



Open Access Full Text Article

RESEARCH ARTICLE

Factors associated with safe delivery practices in Bangladesh

[Facteurs associés aux pratiques d'accouchement sécuritaires au Bangladesh]

Md. Mortuza Ahmmed¹

¹Department of Mathematics,
American International
University – Bangladesh

Correspondence:

Md. Mortuza Ahmmed,
Assistant Professor,
Department of Mathematics,
American International
University – Bangladesh
(AIUB), Ka-66/1, Kuratoli Road,
Kuril, Khilkhet, Dhaka 1229,
Bangladesh

Email:

mortuza@aiub.edu

Article received:
23 November 2017

First response:
26 November 2017

Article accepted:
27 December 2017

Abstract: Infant and maternal health and safety are often high on the agenda of governments in developing countries. Giving such women freedom of choice in decision-making has the potential to enhance the proportion of safe delivery practices and to improve infant and maternal health and safety. However, in many countries, few women participate in decision-making because of cultural traditions. The objective of this study was to identify the household characteristics, especially those of women that have significant relationships with safe delivery practices (i.e., delivery that occurred in the presence of doctors or trained healthcare professionals) in Bangladesh. The effects of the socio-demographic variables on the pursuit of safe delivery practices were evaluated through logistic regression analysis. The study is based on secondary data drawn from the Bangladesh Demographic and Health Survey (BDHS), 2011. The results suggest that several socio-demographic factors have significant associations with safe delivery practices in Bangladesh, especially education (woman and husband), previous access to antenatal care, and exposure to mass media. The choice of safe delivery practices is highly influenced by the household's and the woman's characteristics and health institutions in Bangladesh should consider these to improve the effectiveness of their policies.

Keywords: safe delivery practices, maternal health, Bangladesh Demographic and Health Survey (BDHS), logistic regression model.

Résumé : La santé et la sécurité des nourrissons et des mères sont souvent au premier rang des priorités des gouvernements des pays en développement. Donner aux femmes la liberté de choix dans la prise de décision peut permettre d'accroître le recours aux pratiques d'accouchement sécuritaires et d'améliorer la santé et la sécurité des nourrissons et des mères. Cependant, dans de nombreux pays, peu de femmes participent à la prise de décision en raison des traditions culturelles. L'objectif de cette étude était d'identifier les caractéristiques du ménage, en particulier celles des femmes, qui ont des relations significatives avec les pratiques d'accouchement sécuritaires (i.e. accouchement en présence de médecins ou de professionnels de la santé formés) au Bangladesh. Les effets des variables sociodémographiques sur le choix de pratiques d'accouchement sécuritaires ont été évalués au moyen d'une analyse de régression logistique. L'étude est basée sur des données secondaires tirées de l'Enquête Démographique et de Santé du Bangladesh, 2011. Les résultats suggèrent que plusieurs facteurs sociodémographiques ont des liens significatifs avec les pratiques d'accouchement sécuritaires au Bangladesh, en particulier l'éducation (femme et mari), l'accès antérieur à des soins prénataux et l'exposition aux médias de masse. Le choix de pratiques d'accouchement sécuritaires est fortement influencé par les caractéristiques du ménage et de la femme, et les institutions de santé du Bangladesh devraient considérer celles-ci afin d'améliorer l'efficacité de leurs politiques.

Mots clés : pratiques d'accouchement sécuritaires, santé maternelle, Enquête Démographique et de Santé du Bangladesh, modèle de régression logistique.

©2017 Ahmmed, publisher
and licensee CybelePress.com.
This is an Open Access article,
allowing unrestricted non-
commercial use, provided the
original work is properly cited.

Introduction

Bangladesh was the home of over 140 million people, per the latest census report, in 2011 [1]. It has made outstanding progress in improving maternal as well as child health during the last few decades. Infant mortality has dropped from 175 to 37 per 1,000 live births between 1960 and 2011 [2]. Despite such progress, only 55% of women delivered children with a medically trained provider in 2011 [3]. A leading cause for infant and maternal mortality in Bangladesh is the low utilization of available health care services, like antenatal care and skilled birth attendance at delivery [4]. Particularly, antenatal care by medically trained personnel is an intrinsic source of safe delivery practices [4].

