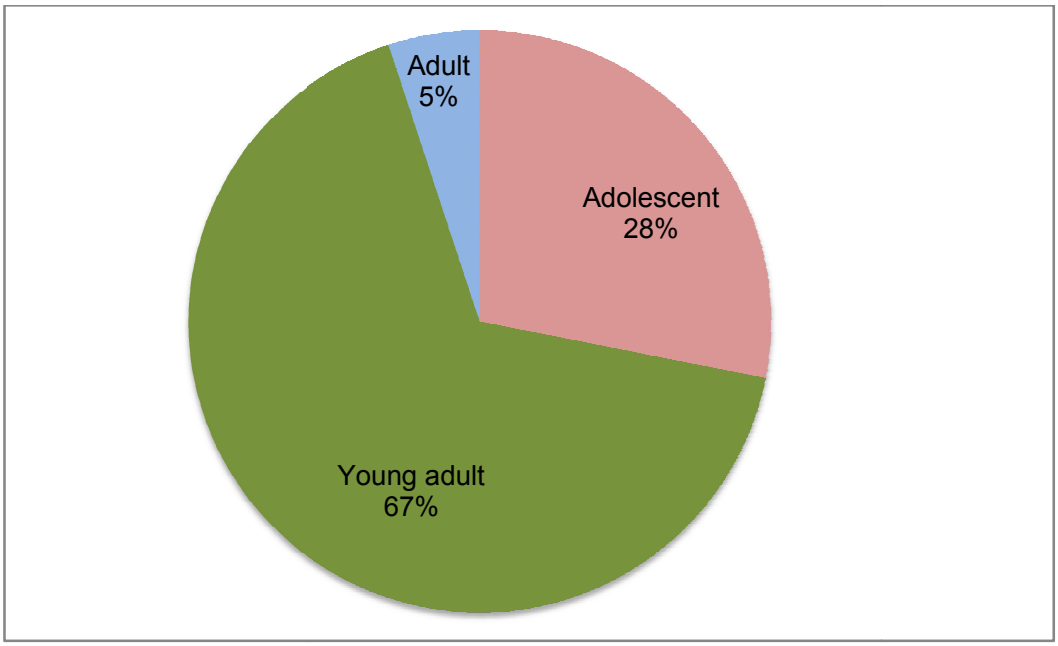


Figure 4.1: Prevalence (%) of maternal age at first childbirth in years

The highest 67% women had given their first birth during 20-34 years of age, 28% women had given their first birth in between 12-19 years of age and followed by adult women aged 35 years and over.

Prevalence of antenatal visit

Figure 4.2 represents the prevalence of antenatal visit by women. Around thirty five (35.44%) percent women didn't have any antenatal visit by SHP, the highest 25.4% had 2-3 times antenatal visit and the lowest 15.3% had at least one time antenatal visit by SHP. Figure 2 also shows that around twenty four (23.9%) percent had four or more times antenatal visit by SHP.

