Individual's Characteristics Affecting Maternal Health Services Utilization: Married Adolescents And Their Use Of Maternal Health Services In Bangladesh

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Abstract
Many women, as well as married adolescent women, in Bangladesh experience life threatening complications during pregnancy and childbirth and also after childbirth. But health services utilization is far under any acceptable standard. The situation of pregnancy and childbirth related morbidity and mortality is worse in Bangladesh because of low utilization of maternal health services. Using data from Bangladesh Demographic and Health Survey–2004, an attempt has been made to investigate maternal health services utilization by ever married adolescent women in Bangladesh. This study, based on the Andersen's health seeking behavior model, considers individual's characteristics which influence health service utilization.

In order to estimate the effects of individual's characteristics on maternal health services utilization, four dependent variables were considered: antenatal care, place of delivery, assistance during delivery and postnatal care; and logistic regression models were estimated for those four dependent variables.

Results reveal that education level is the most significant determinant for increasing utilization of antenatal care, of place of delivery at health facilities, and of assistance at delivery. Type of family has significant impact on place of delivery, and on assistance at delivery. Household wealth index and place of residence are also the significant determinants for antenatal care. Only age at childbirth has statistically significant impact on postnatal care. For raising maternal health services utilization, some long term interventions such as providing education to girls should be emphasized. Short term intervention as community education for adult members of extended families and for ever married adolescent women should be implemented.

INTRODUCTION
Maternal health situation is miserable in Bangladesh. Bangladesh has a high maternal mortality ratio, 322 per 100,000 live births[,] and adolescent (aged 10–19 years) motherhood rate in Bangladesh is one of the highest in the world. Proportion of adolescent women who are mothers or are currently pregnant is the highest (about 35%) in Bangladesh among the Asian countries[,] and it is, may be, one contributory factor to increase the national figure of maternal mortality ratio, because adolescent mothers are more likely to suffer in pregnancy related complications and to die in childbirth than women who are older than 19 years[.] Over one decade, Bangladesh has made slight progress in improving maternal and child health. For example, maternal mortality ratio has dropped from 508 per 100,000 live births in 1989[,] to 322 per 100,000 live births in 2001[,] , and infant mortality rate declined from 87 deaths per 1000 live births in 1993 to 65 deaths per 1000 live births in 2004[)]. Infants born to mothers aged less than 20 years have much higher level of mortality than infants born to mothers aged 20 and/ or more years in Bangladesh[)]. Though pregnancy related mortality ratio (PRMR) is the lowest in the adolescent group in Bangladesh but mortality during pregnancy is the highest in adolescent group compared to older than adolescent group[)]. Like other developing countries, many women, as well as married adolescent women, experience life threatening complications during pregnancy and childbirth and also after childbirth in Bangladesh. The complications of pregnancy or childbearing can be mostly reduced if a woman is healthy and well nourished before becoming pregnant, if she has a health check up by medically trained provider during her pregnancy (antenatal care), if the delivery done at health facility (place of delivery), and if a medically trained provider assists during delivery (assistance at delivery). The mother should
also be checked by health professional (postnatal care) especially during 12 hours after delivery, and also, until six weeks after giving birth.