Complications at the time of delivery are among the principal causes of maternal mortality in Bangladesh [5]. Many initiatives have been initiated over the years by the government as well as non-governmental organizations (NGOs) to reduce both maternal and child mortality. Despite this, the maternal mortality ratio (MMR) is still high (194 per 100,000 live births in 2010) [6]. A considerable number of deliveries take place at home, where the deliveries are assisted by Traditional Birth Attendants (TBAs) or relatives. Since, in Bangladesh, TBAs are not trained healthcare professionals, this represents a risk for infant and maternal health and safety. Due to cultural traditions, women face serious difficulties in freely choosing the delivery attendants that are most convenient for them. The situation is, however, improving day-by-day due to the growing levels of education and consciousness among the people.

In recent years, the government of Bangladesh enhanced, in a phased style, the tangential-level public health facilities' ability to provide basic and extensive emergency obstetric care services. A demand-side financing maternal health voucher scheme was introduced in 2007 to increase the usage of maternal health care services [7], yet there was no momentum in

developing such access to all the sections of society. Care-seeking is molded by supply as well as demand; developing supply is not always sufficient to boost access. Hence, we need to figure out the role of socio-demographic variables in determining the pursuit of safe delivery practices in Bangladesh. The aim of safe delivery practices is to ensure safe and hygienic conditions during pregnancy. In this paper, we shed some light on this issue and tried to assess the factors related to this. By doing this, we were able to identify which factors potentially influence the choice to pursue safe delivery practices in Bangladesh.

Historic trends

A graphical comparison between the trends of safe delivery practices and the under-5 mortality rate over the years is shown in Figure 1; these data are from the summary reports published by the BDHS. As we can see, there were substantial shifts in both trends but in opposite directions. The percentage of safe delivery practices increased over the years and the under-5 mortality rate (per 1,000) decreased during the same period.

In Figure 2, we can visualize the trends in the maternal mortality rate in Bangladesh [2]. The maternal mortality rate (per 100,000 live births) declined from 399 in 2000 to 176 in 2015. These drops in maternal and child death rates are a positive consequence of increasing health care facilities' safe delivery practices over the last two decades [5].

Methodology

The study is based on national-level data drawn from the Bangladesh Demographic and Health Survey (BDHS), 2011. It was the sixth such survey conducted by the National Institute of Population Research and Training (NIPORT) under the government of Bangladesh. In the survey, 17,842 women, aged 15-49, were interviewed. Our focus was on the respondents that had children under five years of age at the time of the survey. Finally, after excluding missing data

from the adjusted dataset, the final database used in the analysis included 6,241 respondents. We studied the association between safe delivery practices

and various socio-demographic variables by the chi-square test. A significant association was determined by a chi-square test result with a p-value ≤ 0.05 .

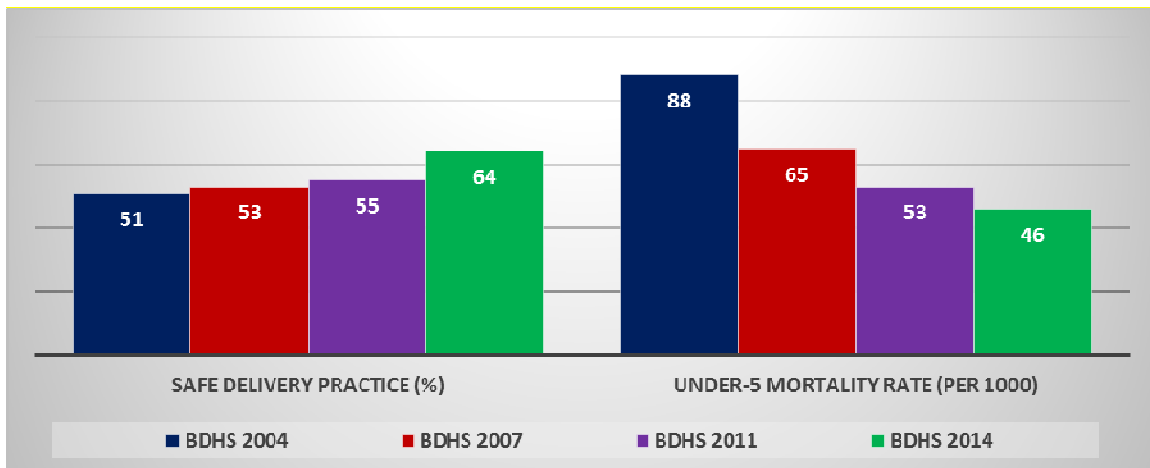


Figure 1: Trends in safe delivery practices and under-5 mortality rate in Bangladesh