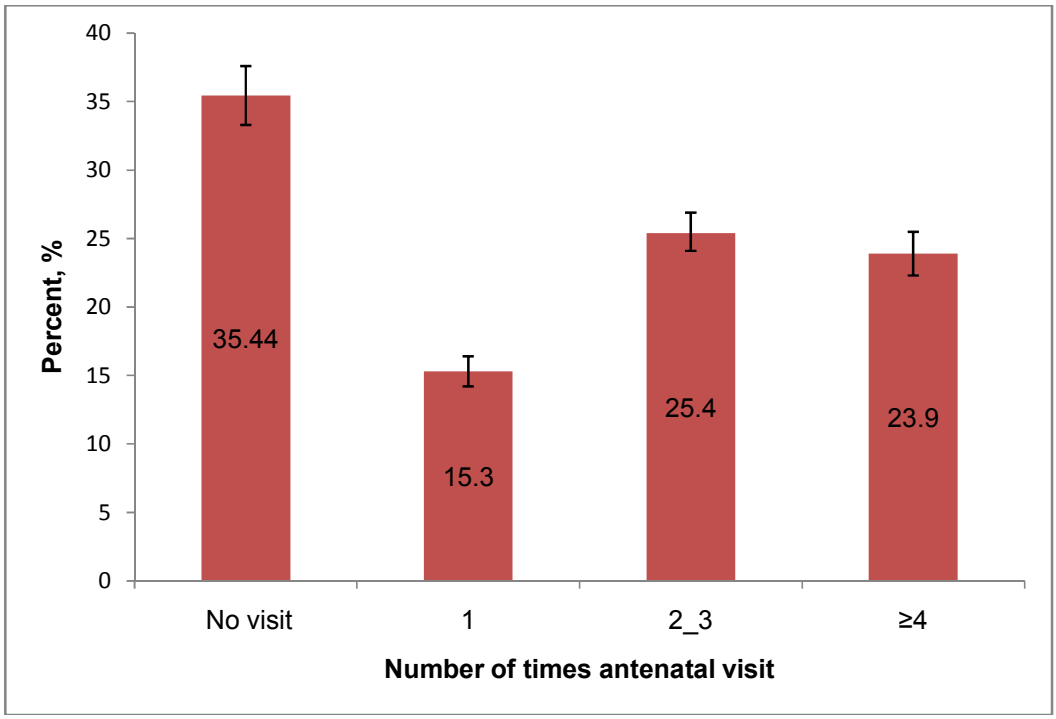


Figure 4.2: Prevalence of antenatal visit by women

Prevalence of skilled birth attendance

Figure 4.3 exhibits the prevalence of skilled birth attendance by maternal age at birth. Around eight (7.8%) percent adolescents who had at least one birth had been visited by skilled birth attendance during their last delivery whereas 18.8% for young adults and about only one (1.08%) percent for adult study participants.