Government of Bangladesh has strong commitment to deliver health care facilities to general people through innovative approaches like essential service package (ESP) or through other collaborative approaches but health services utilization is far under any acceptable standard [6]. The situation of pregnancy and childbirth related morbidity and mortality is worse in Bangladesh because of low utilization of maternal health services. Since adolescent motherhood rate, in Bangladesh, is one of the highest in the world and among the Bangladesh mothers, adolescent mothers' mortality during pregnancy is higher compared to older mothers, so this study expects to investigate maternal health services utilization by ever married adolescent women in Bangladesh. For lowering morbidity and mortality of adolescent mothers related to pregnancy and childbirth, it is important to raise the utilization of maternal health services by them (adolescent mothers) in Bangladesh. To determine increased health services utilization, characteristics of health services such as availability, accessibility of services are important [7]. Some studies argue that service availability and accessibility are essential for increasing service utilization [4], but only service existence and availability are not enough for increasing service utilization, for example, Basu A.M. in his study on health care use revealed that mere provision of services does not lead to utilization [5]. One study on maternal health services utilization conducted by Matsumura M. and Ghubaju B. argued that characteristics of health service system is not the only explanatory factor for utilization of maternal health services but other factors such as social structure and characteristics of individual should be considered for raising maternal health services utilization [10]. For investigating maternal health services utilization by ever married adolescent women in Bangladesh, this study considers individual's characteristics which influence health service utilization based on health seeking behavior model developed by Anderson R. and Newman J. F. [11] and which is revised by Andersen R.M [12]. The Andersen's health seeking behavior model is a guiding framework of this study for analyzing married adolescents' use of maternal health services in Bangladesh. The mentioned health seeking behavior model hypothesizes that health services utilization by individual, along with social determinants and health services system, is a function of three sets of individual's characteristics of the population: predisposing, enabling (ability to secure the services) and need. Demographic (age, sex, marital status etc.), social structure (education, religion, occupation, family size etc.) and health attitudinal-belief on health and health service use are considered as components of predisposing characteristics [13]. Andersen R and Newman J. F argued that some means (resources) must be need for individual to make use of health services, even though some individual may be predisposed to use those health services [14]. A condition, which make an individual to satisfy a need regarding health services may consider as an enabling factor. Enabling factors may be measured as family resources or other sources which help to use health services, such as health insurance or other type of payment for securing health services. Also some other enabling factors from community level can affect the health service utilization such as place of region and urban-rural nature of the community where the individual's family lives [15]. This study does not consider attitudinal-belief characteristics of individual because of data unavailability. Since all individuals included in the study sample had given live birth (see 3.1), the ‘need’ component of Andersen's health seeking behavior model is controlled by sample selection. This study will identify mothers’ characteristics which affect maternal health services utilization, and it may helpful for policy makers/ service providers regarding maternal health to make future plan(s) or programs for maternal health in Bangladesh. To proceed on analyzing married adolescents' use of maternal health services in Bangladesh, concept of maternal health services and its delivery system in Bangladesh is in order to be introduced.

CONCEPT OF MATERNAL HEALTH SERVICES AND ITS DELIVERY SYSTEM IN BANGLADESH

MATERNAL HEALTH SERVICES

According to International Conference on Population and Development, maternal health services which based on the concept of informed choice should include the following: education on safe motherhood, prenatal/antenatal care that is focused and effective, maternal nutritional programs, adequate delivery assistance that avoids excessive resource to Caesarian sections and provides for obstetric emergencies; referral services for pregnancy, childbirth and abortion complications; postnatal care and family planning [16]. Among those maternal health services, mentioned above, this study focuses on antenatal care, assistance during delivery, and postnatal care. Also place of delivery as a maternal health service included in this study, because delivery at institutional level (government/private...
hospitals/hospitals running by NGOs/clinics/centers or at other type of health facility) receives better facilities and assistance than delivery at home.

MATERNAL HEALTH SERVICES DELIVERY SYSTEM IN BANGLADESH

The largest part of country’s health infrastructure and health service system has been established by Government’s management and control. Ministry of Health and Family Welfare (MOHW) is responsible for comprehensive health policy formulation, planning and decision making in Bangladesh. There are two implementation wings under the MOHFW: (i) Directorate General of Health Services (DGHS) and (ii) Directorate General of Family planning (DGFP). The DGHS and DGFP are responsible for implementing all health programs and family planning programs respectively. In Bangladesh, the health service delivery system in public sector is divided in primary, secondary and tertiary levels. Health services delivery and care facilities providing by public health sector at various levels in Bangladesh are presented in table 1.

The Community Clinics are running for every six thousand population at village level in the country. Also, there are 96 maternal and child welfare centers (MCWCs) established at district level (also with some upazila level). To achieve the Millennium Development Goal 5 (Reduction of maternal mortality ratio to two thirds between 1990 and 2015), maternal health services have been given uppermost priority in the country’s health system.

Figure 1

Table 1: Level and type of health facility in public sector health system, Bangladesh.

