Age at first marriage and other socio-economic factors associated with pregnancy related service utilization: evidence of Bangladesh

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August 2013
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AIDS	Acquired Immune Deficiency Syndrome
ANC	Ante Natal Care
BBC	British Broadcasting Corporation
BDHS	Bangladesh Demographic Health Survey
HIV	Human Immunodeficiency Virus
IRIN	Integrated Regional Information Networks
MR	Menstrual Regulation
MDG	Millennium Development Goal
NIPORT	National Institute of Population Research and Training
NGO	Non Governmental Organization
OR	Odds Ratio
PoD	Place of Delivery
PNC	Post Natal Care
STI	Sexually transmitted infections
TFR	Total Fertility Rate
UNICEF	United Nations Children's Fund
UNFPA	United Nations Population Fund
UN	United Nations
WHO	World Health Organization

Abstract

Background and Objective: Early marriage is a common phenomenon in Bangladesh, legally unacceptable, but socially acceptable. The legal age for marriage is 18 for girls and pregnancy without wedlock is forbidden. Every 6 girls out of 10 are the victim of child marriage, more than one fifth of adolescent girls undergo their first birth before fifteen, nearly two thirds before eighteen and 80% by twenty years of age. Early child birth is widely criticized for the increased chance it brings of maternal mortality, morbidity and infant mortality. Considering this reality the objective of this research is to investigate how and to what extent the utilization of pregnancy related services could be associated with age at first marriage. The research will also explore to what extent these service utilizations vary due to women's socio-demographic reality and status.

Materials and methods: Secondary data from Bangladesh Demographic and Health Survey (BDHS), 2011 has been used; sample size is 17842 ever married women in reproductive age. Data has been analyzed in three consecutive stages, in uni-variate level frequency and percentage distribution, in bi-variate level cross tabulation along with chi-square and finally bi-variate and multivariate logistic regression analysis.

Results: In this research three pregnancy services utilization were examined, ANC, PNC and Place of delivery. The study shows that the age at first marriage has a crucial effect on place of delivery and PNC service utilization; every one year increase of age at first marriage increases the institutional delivery by 5.4% and PNC utilization by 4.1%. But it has no significant effect with ANC service utilization. Current age is positively associated with place of delivery and ANC service utilization but not with PNC. The effect of parity is negatively associated with all service utilization. Education was the most influential variable and greater than secondary level of education increases the odds of ANC service utilization the most (OR 9.011). Secondary and above level of education resulted in the highest effect on each service utilization, when no education is the reference category. The effect of wealth status is also observed as a key determinant after education.

Conclusion: Pregnancy service utilization would be enhanced by addressing the gradual incensement of age at marriage of women. Intense attention is required to improve women's socio-economic and demographic reality and status in Bangladesh.

Key Words: *Bangladesh, Age at first marriage, Child marriage, ANC, PNC*

1. Introduction

1.1 Background

"No girl should be robbed from her childhood, from education, from health, from aspirations" (Michelle, 2011, cited by Mwaura, 2011, p.2). Yet today millions of girls are denied from their rights when they are married as child brides. Child marriage or early marriage for women is one of the most prevalent and severe infringements of human rights (PLAN, 2013).

Current figures of early marriage across the world is 60 million, approximately 31 million are in South Asia (Nour, 2009). According to UNFPA, between 2011 to 2020, 140 million girls are estimated to become child brides (UN Women, 2011).

In Bangladesh, marriage is considered as a robust social institution and childbearing without marriage is socially unacceptable. Hence, age of first-birth is certainly linked with the age at first marriage and the lapse of time between marriage and first-birth is not very great in developing settings, including in Bangladesh (Kirdar et al, 2012).

Early marriage is not a stagnant event in life, it has lifelong consequences; it affects the opportunity of education, endangers health, confounds personal growth and hinders development of girls. Above all, maternal health risks potentially increase due to early marriage, which includes maternal death, morbidity and infant mortality as well. Moreover, young girls who are more likely to be unaware about pregnancy related services and also less vocal about their rights are usually denied from service utilization at the time of pregnancy. Statistics indicate that early marriage is frequent in developing countries; the most prevalent 10 countries for early marriage are Niger (75%), Chad and Central African Republic (68%), Bangladesh (66%), Guinea (63%), Mozambique (56%), Mali (55%), Burkina Faso and South Sudan (52%) and Malawi (50%). These percentages are calculated from the total marriage taken place in a year of those countries. In terms of absolute numbers, India encounters the highest number of child marriage incidents every year due to the size of its population. Bangladesh is ranked the fourth most prevalent country for early marriage and every 6 girls out of 10 are the victim of this (UN Women, 2011; WHO 2013a). Another statistics shows that, in South Asia, 46% of children are married formally or in an informal union before they reached the age of 18 (PLAN, 2013).

Research identifies a close connection between pregnancy related service utilization and age at first marriage. Pregnancy related service utilization has a wide impact on reducing maternal mortality and morbidity as well as in reducing infant death and infection. Empirical evidence reflects that the utilization of pregnancy related services such as antenatal care (ANC), postnatal care (PNC) and institutional delivery is comparatively low in developing settings, which potentially amplify the rate of either maternal death or morbidity and act as a foremost cause of infant death. On the other hand, pregnancy related services utilization is remarkably low for the women who get married earlier than the national average in developing countries. In addition, early pregnancy creates an

extended threat for childbearing due to mental and physical incompetence of women to become a mother at an early stage of their reproductive life. Considering this, it is immensely important to address the holistic scenario of maternal mortality and morbidity of developing countries by linking the threat of early pregnancy with the utilization of pregnancy related services.

Pregnancy service utilization begins from the very initial stage of the journey of pregnancy when the pregnancy is first identified and continues until post natal period. Pregnancy utilization thus splits into three different phases; antenatal period, delivery period and postnatal period; particular service is required at each stage. A number of studies appraised the effectiveness of ANC and refer to it as an initial encouraging point of up-taking safe delivery care and as a result it might potentially contribute in reducing maternal and infant mortality. Key components of ANC include communication of health-related information, screening for risk factors, prevention and management of complications and preparation for delivery in a safe place by skilled attendants. It specifically comprises tetanus toxoid immunization, iron supplementation, early detection and treatment of pre-eclampsia, preparation for transportation to a delivery site and safe delivery education components, which can significantly contribute to reduce maternal and infant mortality (Pervin et al, 2012).

It has been widely said that the reduction of high maternal mortality and morbidities, as well as child mortality, is closely connected with delivery care utilization. In developing settings most of the deliveries are usually taken place at home, commonly assisted by traditional birth attendants or elderly community ladies/relatives who have no medical knowledge on delivery assistance. No scientific medical appliances are used for the delivery process or for cord cutting and tying of infants. Moreover, the non-medical delivery assistant may be unable to identify a critical situation and to refer the woman to a medical centre or hospital at the time of emergency. On the other hand, home delivery with untrained or non-medical delivery assistants usually follows harmful traditional practices that enhance the risk of post partum hemorrhage for mother and infection for both mother and infant. Place of delivery is thus closely related with reduction or amplification of the rate of maternal and infant death (Begum et al, 2012).

Research and empirical evidence also show that most of the neonatal deaths usually occur within the first 24 hours of life, and three-quarters of neonatal deaths occur in the first week after birth. Hence, to reduce child death, World Health Organization recommends post natal check-up within six hours of delivery. In remote areas of some developing settings, postnatal check-up within 72 hours is considered as an essential service to reduce deaths of mothers and neonates. PNC services includes early initiation of breastfeeding, immediate drying and warming of neonates, neonatal resuscitation, skin-to-skin contact, special care of low-birth-weight babies, and management and referral of danger signs (Syed et al., 2006).

As explained earlier, marriage is universal and pregnancy comes after marriage in Bangladesh, non-marital pregnancy is not accepted socially and legally in the country; women encounter strong social pressure to prove fertility as soon as they get married.

Thus the probability of being pregnant tends to happen earlier within the commonly practiced marital fertility tradition (Kamal, 2012; McCleary-Sills et al, 2012).

Probability of utilization of pregnancy related services are comparatively less for the young mothers, which creates a critical situation of higher maternal and neonatal death occurrence. Thus it is impossible to address the issue of maternal and neonatal mortality and maternal morbidity without measuring the harm of early age at marriage and it is crucial to address the early pregnancy incidence in the light of service utilization.

1.2. Literature review

1.2.1 Why early marriage is prevalent?
Multiple causes foster early marriages; most of the reasons are linked to the cultural, societal, economic and religious aspects. Study shows that, poverty has a strong influence on higher prevalence of early marriage. Families from poor economic background are vulnerable in terms of having fewer resources and incentives and they usually prefer their young girls to be married off early rather than invest in education or human development (Mathur et al, 2003).

In certain cultures, marrying off a young girl presume that the girl's sexuality would be protected by marriage while she would remain virgin until the marriage. In Bangladesh, early marriage is sometimes considered as the means of controlling female sexuality with a prediction of limiting social interactions between men and women (Chowdhury, 2004).

Similar to other South Asian countries, the practice of early marriage in Bangladesh is mainly linked to financial struggles or poverty and guided by certain cultural or religious norms. It is evident that, Bangladeshi girls are often getting married before their eighteenth birthday; occasionally it happens when they are barely teenagers. The reason for those child marriage incidents in Bangladesh is certainly rooted on social norms; sometimes it is fuelled by tradition, often obligated by religious values and poverty also acts as a major catalyst (Kamal, 2012; Sarkar, 2009).

Patriarchy has an important influence on early marriage. In patriarchal family culture, a young girl has a little scope to raise her voice or to bargain about the decision taken by her guardians or elderly family members about her marriage. On the other hand, in the poverty prone society, marrying off a young girl to an older man and sending her into another family is often considered as a survival strategy from poverty and at the same time it is regarded as a financial security for that young girl (Farhana, 2012).

1.2.2 Why early marriage is harmful?
Child marriage or early marriage identifies as a harmful event in the course of life; it exposes women to health risks associated to early pregnancy, difficult childbirth and complication due to premature baby birth (UN Women, 2011).

Early marriage of women intimidates womanhood and generates absolute threat for womanhood. Early marriage is indeed a far-reaching issue that has a potential impact not

only on the lives of the girl who get married early, but also creates a negative influence on lives around her. Age at marriage of a woman has a wide impact on reproductive health and on reproduction. Sometime mother's psychological and physiological health is closely connected with the health of the new born. A young girl who is barely a teenager is certainly not ready, either psychologically or physically, to get married and become a mother. Pregnancy at such an age could create a devastating affect for both mother and child while mother's body is not mature enough for reproduction. On the other hand, mental and physical maturity is necessary to manage and cope with a relationship with a husband; considering in most of the cases the husband's are much older than wives in the case of early marriage that might put a young girl at a disadvantage for life (Kurup, 2013; Kamal, 2012).

It is worthwhile to mention that, pregnancy is the leading cause of death among girls aged 15-19 worldwide. Girls younger than 15 years are five times more likely to die in childbirth than women who are in their twenties (UNFPA, 2005).

As Bangladesh is one of the top ranked country for early marriage, a wide section of maternal death happens in the country as the by-product of early marriage. In most of the cases, the young brides are usually less capable to negotiate with their husbands or the family members of in-laws families in a traditional setting of extended family for the crucial aspects of life, such as, use of contraception, seeking essential medical care at the time of pregnancy and also sometimes fail to attain the necessary information for reproductive health. Early marriage also reinforces the vicious cycle of poverty, with limited education and skills bringing down the potential of the girl, her family, her community and her country. These impacts extend throughout a girl's adult life and into the next generation (PLAN, 2013).

It is evident that, early childbearing enhances the possibility of the risk of maternal mortality. Moreover, women married in early age usually carry a liability to prove themselves fertile very soon after marriage (Santhya et al, 2010). In addition, the babies born to mothers aged less than 14 years are 50% more likely to die than the mothers who gave birth after the age of 20 (Save the children, 2013).

Young mothers are less likely to have institutional delivery for their first birth, which might be attributed to their lack of knowledge of sexual and reproductive health. Research shows that the women married early are more likely to have experienced at least one pregnancy loss than others. Early marriage increases the vulnerability of STI and HIV risk too (Santhya et al, 2010).

Studies show that girls between the ages of 10 to 14 are five times more vulnerable to die in pregnancy and childbirth than women aged 20 to 24 (UNFPA & University of Aberdeen, 2004).

Research shows that early marriage may result in exploitative domestic situations (Field, 2004). Research claims that early marriage often contributes to unintended pregnancy and domestic violence (Field, 2006). It has a detrimental effect contributing to greater

exposure to frequent childbearing, unplanned motherhood, unsafe abortions (IRIN, 2012). If the unintended pregnancy would be resolved through abortion, people, especially poor people, go for unsafe abortion offered by traditional healers, which might cause serious reproductive health effects (Grimes et al, 2006).

The women who experience early marriage are relatively more exposed to STIs and HIV, as they generally are unable to negotiate condom use or to refuse sexual relations and are almost bound to have sexual relations with their marital counterpart who are generally older and have more sexual experiences. Young married women often fail to seek health care without the permission of their husbands or other family members, generally cannot pay for health care independently and may experience periods of depression (Hervish & Feldman, 2011).