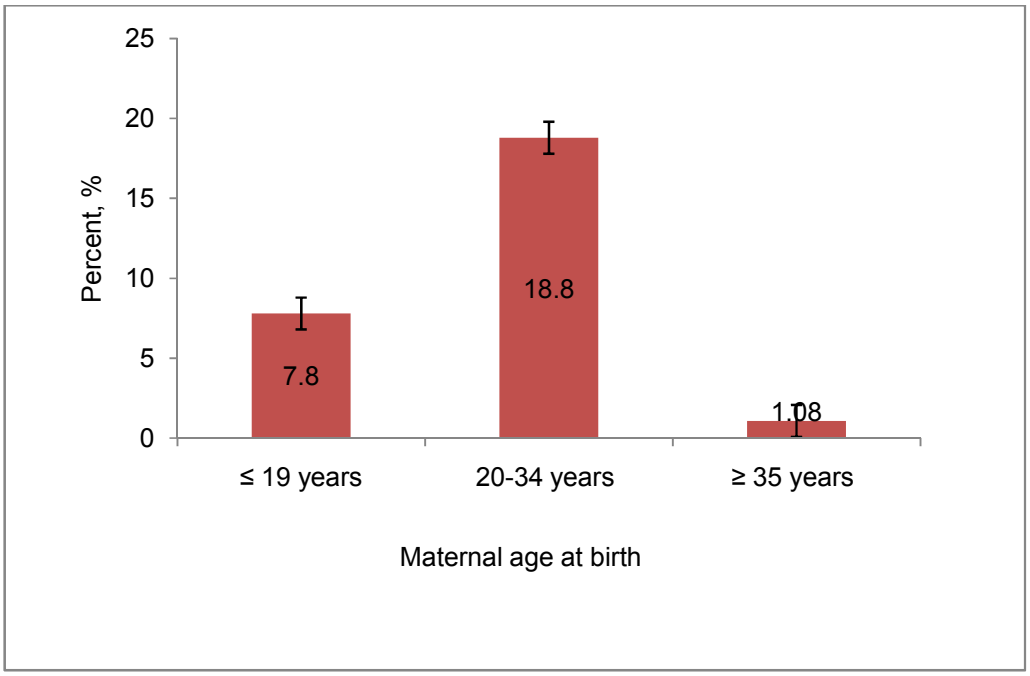


Figure 4.3: Prevalence of skilled birth attendance by maternal age at birth

4.3 Descriptive statistics

4.3.1 Heath care-seeking behavior of participants among adolescents, young adults and adults

To identify intergenerational health care-seeking behavior of the study participants, bivariate analysis was done considering any contraceptive method, modern contraceptive method, at least one antenatal care visit by SHP, at least four or more antenatal care visit by SHP, institutional delivery, delivery by SHP, and mothers' postnatal checkup by SHP as outcome variables. Table 4.2 shows health care-seeking behavior by intergenerational age group of mothers.

Table 4.2 Differentials in the utilization of maternal healthcare services among adolescents, young adults, and adults (n=8,753): Bangladesh Demography and Health Survey 2011

Variables	Age group (yrs), n (%)			P-value
	≤ 19	20-34	≥ 35	
Study participants	2409 (27.5)	5885 (67.2)	459 (5.2)	
Any contraceptive[1]				
No	862 (29.1)	2079 (66.7)	135 (4.2)	0.06
Yes	1513 (28.0)	3643 (66.6)	309 (5.5)	
Modern contraceptive[2]				
No	74 (18.1)	301 (65.3)	76 (16.6)	<0.001
Yes	1439 (28.9)	3342 (66.7)	233 (4.4)	
ANC ≥1 visit by SHP[3]				
No	831 (24.8)	2279 (68.1)	255 (7.1)	<0.001
Yes	1029 (26.8)	2758 (68.8)	173 (4.4)	
ANC ≥4 visit by SHP				
No	886 (27.7)	2211 (67.7)	155 (4.6)	0.43
Yes	414 (26.6)	1,157 (69.6)	57 (3.8)	
Place of delivery				
Home	1785 (2.2)	4230 (66.4)	356 (5.4)	0.14
Institution[4]	624 (27.8)	1655 (68.1)	103 (4.1)	
Delivery by SHP				
No	1696 (28.1)	4033 (66.4)	349 (5.5)	0.04
Yes	713 (28.2)	1852 (67.9)	110 (3.9)	
Mothers' postnatal checkup by SHP[5]				
No	1383 (25.8)	3638 (68.2)	333 (6.0)	0.23
Yes	477 (26.0)	1399 (69.3)	95 (4.7)	

Note:

[1] **Any contraceptive method**; Pill, IUD, injections, condom, female sterilization, male sterilization, periodic abstinence, withdrawal, other, implants/norplant

[2] **Modern contraceptive method**; Pill, IUD, male condom, female sterilization, male sterilization, injectable, implants

[3] **SHP**: Skilled health professionals include doctors, nurses and trained mid-wives,, family welfare visitors

[4] **Institutional delivery**; Delivery care received from govt. hospital, private hospital, private clinic, upazilla health complex, etc.

[5] **Mothers' postnatal checkup**; SHP provided care to women within 42 days after delivery

Among the participants who reported use of any types of contraceptives, the highest prevalence was noted among the young adult group (66.6%) followed by the adolescents (28.0%). On the other hand, lower prevalence of contraceptive use was noted among the adults (5.5%). The utilization of modern contraceptive methods for adolescent women is 28.9% whereas for young adult it is 66.7% which is comparatively more than double of the adolescents. Lowest prevalence of using modern methods of contraception was reported among the adults (4.4%). The proportion of receiving at least one antenatal care visit for adolescents provided by SHP is much lower (26.8%) than young adults (68.8%) but higher than adult (4.4%).

The proportion of receiving at least four or more antenatal care visit for adolescent provided by SHP is much lower (26.6%) than young adults (69.6%) but higher than adults (3.8%). Approximately 28.0% adolescents had institutional delivery as compared with 68.1% young adult and the corresponding figure for adults is 4.1%. The proportion of assisted delivery by SHP among the adolescents (28.2%)is much lower than the young adults (67.9%) but higher than the adult (3.9%). Table 4.2 also exhibits that mothers' postnatal checkup by SHP for adolescent is also much lower (26.0%) than young adult (69.3%) and however higher than adult (4.7%).