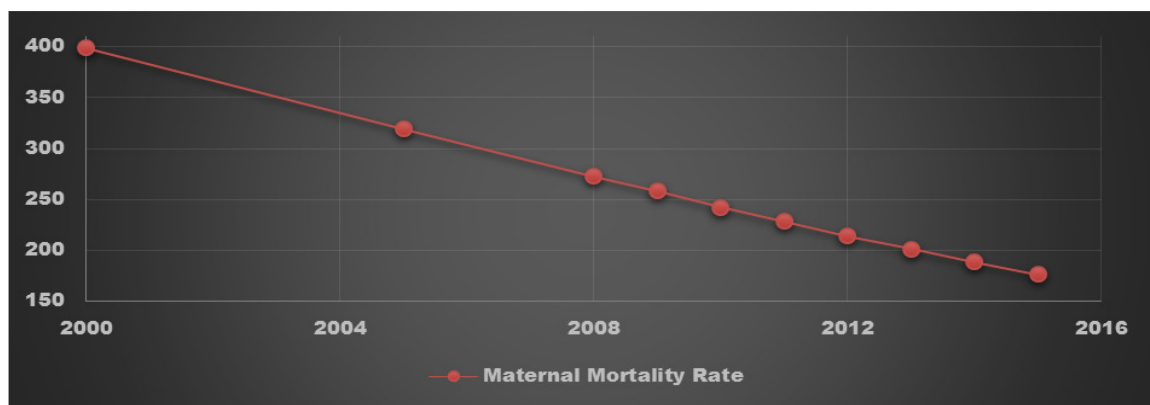


Figure 2: Trends in maternal mortality rate in Bangladesh

A logistic regression model was fitted using safe delivery practices as the dependent variable and selected socio-demographic variables as independent variables. The initial choice of socio-demographic variables was based on the model of Grossman [8] and from empirical studies [9-13]. The final selection of independent variables was done based on the bivariate analysis (along with the chi-square test), which indicated which variables were significantly associated with our dependent variable and which were not. Variables showing significant associations with the dependent variable were included in the logistic regression model. Logistic regression is the relevant regression analysis to conduct

when the dependent variable is dichotomous; it is used to explain the relationship between a dependent variable and one or more explanatory variables which are of the nominal, ordinal, interval or ratio levels. It does not need any assumptions regarding the distributions of the explanatory variables. It provides an estimated value for the strength of the association, adjusting for other variables. The exponential of the coefficients represents odd ratios (OR) for the corresponding variable.

The analysis was performed using SPSS version 20.0. The dependent variable was dichotomous: it was given a value of 1 if the delivery was attended by trained medical

personnel (i.e., medical doctor, nurse, or midwife) and given value 0 otherwise. The model was fitted as:

$$E(y) = \frac{e^{\beta X}}{1 + e^{\beta X}},$$

$$\beta = [\beta_0, \beta_1, \beta_2, \dots, \beta_{11}],$$

$$X = [x_1, x_2, x_3, \dots, x_{11}]'$$

where y = safe delivery practices, x_1 = age of the respondents, x_2 = area of residence, x_3 = religion of the respondents, x_4 = education of the respondents, x_5 = husband's education, x_6 = employment of the respondents, x_7 = wealth index of the respondents, x_8 = place of delivery, x_9 = exposure to mass media, x_{10} = antenatal care, and x_{11} = belonging to NGO.

The variable "exposure to mass media" was calculated by combining three factors from the BDHS, namely: reading newspapers or magazines, watching television, and listening to radio. If one or more of these media were identified, the variable took the value 1 and 0 otherwise. Similarly, the variable "antenatal care" was calculated by combining the factors ANC (antenatal care) doctor, ANC nurse, ANC FWV (family welfare visitor), ANC MA (medical assistant), or SACMO (sub-assistant community medical officer), ANC CSBA (community skilled birth attendant), and ANC TTBA (traditionally-trained birth attendant).