Early marriage has an impact on women's reproductive life in both practice and service receiving perspective. Childbearing in the early stage of life might increase the probability of death at the time of delivery and if the delivery is not conducted at the institutional setting it might even widen the risk of morbidity. In the case of child loss, the women may attempt to become pregnant as soon as possible to prove her fertility, leading to further complications. The girls who have become brides at an early age enjoy less or limited access to quality health care services and information in comparison to their elder counterparts (Mathur et al, 2003).

Early marriage also has a wide impact on infant mortality. Almost one million infants die every year worldwide that were given birth to by their young mothers (Jain & Kurz, 2007). Early marriage has a significant association with maternal morbidity as well. The girls having babies at a young age are at high risk of suffering from obstetric fistula. It might also cause a condition of tearing vagina, bladder and rectum during delivery. In such situation, lifelong leakage of urine and feces might occur if the case is not properly treated or left untreated (UNFPA & Engender Health, 2003).

1.2.3 Scenario in Bangladesh; research area
Bangladesh, country of South Asia, with 160 million inhabitants and likely to increase it's population by 50 million by 2020. The density of people in the country is much higher than any mega country of the world and will increase from 2,700 to 4,500 per sq mile by 2050. Bangladesh has achieved considerable success in reducing fertility with a total fertility rate (TFR) of 6.3 in 1975 and 2.3 in 2011. Population momentum will bring the population close to 250 million unless something very dramatic and unforeseen occurs to bring fertility below replacement level within a decade or two (Streatfield & Karar, 2008).

The population pyramid of Bangladesh shows that 45% of the 160 million inhabitants of the country are aged under 18, with approximately 39% of girls getting married before the age of 18; with the marriage before the age of 18 is substantively higher in rural areas (UNICEF, 2009). Adolescent birth rate i.e. the number of births per 1,000 girls aged 15-18 is 133 and 40% of the girls experience their first birth before the age of 18 (UNICEF, 2003).

Latest demographic health survey shows that 25% of the total births of the country occur before the women reach the age of 20, 57% during their twenties, and 17% during their thirties. Fertility difference also exists among the rural and urban settings while TFR is 2.0 in urban and 2.5 in rural settings (NIPORT, 2011).

Available empirical evidence highlights the reality of Bangladesh; more than one fifth of adolescent girls undergo their first birth before the age of fifteen, nearly two thirds before the age of eighteen and 80% by the age of twenty. Nearly three out of five (59%) currently married 15–19 year-old Bangladeshi girls have already had their first child (Rahman, 2010). According to UNICEF, about half of all Bangladeshi girls are married by the age of 15, and 60% became mothers by the age of 19 (MDGIF, 2013).

In most rural families of Bangladesh, girls are never consulted about whom or when they marry. Their parents and the family seniors choose the groom, fix the date and arrange the wedding ceremony. Seeking a girl's consent on marriage is still considered a taboo in most families (Save the children, 2013).

Girls are forced into marriage by their families while they are still enjoying their childhood because it is assumed that marriage would secure their life both financially and socially. Most of such child marriage is arranged-marriage; with girls hardly asked about their opinion and most of those marriages are forced marriages (UNFPA, 2012). Usually the age gap between spouses remains high in the early marriage. Research confirms that the wide age gaps between younger married girls and their spouses clearly creates an unequal power relation between the young bride and her older and more experienced husband, resulting in husbands having total control over sexual relations and decision making (Santhya et al, 2010).

Internationally it has been defined that any marriage that occurs before the age of 18 would be considered as child marriage and a violation of human rights (Rodgers, 2012). Under the Child Marriage Restraint Act 1929, the legal age of marriage for females is 18 in Bangladesh. The National Child Marriage Restraint Act of 1929, which was revised in 1984, holds a provision of punishment for whoever performs, conducts or directs child marriage, perpetrators would face imprisonment of up to a month with a fine of 1,000 taka (around $US12.20) (Farhana , 2012).

Early marriage is a common phenomenon in the country even if is legally unacceptable, but widely acceptable by the society. Legal age for marriage is 18 for girls (21 for boys), child marriage or early marriage is defined as the marriage of a child under the age of 18 years, which is not an uncommon occurrence in Bangladesh particularly among the poorest populations of the country**.** Bangladesh is a signatory of UN convention on Consent to Marriage in 1998; this convention requires signatory states to ensure the consent from both parties entering into a marriage and to establish a legal minimum age for marriage (Farhana, 2012).

The vital registration system is poor in Bangladesh and no reliable official data source for vital registration is available. Child marriage is often under reported. There are very few administrative mechanisms active in the country to track and protect the early or child

marriage. It is an occasional phenomenon that the either legislative or administrative authorities could intervene to prevent any child marriages (IRIN, 2012).

UNICEF identified that birth registration helps to prevent early marriage; however not more than 36% of all children are registered yet. It is not complicated to produce fake documents for an early marriage and legislation fails to cover such aspects (UNICEF, 2009).

Patriarchy is common in Bangladesh and as a result power disparities within unions exist. An age difference among the couples becomes highlighted in the case of early marriage and power disparity is more evident in such cases. Early marriage potentially contributes to various social consequences like growth of population and wider incidence of having orphans in the society (Field & Ambrus, 2008).

Dowry (bridal price paid by the bride's family) is a common practice during the marriage in Bangladesh. There is an inverse relationship found between the amount of *Dowry* and the age of bride; the more the age is the greater the *Dowry* payment needed. Hence, to pay reduced amount of *dowry* payments, poor parents of young girls intend to arrange marriage as early as possible, even sometimes before their puberty. Moreover, parents, especially who are poor, always fear the sexual harassment of their young daughters and consider marriage as a viable solution. The societal attitudes also continuously prompt the parents to marry girls off before reaching adulthood. In a case study based report published recently by BBC shows that early marriage has a clear linkage with poverty. It was revealed that the age of bride and the amount of *Dowry* has an inverse relation and the parents sometime consider early marriage as worthy solution (Crawford, 2012; IRIN, 2012).

Research shows that early marriage has an impact on women's reproductive life in both practice and service receiving perspective. The childbearing in the early stage of life might increase the death probability at the time of delivery and if the delivery is not cared for at an institutional level it might widen the risk of morbidity. If the case of child loss happens, the women would go for another try as early as possible to prove her fertility and complication increases more. The girls who become brides at an early age enjoy less or limited access, to quality health care services and information in comparison to their elder counterparts (Mathur et al, 2003).

Hence all the global promises that are made by the international community to reduce global poverty will not be fulfilled until and unless the practice of child marriage will be tackled at any cost. As a signatory of MDGs, Bangladesh has limited time to address the issue of child marriage more pragmatically in the existing reality. On the other hand, the practice of early marriage is an obstacle to all sorts of development goals of Bangladesh. It directly hinders the first six millennium development goals. Girls who marry young do not receive the educational and economic opportunities that might help them to lift themselves and their families out of poverty (related to MDG 1: End poverty and hunger). Child brides are usually forced to drop out of school (related to MDG 2: Universal education). Child brides rarely place their opinion or decision to marry (related to MDG 3:

Gender equality). The babies of a mother under 18 are 60% more likely to die in their first year of life than a baby born to a mother older than 19 (related to MDG 4: Child health). Girls under 15 are five times more likely to die in childbirth than women in their twenties (related to MDG 5: Maternal health). Child brides face lack of information or the power to negotiate about safe sexual practices with their often older and more sexually experienced husbands (related to MDG 6: Combat HIV/AIDS) (Girls not brides, 2012).

1.3 Objective

In Bangladesh, as in many other South Asian countries, long tradition of early marriage and early motherhood exists. The Muslim Family Ordinance ACT 1961 (amended in 1981) set the minimum age at first marriage for women to 18 years, but it is hardly followed. Moreover early marriage is accepted as a commonly practiced societal norm. This practice could have some obvious consequences in the life of Bangladeshi women. In addition, the overall development and health indicators regarding women and children's development are closely associated with the age of marriage of women. It is widely agreed that when a girl is married off at a young age, she is perhaps either not allowed to develop her own or to contribute to the society fully. Considering the ongoing diverse societal reality, it is indeed necessary to design scientific research on early marriage and its consequences on reproductive health of women.

Studies on age at first marriage and its health consequences among women of Bangladesh are limited. In addition most of the research conducted so far had a focus on examining the customs and factors affecting age of females at first marriage (Chowdhury, 2004; Islam & Ahmed 1988; Islam & Mahmud, 1996; Naher 1985; Nasrin & Rahman, 2012; Akanda, 2012).

Little attention has been paid on the obstacles that a young mother could encounter and no research has been designed so far to link the pregnancy related heath services utilization with age at first marriage, focusing on women's socio-economic context. Considering this, the objective of this research is to investigate the association between the age at first marriage and the pregnancy related service utilization. The objective will also focus on the impact of women's socio-economic and demographic status on pregnancy service utilization for the women in Bangladesh. The study will use the nationally representative data of the Bangladesh Demographic and Health Survey (BDHS), 2011.

By analyzing the BDHS data set this particular study will try to find out how and to what extent the utilization of pregnancy related services are extrapolated due to age at first marriage and women's socio-economic status.

1.4 Research question

1.4.1 Main Question
Aligned with the research objective, the following research question has been formulated
- How and to what extent the utilization of pregnancy related services is associated with age at first marriage of the women in Bangladesh and to what extent these utilization varies due to women's socio demographic reality and status?

1.4.2 Sub Questions
From the main research question the research will investigate the following sub-questions
- How and to what extent is the utilization of pregnancy related services (ANC, PNC and PoD) associated with age at first marriage?
- How and to what extent does the utilization of pregnancy related services (ANC, PNC and PoD) vary due to women's socio demographic reality and status?

1.5 Hypothesis

To find the answer to the above mentioned research questions, it has been hypothesized that the utilization of pregnancy related services are positively associated with age at first marriage for the women in Bangladesh; i.e. when the age at first marriage increases, service utilization also increases. Another hypothesis is, the utilization of pregnancy related services are positively associated with the effect of socio economic status, i.e., with the increase of socio-economic status the service utilization also increases. Furthermore, it has also been hypothesized that the demographic status (current age and parity) are negatively associated with the service utilization, the more the current age and parity the less the service utilization is.

Hypothesis 1 # The utilization of pregnancy related service and facility is positively associated with age at first marriage for Bangladeshi women (when the age at first marriage increases pregnancy service utilization also increases)

Hypothesis 2 # The utilization of pregnancy related service is positively associated with socio-economic status of Bangladeshi women (when socio-economic status increases pregnancy service utilization also increases)

Hypothesis 3 # The utilization of pregnancy related service is negatively associated with selected demographic status for Bangladeshi women (when current age and parity increases pregnancy service utilization also decreases)

1.6 Structure of the thesis

Chapter one outline the background and the objective of the study with relevant literature review. Further, it gives an overview of the past studies that explain some salient feature, causes and consequences of early marriage and pregnancy service utilization status in the study area. Chapter two explained the theoretical framework of the thesis with the brief description of the important concepts that. Chapter three discussed the material and

methods of the chapter as well as the analysis plan and the operational definition of the variables that would be analyzed. Chapter four presents the findings of the research based on the methods described in chapter three and at the end of this chapter a summarization of the result is also presented. Discussion and conclusion are provided in chapter five; linking the findings to both theory and literature, highlighting on the objectives and research questions thus drawing recommendations. Limitation of the study and also the area for further research is also included in this last chapter.

2. Theoretical framework and conceptual model

The cornerstone of this research is based on the structural functional approach. In sociology and anthropology, structural functionalism is identified as a wide perspective of interpreting societal structure. Functionalism addresses the society as a whole in terms of function; defines the society as a complex entity where various parts of the society such as family, norms, customs, tradition, institution, government etc. work together to create a stable structure of society. Each part of the society plays their role individually in a systematic manner and finally contributes as a whole. The approach argues that social functions are deduced from the centre of complex social structure and thus the combined result of social function and structure contribute to social action (Subedi, 2010).

Following the frameworks guideline of this structural functional approach, the conceptual frame for this research has been developed. Considering the focus of the structural functional approach, the framework of this research shows that the stable pattern of social behavior is the combined result of the shape of families, individual behavior and social institution from where social action has been deduced. To explain the social structure all the component including; health, education, wealth, media, religion and social institution work individually and contribute to creating a stable social structure. Eventually social action is generated from that social structure.

In the conceptual framework (Figure 1), the left side indicates that the social structure and social function are interlinked and has an influence on each other, though this interaction has not been studied in this research. Social structure is consisting of education, place of residence, wealth possession, media exposure, working status; social function of this research is the time/age of the event of marriage and place. Social action is the direct contribution of social function and social function has been influenced from social structure. Social structure can contribute to social action either directly or via social function, which has been shown on the right hand side of the framework.

In this research, pregnancy service utilization is the social action; three specific actions are conceptualized; antenatal care (ANC), place of delivery (PoD) and postnatal care (PNC) will be examined. How and to what extent social structure and social function contribute to social action will be examined through this research. The dark arrow of the framework in the right hand side depicts the association that will be studied under this research.