<table>
<thead>
<tr>
<th>Level</th>
<th>Administrative Unit</th>
<th>Type of Health Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tertiary</td>
<td>National or Divisional capital</td>
<td>Teesajal Hospital Institute (90*)</td>
</tr>
<tr>
<td>Secondary</td>
<td>District</td>
<td>District Hospital (60*)</td>
</tr>
<tr>
<td>Primary</td>
<td>Upazila</td>
<td>Upazila Health Complex (UHC) (41*)</td>
</tr>
<tr>
<td>Primary</td>
<td>Union</td>
<td>Union Health and Family Welfare Centre (UHFWC) (408**)</td>
</tr>
<tr>
<td>Primary</td>
<td>Ward</td>
<td>Community Clinic (CC)***</td>
</tr>
</tbody>
</table>

The services are provided through nationwide facility system as represented in table 1. Services are provided by the Family Welfare Assistants and Health Assistants at the village level. A Family Welfare Visitor (FWV) and a Sub-assistant Community Medical Officer (SACMO) or Medical Assistants (MA) is/are responsible for providing services at the union level. There are also some graduate medical officers who are involved at UHFWCs for providing maternal health services. At the Upazila level, the Maternal and Child Health (MCH) unit of the Upazila Health Complex (UHC) is providing child health services and maternal health services as well. Through an out patient consultation center and labor ward, district hospitals (DHs) at the district headquarters provide maternal health services.

Besides government sector health services, some private for-profit providers and private not for-profit providers play significant roles for providing health services including maternal health services in the country as well.

METHODS OF ANALYSIS

DATA

For analyzing married adolescents’ use of maternal health services in Bangladesh, data extracted from Individual Recode Data file of Bangladesh Demographic and Health Survey (BDHS)–2004. The sample, used for this study, included those ever married adolescent women (EMAW) who had at least one birth in the five years preceding the survey interview. For those EMAW who had more than one birth, only utilization behavior of maternal health services associated with most recent pregnancy was considered. The sample of this study (for antenatal care, place of delivery and assistance during delivery) consists of 891 ever married adolescent women. For studying postnatal care, this study considers 776 ever married adolescent women (whose last delivery was at home).

STATISTICAL ANALYSIS

In order to estimate the effects of individual’s characteristics on maternal health services utilization, four dependent variables were considered in this study: antenatal care, place of delivery, assistance during delivery and postnatal care. All of these four variables (y) are dichotomous (see 3.3.1). Since dependent variables are dichotomous, logistic regression models were estimated for those four dependent variables. Logistic regression models provide an opportunity to estimate the probability of health service utilization depending on the independent variables included in the model. The logistic regression model for each of four dependent variables was considered as following:
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Figure 2

\[
\text{logit} \left( \frac{y}{1-y} \right) = \ln \left( \frac{y}{1-y} \right) = \ln \left( \frac{P(y=1)}{P(y=0)} \right) = \alpha + \sum \beta x_i
\]

Where, \( \beta = \) regression coefficient
\( \alpha = \) constant
\( x = \) independent variable

And \( \exp(\beta) = \) odds ratio of one individual having characteristics \( i \), (3)

Values of Probability of maternal health services utilization were estimated by using the equation (2).

**VARIABLES CONSIDERED IN THE ANALYSES**

**DEPENDENT VARIABLES**

The study analyses four types of health service utilization: antenatal care, place of delivery, assistance at delivery and postnatal care, and those four health services are dichotomous and included as dependent variables in this study. In this study, dichotomous dependent variables indicate the non-use or use of respective maternal health service. Table 2 shows the descriptive statistics for four dependent variables.

**INDEPENDENT VARIABLES**

Several covariates or characteristics, possessed by study population, based on Andersen's health seeking behavior model (sec 1) were included in the logistic regression model as independent variables, such as predisposing characteristics — age at most recent birth, education level, religion, occupation, family size, and enabling characteristics — household wealth index, place of region and place of residence.

Since people of different age groups have different scale of illness or health complications and consequently different

54% of total sample of EMAW who gave birth five years preceding the survey interview received antenatal care from medically trained provider for their last birth. Urban EMAW were more likely to have received antenatal care from medically trained provider for their last birth than rural EMAW (69.2% and 48.3% respectively).