Results

The background characteristics of the respondents are shown in Table 1. A large proportion of the respondents (82.2%) belonged to the age group 18-35. About two-thirds of them resided in rural areas and most were Muslim (91.2%). About 30.4 percent of the respondents experienced their delivery in safe conditions with a trained specialist, and a significant portion of them (81.6%) had their deliveries at home. The percentage of deliveries in safe conditions was lower in this subsample of the BDHS since some observations were dropped from the whole survey. As indicated in the methodology section, some

respondents have missing data and those were dropped to perform our analysis. The results from Table 1 also show that there were almost equal numbers of respondents from the poor and rich categories of the wealth index. Most of the respondents (77%) were unemployed. The percentage of participants with a higher level of education was considerably low for both the respondents (7.3%) and their husbands (11.9%). More than one-third (36.4%) of the respondents belonged to different types of NGOs and only 15.5% were exposed to mass media.

The results of the chi-square test are shown in Table 2. We can see that all the socio-demographic variables in our study have significant associations with safe delivery practices.

Muslim respondents were associated with a relatively higher rate of unsafe delivery practices (70.3%), but the difference is small and is different for women with a primary-level or illiterate-level education. The high association with education was expected as it plays a vital role in decision-making regarding various household-related issues, including childbirth and family planning. The husband's education is also very important as he is typically the family head in Bangladesh, and his decision-making power has significant impact.

Surprisingly, women that belong to different types of NGOs have a higher rate of unsafe delivery practices. Bangladesh is a country with one of the biggest NGO sectors in the globe. This sector generates job opportunities for women in rural areas to involve them in economic activities, which empower them as well as offer them a superior role in family life and decision-making. NGOs have been associated with health care services right from the beginning. Along with help from the government, NGOs enabled Bangladesh's extensive coverage of many health interventions. The initiatives undertaken by different NGOs have played a vital role in improving maternal health and reducing child mortality in Bangladesh [14].

Consequently, this negative correlation was unexpected and could be attributable to the fact that NGOs mainly target the most

vulnerable, thus reflecting an endogeneity effect.

Table 1: Distribution of respondents by socio-demographic characteristics

| | | Frequency | Percentage |
|------------------------|--------------|-----------|------------|
| Age | Below 18 | 559 | 9.0 |
| | 18-35 | 5128 | 82.2 |
| | Above 35 | 554 | 8.9 |
| | Total | 6241 | 100.0 |
| Residence | Urban | 2137 | 34.2 |
| | Rural | 4104 | 65.8 |
| | Total | 6241 | 100.0 |
| Religion | Muslim | 5693 | 91.2 |
| | Hindu | 502 | 8.0 |
| | Others | 46 | .7 |
| | Total | 6241 | 100.0 |
| Education | No education | 1728 | 27.7 |
| | Primary | 3641 | 58.3 |
| | Secondary | 419 | 6.7 |
| | Higher | 453 | 7.3 |
| | Total | 6241 | 100.0 |
| Wealth index | Poor | 2541 | 40.7 |
| | Middle | 1165 | 18.7 |
| | Rich | 2535 | 40.6 |
| | Total | 6241 | 100.0 |
| Employment | No | 4805 | 77.0 |
| | Yes | 1436 | 23.0 |
| | Total | 6241 | 100.0 |
| Husband's education | No education | 2132 | 34.2 |
| | Primary | 1775 | 28.4 |
| | Secondary | 1592 | 25.5 |
| | Higher | 742 | 11.9 |
| | Total | 6241 | 100.0 |
| Place of delivery | Home | 5091 | 81.6 |
| | Outside | 1150 | 18.4 |
| | Total | 6241 | 100.0 |
| Exposure to mass media | No | 5274 | 84.5 |
| | Yes | 967 | 15.5 |
| | Total | 6241 | 100.0 |
| Belonging to NGO | No | 3972 | 63.6 |
| | Yes | 2269 | 36.4 |
| | Total | 6241 | 100.0 |
| Antenatal Care | No | 3558 | 57.0 |
| | Yes | 2683 | 43.0 |
| | Total | 6241 | 100.0 |
| Safe Delivery | No | 4343 | 69.6 |
| | Yes | 1898 | 30.4 |
| | Total | 6241 | 100.0 |

In case of deliveries at home, there is higher rate of unsafe delivery practices. This is not surprising since when childbirth happens outside the home, it occurs in places like

government hospitals, health complexes, maternal and child welfare centers, private hospitals, or clinics, etc., where trained specialists are present.