Figure 1: Conceptual framework
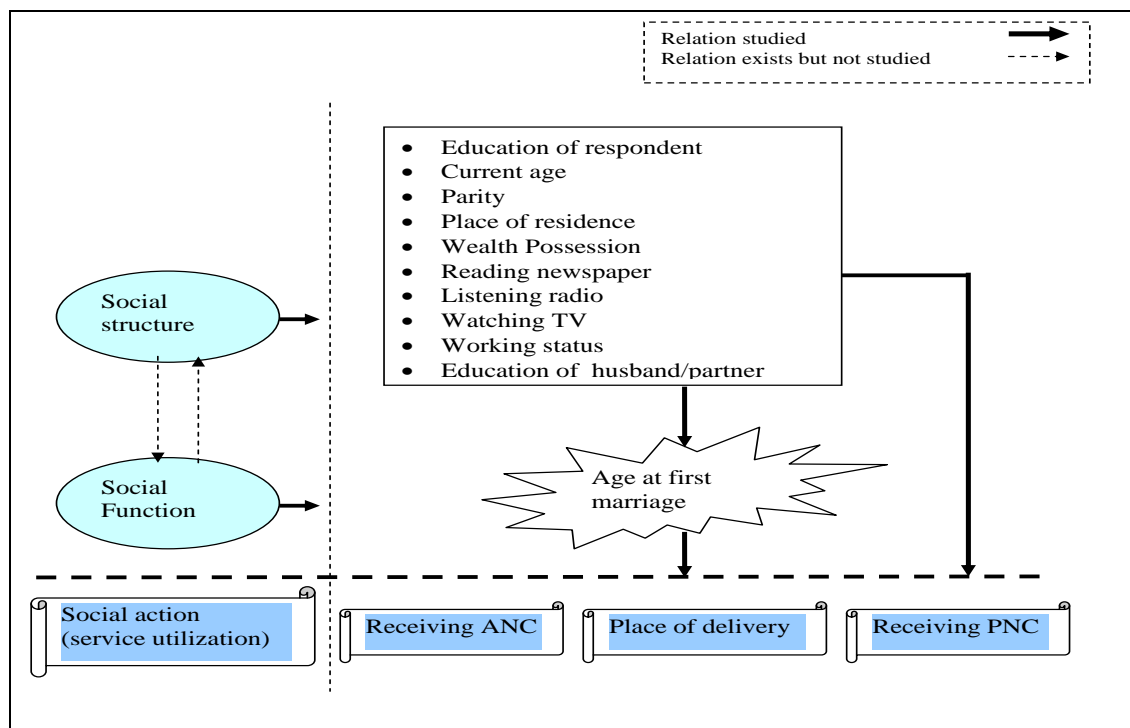
2.1 Important concepts

To portray pregnancy related service utilization, three prominent concepts have been used in this research. These three concepts are antenatal care, place of delivery and postnatal care. These three concepts essentially cover the entire pregnancy period of a woman. WHO define these services and standardized it internationally, thus these are the unique indicators for measuring pregnancy service utilization worldwide. The concepts are described below.

2.1.1 Antenatal care ANC
According to WHO, Antenatal care coverage is an indicator of access and utilization of care during pregnancy. Antenatal care includes recording medical history, assessment of individual needs, advice and guidance on pregnancy and delivery, screening tests, education on self-care during pregnancy, identification of conditions detrimental to health during pregnancy, first-line management and referral if necessary. The WHO measures 'ante natal care' as the: 'Percentage of women who utilized antenatal care provided by skilled birth attendants for reasons related to pregnancy at least once during pregnancy among all women who gave birth to a live child in a given time period (WHO, 2013a).

2.1.2 Post Natal Care PNC
The postnatal period begins immediately after birth and extends for about six weeks. This time is important for mothers because in this period of time mother's body, hormone levels and uterus size returns slowly back to before pregnancy stage. The newborn infant also starts to adapt to life outside the womb and its health during this time will be

monitored. Another focus of postnatal care is to make sure that the new mother is healthy and capable of taking care of the baby and knows how to breastfeed correctly and adjust to a new life with her baby (WHO, 2013b).

2.1.3 Place of delivery POD

Place of delivery is always considered as a powerful indicator to draw how sufficiently medical care is available at the time of delivery. In Bangladesh, most of the delivery usually taken place at home without any medical care and those home deliveries are often taken care of traditional birth attendant who are not likely to be medically trained. This practice is more pronounced in rural areas (Begum et al, 2012).

3. Data and methods

3.1 Sample and data collection

The study used secondary data from Bangladesh Demographic and Health Survey (BDHS), 2011. It is the sixth nationally representative sample survey.

Two stages stratified sampling technique was used for the survey; the first stage was for rural/urban and the second stage was for household level clustering. Data collection took place over five-months of time and three types of Questionnaires (Household Questionnaire, Woman's Questionnaire, and Man's Questionnaire) adapted from model survey instruments of measure DHS project. The questionnaire was translated into Bangla apart from English; the widely used national language. Different professionals participated in the process of data collection. The questioner was also pretested before the final data collection had been taken place.

For this research only the data for ever married women (from the women's questionnaire) were used. With this design, the survey selected 18,000 residential households, and was expected to result in completed interviews with about 18,222 ever-married women and the response rate was 98% at house hold level. Here in the analysis sample (n) is 17842, i.e; the sample of ever married women of reproductive age is 17842 which is the sample for this research. The survey was conducted under the authority of the National Institute for Population Research and Training (NIPORT) of the Ministry of Health and Family Welfare. The details of the survey have been described in the survey report (NIPORT, 2011).

3.2 Variable selection

For deepening the understanding of the research question of what extent the age at first marriage and other demographic and socio-economic factors are associated with pregnancy service utilization, the research investigated certain variables.

3.2.1 Outcome variables
Three outcome variables have been selected in accordance with the research question. The selected outcome variables are specified to highlight the utilization of pregnancy related services; the variables are 'place of delivery (POD)', 'receiving antenatal care (ANC)' and 'receiving post natal care (PNC)'. The selected variables are recoded and indexed as dichotomous; the place of delivery is transformed as whether the place is home or institution, receiving ANC and PNC are as affirmative or negative.

3.2.2 Explanatory variable
In DHS, the variable 'age at first cohabitation' was found, which is used as a proxy of 'age at first marriage' as in the context of Bangladesh age at first marriage and age at first cohabitation are synonymous. The variable 'age of first cohabitation' thus transformed as 'age at first marriage' and was used as the main explanatory variable for this research,

which is measured by year as unit. This is a continuous variable and a linear relationship exists among this variable with all three outcome variables.

3.2.3 Control variable
To assess the utilization of pregnancy, two vital demographic factors were included as the control variable variables: current age of the women and parity. Moreover, a set of socio-economic variables was also used to describe the situation of the individual; women's education, place of residence, wealth index, husband's education, working status of the women, exposure with social media (news paper, radio, TV).

The definitions and coding of the outcome variable, explanatory variable and control variables considered for analysis are presented in the table below (Table 1).

Table 1 Operational definition and measurement of dependent and independent variables

Variable	Description	Measurement scale
Outcome variables		
Receiving ANC	Whether women received ANC or not	Dichotomous 0=No and 1=Yes
Place of delivery	Where the delivery taken place	Dichotomous 0=Home and 1=Institution
Receiving PNC	Whether women received PNC or not	Dichotomous 0=No and 1=Yes
Explanatory Variables		
Age at first marriage	Age of women at the time of first marriage	Continuous (count data) Unit increase: year
Control Variables		
Demographic Variables		
Current age of women	Respondent's current age at the time of survey	Continuous (count data) Unit increase: year
Parity	No of children respondent has at the time of survey	Continuous (count data) Unit increase
Socio-economic variable		
Women's education	Educational level of women	Ordinal 0=No education 1=Primary 2=Secondary 3=Higher
Husband's education	Educational level of husbands	Ordinal 0=No education 1=Primary 2=Secondary 3=Higher
Place of residence	Current place of residence	Ordinal 1=Urban and 2=Rural
Wealth index	Luxurious materials available in household	Ordinal 1=Poorest; 2=Poorer 3=Middle; 4=Richer 5=Richest
Current working status of women	Whether the respondent currently work or not for earning money	Dichotomous 0=No and 1=Yes
Read newspaper /Magazine	Whether the respondent read news paper and magazine or not	Dichotomous 0=Not at all and 1=Sometime
Listen radio	Whether the respondent listen radio or not	Dichotomous 0=Not at all and 1=Sometime
Watch TV	Whether the respondent watch TV or not	Dichotomous 0=Not at all and 1=Sometime

3.3 Analysis plan

Variables were analyzed in three consecutive stages, uni-variate classification analysis that is frequency and percentage distribution, bi-variate classification analysis that is cross tabulation and χ2 test, and finally bi-variate and multivariate analysis through logistic regression. The associations of outcome variables with explanatory variable and control variables were assessed by chi-square tests, with significance for all analyses set at $p<0·05$. This was followed by logistic regression to assess the net effect of the covariates on the outcome variables.

Initially to draw some descriptive information, uni-variate classification analyses through frequency and percentage distribution were performed for the background characteristics of respondents for the variables that are mentioned as control variables and also for the outcome variables.

Bi-variate analysis (cross tabulation and χ2 test) were conducted between each control variable with the explanatory variable and also with each outcome variable with the explanatory variable to investigate the possible contributing factors and correlates of socio-economic variables and outcome variables with the explanatory variable, i.e., to investigate the association of each variables with the group of women entering cohabitation at the age of 18 or before and later. The control variables that were significantly associated ($p < 0.05$) with the outcome variables in the bi-variate analysis were considered as possible contributory factors and entered into the regression models.

Furthermore, bi-variate and three separate multi-variate logistic regression techniques were applied for determining socio-demographic impact and also the early marriage contribution on outcome variables separately. Odds ratio (OR) at 95% confidence level to indicate the likelihood of explanatory variable for outcome variable is presented. The statistical analyses applied in this study were performed with SPSS (version 20). Finally Nagelkerke R^2 was used to measure the explained variance of data. Besides -2Log likelihood being observed, the Wald statistics and Hosmer–Lemenshow show test was performed to find the goodness of fit of the logistic regression model.

4. Results

4.1 Socio-economic and demographic background of respondents

The background information of the study population is indeed important to assess the socio-economic status of the respondents. It is also exigent to get a clear idea about the demographic standing of the respondents especially when the research considers pregnancy related service utilization. It should be noted that the study population is 17,842 ever-married women who are in the reproductive age group i.e., 12-49. When the pregnancy related information has been captured, only those women, who had given birth five years preceding the survey, had been asked about the pregnancy service utilization.

Approximately one fourth (26%) of the women have no education, 30% have only primary education, another 36% have education up to secondary level and only 8% of them have more than secondary standard of education. Educational level of husband/partner depicts almost the same result as their female counterpart. Results shows that 29% husbands have no education and another 27% have only primary level of education, which is slightly lower than their wives. Only in the category of higher than secondary group husband's level was more than their wives and it is 15% for husbands, while it is 8% for the women. Around 8% are in age less than 18 years old, 26.7% are in the age group of 19 to 25 years and 18.3% are in 26 to 30 years age group and the rest 47.0% are in the above category (Table 2)

Economic freedom can play a vibrant role for decision making about pregnancy related service utilization. About 87% of the respondents are either jobless or not engaged in earning money. Almost two third of the respondents (65.3%) are living in rural areas. Sometime it is argued that media exposure is more important now a day to access correct messages to decide what they should do for their reproductive life, especially for the women in developing countries. Results reveal that more than 80% of the respondents were never exposed to radio and newspaper in order to collect information related to reproductive health or pregnancy related awareness tips. Respondents were divided into their wealth status and it was found that 17% of them came from the poorest quintile and 19% are poorer and 19% are from middle-income group. Richer and richest represents 21% and 23% respectively (Table 2).

Table 2: Distribution of respondent by background characteristics

N = 17842	Frequency (%)
Current age	
o 18 and less	1422 (8.0)
o 19-25	4772 (26.7)
o 26-30	3264 (18.3)
o Above 30	8384 (47.0)
Mean(± SD)	30.78 (± 9.27)
Parity	
Mean(± SD)	2.57 (± 1.86)
Respondent's Education level	
o No education	4639 (26.0)
o Primary	5332 (29.9)
o Secondary	6406 (35.9)
o Higher	1465 (8.2)
Husband/partner's education level	
o No education	5197 (29.1)
o Primary	4834 (27.1)
o Secondary	5175 (29.0)
o Higher	2627 (14.7)
Respondent currently working	
o No	15468 (86.7)
o Yes	2374 (13.3)
Place of residence	
o Urban	6196 (34.7)
o Rural	11646 (65.3)
Wealth Index	
o Poorest	3096 (17.4)
o Poorer	3345 (18.7)
o Middle	3428 (19.2)
o Richer	3777 (21.2)
o Richest	4196 (23.5)
Watching TV	
o Not at all	6807 (38.2)
o Sometime	11035 (61.8)
Listening radio	
o Not at all	16243 (91.0)
o Sometime	1599 (9.0)
Reading newspaper and magazine	
o Not at all	14800 (83.0)
o Sometime	3042 (17.0)

4.1.1 Dependent variables

Three essential service utilizations related to pregnancy period are the dependent variables for this research; these are Antenatal care (ANC), Place of delivery (POD) and Postnatal coverage (PNC). These three variables produce a holistic snapshot of the pregnancy period of a women starting from the commencement of pregnancy up-to end of the process.

Result revealed that 71% of the deliveries occur at home. Around 67% women received antenatal care while 46% received post-natal care among the study population. It should

be noted that among the 17,824 respondents 7,325 women who had given birth in the five years preceding the survey provided this information (Table 3).