Place of delivery specifies whether the delivery was at home — respondent’s or others’ home — (coded as 0) or other than home (coded as 1). The other than home category includes all types of deliveries which were done at government/private hospitals/hospitals running by NGOs/clinics/centers or at other type of health facility.

Assistance during delivery indicates assistance received at delivery from medically trained provider. Assistance received from medical doctor, nurse/midwife, family welfare visitor or MA/SACMO is considered as assistance received from medically trained provider and coded as 1. Assistance received during delivery from traditional birth attendant (TBA), relative/friend, untrained TBA, non-qualified doctor, health assistant, and family welfare assistant or from other person except medically trained provider is considered as assistance from medically non-trained provider and coded as 0.

Postnatal care indicates after delivery (at home only, because it is assumed that deliveries at health facility will receive postnatal checkup as a part of routine institutional delivery care) health checkup for mother from health professional (doctor, nurse/midwife, family welfare visitor, MA/SACMO, health assistant or family welfare assistant) which coded as 1 and health checkup for mother from TBA, non-qualified doctor, other person except health professional or no any health checkup is considered as no postnatal care (coded as 0).

Table 2: Descriptive statistics for dependent variables (maternal health services).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>National</th>
<th>Urban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antenatal care</td>
<td>Used antenatal care from medically trained provider</td>
<td>804</td>
<td>100</td>
<td>253</td>
</tr>
<tr>
<td></td>
<td>Yes (1)</td>
<td>408</td>
<td>100</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>No (0)</td>
<td>396</td>
<td>100</td>
<td>177</td>
</tr>
<tr>
<td>Place of delivery</td>
<td>Home Vs. Other than house</td>
<td>804</td>
<td>100</td>
<td>253</td>
</tr>
<tr>
<td></td>
<td>Yes (1)</td>
<td>776</td>
<td>96.7</td>
<td>248</td>
</tr>
<tr>
<td></td>
<td>No (0)</td>
<td>28</td>
<td>3.3</td>
<td>4</td>
</tr>
<tr>
<td>Assistance at delivery</td>
<td>Medical assistance from medically trained provider</td>
<td>804</td>
<td>100</td>
<td>253</td>
</tr>
<tr>
<td></td>
<td>Yes (1)</td>
<td>748</td>
<td>93.4</td>
<td>136</td>
</tr>
<tr>
<td></td>
<td>No (0)</td>
<td>56</td>
<td>6.6</td>
<td>17</td>
</tr>
<tr>
<td>Postnatal care</td>
<td>Used postnatal care from health professional</td>
<td>776</td>
<td>100</td>
<td>458</td>
</tr>
<tr>
<td></td>
<td>Yes (1)</td>
<td>696</td>
<td>91.1</td>
<td>418</td>
</tr>
<tr>
<td></td>
<td>No (0)</td>
<td>80</td>
<td>9.9</td>
<td>40</td>
</tr>
</tbody>
</table>

Note: 1= Unknown
Source: Bangladesh Demographic and Health Survey-2004

Antenatal care indicates whether care was sought from medically trained provider (doctor, nurse/midwife, family welfare visitor, MA/SACMO) which coded as 1; if care was sought from other than medically trained provider or no antenatal care was sought then it was coded as 0. More than

Postnatal care indicates after delivery (at home only, because it is assumed that deliveries at health facility will receive postnatal checkup as a part of routine institutional delivery care) health checkup for mother from health professional (doctor, nurse/midwife, family welfare visitor, MA/SACMO, health assistant or family welfare assistant) which coded as 1 and health checkup for mother from TBA, non-qualified doctor, other person except health professional or no any health checkup is considered as no postnatal care (coded as 0).

**INDEPENDENT VARIABLES**

Several covariates or characteristics, possessed by study population, based on Andersen's health seeking behavior model (sec 1) were included in the logistic regression model as independent variables, such as predisposing characteristics — age at most recent birth, education level, religion, occupation, family size, and enabling characteristics — household wealth index, place of region and place of residence.