Table 2: Distribution of respondents by safe delivery practices and socio-demographic characteristics

| | | Safe delivery practices (%) | | Total | Significance |
|------------------------|------------|-----------------------------|------|-------|---------------------------------------|
| | | Yes | No | | |
| Age | Below 18 | 2.7 | 6.3 | 9.0 | $\chi^2 = 14.292$ p-value = 0.001 |
| | 18-35 | 25.6 | 56.5 | 82.1 | |
| | Above 35 | 2.1 | 6.8 | 8.9 | |
| | Total | 30.4 | 69.6 | 100 | |
| Residence | Urban | 15.8 | 18.4 | 34.2 | $\chi^2 = 384.375$ p-value = 0.000 |
| | Rural | 14.6 | 51.2 | 65.8 | |
| | Total | 30.4 | 69.6 | 100 | |
| Religion | Muslim | 27.1 | 64.1 | 91.2 | $\chi^2 = 13.184$ p-value = 0.001 |
| | Hindu | 3.0 | 5.0 | 8.0 | |
| | Others | 0.3 | 0.5 | 0.8 | |
| | Total | 30.4 | 69.6 | 100 | |
| Education | Illiterate | 4.0 | 23.7 | 27.7 | $\chi^2 = 740.832$ p-value = 0.000 |
| | Primary | 17.6 | 40.7 | 58.3 | |
| | Secondary | 3.1 | 3.6 | 6.7 | |
| | Higher | 5.7 | 1.6 | 7.3 | |
| Wealth index | Poor | 6.5 | 34.2 | 40.7 | $\chi^2 = 749.849$ p-value = 0.000 |
| | Middle | 3.8 | 14.9 | 18.7 | |
| | Rich | 20.1 | 20.5 | 40.6 | |
| | Total | 30.4 | 69.6 | 100 | |
| Employment | Yes | 6.2 | 16.8 | 23.0 | $\chi^2 = 9.326$ p-value = 0.002 |
| | No | 24.2 | 52.8 | 77.0 | |
| | Total | 30.4 | 69.6 | 100 | |
| Husband's Education | Illiterate | 5.7 | 28.5 | 34.2 | $\chi^2 = 801.913$ p-value = 0.000 |
| | Primary | 6.6 | 21.8 | 28.4 | |
| | Secondary | 10.0 | 15.5 | 25.5 | |
| | Higher | 8.2 | 3.7 | 11.9 | |
| Place of delivery | Home | 13.7 | 67.9 | 81.6 | $\chi^2 = 2420.88$ p-value = 0.000 |
| | Outside | 16.7 | 1.7 | 18.4 | |
| | Total | 30.4 | 69.6 | 100 | |
| Exposure to mass media | Yes | 8.8 | 6.7 | 15.5 | $\chi^2 = 369.887$ p-value = 0.000 |
| | No | 21.6 | 62.9 | 84.5 | |
| | Total | 30.4 | 69.6 | 100 | |
| Belonging to NGO | Yes | 9.7 | 26.7 | 36.4 | $\chi^2 = 23.112$ p-value = 0.000 |
| | No | 20.7 | 42.9 | 63.6 | |
| | Total | 30.4 | 69.6 | 100 | |
| Antenatal care | Yes | 20.4 | 22.6 | 43.0 | $\chi^2 = 650.988$ p-value = 0.000 |
| | No | 10.0 | 47.0 | 57.0 | |
| | Total | 30.4 | 69.6 | 100 | |

Similarly, women with poor economic status have a higher rate of unsafe delivery practices as financial inability restricts their access to the many health-related facilities that are not free of charge [15]. More surprising is the fact that a high proportion of richer women still choose unsafe delivery practices. Indeed, the proportions of both safe (20.1%) and unsafe (20.5%) delivery practices are identical in the case of rich women. This is an important argument in considering that safe delivery practices are a result of choice as rich people continue to have unsafe delivery practices despite being able to afford safe delivery practices.