Table 3 Distribution of dependent variables

N = 7325	Frequency (%)
Place of delivery	
o Home	5209 (71.1)
o Institution	2116 (28.9)
Received ANC	
o No	2445 (33.4)
o Yes	4880 (66.6)
Received PNC	
o No	3966 (54.1)
o Yes	3359 (45.9)

4.1.2 Explanatory variable

Result shows that the age at first marriage is quite low in Bangladesh. The minimum age at first marriage is 10 and maximum is 33. About 87% of the respondent stated their married life before or at the age of 18. The median and standard deviation of the age at first marriage is 15 (±2.97) (Figure 2).

Figure 2: Age at first marriage of respondent
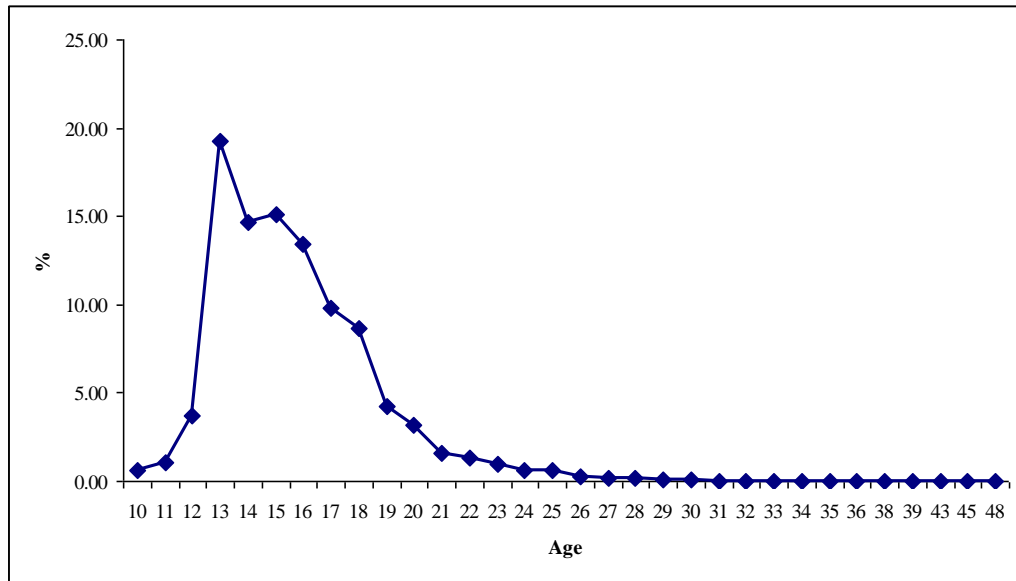
4.2 Socio economic correlates with dependent variables (POD, ANC and PNC)

4.2.1 Correlates with PNC and ANC
In this section, the association between place of delivery, receiving ANC and receiving PNC with some selected socio-economic variables will be presented.

Result indicates that receiving ANC is always higher than receiving PNC. The relationship is significantly separated between educational status and receiving ANC and PNC both (p=0.000 for both) (Table 4). The higher the level of education for the women, the more they utilize those services. Interestingly, among the higher educated groups, the difference between receiving ANC and PNC is less prominent than the other three categories of education. Among the group of no education 60% and 74% are out of ANC and PNC services utilization respectively (Figure 3).

Figure 3: Utilization of ANC and PNC services according to educational status
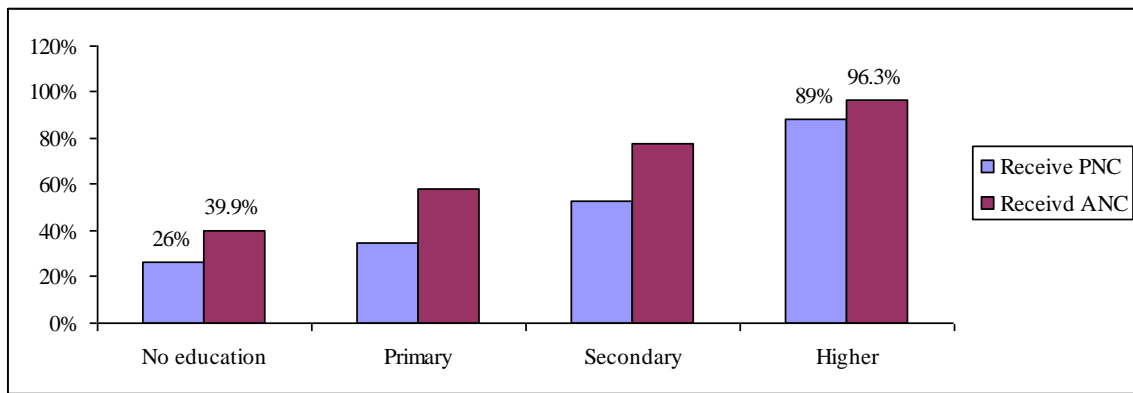
On the other hand, place of residence of the respondents came up as a significant underpinning factor for receiving both ANC and PNC services. Results revealed that a higher percentage of women received both ANC and PNC services in urban areas than that of rural. Around 81% and 61% of the urban women received ANC and PNC while the percentage is only 59% and 39% respectively in rural areas (Figure 4). The relationship between the place of residence with both services separately is significant (p=0.000 for both) (Table 4).

Figure 4: Utilization of ANC and PNC according to place of residence
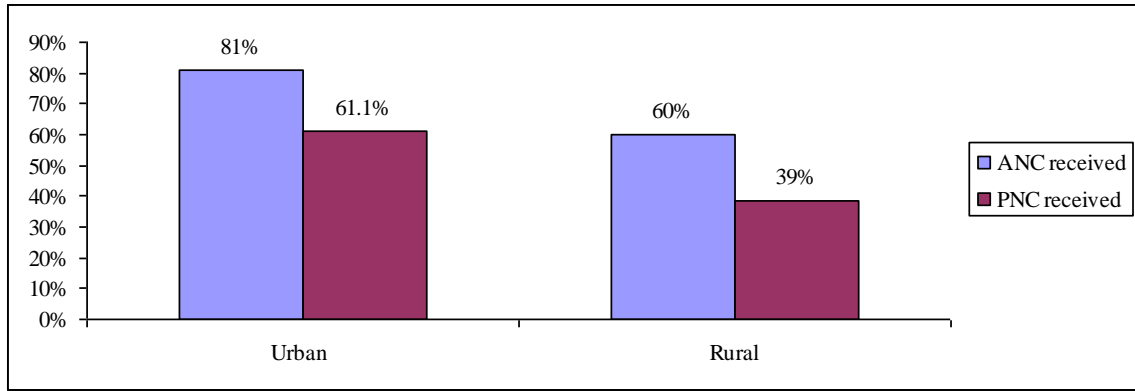
Poverty is always identified as one of the major factors that lead to women not receiving various types of medical services at the time of pregnancy in Bangladesh. Results show that the higher wealth status enhance the chance of receiving ANC and PNC services. The more wealth the women and her family possess, the more they utilize ANC and PNC services. In the poorest wealth quintile 26% receive PNC, while it is 75% for the richest quintile of wealth and it shows a gradual increasing trend according to wealth status. In the case of receiving ANC, less than 45% utilize the services among the poorest while among the richest it is more than 90% (Figure 5). Both the ANC and PNC service utilization has a significant relationship with wealth status (p=0.000 for both) (Table 4).

Figure 5: Utilization of ANC and PNC according to wealth status
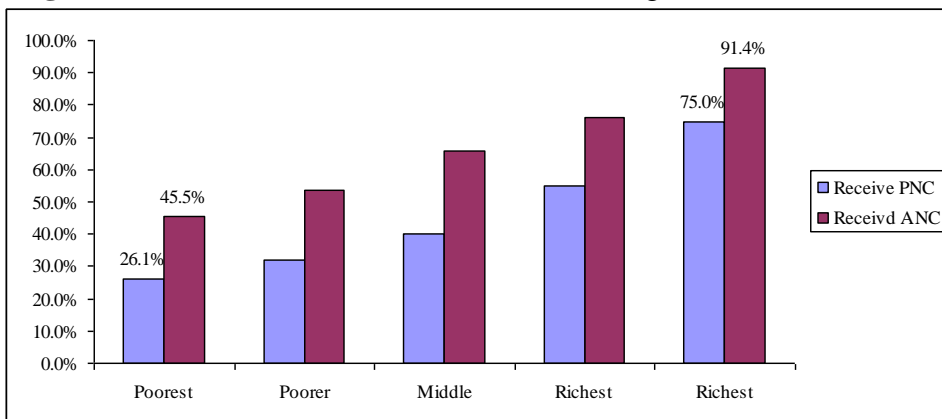
Results reflect that the effect of media exposure is also important for receiving pregnancy related service utilization. The more the women are exposed to media, the more they get information and can make themselves aware. The result unfold that the more the women are reading newspapers and magazines, listen to radio and watch TV, the more they receive the ANC and PNC services and in each exposure there is a significant relationship with ANC and PNC service utilization (Table 4).

Table 4: Association between ANC & PNC service utilization with socio-eco variables

Variables	Receiving ANC		Receiving PNC	
	Yes	No	Yes	No
Respondent's education				
No education	532 (39.9)	800 (60.1)	348 (26.1)	984 (73.9)
Primary	1267 (57.8)	926 (42.2)	768 (35.0)	1425 (65.0)
Secondary	2478 (78.1)	696 (21.9)	1688 (53.2)	1486 (46.8)
Higher	603 (96.3)	23 (3.7)	555 (88.7)	71 (11.3)
	$\chi2=939.13$, df = 3, p = 0.000		$\chi2=843.06$, df = 3, p = 0.000	
Respondent's work status				
Have no work	4353 (55.4)	2203 (33.6)	2985 (45.5)	3574(54.5)
Have work	527(68.8)	239 (31.2)	374 (48.8)	392 (51.2)
	$\chi2=1.825$, df=1, p=0.177		$\chi2=3.036$, df=1, p=0.081	
Place of residence				
Urban	1886(81.0)	442 (19.0)	1422 (61.1)	906 (38.9)
Rural	2994(59.9)	2003(40.1)	1937 (38.8)	3060 (61.2)
	$\chi2=317.88$, df = 1, p = 0.000		$\chi2=318.63$, df = 1, p = 0.000	
Wealth index				
Poorest	695 (45.5)	831 (54.5)	399 (26.1)	1127 (73.9)
Poorer	752 (53.7)	648 (46.3)	446 (31.9)	954 (68.1)
Middle	924 (65.6)	484 (34.4)	565 (40.1)	843 (59.9)
Richer	1122 (76.2)	351 (23.8)	811 (55.1)	662 (44.9)
Richest	1387 (91.4)	131 (8.6)	1138 (75.0)	380 (25.0)
	$\chi2=888.90$, df = 4, p = 0.000		$\chi2=936.22$, df = 4, p = 0.000	
Reading newspaper/magazine				
Not at all	3746 (62.0)	2297(38.0)	2430 (40.2)	3613 (59.8)
Sometime	1134 (88.5)	148 (11.5)	929 (72.5)	353 (27.5)
	$\chi2=333.15$, df = 1, p = 0.000		$\chi2=443.12$, df = 1, p = 0.000	
Listening Radio				
Not at all	4398 (66.2)	2248 (33.8)	3011 (45.3)	3635 (54.7)
Sometime	482 (70.1)	197 (29.0)	348 (51.3)	331 (48.7)
	$\chi2=6.414$, df = 1, p = 0.011		$\chi2=8.774$, df = 1, p = 0.003	
Watching TV				
Not at all	1458 (51.1)	1397 (48.9)	918 (32.2)	1937(67.8)
Sometime	3422 (76.6)	1048 (23.4)	2441(54.6)	2029(45.4)
	$\chi2=508.91$, df = 1, p = 0.011		$\chi2=353.80$, df = 1, p = 0.011	

Current age of the respondents is examined with ANC and PNC service utilization and the result reflects that those pregnancy service utilization is gradually higher for the women who are more than 18 years of age and it starts decreasing steeply for the women who are 28 years and older. That is the utilization of ANC and PNC is comparatively less for the younger women than their older counterparts, but the women who are older than 28 years now are less likely to receive those services. The Figure 6 also reflects that women born earlier are less exposed with ANC and PNC services utilization, while the young cohorts are more likely to obtain those services. Utilization of ANC and PNC services differ significantly according to the current age (p=0.000 for ANC and p=0.005 for PNC).