Since people of different age groups have different scale of illness or health complications and consequently different
type of health service utilization. Age at most recent birth (last birth) of ever married adolescent women included as independent variable and it was coded as 0 (if age at last birth less than 17 years) and 1 (if age at last birth 17 years and more). Education and culture may affect individual’s health service utilization behavior because (i) educated women are more likely to be informed about modern or even more health services availability in their society; (ii) cultural factors such as religion in case of Bangladesh, may limit or encourage health services utilization behavior [2].

Education included as an independent variable for assessing the effect of adolescent mothers’ education level on maternal health services utilization and was coded as 0 (no education), 1 (primary) and 2 (above primary). Religion, which coded as 0 (Islam) and 1 (other than Islam) and included as an independent variable for controlling the cultural or social structure factor. Occupation has been considered in this study as type of work they involved and is measured as whether the individual worked outside their household (and earned cash) or not. Type of work included as independent variable and it was coded as 0 (not working) and 1 (working).

Family size has been considered as type of family (nuclear or extended) depending on the number of household member and measured as number of adult household member.

We defined family with two adult members as nuclear family and more than two adult members as extended family. Hence depending on family size, type of family included as an independent variable and was coded as 0 (nuclear) and 1 (extended).

Household wealth index was coded as: poorer = 0, poor = 1, middle = 2, richer = 3, and rich = 4. Place of region, division of the country where individual resides, was coded as: Barisal = 0, Chittagong = 1, Dhaka = 2, Khulna = 3, Rajshahi = 4 and Sylhet = 5. Place of residence — urban or rural, was coded as rural = 0, and urban = 1.

LOGISTIC REGRESSION ANALYSIS FOR UTILIZATION OF MATERNAL HEALTH SERVICES

This section displays the results of logistic regression analyses predicting the utilization of maternal health services using various independent variables mentioned in section 3.3.2. Three models for three dependent variables — antenatal care, place of delivery and assistance at delivery - were fitted for all ever married adolescent women who had had at least one birth for national (both urban and rural), urban and rural areas respectively. One model for postnatal care was fitted only for national and rural area, because postnatal care users in urban areas were very few.

USE OF ANTENATAL CARE

The results of logistic regression model fitted for antenatal care are presented in table 3. Among the predisposing characteristics of women only education variable has positive and significant effects on antenatal care in national level. Results show that adolescent women with primary education and above primary education are more likely to use antenatal care than adolescent women with no education. With respect to enabling characteristics of women, household wealth index and place of residence (urban-rural) have positive and statistically significant impact on use of antenatal care in national level. Also some disparities exist in antenatal care utilization between regions. The results derived from rural sample are similar to the results derived from national sample regarding significance of independent variables (but the magnitudes of their impact is not similar); but the results derived from urban sample are not similar with the result of national sample.
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**Figure 4**

Table 3: Logistic regression estimates for use of antenatal care by ever married adolescent women (EMAW), Bangladesh.

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>National</th>
<th>Odd ratio</th>
<th>95% CI</th>
<th>Urban</th>
<th>Odd ratio</th>
<th>95% CI</th>
<th>Rural</th>
<th>Odd ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at last birth</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;17 years (RC)</td>
<td>-0.179</td>
<td>0.824</td>
<td>0.641</td>
<td>0.089</td>
<td>1.00</td>
<td>1.00</td>
<td>0.87</td>
<td>0.69</td>
<td>1.11</td>
</tr>
<tr>
<td>17-19 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>0.81</td>
<td>2.26</td>
<td>1.74</td>
<td>0.68</td>
<td>0.47</td>
<td>0.74</td>
<td>0.71</td>
<td>0.13</td>
<td>0.78</td>
</tr>
<tr>
<td>No education (RC)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Religion</td>
<td>0.33</td>
<td>1.41</td>
<td>1.08</td>
<td>0.89</td>
<td>1.00</td>
<td>1.00</td>
<td>0.94</td>
<td>1.04</td>
<td>1.11</td>
</tr>
<tr>
<td>Islam (RC)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Other than Islam</td>
<td>0.19</td>
<td>1.19</td>
<td>1.00</td>
<td>0.98</td>
<td>1.00</td>
<td>1.00</td>
<td>0.92</td>
<td>1.04</td>
<td>1.06</td>
</tr>
<tr>
<td>Work status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Working (RC)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Working</td>
<td>-0.21</td>
<td>0.81</td>
<td>0.59</td>
<td>0.06</td>
<td>0.90</td>
<td>0.93</td>
<td>0.89</td>
<td>0.91</td>
<td>0.93</td>
</tr>
<tr>
<td>Type of family</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nuclear (RC)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Extended</td>
<td>-0.37</td>
<td>0.70</td>
<td>0.43</td>
<td>0.87</td>
<td>0.56</td>
<td>0.90</td>
<td>0.93</td>
<td>0.77</td>
<td>0.69</td>
</tr>
</tbody>
</table>