It is also important to note that women in Bangladesh do not possess equal rights to their male counterparts in decision-making. Their movement as well as decision-making authority are strictly regulated at home. In 48% of cases, their husbands alone make decisions about their health [16]. This could explain why unsafe delivery practices are still high in Bangladesh; however, this situation is changing as women are more and more educated and have access to more opportunities. In our study, this is echoed by the fact that women above 35 have the highest percentage of unsafe delivery practices (76.4%).

The logistic regression results are shown in Table 3. The likelihood of safe delivery practices decreased with age according to our result, which is congruent with the fact that old cultural habits are more anchored in older age groups. However, at the same time, we have to consider that the legitimate age of marriage for women is 18 years in Bangladesh as per the constitution, though many marriages occur before 18 years of age, even if the percentage of women marrying before the authorized age has declined from 73% in 1989 to 65% in 2011 [3]. Since a large proportion of women get married and start childbearing during their teenage years (31%), they may have felt that they had sufficient knowledge and experience to handle the complications regarding delivery [17]. Only a proper education could have helped them to overcome this misconception, but as we can

see from Table 2, only 14% of the respondents got the opportunity to continue their education above the primary level. Therefore, they may show interest in any assistance during their pregnancy period. Moreover, many of these women suffer from typical cultural traditions that make them and their children vulnerable [18]. For example, the mother and child are separated just after the delivery because of beliefs about contamination linked to the delivery process. Their incarceration is believed to save them from the risk of disease and evil spirits. The incarceration period can continue up to 40 days [18].

The education levels of the respondents as well as their husbands are two crucial factors that affect safe delivery practices. Educated mothers were 1.262 times more likely to have safe delivery practices than illiterate mothers.

The economic status of the respondents showed a significant association with safe delivery practices. Rich women were 1.372 times more likely to have safe delivery practices than poor women. Women's economic autonomy has a causative relationship with their health care-seeking behavior [19]. As expected, women whose delivery took place outside the home were 31.184 times more likely to have safe delivery practices than those whose delivery took place at home. Most deliveries occur at home in this country: approximately eighty percent of the country is rural [20] and delivery at home is very common in the rural areas of Bangladesh. When the pain starts, a rural woman generally notifies her husband about it. He then asks for help from his mother, relatives, or neighboring women. They try their level best to deliver by themselves. They call in a TBA as soon as they fail in their attempts. If she fails, the respondent is then taken to a nearby clinic or hospital. Generally, the respondent does not possess any choice about her delivery management in any of the phases of her delivery. It is the decision of the household, rather than the respondent, that plays a decisive role in safe delivery practices.

Table 3: Logistic regression results

| | | β | S.E. | Wald | p-value | OR(e^{β}) | 95% CI for OR | |
|------------------------|------------|---------|------|--------|---------|-------------------|---------------|--------|
| | | | | | | | Lower | Upper |
| Age | <35 | - | - | - | - | 1 | - | - |
| | ≥ 35 | -.313 | .146 | 4.611 | .032 | .732 | .550 | .973 |
| Residence | Urban | - | - | - | - | 1 | - | - |
| | Rural | -.455 | .078 | 33.793 | .000 | .635 | .544 | .740 |
| Religion | Others | - | - | - | - | 1 | - | - |
| | Muslim | -.181 | .126 | 2.061 | .151 | .834 | .651 | 1.068 |
| Education | Illiterate | - | - | - | - | 1 | - | - |
| | Literate | .233 | .096 | 5.835 | .016 | 1.262 | 1.045 | 1.524 |
| Wealth Index | Poor | - | - | - | - | 1 | - | - |
| | Rich | .316 | .086 | 13.586 | .000 | 1.372 | 1.159 | 1.622 |
| Employment | Yes | - | - | - | - | 1 | - | - |
| | No | .029 | .087 | .112 | .738 | 1.030 | .868 | 1.222 |
| Husband's education | Illiterate | - | - | - | - | 1 | - | - |
| | Literate | .161 | .089 | 3.263 | .071 | 1.174 | .986 | 1.398 |
| Place of delivery | Home | - | - | - | - | 1 | - | - |
| | Outside | 3.440 | .112 | 939.57 | .000 | 31.184 | 25.027 | 38.856 |
| Exposure to mass media | No | - | - | - | - | 1 | - | - |
| | Yes | .557 | .099 | 31.780 | .000 | 1.745 | 1.438 | 2.118 |
| Belonging to NGO | Yes | - | - | - | - | 1 | - | - |
| | No | .013 | .076 | .027 | .870 | 1.013 | .872 | 1.176 |
| Antenatal care | No | - | - | - | - | 1 | - | - |
| | Yes | .760 | .076 | 100.39 | .000 | 2.138 | 1.843 | 2.481 |