Figure 6: Utilization of ANC and PNC services according to current age
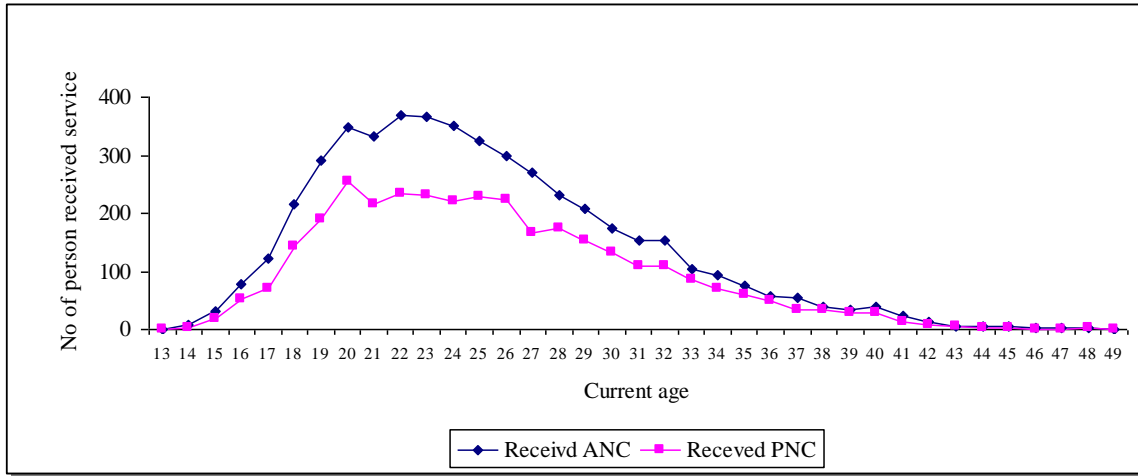
Parity is another indicator which has an influence on pregnancy related service utilization. The result reveals that the parity has a negative relation with ANC and PNC service utilization and this relationship is significant (p=0.000 for both); the increase of the unit of parity decreases the utilization of ANC and PNC services utilization gradually (Figure 7).

Figure 7: Utilization of ANC and PNC services according to parity
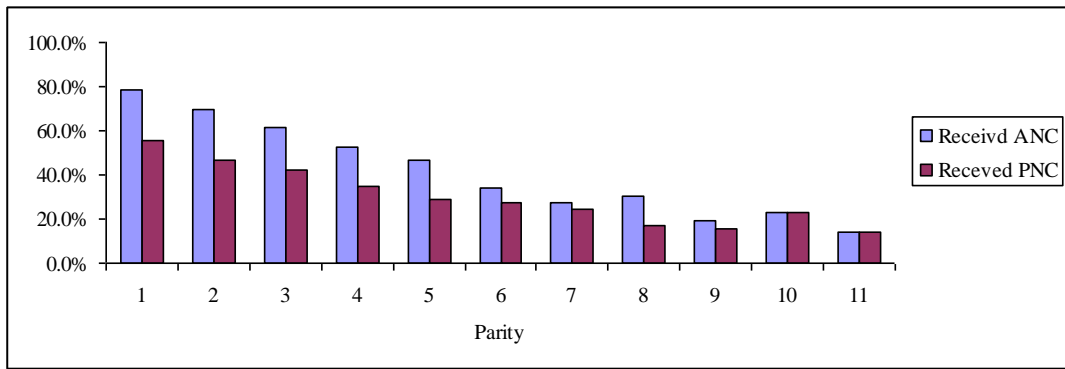
4.2.2 Correlates with place of delivery

Result already reflects that in Bangladesh 71% of deliveries is taken place at home (Table 3) and this percentage is higher in rural areas (Figure 4). Institutional delivery plays a vital role in reducing maternal mortality and morbidity and also infant mortally to a good extent. It also increases the utilization of PNC services.

Education has a wide impact on selection of the place of delivery. Results revealed that the more the women are educated, the more they go for institutional delivery. The respondents who had no education, 90% of them select home for their delivery whereas the percentage of home delivery decreases according to the increase of educational status. Institutional delivery is highest among the higher educated women which is 70% .The increase of institutional delivery shows a gradual increase according to the increase of education; from the secondary to higher education the increase is steep (Figure 8). Place

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of delivery has a significant relationship with educational status of women (p=0.000) (Table 5)

Figure 8: Place of delivery according to educational status
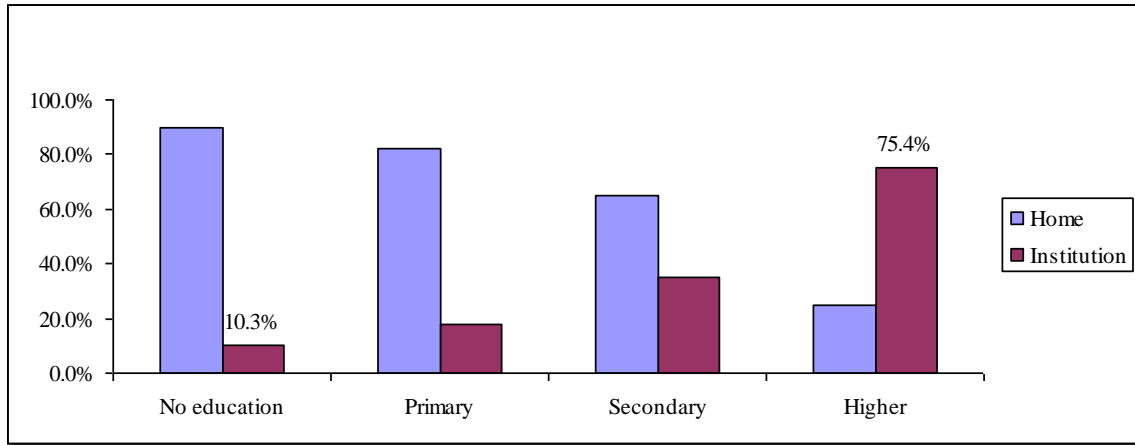
Table 5 also shows that the place of delivery has a significant relation with place of residence (p=0.000). In rural areas almost 80% delivery takes place in home while in urban it is 54% (Figure 9)

Figure 9: Place of delivery according to place of residence
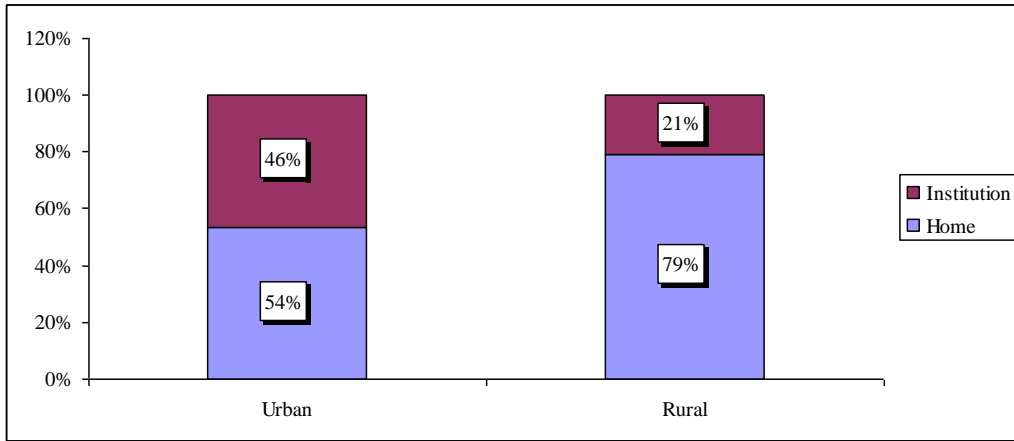
Wealth status has also a vast influence on the selection of place of delivery. Results shows women from poorest, poorer and middle-income quintile are experiencing institutional delivery in very low proportions. Only 10% of poorer, 14% of poorest, 23% of middle income quintile of women avail institutional delivery while for the richest group it is almost 70% which significantly differs according to the wealth status (Figure 10) and the relationship between place of delivery and wealth status is significant (p = 0.000) (Table 5)

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Figure 10: Place of delivery according to wealth status
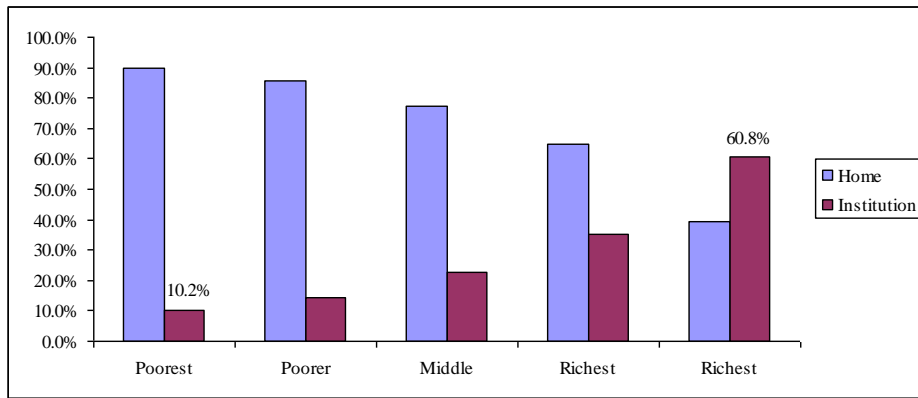
Working status of women was found insignificant with the place of delivery (p=0.342) at 5% level of significance (Table 5).

Media exposure plays an important role for selecting the place of delivery. The more the women are exposed with media, the more they get information and can make themselves aware about selecting place of delivery. The result shows that the more the women were reading newspaper and magazines, listened radio and watched TV, the more they go for institution at the time of delivery and a significant difference was found among the exposed and non exposed with media (p= 0.000, p=0.022, p=0.011) for reading newspaper and magazines, listen to radio and watch TV respectively with place of delivery (Table 5)

Current age of the respondents is examined with the dependent variable place of delivery and the result reflects that institutional delivery is comparatively higher for the young cohort of women and it gradually increases by the current age (Figure 11)). There is a significant relationship among the current age of the respondent and the place of delivery (p=0.008).

Figure 11: Place of delivery according to current age of the respondent

Table 5 Association between places of delivery with socio economic variables

Variables	Place of delivery	
	Home	Institution
Respondent's education		
No education	1195 (89.7)	137 (10.3)
Primary	1806 (82.4)	387 (17.6)
Secondary	2054 (64.7)	1120 (35.3)
Higher	154 (24.6)	472 (75.4)
$\chi2=1081.77$, df = 3, p = 0.000		
Respondent's work status		
Have no work	4653 (70.9)	1906 (29.1)
Have work	556 (72.6)	210 (27.4)
$\chi2=0.903$, df = 1, p = 0.342		
Place of residence		
Urban	1250 (53.7)	1078 (46.3)
Rural	3959 (79.2)	1038 (20.8)
$\chi2=504.01$, df = 1, p = 0.000		
Wealth index		
Poorest	1370 (89.8)	156 (10.2)
Poorer	1201 (85.8)	199 (14.2)
Middle	1089 (77.3)	319 (22.7)
Richer	954 (64.8)	519 (35.2)
Richest	595 (39.2)	923 (60.8)
$\chi2=1213.74$, df = 4, p = 0.000		
Reading newspaper/magazine		
Not at all	4632 (76.7)	1411 (23.3)
Sometime	577 (45.0)	705 (55.0)
$\chi2=515.50$, df = 1, p = 0.000		
Listening Radio		
Not at all	4752 (71.5)	1894 (28.5)
Sometime	457 (67.3)	222 (32.7)
$\chi2=5.282$, df = 1, p = 0.022		
Watching TV		
Not at all	2453 (85.9)	402 (14.1)
Sometime	2756 (61.7)	1714 (38.3)
$\chi2=399.31$, df = 1, p = 0.011		

The result reveals that when the parity is 1 or 2, more delivery takes place in institution, while the parity increase institutional delivery also decreases (Figure 12). The relationship between parity and the place of delivery is negative and it is significant (p=0.000).

Figure 12: Place of delivery according to parity
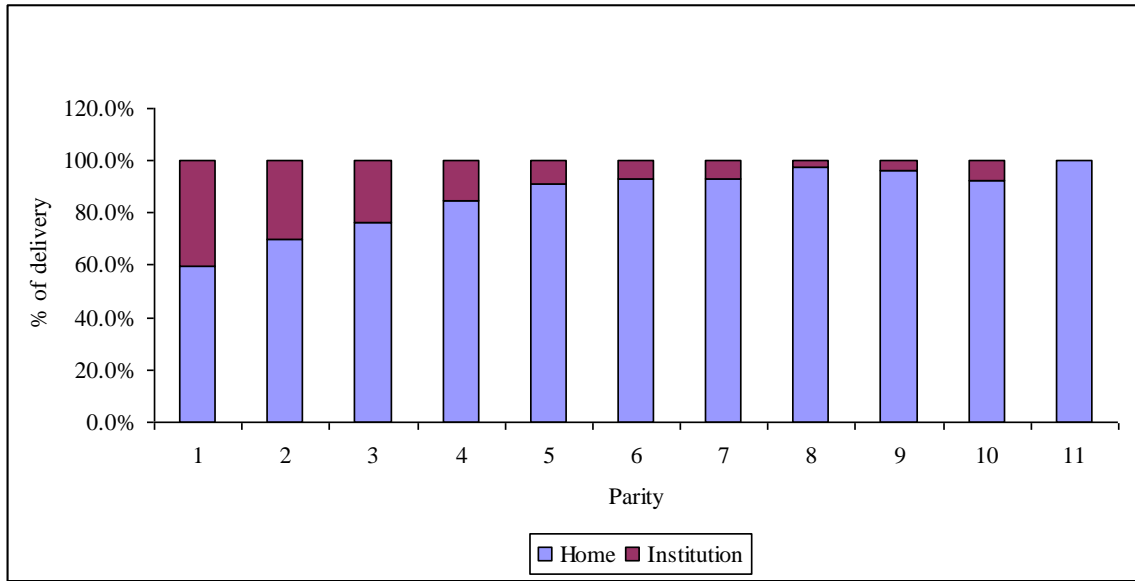
4.3 Correlates of explanatory variable with dependent variables (POD, ANC, PNC)

Age at first marriage is the main explanatory variable in this research. Here the correlates of explanatory variables with three dependent variables will be presented.