For urban sample, no predisposing characteristic of women has significant impact on antenatal care utilization. Only household wealth index has statistically significant impact on antenatal care in urban areas of Bangladesh.

The expected odds, of the adolescent women belong to the household of the highest quintile of the household wealth index, for using antenatal care increase by 11.87%, 23.13% and 1.73% compared to the adolescent women belong to the household of the lowest quintile of the household wealth index for national, urban and rural areas respectively. Also, regional variations regarding antenatal care utilization exist in this study population.

**PLACE OF DELIVERY**

The results of logistic regression estimate for place of delivery are presented at table 4. Education level and type of family from predisposing characteristics of women have statistically significant impact on assistance at delivery in national level of Bangladesh. The EMAW with primary and above primary education are more likely, estimated odds are 1.54 and 2.93 respectively, than EMAW with no education to take assistance at delivery from medically trained provider in national level of Bangladesh.

**ASSISTANCE AT DELIVERY**

Table 5 shows the results of logistic regression estimates for assistance during delivery. Education level and type of family from predisposing characteristics of women have statistically significant impact on assistance at delivery in national level of Bangladesh. The EMAW with primary and above primary education are more likely, estimated odds are 1.54 and 2.93 respectively, than EMAW with no education to take assistance at delivery from medically trained provider in national level of Bangladesh.
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Figure 6
Table 5: Logistic regression estimates for assistance at delivery of ever married adolescent women (EMAW), Bangladesh.

Those EMAW who are member of extended type family are less likely to receive assistance at delivery from medically trained provider than EMAW from nuclear type family. The estimated odds of EMAW who are member of extended type family receiving assistance at delivery from medically trained provider decreased by 79% compared with EMAW from nuclear type of family. Use of health services by EMAW from extended type of family may depends on decision of older members (except husband of respected EMAW) of the family which may, some times, hinders to take assistance at delivery from medically trained provider.

USE OF POSTNATAL CARE

Logistic regression estimates for postnatal care use regarding national sample and rural sample are presented in table 6. Only age at the time of last birth from predisposing characteristics of women has statistically significant impact on postnatal care utilization. Education is also positively associated to raise the postnatal care utilization but not statistically significant.

Figure 7
Table 6: Logistic regression estimates for postnatal care use by ever married adolescent mothers, Bangladesh.

PREDICTED PROBABILITIES FOR USING MATERNAL HEALTH SERVICES

INFLUENCE OF EDUCATION, HOUSEHOLD WEALTH INDEX AND PLACE OF RESIDENCE ON ANTENATAL CARE UTILIZATION

Predicted probabilities for using antenatal care are calculated by using those independent variables which were statistically significant in the logistic regression model. Education level, wealth index and place of residence were shown to have significant impact on antenatal care utilization from medically trained provider in the logistic regression model. Therefore, a separate logistic regression model was fitted with these independent variables to predict the probabilities for receiving antenatal care from medically trained provider:

\[
\text{logit}(\text{probability for using antenatal care}) = 0.275 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3
\]

where, \(X_1 = \text{level of education}= x_{10}=0 \ x_{11}=1 \ x_{12}=2\) , \(\beta_1 = (\beta_{10}=0 \ \beta_{11}=0.311 \ \beta_{12}=0.851)\)

\(X_2 = \text{household wealth index}= x_{20}=0 \ x_{21}=1 \ x_{22}=2 \ x_{23}=3 \ x_{24}=4\) ,

\(\beta_2 = (\beta_{20}=0 \ \beta_{21}=0.645 \ \beta_{22}=0.943 \ \beta_{23}=1.399 \ \beta_{24}=2.496)\).