4.4 Health care-seeking behavior among the adolescents

Multilevel Poisson regression models

The unadjusted relative risk (URR), adjusted relative risk (ARR) and 95% confidence intervals (CI) for health care-seeking behavior among the adolescents, young adults, and adults were calculated. The study performed likelihood test to choose preferable models. The tests compared fixed effect models against random effect models and observed statistically significant results ($p<0.05$). The observation implies that the random effect models are necessary to deal with clustering data. Due to the limited sample size, this study considered multilevel Poisson regression analysis for specific health outcomes including using any contraceptive method, modern contraceptive method, at least one antenatal care visit by skilled health professionals (SHP), at least four or more antenatal care visit by skilled health professionals (SHP), institutional delivery, delivery by SHP, and mothers' postnatal checkup by SHP. The results of multi-level Poisson regression models for three different age groups of women in connection with health care-seeking behavior are shown in Table 4.3.

Table 4.3 Relative risk (RR) of health care-seeking behavior among adolescents, young adults, and adults (n=8,753): Bangladesh Demography and Health Survey 2011*

Variables	Age group of women ≤19 years		Age group of women ≥35 years	
	RR (95% CI)	p-value	RR (95% CI)	p-value
Any contraceptive				
Unadjusted RR	1.00 (0.96-1.04)	0.53	1.09 (1.02-1.17)	0.02
Adjusted RR	1.04 (0.99-1.09)	0.94	0.96 (0.88-1.06)	0.12
Modern contraceptive				
Unadjusted RR	1.04 (1.02-1.05)	0.01	0.82 (0.77-0.88)	<0.001
Adjusted RR	1.01 (0.99-1.03)	0.88	0.89 (0.82-0.97)	<0.001
ANC ≥1 visit by SHP				
Unadjusted RR	1.02 (0.97-1.07)	0.28	0.76 (0.68-0.86)	<0.001
Adjusted RR	0.87 (0.82-0.93)	0.01	1.07 (0.93-1.23)	0.06
ANC ≥4 visit by SHP				
Unadjusted RR	0.96 (0.88-1.05)	0.37	0.80 (0.64-1.00)	0.32
Adjusted RR	0.91 (0.80-1.03)	0.14	1.00 (0.79-1.26)	0.24
Institutional delivery				
Unadjusted RR	0.96 (0.88-1.04)	0.56	0.88 (0.73-1.05)	0.06
Adjusted RR	0.77 (0.69-0.85)	0.01	1.24 (1.00-1.55)	<0.001
Delivery by SHP				
Unadjusted RR	0.98 (0.91-1.06)	0.07	0.82 (0.69-0.98)	0.02
Adjusted RR	0.80 (0.73-0.89)	0.01	1.04 (0.85-1.28)	0.08
Mothers' postnatal checkup by SHP				
Unadjusted RR	0.95 (0.87-1.04)	0.87	0.87 (0.73-1.04)	0.10
Adjusted RR	0.75 (0.67-0.85)	0.01	1.36 (1.07-1.73)	0.01

*Reference category group: aged **20-34** years

n; number of event

Relative risks (RR) are shown in outside the parenthesis and confidence intervals (CI) are shown in to the parenthesis

The proportion (percent) and the result of multilevel Poisson regression analysis (relative risk (95% confidence interval)), are tabulated for each variable according to maternal age at birth.

All multilevel Poisson regression analysis includes current age, age at first marriage, religion, children ever born, exposure to mass media, respondents' education, wealth index, region, place of residence and food insecurity as confounding factors.

Any contraceptive method

Adult women were 1.09 times more likely to use any contraceptive methods (95% confidence interval [CI]: 1.02-1.17) as compared to the young adults. However the significance was lost after adjusting the relevant covariates (Adjusted relative risk [ARR]: 0.96, 95% CI: 0.88-1.06).