Results show that the ANC and PNC services utilization has a significant relationship with age at first marriage separately (p=0.000 for both). Both the PNC and ANC service utilization increases with the increase of age at marriage (Figure 13).

Figure 13: PNC and ANC service utilization with age at first marriage
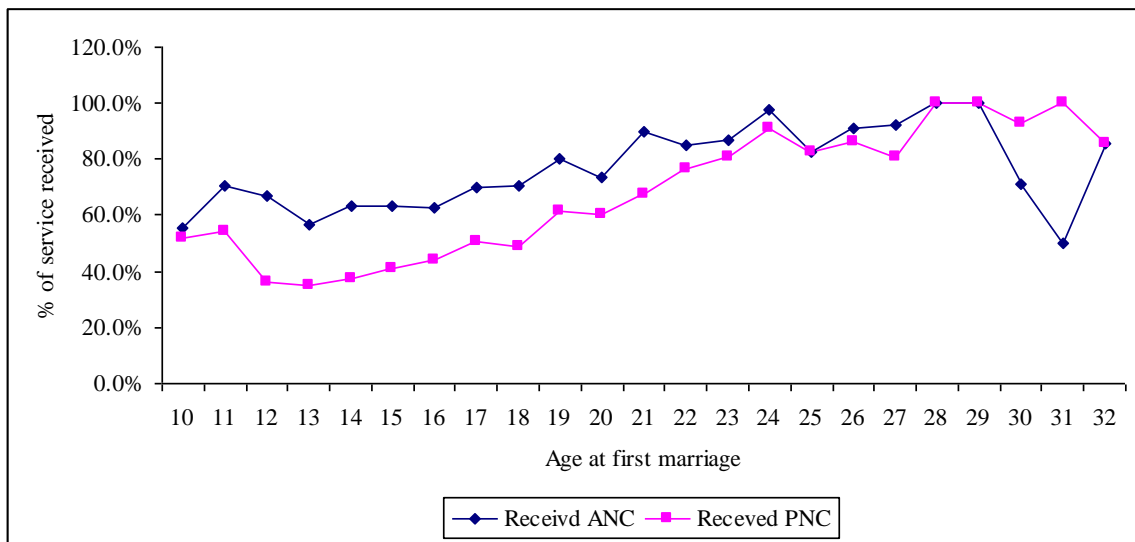
Percentage of institutional delivery is also higher for the high age at first marriage, up to 19 years of age, the home delivery ranges from 50% to 80% while after age of 20 institutional delivery increases at a very high proportion (figure 14). Results show that the place of delivery has a significant relationship with age at first marriage (p=0.000).

Figure 14: Place of delivery with age at first marriage
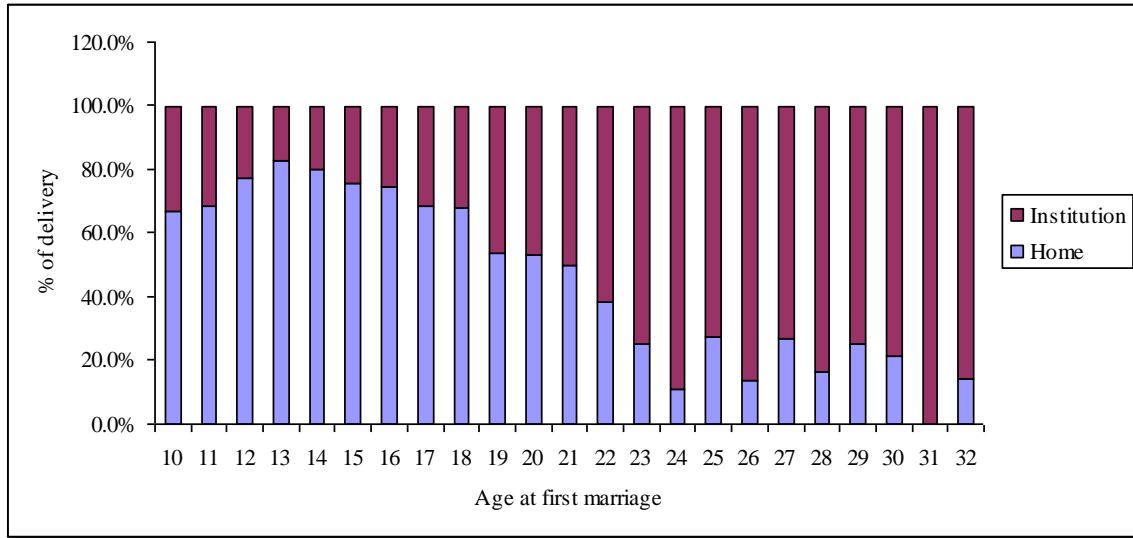
4.4 Logistic regression

Logistic regression model is also used here to identify which background factors contribute and shape the utilization of pregnancy related services. The regression result is used to explain the contribution of age at marriage toward the pregnancy related services, while other background variables were controlled.

In the logistic regression, three dependent variables are examined separately with the background and explanatory variables; these are Place of delivery, receiving ANC and receiving PNC.

Association among every potential background variables with each dependent variable was examined before incorporating the logistic regression model. Partial correlation among the independent variables was also reviewed and among the most correlated variables these have been kept in the model to avoid multicollinearity problems; as the correlation between the respondents' education and their husband's education was highly correlated, only respondents' education was kept for the final model. The background control variables are both demographic and socio-economic; the demographic variables current age and parity, the socio-economic variables are place of residence, educational status, wealth status, exposure to radio, TV and newspaper are incorporated in the model. The explanatory variable of the model is the age at first marriage. Age at first marriage, current age and parity are the continuous variables and the others are categorical. The dichotomous categories are place of residence categorized by urban and rural, media exposure such as newspaper, TV and radio all three are categorized as not at all or

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sometimes exposed. Wealth index and respondents' educational status has more than two categories.

In the first step before going to the full model, the primary explanatory variable 'age at first marriage' has been regressed alone with the dependent variable to get the initial model. In the second step, all the control variables along with the explanatory variable 'age at first marriage' run separately and get few different models. In the final stage the full model was produced by incorporating all control variables and explanatory variables together. The final model (Model 6 in the Table 6, 7 and 8) will reflect the absolute effect of the explanatory variable 'age at first marriage' while other independent variables are controlled towards the respective dependent variables.

Table 6 Logistic regression models while Place of Delivery is the dependent variable: Logistic regression with place of delivery

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	B	Exp(b)	B	Exp(b)	B	Exp(b)	B	Exp(b)	B	Exp(b)	B	Exp(b)
Age at 1st marriage	.204***	1.226	.225***	1.253	.213***	1.237	.159***	1.172	.100***	1.105	.053***	1.054
Current age			-.041***	.960	-.041***	.959	-.043***	.958	-.028***	.972	.032***	1.033
Residence												
Rural ®												
Urban					1.115***	3.050	.506***	1.658	.555***	1.742	.486***	1.625
Wealth index												
Poorest ®												
Poorer							.331**	1.392	.166	1.181	.110	1.116
Middle							.811***	2.251	.517***	1.677	.390***	1.476
Richer							1.290***	3.633	.926***	2.525	.754***	2.125
Richest							2.077***	7.984	1.543***	4.678	1.291***	3.635
Education												
No edu ®												
Primary									.358***	1.431	.271**	1.312
Secondary									.868***	2.382	.658***	1.932
Higher									1.852***	6.372	1.488***	4.430
Parity											-.346***	.708
Read newspaper												
Not at all ®												
Sometime											.202*	1.224
Listening radio												
Not at all®												
Sometime											-.034	.967
Watching TV												
Not at all®												
Sometime											.333***	1.395
Constant	-4.204	.015	-3.514	.030	-3.708	.025	-3.608	.027	-3.445	.032	-3.401	.033
-2 Log likelihood	8298.28[a]		8224.46[a]		7833.346[a]		7296.244[a]		7095.412[a]		6985.450[a]	
Nagelkerke R^2	.096		.109		.178		.266		.298		.315	
Chi-square/df	46. 488/6		25.867/8		4.674/8		4.333/8		3.471/8		3.4561/8	
H &L Test	p=0. 000		p=0. 001		p=.792		P= .826		P= .901		P= .894	

Note: *p<0.05, **p <0.01, ***p<0.001 ® = Reference category

In Table 6, the logistic regression models in which place of delivery is the dependent variable has been presented. Here **Model 1** reflects that the increase of age at marriage increases the odds of having institutional delivery (OR=1.226).

While the age at first marriage and current age of respondent were considered as an independent variable to run a logistic regression in **Model 2**, it shows that the coefficient of age at first marriage is slightly higher than the Model 1 (OR=1.253). On the other hand current age of respondents is negatively associated with the dependent variable; every one year increase of current age decreases the odds of having institutional delivery by 0.960 times. That is the women born comparatively later possess more odds for institutional delivery than their elderly counterpart.

It is widely known from literature that the place of residence; that is whether the respondent came from urban or rural setting is also profound for any utilization of pregnancy services in the development setting. While the logistic regression was run considering the place of residence along with age at first marriage and the current age of respondents in **Model 3**, it displays that the effect of age at first marriage is slightly lower than the previous model (OR=1.237) and the odds are 1.115 times higher for the women living in urban areas to have institutional delivery compared to their rural counterpart.

In **Model 4**, age at first marriage, current age of the respondents, place of residence and also the wealth status was incorporated as independent variables to draw the model, the result shows lower coefficient for age at first marriage than the previous model (OR=1.172). All the categories of wealth index are positively associated with the dependent variable in the model; that is the higher the wealth possession, the higher the odds of having institutional delivery. The model reflects that the odds for poorer category are 1.392 times more likely to have institutional delivery than the poorest and the odds increases up-to 7.984 times for the richest while poorest are the reference category.

In **Model 5** where educational status of women was also included with all the independent variables used in the earlier models; the effect of age at first marriage is again lower than the previous models (OR=1.105). Educational status of women for each category are positively associated in the model; the increase of educational status increases the odds of having institutional delivery and it shows highest odds for higher educated (OR=6.372) than the women who have no education.

In the **Model 6**, parity and the exposure of the social media like reading newspaper, watching TV and listening radio are also incorporated along with the other independent variables used in the previous models.

Age at first marriage, current age of respondent, place of respondent (ref: rural), educational status (ref: no education), all categories of wealth index except the poorer category (ref: poorest), reading news paper (Ref: not at all) and watching TV (Ref: not at all) all these variables' effects are positive in the model and significantly differ from zero.

Each year increase of age at marriage increases the odds of institutional delivery by 1.054 times. The odds for the women living in urban areas are 1.625 higher to go for institutional delivery than the women living in rural areas. Respondents who have education higher than secondary level have 4.428 times higher odds to have institutional delivery than the women who are not educated. Women from richest wealth group are 3.635 times more likely to have institutional delivery than of the poorest counterpart. The odds for the women who are watching TV sometimes are 1.396 times higher to visit institute at the time of delivery in comparison to the people who never watch TV. The odds for women who read newspaper sometimes are 1.223 times higher to visit institution at the time of delivery in comparison to those who never read.

Current age of respondent was negatively associated with dependent variable in the previous models, but in the final model with 8 other independent variables, it is depicted as positively associated; each year increase of current age increases the odds of having institutional delivery by 1.033 times. In the final model parity is negatively associated with the dependent variable, that is increase of one unit of parity decrease the odds of having institutional delivery and the odds decreases by 0.708 times.

The model fits data reasonably well, significance is P=.894 at Hosmer and Lemenshow Test. Nagelkerke R Square is 0.315, that means 31.5% variance of the data has been explained by the variables used in the model which is relatively good for logistic regression model.

Table 7 Logistic regression models while receiving ANC is the dependent variable: Logistic regression with receiving ANC

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	B	Exp(b)	B	Exp(b)	B	Exp(b)	B	Exp(b)	B	Exp(b)	B	Exp(b)
Age at 1st marriage	.123***	1.131	.143***	1.154	.131***	1.140	.073***	1.076	.015	1.016	-.022	.978
Current age			-.051***	.950	-.051***	.950	-.051***	.950	-.027***	.973	.023**	1.023
Residence									.			
Rural ®												
Urban					.994***	2.703	.390***	1.477	459***	1.583	.398***	1.488
Wealth index												
Poorest ®												
Poorer							.288***	1.334	.096	1.101	.052	1.054
Middle							.735***	2.086	.388***	1.473	.276**	1.317
Richer							1.165***	3.205	.727***	2.070	.567***	1.763
Richest							2.220***	9.211	1.543***	4.676	1.285***	3.615
Education												
No edu ®												
Primary									.504***	1.656	.420***	1.522
Secondary									1.134***	3.107	.936***	2.551
Higher									2.603***	13.500	2.198***	9.011
Parity											-.253***	.777
Read newspaper												
Not at all ®												
Sometime											.371***	1.450
Listening radio												
Not at all®												
Sometime											-.095	.909
Watching TV												
Not at all®												
Sometime											.274***	1.315
Constant	-1.248	.287	-.240	.787	-.323	.724	-.003	.997	-.195	.823	-.211	.810
-2 Log likelihood	9156.728ᵃ		9004.519ᵃ		8716.183ᵃ		8163.356ᵃ		7873.586ᵃ		7095.412ᵃ	
Nagelkerke R²	.032		.060		.112		.204		.250		.298	
Chi-square/df	37.270/6		14.387/8		19.424/8		6.565/8		3.034/8		3.471/8	
H &L Test	p=0. 000		p=0. 072		p=.013		P= .584		P= .932		P= .901	

Note: *p<0.05, **p <0.01, ***p<0.001

In Table 7, the logistic regression models with receiving ANC as the dependent variable has been presented. **Model 1** reflects that the increase of age at marriage increases the odds of receiving ANC (OR=1.131).