S.E. standard error; OR odd-ratio; CI confidence interval.

Women with exposure to mass media were 1.745 times more likely to have safe delivery practices than those who lacked such exposure. The relationship between them was also highly significant (p-value = 0.000). Mass media helps to create awareness among people about the complications that could arise from unsafe delivery practices [21]. From Table 3, we also see that antenatal care of the respondents was highly significantly associated with safe delivery practices. Women having antenatal care were 2.138 times more likely to have safe delivery practices than those who did not.

Discussion

In this study, we tried to assess the impact of various important socio-demographic factors on maternal delivery practices. Poor socio-economic status, cultural obstructions, social customs, and, most importantly, lack of proper education

generally avert women from accessing healthcare services. Moreover, it is the husband who decides about maternal healthcare in most cases. Very simple healthcare practices are often overlooked by their respective families because it is against either social customs or general principle. As a consequence, women are frequently unable to realize when and why it is necessary to pursue safe delivery practices [22]. In this setting, our study showed that education is all the more important to increase the use of safe delivery practices. Despite education being made free for girls by the government, the dropout rates continue to be high [23]; if pursued, however, education has positive consequences on developing health consciousness.

Another finding of our study is that women who are not exposed to mass media, that is, are not able to read newspapers or magazines, watch television,

or listen to radio, more frequently have unsafe delivery practices. This finding matches another relevant study [21] and can be explained by the fact that women are potentially unaware of the latest advancements of medical science and other relevant information regarding pregnancy and maternal as well as child health. As expected, the rate of unsafe delivery practices is also higher in the case of women who are not provided with proper antenatal care.

A major strength of our study is that we used individual data from 6,241 respondents. However, we did not use the other BDHS available. With those databases, we could have performed panel estimates, which would have provided more information and probably richer analyses.

This study will help the respective ministry of the government to customize their existing plans to improve maternal and child health. The government should work together with the NGOs and other health agencies active in Bangladesh to ensure that female education be continued up to a higher level and provide them proper knowledge about their reproductive health. Media agencies should play their role in creating awareness among our society about maternal health care as well as the negative consequences of early marriage. In this setting, more initiatives should be taken to empower our women [12].

Conclusion

This study provided information based on secondary data available from BDHS, 2011. Although some studies have been conducted regarding the mentioned theme, relatively little research has focused on issues like women's decision-making behavior, which is part of women's empowerment. We must focus on this matter seriously because unsafe delivery practices in turn will lead to maternal and child mortality. The findings of this study suggest which factors to act upon so as to prepare a plan to ensure maternal and child health.

Acknowledgments

The author thanks the National Institute of Population Research and Training (NIPORT) for providing the BDHS database and two anonymous reviewers for their comments on previous versions of this paper.

Funding

None.

Conflicts of interest

The author declares that he has no conflicts of interest.