Modern contraceptive method

In the unadjusted model adolescents were 1.04 times more likely to use modern contraceptive methods compared to young adults (95% CI: 1.02-1.05). However, after adjusting the potential covariates, the result is ARR: 1.01; 95% CI: 0.99-1.03. In the unadjusted model the adult were 0.82 times less likely to report of using modern contraceptive methods compared to young adults and the association is statistically significant (95% CI: 0.77-0.88). In the adjusted model adult were 0.89 times less likely to report of using modern contraceptive as compared to the young adult (95% CI:0.82-0.97).

At least one antenatal care (ANC) visit by SHP

The utilization of at least one time ANC visit provided by SHP for adolescent mothers were more likely (unadjusted relative risk [URR]: 1.02; 95% CI: 0.97-1.07) than young adults. After the adjustment of confounding factors, the finding also shows that the utilization of at least one time ANC visit provided by SHP for adolescents were less likely than young adults. However, the relation was found to be significant (ARR: 0.87; 95% CI: 0.82-0.93). In the unadjusted model adults were 0.76 times (95% CI: 0.68-0.86) less likely to receive at least one ANC by SHP as compared to the young

adults. In the adjusted model adults were more likely to receive at least one ANC (ARR: 1.07; 95% CI: 0.93-1.23).

At least four or more antenatal care (ANC) visit by SHP

Both in the unadjusted (URR: 0.96; 95% CI: 0.88-1.05) and adjusted models (ARR: 0.91; 95% CI: 0.80-1.03) adolescents are less likely to receive 4 or more ANC visits by SHP as compare to the young adult. However these relationships were not found to be significant. No association was observed between receipts of 4 or more ANC visits for adult age group in the unadjusted (URR: 0.80; 95% CI: 0.64-1.00) and adjusted model (ARR: 1.00; 95% CI: 0.79-1.26).

Institutional delivery

In the unadjusted models adolescents were less likely (URR: 0.96; 95% CI: 0.88-1.04) to go for institutional delivery care and the same scenario was found for the adult (URR: 0.88; 95% CI: 0.73-1.05). However these relationships were not found to be significant. After adjusted the potential covariates, adolescents were less likely to have institutional delivery (ARR: 0.77; 95% CI: 0.69-0.85). In the adjusted model, adult were 1.24 times (95% CI: 0.99-1.55) more likely to have institutional delivery as compared with the young adult.

Assisted delivery by SHP

In the unadjusted model adolescents were 0.98 times (95% CI: 0.91-1.06) less likely to assist delivery from SHP as compared to the young adult. In the adjusted model adolescents were significantly 0.80 times (95% CI: 0.73-0.89) less likely to assist delivery from SHP as compare to the young adult. In the unadjusted model adult

mothers were 0.82 times (95% CI: 0.69-0.98)less likely to assist delivery from SHP as compared to the young adults. However the relationship in the adjusted model is ARR: 1.04; 95% CI: 0.85-1.28.

Mothers' postnatal checkup by SHP

In both the unadjusted models, the association between receiving post natal checkup by SHP and adolescents is URR: 0.95; 95% CI: 0.87-1.04 and adults is URR: 0.87; 95% CI: 0.73-1.04. However, in the adjusted model adolescents were significantly 0.75 times (95% CI: 0.67-0.85) less likely to receive post natal check by SHP as compared to the young adult. In addition, adults were significantly 1.36 times (95% CI: 1.07-1.73) more likely to receive postnatal checkup by SHP as compared to their young adult counterparts.

Chapter 5

Discussion of the Study

5.1 Overview

Chapter five summarizes the major findings of the whole thesis, general discussions, and methodological considerations.