As shown in figure 1, probability for receiving antenatal care increases as household index increases. There are
differences in predicted probabilities for receiving antenatal care depending on education level and place of residence. The predicted probabilities are clustered together towards the upper end of household wealth index.

**Figure 8**

Figure 1: Predicted probabilities for antenatal care of ever married adolescent women (EMAW), Bangladesh, 2004.

When the household wealth index is high, differences in educational level and place of residence do not seem to affect the antenatal care utilization, but differences in educational level and place of residence seem to affect the antenatal care utilization when the household wealth index is low. At the lowest household wealth index, group of ever married adolescent women with no education and from rural areas have the lowest probability for receiving antenatal care compared to women with primary and above primary and from rural areas; also same results hold for women from urban areas. Probability for receiving antenatal care of a woman in rural areas with no education and belongs to lowest quintile of household wealth index is \[\frac{1}{1+e^{0.275+0.311(1)+0(0)}} = 0.5683\] only 0.56, those (probabilities) of woman in rural areas with primary and above primary education and belongs to lowest quintile of household wealth index are \[\frac{1}{1+e^{0.275+0.851(2)+0(0)}} = 0.8784\] 0.87 respectively. The probability for receiving antenatal care of a woman in urban areas with no education and belongs to lowest quintile of household wealth index is \[\frac{1}{1+e^{-0.275+0.0(0)+0(0)+0.363(1)}} = 0.6424\] 0.64 and \[\frac{1}{1+e^{-0.275+0.0(0)+0.363(1)}} = 0.8784\] 0.87 respectively. However, even in scarce of resources, though women from urban areas are more likely to use antenatal care than women from rural areas, but education has an impact to raise the antenatal care utilization both in urban and rural areas.

**INFLUENCE OF EDUCATION AND TYPE OF FAMILY ON PLACE OF DELIVERY**

In the logistic regression model for assessing the influence of individual’s characteristics on place of delivery, education level and type of family have shown statistically significant effects. So, for predicting probabilities for place of delivery at health facility (other than home) another logistic regression model was fitted with education level and type of family as independent variables. The form of the logistic regression model as the following:

\[
\text{logit}(\text{probability for place of delivery at other than home}) = -1.217 + \beta_1 X_1 + \beta_2 X_2
\]

where, \(X_1 = \text{level of education} = (x_{10} = 0, x_{11} = 1, x_{12} = 2)\), 
\(\beta_1 = (\beta_{10} = 0, \beta_{11} = 0.605, \beta_{12} = 1.674)\)

\(X_2 = \text{type of family} = (x_{20} = 0, x_{21} = 1)\), 
\(\beta_2 = (\beta_{20} = 0, \beta_{21} = -1.115)\).

**Figure 9**

Figure 2: Predicted probabilities for place of delivery of ever married adolescent women (EMAW), Bangladesh, 2004.

The predicted probabilities for delivering at health facility (other than home) show the impacts of type of family and education level on place of delivery (figure 2). EMAW from nuclear type of family were more likely to use health facility (other than home) for their last child delivery than EMAW from extended type of family. EMAW from extended type of families, maybe, have less decision making power regarding health services utilization. Probabilities for using health facilities (other than home) for recent (last) child delivery increases as education level of EMAW increases at both types of family. Probability for delivering at health facility
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The probability for delivering at health facility (other than home) of EMAW from nuclear type of family with no education is 0.23 \[\frac{1}{1+e^{-0.1217+0(0)+0(0)+0(0)}} = 0.2285\], and those (probabilities) of EMAW from nuclear type of family with primary and above primary education are 0.35 \[\frac{1}{1+e^{-1.217+0.605(1)+0(0)+0(0)}} = 0.3516\] and 0.89 \[\frac{1}{1+e^{-1.217+1.674(2)+0(0)}} = 0.8938\] respectively. Therefore, education has an impact to raise the use of health facilities (other than home) as place of delivery even for controlling the type of family.