In the **Model 2 w**hile the age at first marriage and current age of respondent were considered as independent variable to run the logistic regression, it shows that the effect of age at first marriage is positively associated with dependent variable and the effect of current age of respondents are negatively associated with the dependent variable of receiving ANC services. That is every one year increase of age at first marriage increases the odds of receiving ANC by 1.154 times. However, for every year increases of current age the odds of ANC service receiving decreases by 0.950 times, that is the women born comparatively later age cohort have more probability for receiving ANC than born in older cohort.

While place of residence was included along with age at first marriage and current age of respondents in **Model 3**, it shows that the age at first marriage is slightly lower than the previous model (OR=1.140) and the odds for the women living in urban areas are 2.703 times higher to receive ANC services comparing to their rural counterparts.

In **Model 4**, age at first marriage, current age of the respondents, place of residence and also the wealth status was incorporated as independent variable to draw the model, the result shows much lower coefficient for age at first marriage than the previous model (OR=1.076). All the categories of wealth index are positively associated with the dependent variable in the model; that is the higher the wealth possession is, the higher the odds of receiving ANC. The odds increases gradually according to the increase of wealth and for the poorer category the odds is 1.334 times higher and for the highest wealth status the odds is 9.211 times higher compared to the poorest wealth status category.

In **Model 5** where educational status of women was also included with all the independent variables used in the earlier models; age at first marriage is again lower than the previous models (OR=1.016). Educational status of women of each category are positively associated in the model; the increase of educational status dramatically increases the odds of receiving ANC services and it shows highest odds for higher educated (OR=13.500) than the women who have no education.

In the **Model 6**, where parity and the exposure of the social media like reading newspaper, watching TV and listening to the radio are also incorporated along with the other independent variables used in the previous models, age at first marriage has no significant effect in the model.

Current age of respondent, place of respondent (ref: rural), educational status (ref: no education), all categories of wealth index except the poorer category (ref: poorest), reading news paper (Ref: not at all) and watching TV (Ref: not at all) all these variables' effects are positive in the model and are significantly different from zero.

Though the current age of respondents was negatively associated with dependent variable in the previous models, in the final model with 8 other independent variables it is positively associated with the dependent variable of receiving ANC. Each year increase of current age increases the odds of receiving ANC services increase by 1.023 times.

The odds for the women living in urban areas are 1.488 times higher to receive ANC than the women living in rural areas. For the respondents who have education higher than secondary level, the odds are 9.011 times higher for them to receive ANC in comparison to the women who have no education. The odds for the women from richest wealth group are 3.615 times higher to receive ANC than that of their poorest counterpart. The odds for the women who are watching TV sometime and who read newspaper sometime are 1.315 times and 1.405 times higher respectively to receive ANC services than the women who were never exposed to them.

In the final model parity is negatively associated with the dependent variable that is an increase of one unit of parity decreases the odds of having ANC services and the odds decrease is 0.777 times for each unit increase.

The model fits data reasonably well, significance is P=.901 at Hosmer and Lemenshow Test. Nagelkerke R Square is 0.298, 29.8% variance of the data has been explained by the variables used in the model which is relatively good for logistic regression model.

Table 8 Logistic regression models while receiving PNC is the dependent variable: Logistic regression with PNC

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	B	Exp(b)	B	Exp(b)	B	Exp(b)	B	Exp(b)	B	Exp(b)	B	Exp(b)
Age at 1st marriage	.161***	1.175	.173***	1.189	.162***	1.176	.113***	1.120	.059***	1.060	.040**	1.041
Current age			-.027***	.973	-.026***	.974	-.026***	.974	-.012**	.988	.011	1.011
Residence												
Rural ®												
Urban					.834***	2.303	.289***	1.335	.321***	1.378	.289***	1.335
Wealth index												
Poorest ®												
Poorer							.248***	1.281	.125	1.134	.104	1.109
Middle							.546***	1.726	.310***	1.363	.255**	1.290
Richer							1.061***	2.888	.762***	2.144	.675***	1.965
Richest							1.769***	5.863	1.292***	3.640	1.142***	3.134
Education												
No edu ®												
Primary									.240**	1.271	.182**	1.200
Secondary									.661***	1.937	.516***	1.675
Higher									1.991***	7.321	1.681***	5.373
Parity											-.123***	.884
Read newspaper												
Not at all ®												
Sometime											.369***	1.446
Listening radio												
Not at all®												
Sometime											.012	1.012
Watching TV												
Not at all®												
Sometime											.122**	1.130
Constant	-2.732	.065	-2.230	.108	-2.343	.096	-2.132	.119	-1.895	.150	-1.863	.155
-2 Log likelihood	9755.562[a]		9711.884[a]		9457.313[a]		8969.249[a]		8750.769[a]		8704.233[a]	
Nagelkerke R^2	.062		.070		.113		.192		.225		.232	
Chi-square/df	32.080/6		25.059/8		13.750/8		10.357/8		9.756/8		4.319/8	
H &L Test	p=0. 000		p=0. 002		p=.089		P= .241		P= .283		P= .827	

Notes: *p<0.05, **p<0.01, ***p<0.001

In Table 8, the logistic regression models with receiving PNC as dependent variable has been presented. **Model 1** reflects that the increase of age at marriage increases the odds of receiving PNC (OR=1.175).

In the **Model 2 w**hile the age at first marriage and current age of respondent were considered as independent variables to run a logistic regression, it shows that the effect of the age at first marriage is positively associated with receiving PNC. On the other hand, the current age of respondents is negatively associated with the dependent variable of receiving PNC services. That is every one year increase of age at first marriage increases the odds of receiving PNC by 1.189 times. However, the increases of current age decrease odds of receiving PNC service by 0.973 times. That is the women born comparatively later cohort have more probability for receiving PNC than their women born in comparatively older cohort.

While place of residence was included along with age at first marriage and current age of respondents in **Model 3**, it shows that the effect of age at first marriage is slightly lower than the previous model (OR=1.176) and the odds for the women living in urban areas are 2.303 times higher to receive PNC services compared to their rural counterpart.

In **Model 4**, age at first marriage, current age of the respondents, place of residence and also the wealth status were incorporated as independent variables to draw the model, the result shows much lower coefficient for age at first marriage than the previous model (OR=1.120). All the categories of wealth index are positively associated with the dependent variable of the model; that is the higher the wealth possession is, the higher the odds receiving PNC. The odds increases gradually according to the increase of wealth and for the poorer category the odds is 1.281 times higher and for the highest wealth category the odds is 5.863 times higher than the poorest wealth status category.

In **Model 5** where educational status of women was also included with all the independent variables used in the earlier models; the effect of age at first marriage is again lower than the previous models (OR=1.060). Educational status of women of each categories are positively associated in the model; the increase of educational status dramatically increases the odds of receiving PNC services and it shows highest odds for higher educated (OR=5.373) than the women who have no education.

In the **Model 6**, where parity and the exposure of the social media like reading newspaper, watching TV and listening to the radio are also incorporated along with the other independent variables used in the previous models, except parity, all the variables has positive effect on dependent variable. The effects are significantly different from zero.

The effect of age at first marriage has a positive contribution on higher odds of receiving PNC services (OR=1.041). In the final model, the current age of respondent has higher effect on incensement of odds and every year increase of age increases the odds of receiving PNC by 1.011 times.

The odds for the women living in urban areas are 1.355 times higher to receive PNC than the women living in rural areas. Respondents who have education higher than secondary level have higher odds (OR= 5.373) to receive PNC than those who are not educated. The odds for the women from richest wealth are 3.134 times higher to receive PNC than of their poorest counterpart. The odds for the women who watch TV sometimes are 1.130 times to visit receive PNC services in comparison to the women who never watch TV. Odds are also 1.446 times higher for the women who read newspaper sometimes to have PNC services in comparison to those who never read it.

Parity is negatively associated with the dependent variable, that is, increase in one unit of parity decrease the odds of receiving PNC services and the odds decrease is 0.884 times for each unit increase of parity. The model fits data reasonably well, significance is P=.827 at Hosmer and Lemenshow Test. Nagelkerke R Square is 0.232, 23.2% variance of the data has been explained by the variables used in the model which is relatively good for logistic regression model.

4.4.1 Comparison of three Models

A comparative picture of three logistic regression models presented and explained earlier has been presented here in the Table 9; depict that the effect of age at marriage is significantly associated with the place of delivery and utilization of PNC service while controlling for socio-economic and demographic variables. But the effect of age at first marriage is not significantly associated with utilization of ANC service (Figure 15). The three separate models give almost similar picture of explanation though some significant variation is noticed (Figure 16).

Figure 15: Odds of age at first marriage in three different models
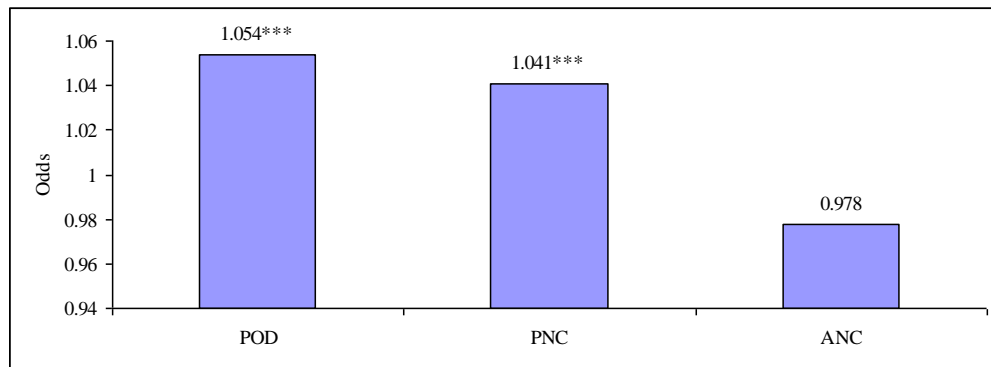
Note: * POD=Place of delivery, PNC=Post natal care, ANC=Antenatal care

Educational status of women is the most prominent variable in each model and it was found as the most influential determinant for ANC service utilization. Highest educational level influence much higher odds than the other categories of educational level in each model. Wealth status came up as the second most influential variable after education and has almost similar effect in each model and it gradually portrays higher odds from poorer to richest. Current age of the respondents, place of residence and the exposure with media (TV and newspaper) showed an almost equal positive effect in each model. Parity is negatively associated with all outcome variables and the odds decreases

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with almost similar magnitude due to parity (Figure 16 and Table 9). All the models fit reasonably well and 23% to 30% cases are explained by the variables used in the model, which is relatively good for logistic regression model (Table 9).

Figure 16: Three different models according to odds
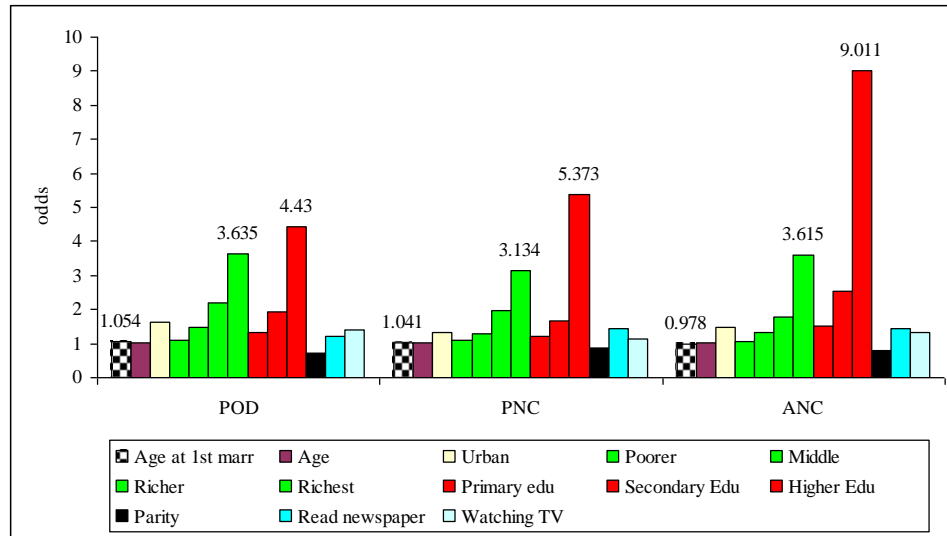
* POD=Place of delivery, PNC=Post natal care, ANC=Antenatal care

Table 9 Comparison table for three Models

	Place of delivery		PNC		ANC	
	B	Exp(b)	B	Exp(b)	B	Exp(b)
Age at 1st marriage	.053***	1.054	.040**	1.041	-.022	.978
Current age	.032***	1.033	.011	1.011	.023**	1.023
Res: Rural ®						
Res: Urban	.486***	1.625	.289***	1.335	.398***	1.488
WI: Poorest ®						
WI: Poorer	.110	1.116	.104	1.109	.052	1.054
WI: Middle	.390***	1.476	.255**	1.290	.276**	1.317
WI: Richer	.754***	2.125	.675***	1.965	.567***	1.763
WI: Richest	1.291***	3.635	1.142***	3.134	1.285***	3.615
No Edu ®						
Primary Edu	.271**	1.312	.182**	1.200	.420***	1.522
Secondary Edu	.658***	1.932	.516***	1.675	.936***	2.551
Higher Edu	1.488***	4.430	1.681***	5.373	2.198***	9.011
Parity	-.346***	.708	-.123***	.884	-.253***	.777
Read newspaper Not at all ®						
Read newspaper Sometime	.202*	1.224	.369***	1.446	.371***	1.450
Listening radio Not at all®						
Listening radio Sometime	-.034	.967	.012	1.012	-.095	.909
Watching TV Not at all®						
Watching TV Sometime	.333***	1.395	.122**	1.130	.274***	1.315
Constant	-3.401	.033	-1.863	.155	-.211	.810
-2 Log likelihood	6985.450[a]		8704.233[a]		7095.412[a]	
Nagelkerke R^2	.315		.232		.298	
Chi-square/df	3.4561/8		4.319/8		3.471/8	
H &L Test	P= .894		P= .827		P= .901	

Note: *p<0.05, **p <0.01, ***p<0.001 ® Reference category

4.5 Summary of the result

This study shows that the age at first marriage has a crucial effect on place of delivery and PNC service utilization. Increase of each year of age at first marriage increases the institutional delivery by 5.4% and PNC utilization by 4.1%. Another noticeable result is PNC receive utilization rate is much lower for home delivery. There is no significant association found between the effect of age at first marriage and ANC service utilization. Education came up as the most influential variable in each model; for ANC service utilization the effect of education is highest. The highest educational level indicating more than secondary level of education increases the ANC service utilization most (odds is 9.011). The effect of education is dramatically higher in each model when it crosses the secondary level.