5.2 Summary findings of the study and general discussion

5.2.1 Reproductive health problems

In this study it is observed that 11.8% of adolescent (10-19 years age group) women were married under 16 years of age whereas the corresponding proportion for young adult women (age group 20-34 years) accounted for 49.2%. On the other hand 10.2% of adolescents were married after 15 years of age and around sixty percent (59.6%) of young adult women were married after 15 years of age. This finding is similar to a recent report of UNICEF. According to which approximately a third of adolescent's women were married by the age of 15 in Bangladesh. Although the legal age at first marriage for females in Bangladesh is 18 years, after that world's highest rates of early marriage occurs in Bangladesh (UNICEF 2001).

In Bangladesh there are many social pressures to marry of pubescent girls(Aziz and Maloney 1985). If the marriage of a pubescent girl is delayed, her parents and sometimes the girl herself are made to feel guilty. Poverty is one of the major factors under pining early marriages among the adolescents. Where poverty is acute, a young girl may be regarded as an economic burden and parents look for early marriage of their daughters as an alternative way of reducing the burden (Chowdhury, Hoq et al. 2013). Progress made by Bangladesh regarding this issue, especially those factors that are related to early marriage and early conception has been extremely poor. However, no systematic effort to slump down rate has been strongly undertaken by civil society organizations (CSOs) and public or private organizations as well.

Adolescents are at high risk of iron deficiency and anemia. This is due to rapid pubertal growth with 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 (Ramakrishnan 2000, WHO 2011). 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(Beard 2001). The bivariate analysis shows that one in ten adolescents were suffering from anemia. The similar level of figure has been observed in other developing countries such as in Ethiopia (13.4%; (Agency 2011)), India (13.1%; (Goel and Gupta 2007)), and Eastern Sudan (12.1%; (Abdelrahim et al. 2009)).

Poor nutrition status among adolescents is also an important determinant of poor health outcomes. Undernutrition has far reaching consequences, especially in girls. If their nutritional needs are not met, they have high risk of mortality as a result of pregnancy and childbirth and they are more likely to give birth to low birth weight infants (Hadley et al. 2008, Belachew et al. 2011). Furthermore, in all adolescents, short stature resulting from chronic undernutrition is associated with reduced lean body mass and deficiencies in muscular strength and working capacity (Fleming et al. 1985). Thus, one approach to break the intergenerational cycle of malnutrition and poor health is to improve the nutrition of adolescents; otherwise, the vicious cycle will continue. The study discovered that 15.6% adolescents were chronic undernourished. The multivariate analysis also shows that adolescents were more likely to be chronic undernourished as compared to the young adult women. In Bangladesh, although adolescents' undernutrition is highly prevalent in general, data on adolescents are scarce. A national level survey on adolescent girls reported that 14% of adolescent girls were chronic undernourished (Welfare 2010). The prevalence of chronic undernutrition among the adolescent's girls in our study is higher than those of some other developing countries such as in Ethiopia (6.2%; (Gebreyohannes et al. 2014)) and Chad (8.7 %; (Beasley et al. 2002)).

In our study 7.6% adolescents reported to have STIs. In patriarchal country like Bangladesh women are subordinate to men in all aspects of life. Evidence shows that victims of adolescent girls in their marital life are less likely to refuse sex (Silverman et al. 2007); therefore, they may be less likely to negotiate the use of a condom for fear of retribution, which places them at risk of STIs. Also, psychological distress and stress-induced immune suppression are high during the period of adolescents, which

may cause an increase of somatic symptoms including the risk of abnormal genital discharge (Patel et al. 2006).

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. Our study found that 15.2% adolescents reported to have more pregnancy complications as compared to 6.7% adult women. The multivariate analysis also indicates that adolescents were more likely to suffer from pregnancy complications as compared to the young adult. Satin and associates reviewed 16,512 births to girls aged 11–15, 16–19, and 20 and older (Satin et al. 1994). In his study, significant differences in pregnancy complications and outcomes were found among adolescents younger than 15 years. There was an increased risk of preterm delivery in teenage mothers younger than age 15. The percent of LBW infants (less than 2500 g) was also found to be significantly increased when compared with older adolescents and women older than age 20: 14% *versus* 10% *versus* 9%, respectively. 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. Findings show that compared to mothers aged 25 to 29 having their first child, teenage mothers appear to have more labor and delivery outcomes (Lopoo 2011). This study also found that the proportion of infecundity among the adolescents is 2.3% as compared to 29.4% young adults and 68.3% adult women.