References

- [1] Banglapedia. Census. National Encyclopedia of Bangladesh. 2011. Available at: <http://en.banglapedia.org/index.php?title=Census>.
- [2] The World Bank. Infant mortality ratio. 2011. Available at: <https://data.worldbank.org/indicator/SH.STA.MMRT?locations=BD&view=chart>.
- [3] National Institute of Population Research and Training. Bangladesh demographic and health survey 2011. Dhaka: National Institute of Population Research and training; 2011.
- [4] Kishowar Hossain AH. Utilization of antenatal care services in Bangladesh: an analysis of levels, patterns, and trends from 1993 to 2007. *Asia Pac J Public Health* 2010;22(4):395–406.
- [5] Haider MR, Rahman MM, Moinuddin M, Rahman AE, Ahmed S, Khan MM. Impact of maternal and neonatal health initiatives on inequity in maternal health care utilization in Bangladesh. *PLoS ONE* 2017;12(7):e0181408.
- [6] National Institute of Population Research and Training (NIPORT). Bangladesh Maternal Mortality and Health Care Survey 2010. Dhaka, Bangladesh: NIPORT, MEASURE Evaluation, and ICDDR, B; 2011.
- [7] Anwar I, Nababan HY, Mostari S, Rahman A, Khan JAM. Trends and Inequities in Use of Maternal Health Care Services in Bangladesh, 1991-2011. *PLoS ONE* 2015;10(3):e0120309.
- [8] Grossman M.. The demand for health: a theoretical and empirical investigation. NBER Occasional Paper 119. New York: National Bureau of Economic Research; 1972.
- [9] Poder TG, He J. How can sanitary infrastructures reduce child malnutrition and health inequalities? Evidence from Guatemala. *Journal of Development Effectiveness* 2011;3(4):543-566.
- [10] Poder TG, He J. The role of ethnic and rural discrimination in the relationship between income inequality and health in Guatemala. *Int J Health Serv* 2015;45(2):285-305.
- [11] Ahmed SM, Adams AM, Chowdhury M, Bhuiya A. Gender, socioeconomic development and health-seeking behavior in Bangladesh. *Soc Sci Med* 2000;51(3):361–71.
- [12] Hossain I, Hoque MM. Determinants of choices of delivery care in some urban slums of Dhaka city. *Pakistan journal of social sciences* 2005;3(3):469-75.

- [13] Awomo Ndongo JC. Mutuelles de Santé et Consommation de Soins de Santé au Cameroun. *International Journal of Health Preference Research* 2016;1:2-15.
- [14] The World Bank. Economics and Governance of Nongovernmental Organizations in Bangladesh. Bangladesh Development Series Paper No: 11. The World Bank Office, Dhaka; 2006. Available at: <http://documents.worldbank.org/curated/en/105291468207267279/pdf/382910BDONGOre10also03586101PUBLIC1.pdf>.
- [15] The NGO Service Delivery Program in Bangladesh. Decreasing Maternal Mortality and Morbidity through Safe Delivery and the NSDP Home Based Delivery Initiative. Technical Report, Cooperative Agreement No. 388-A-00-02-00060-00, April 2007. Available at: http://www2.pathfinder.org/site/DocServer/Monograph_5.pdf?docID=9121.
- [16] Mostafiz M. Discrimination Against Women in Bangladesh. SSRN (August 30, 2015). Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2653303.
- [17] National Institute of Population Research and Training. Bangladesh demographic and health survey 2014 - key indicators. Dhaka: National Institute of Population Research and training; 2014.
- [18] Choudhury N, Moran AC, Alam MA, Ahsan KZ, Rashid SF, Streatfield PK. Beliefs and practices during pregnancy and childbirth in urban slums of Dhaka, Bangladesh. *BMC Public Health* 2012;12:791.
- [19] Rabbi AMF, Karmaker FC. The Socio-economic Determinants of Antenatal Health Care Utilization in Bangladesh: Evidence from Multivariate Techniques. *Dhaka Univ J Sci* 2015;63(1):19-23.
- [20] Chowdhury AMR, Mahbub A, Chowdhury AS. Skilled Attendance at Delivery in Bangladesh: an Ethnographic Study. Research Monograph Series No. 22. BRAC Research and Evaluation Division Dhaka, Bangladesh; 2003.
- [21] Amrin A. An Analysis of the Status of Antenatal Care in Bangladesh. *International Journal of Science and Research Methodology* 2016;5(2):49-57.
- [22] UNICEF. Maternal and Neonatal Health in Bangladesh. Unicef; 2009. Available at: https://www.unicef.org/bangladesh/Maternal_and_Neonatal_Health.pdf.
- [23] Ministry of Health and Family Welfare. Success Factors for Women's and Children's health: Bangladesh. Ministry of Health and Family Welfare, Bangladesh, Partnership for Maternal, Newborn & Child Health, WHO, World Bank and Alliance for Health Policy and Systems Research; 2015. Available at: http://www.who.int/pmnch/knowledge/publications/bangladesh_country_report.pdf.