The model shows that the effect of current age of women is positively associated with place of delivery and ANC service utilization; the more women are aged the more they receive ANC services and choose institution as the place of delivery. Every year increase of age the odds increases 1.033 for institutional delivery and 1.023 for ANC service utilization. But the effect of current age is not significantly associated with PNC service utilization.

Interesting effect of parity is also observed from the results. In all three models the effect of parity is negative, that is the unit increase of parity decreases the service utilization. Reflection on the three models shows that the effect of parity is comparatively greatest for the place of delivery than utilization of ANC and PNC; every unit increase of parity the probability of institutional delivery decreases by 29%.

The effect of wealth status is equally visible in the three models, the richer the women the more they have the probability of utilization of services when the poorest are the reference category. But the poorer and poorest have no significantly different effect, the richest has the highest odds. Urban women have more probability of service utilization than the rural women and for all three services odds are 1.488 times to 1.652 times higher for the urban women. Reading newspapers and watching TV has also the positive effect on service utilization.

5. Discussion and conclusion

5.1 Discussion

The social and cultural importance of the event 'marriage' is profound in the religiously conservative and patriarchal society of Bangladesh. As a result marriage is closely related to childbirth and eventually without marital bond childbirth is not socially and legally acceptable. On the contrary, marriage happens early in the life cycle due to societal, religious and economic reasons; prevalence of early marriage is 82%, and the mean age at first marriage is 15.3 years, indicating that women are married-off 2.7 years earlier than the legal age at first marriage (18 years for women) in Bangladesh (Kamal, 2012).

In such a context where marriage and childbirth is closely interlinked, age at marriage and pregnancy service utilization is also interlinked. This study had the objective to examine the association between utilization of pregnancy related services with age at first marriage and the affect of women's social, economic and demographic status on pregnancy related service utilization.

Bangladeshi tradition encourages delivery at home with the assistance of traditional birth attendants or elderly women of the community (NIPORT, 2009). Recent research revealed that only 14.7% of the women went for institutional delivery in Bangladesh (Kamal et al, 2013). Another research revealed that approximately 25,800 women and girls die and another 516,000 to 774,000 face morbidity and disability due to pregnancy or child birth related complications in Bangladesh each year, which is mostly the result of unsafe delivery practices at home (Hill et. al., 2001).

In the light of this previous research the study formulated the hypothesis that the age at first marriage and place of delivery has a close association; and the result of this research shows that every year increase of age at first marriage has a substantial effect on the uptake of institutional delivery, which is 5.4%; therefore proving the hypothesis to be correct. Moreover, education has a strong influence on institutional delivery and the effect of education is extremely high when it exceeds secondary level. The result revealed a huge gap in term of having institutional delivery among the different wealth group of women and the richest group had remarkably high odds of having institutional delivery compared their poorest counterpart.

Hence age at marriage, place of delivery and utilization of delivery services creates a trajectory, which increases maternal mortality and morbidity. Traditional practice and wealth inequalities play a negative role, while more than secondary level of education contributes positively. Particular effort is needed to break this cycle with proper implementation of law for age at marriage and intensive awareness program, especially focused on rural areas is needed to raise the age at marriage of women so that it might impact positively on having institutional delivery and can eventually reduce the maternal death and maternal morbidity.

Postnatal care is considered as one of the most important maternal health-care services for not only prevention of impairment and disabilities but also reduction of maternal mortality and it extenuates the neonatal death. Recent research revealed that approximately 30% of neonatal deaths occur on the first day of life and 70% occur within seven days of life when mothers might be treated more carefully through PNC services (Baqui et al, 2009). A community-based study in Bangladesh shows that first postnatal care within 48 hours of birth was associated with two-thirds reduction of neonatal deaths (Syed et al, 2011). Research also revealed that the women receiving institutional delivery are more likely to have PNC services and thus institutional delivery practice sometimes identified as the pre-condition of PNC service utilization. This research also revealed that the age at marriage has a profound contribution in increasing PNC service utilization as well as delivery service utilization and odds increase 4.1% for each year increase of age at marriage. Factor associated with place of delivery service utilization like education, wealth position, place of residence have also the similar magnitude of effect in PNC service utilization.

Women's awareness, mental and physical preparation to become a mother and also the bargain and claim related to enjoying more services; all these crucial issues are linked with women's age at marriage. If a woman gets married in her early teens, naturally she becomes less able to bargain and to raise her opinion regarding her own reproductive life. So the decision related to where she will give birth, whether she will enjoy pregnancy related services is mostly dependent on her partners or elderly members of the extended family. These issues are shown from the results of this research as it showed that age at marriage is positively associated with place of delivery and PNC service utilization and enhance the magnitude of service receiving with the increase of each year of marriage delay.

Considering the extensive effort made regarding mother's health care in the last decade, Bangladesh has achieved good progress in ANC service utilization and the results show that the percentage of ANC service receiving is 20% higher than PNC which is 67%. Result also revealed that age at marriage has no significant association with ANC service utilization and this service utilization mostly varied by the educational status of women. The more the women are educated the more they receive ANC services and the difference in utilization is extremely high for the women who have more than secondary level of education and the odds is 9.011 times higher for them in comparison to uneducated women.

It is clear from the results that education is indeed an important variable for all the three pregnancy related service utilizations discussed as outcome variables. In every model the impact of education captured the highest attention but for ANC it is strongest. Interestingly, the primary and secondary education category showed less diverse results considering the magnitude of likelihood, but for the highest category of education (more than secondary) the likelihood jumped tremendously in each model. From that result, it may be concluded that education impacts more when it is more than secondary level of education of women.

In Bangladesh 40% of the population is still living below the poverty line. The wealth status has been found to have a profound impact on pregnancy related service utilization and it exhibits almost similar magnitude of impact on the three service utilizations discussed in this research which is around 3.5 times more for the richest compared to the poorest wealth quintile.

Parity showed a negative impact; the higher the parity decreases the utilization of services. It might reflect the reality that the women consider the event of pregnancy less seriously after their first birth. The result shows that one unit increase of parity decreases the likelihood of utilization of pregnancy related services from 15% to 30% while for the place of delivery it decreases highest, which is 30%.

5.2 Limitation of the study

While accomplishing the research, several limitations have been pointed out that need to be declared before any recommendation or conclusions can be formulated. The limitations might enlighten any future research initiative and also could assist in interpreting the results drawn by this piece of work more realistically.

- In this research, only the utilization status of ANC and PNC was considered; while who is the provider of the services and what their qualifications are was not considered. It can happen in developing settings that the providers are not always qualified enough to offer those services in a standard way.
- The national data was used to capture the status of place of delivery, which is rather a generalized picture of the real scenario. Geographically challenged areas were not analyzed separately.
- Place of residence was categorized into urban and rural, while urban slums required separate analysis because the reality of urban slums are sometimes worse than rural areas, even though it belongs to the urban territory.
- While women encounter the incident of abortion and menstruation regulation (MR), utilization of services in that particular period was not included.
- As the age at first marriage is a previously conducted event, the respondent may produce slightly deviated information from the truth due to recall bias.

5.3 Recommendations

The result and discussion of this research recommends that pregnancy service utilization would be enhanced by addressing the gradual increase of age at first marriage of women and also by providing intense attention on women's socio-economic and demographic reality and situation. Thus research recommends that
- Pregnancy related services utilization is potentially dependant on age at marriage of women in a community and extensive attention is needed to raise the age at first marriage.
- Educational status of women is important indeed but it would not contribute extensively if the attainment of education exceeds secondary level. More than secondary level of education for women should be ensured and effort is required

to remove the obstacles that remain in the society for women not to attend schools after a certain level.

- Inequality due to wealth status needs to be addressed more carefully and in this regard more attention is required to ensure free and less expensive public health facilities especially for pregnant women.
- More comprehensive family planning facilities and services need to be ensured to minimize lower fertility in individual level.
- Media exposure came out as an influential factor for increasing the utilization of services; this needs to be addressed for designing nation wide awareness building campaign.
- Inequalities generated from place of residence need to be addressed carefully since most of service and facilities are urban centered.

5.4 Conclusion

Undoubtedly Bangladesh achieved remarkable progress in reducing maternal mortality, still far more to achieve in regards to infant mortality. The achievement so far accomplished is a combined result of multidimensional effort provided by the Government, the donor agencies and NGOs. Besides, overall development endeavor has latent influence towards the progress regarding maternal health. Despite all of the development efforts embodied throughout the journey of progress and all the enthusiastic appreciation given by the world community for the decreasing rates and figures of maternal mortality of Bangladesh, the grayest area is still the age at first marriage for Bangladeshi women.

As social, cultural and religious taboo closely control social practices as well as encourage early marriage, no short cut development approach can address the issue. Rather an intensive context driven program and initiative is needed to address the issue of early marriage. On the other hand, social security for women is crucial in the reality of Bangladesh that certainly stimulates the incident of early marriage for women; responsibility goes to poor political commitment, social unrest and the feeble law and order situation. The research result clearly suggests that the marriage age could reduce the rate of maternal and infant mortality by increasing the utilization of pregnancy related services. Another important insight is that, any other developing initiative focusing on maternal mortality reduction is expensive than to aware people about the dark side of early marriage. Interestingly, increase of age at first marriage automatically contributes to other human development indicators like education, human development, wealth increase, extended participation of workforce of women and so on as by products.

The frustrating conclusion that came out from various research and empirical evidence that, the progress on increasing age at first marriage in Bangladesh is almost unnoticeable in last two decades while the country showed promising progress on other development indicators; root causes of this particular failure needs to be examined and addressed more delicately as this research firmly recommends that the age at marriage has a substantial contribution on maternal morbidity or mortality and infant mortality. Thus, one of the conclusions of this particular research is to pay attention to enhancing pregnancy services

utilization not only through widening the physical and infrastructural facilities for services; but also educate people about rising age at first marriage; population policy and relevant program should be focused accordingly.

Education, wealth status, place of residence, media exposure, demographic behavior like parity are also found to be significantly associated variables in this research that could ameliorate the utilization of pregnancy related services. Education is noticed as the most influential variable but interestingly that influence is dramatically higher when it crosses a certain limit; the secondary and above. Again education has a close association with age at first marriage too, the more the education achieved the higher the age at first marriage. Conversely when a woman becomes married off, the probability of attaining education is decreased. The conclusion thus points to the opportunity of education for women needs to be addressed carefully and effort is required to extend the opportunity for more than higher secondary level.

This research recommends that each and every aspects of pregnancy related services utilization discussed here in this research are closely interlinked; demand simultaneous attention for improving maternal and infant health in Bangladesh. It is ultimately the question of women's life; matter of infant's survival, so it undoubtedly corresponds to human rights. This research would mold an avenue for further scientific and empirical exploration of research to portray the reality of Bangladeshi women, the reasons and realities behind their pregnancy service utilization and will contribute to formulate more realistic policy recommendations towards the extensive achievement on maternal and infant health situation in Bangladesh.

5.5 Recommended area for further research

The research aimed to portray the utilization of pregnancy services and its cohesion with age at first marriage by controlling some socio-economic and demographic variables. Much more empirical research needs to be accomplished to find out the cause and consequences of early marriage and to capture the reason why this indicator remains stagnant during the last decades. It is also important to portray the policy contribution through scientific research in this regard. Moreover, research needs to be designed on utilization coverage linked with family planning service receiving and with the case of intended and unintended abortion. Last but not least, research focused on certain geographical areas where the rate of early marriage is higher than the national average might give more insight into the ongoing reality of maternal and infant mortality.

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