5.2.2 Health care seeking behavior

Concerns about the adverse consequences of early child bearing, and the risks of contracting sexually transmitted diseases have led to renewed interest in the contraceptive and sexual behavior of adolescents. The fact that adolescents have an enormous impact on future population growth make an understanding of the extent to which young women are aware of and use contraceptives significant policy issue (Yidana et al. 2015). Our study showed that contraceptive use rate among the adolescents (38.0%) is much lower than that for the young adult age group (66.6%). Possible explanations for such lower rate of contraceptive use among the adolescents as compared to young adults are: inadequate knowledge of the role of condoms and hormonal contraceptives on the prevention of both sexually transmitted diseases and lack of education.

Around the world, it is recognized that postnatal care is crucial in maintaining and promoting the health of the woman and the newborn baby, while providing an opportunity for health professionals to identify, monitor and manage health conditions that may develop in the mother and newborn during the postnatal period (Matthews et al. 2010). In addition, postnatal care provides health professionals with the opportunity to promote exclusive breastfeeding, personal hygiene, appropriate feeding practices, and family planning counseling and services. Moreover, postnatal care allows for the provision of postnatal vitamin A and iron supplementation to the mother and immunization of newborns to provide them with optimal start to life. The study highlighted the poor utilization of PNC care among the adolescent mothers, only a little more than one fourth of whom received postpartum care as compared to

69.3% young adult women. Multivariate analysis also indicates that adolescents were less likely to receive post natal care as compared to young adult women. This finding is similar to the findings from studies conducted in Bangladesh and India (Rahman et al. 2011, Singh et al. 2012).

This study also found that adolescents were less likely to have institutional delivery and less likely to assist delivery by skilled health professional. These findings are also consistent with several of the previous findings from studies conducted in developing countries (Rahman 2008, Singh et al. 2012). There may be several factors which are responsible for non-institutional delivery and assisted birth by non-skilled health professional among the adolescents: includes lack of knowledge, literacy problems, cost, transport, previous negative experiences with service providers, and a lack of social and family support. However, bivariate analysis shows that adolescent's women were less likely to receive ANC care compared to the young adult women.

5.3 Methodological considerations

5.3.1 External validity

The findings from the study might be relevant for neighboring low-income countries. The reproductive health problems and health care seeking behavior of the adolescent women exist and are probably relevant in other countries where a large segment of population is adolescents. This study is population-based, and efforts ensured that the samples were representative for 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.

5.3.2 Internal validity and reliability

To ensure validity and reliability of the data collected, the BDHS 2011 state that, fieldworkers underwent careful training in different aspects of interview techniques and data collection. Moreover, existing validated instruments were used with minor modifications to adapt questions to the cultural context. All questionnaires were pre-tested in pilot studies in the study areas.

5.3.3 Selection bias

In order to provide a random sample representative for the population, all women of reproductive age group were invited to participate in study. Refusal rate was low (<1%) in this study, i.e. almost all women located accepted to participate.

5.3.4 Information bias

Under reporting

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.

Reporting of disease-related symptoms

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. Further, this study involved reporting of past behaviors; therefore, recall bias is possible. However, we chose a five-year recall period to minimize this bias.

5.3.5 Confounding bias

In our study, confounders in the statistical analysis were accounted for by multivariate modeling. The confounders adjusted for in the present investigation were those factors that most commonly found to be interrelated with reproductive health problems and health care seeking behavior among the adolescents in the settings studied. However, other factors of importance might include: 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. We will certainly consider these factors in our future studies.

Another limitation of this thesis may be that 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.