INFLUENCE OF EDUCATION AND TYPE OF FAMILY ON ASSISTANCE AT DELIVERY

Education level of EMAW and type of family, where they lived, has shown statistically significant effects on receiving assistance at delivery in the logistic regression model. Therefore, a different logistic regression model was fitted for predicting the probabilities for receiving assistance at delivery from medically trained provider with education level and type of family as independent variables. The shape of the logistic regression model as under:

\[
\text{logit(probability for receiving assistance at delivery from medically trained provider)} = -0.920+\beta_1 X_1+\beta_2 X_2
\]

where, \[X_1= \text{ level of education}= (x_{10}=0 x_{11}=1 x_{12}=2)\]

\[\beta_1 = (\beta_{10}=0 \beta_{11}=0.419 \beta_{12}=1.577)\]

\[X_2= \text{type of family}= (x_{20}=0 x_{21}=1)\]

\[\beta_2 = (\beta_{20}=0 \beta_{21}=-1.127)\]

As displayed in figure 3, education shows remarkable impact on receiving assistance at delivery from medically trained provider. The probability for receiving assistance at delivery from medically trained provider of EMAW from nuclear type of family with no education is 0.28 \[\frac{1}{1+e^{-0.0920+0(0)+0(0)}} = 0.2849578\], and those (probabilities) for receiving assistance at delivery from medically trained provider of EMAW from nuclear type of family with primary and above primary education are 0.11, 0.16 and 0.76 respectively. Therefore, education has an influence to EMAW for receiving assistance from medically trained provider during delivery even controlling for type of family. Also, type of family shows modest impact on receiving assistance at delivery from medically trained provider. EMAW from nuclear type of family are more likely to receive assistance at delivery from medically trained provider than EMAW from extended type of family. In the extended type of family, decision regarding health service seeking, may be made by other adult member(s) of the family and which tends to hold EMAW to receive assistance during delivery from medically trained provider.

CONCLUSION

This study indicates that antenatal care (ANC) utilization by EMAW during their last birth is only about 54%, which is not so impressive. Also, percentages of other maternal health services utilization by EMAW during their last birth are very low (table 2) in Bangladesh. Andersen's health seeking behavior model and logistic regression models have been used to identify most influential characteristics which have significant impact on maternal health services utilization.

Results of analyses reveal that among the predisposing characteristics of EMAW, education level of EMAW is the most significant determinant for increasing utilization of antenatal care form medically trained provider, of place of delivery at health facilities (other than home), and of assistance at delivery from medically trained provider. Also another individual's predisposing characteristic, family size
or type of family, has significant impact on place of delivery, and on assistance at delivery. Among the enabling factors of individual's characteristics, household wealth index and place of residence are the significant determinants for antenatal care. Only age at childbirth has statistically significant impact on postnatal care (whose delivery was at home is considered for postnatal care). Since education level as above primary and even primary level education can increase the chances of an EMAW's use of maternal health services (ANC, place of delivery and assistance at delivery), so for raising maternal health services utilization by EMAW in Bangladesh, some long term interventions, such as providing education to girls, should be emphasized.

Type of family has impacts on maternal health services (place of delivery, assistance at delivery ) utilization, EMAW from extended type of family are less likely to use, so short term intervention as community education for adult members of extended families and for EMAW, about symptoms of complications during pregnancy and at delivery, about importance of treatment should be implemented. Meanwhile, any effort to raise place of delivery at institutional level (other than home) will automatically increase the postnatal care utilization. For raising ANC utilization, programs for maternal health services should target EMAW from low household wealth index at both in urban and rural areas which could help to increase utilization of ANC services.

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References

2. An index of household economic status was created in the BDHS-2004 report depending on household ownership of assets (durable goods and land) and use of selected services (electricity, source of drinking water, sanitation facility, cooking fuel, main roof material, main wall material, and floor material). A single wealth index was developed for the whole sample and the sample was divided into quintiles from lowest to highest (fifth), which is also available in the Individual Recode Data file of BDHS-2004 data file.

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