In spite of these limitations, our study brings to light important information that could serve as a basis to reduce the risk of reproductive health problems among the adolescents and improve the health care seeking behavior among adolescents in Bangladesh.

Chapter 6

Conclusions and Policy Implications

6.1 Conclusions

Utilizing a large nationally representative survey, this study intends to examine the reproductive health problems and health seeking behavior of the adolescents. This study found that a large proportion of married adolescents were suffering from several of the reproductive health problems such as anemia, chronic undernutrition, and STIs. Regarding pregnancy related complications, the proportion is higher among the adolescent women (15.2%) compared to the adult women (6.7%). Overall 12.4% adolescents were reported to have suffered from any kinds of reproductive health problems. From multilevel logistic regression analyses, significantly, adolescent women were less likely to suffer from infecundity but more likely to be chronic undernourished, and suffering from pregnancy related complications as compared to the young adult women (20-34 years). Adolescent women were also more likely to suffer from any kind of reproductive health related problems as compared to young adult women.

Regarding health care seeking behavior, the proportions of adolescents receiving any contraceptive methods or modern contraceptives, receiving ANC, assisted delivery by SHP, institutional delivery and receiving postnatal care from SHP are much lower than those for the young adult women. From multilevel Poisson regression analyses, we found that adolescents were less likely to have institutional delivery, assisted delivery by SHP and less likely to receive port natal care by SHP as compared to young adult women.

6.2 Policy implications

The 1994 International Conference on Population and Development (ICPD) marked a paradigm shift by recognizing that adolescents have unique needs and vulnerabilities The ICPD highlighted the vulnerabilities of adolescence and called for greater recognition of adolescents as a special category with special needs. It emphasized the need to provide adolescents with sexual and reproductive health information and services and for adoption of integrated and comprehensive approaches to reproductive health. Additionally, the ICPD underscored the need to remove social barriers that hinder adolescent's access to reproductive health services, and to modify policies and programs to meet the demographic realities of the 21st century (Germain 2000). Despite the fact that Bangladesh to a Program of Action aimed at providing adolescents with sexual and reproductive health education, information and services, still we found that a vast majority of adolescents in our study were suffering from several reproductive health problems such as anemia, chronic undernutrtion, STIs, infecundity and pregnancy related complications. A vast majority of the adolescents mothers also did not receive ANC, assisted delivery by SHP, institutional delivery,

and PNC. The contraceptive prevalence rate among the adolescents was also very low.

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 adolescents 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, a research is needed to explore 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.

Special training should be conducted for adolescent girls at community clinics, satellite clinics, family welfare centers, and Upazilla health complexes. An adolescent family life education curriculum needs to be developed. Increased networking between all relevant government organizations and NGOs working with adolescents

should be encouraged to ensure the proper implementation of projects. Female doctors need to be deployed for the provision RH services to adolescent girls. Counseling services for the male and female adolescents need to be arranged. Behavior change communication and IEC materials need to be developed and distributed in collaboration with multi-sectoral agencies.

6.3 Future research directions

Adolescents constitute an important socio-demographic group for the health and population sector agencies of Bangladesh, both because of their sheer numbers and their significance for the present and the future of the country. This study has addressed an important public health topic by focusing on adolescent reproductive health problems and their health care seeking behavior. It has contributed vital information that can help to bridge knowledge gaps about reproductive health issues for adolescents. By focusing on a developing country- Bangladesh, the study has highlighted the challenges adolescents in developing countries face, and is likely to face, in accessing and utilizing reproductive health services as well as their several reproductive health problems. Despite the contributions, the study has identified knowledge gaps that merit further research.

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, structure of health facilities were not available in this present study. Future studies should certainly consider these factors.

Further research would benefit from exploring the reasons why married adolescents do not seek care from qualified professionals, and what characteristics would be ideal in adolescent-friendly facilities. If it is so, then these findings may assist policy-makers' efforts in improving existing health systems by establishing adolescent-friendly healthcare services across the country, ultimately aiming to improve the reproductive health status of female adolescents in Bangladesh.

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