Original Research Article

Determinants of the Use of Delivery and Post Natal Care Services by Pregnant Women and Analyses of These Factors Contributing on the Utilization of Maternal Health Care Services in Bangladesh

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ABSTRACT

Background: Unequal utilization of delivery and postnatal care provided by medically trained health professionals in Bangladesh occurs in many forms and complex web of actors such as age, education, income, area of residence and other factors share their contribution for the low utilization. By using data from nationally representative sample, this study investigates to analyze the pattern and determinants of perinatal care service utilization by women in Bangladesh.

Methods: The 2011 Bangladesh Demographic Health Survey (2011 BDHS) data were used for this study. Descriptive statistics involved examining pattern of these services utilization by medical providers followed by bivariate and multivariate logistic regression models which examines the association between all potential factors and outcome variables. Predicted probabilities were calculated and the unequal utilization of services by two opposite spectrum socioeconomic groups was also measured.

Results: Only 30.6% of the deliveries were assisted by medical providers and the figure dropped further for postnatal checkup. Various determinants like mother's education, household wealth, and mother's place of residence, partner's education and occupation had significant effect on the utilization of perinatal care services. The multivariate analysis revealed that women of richest household had 4.7 times (OR=4.7; 95% CI: 3.8-6.0) greater chances of having delivery assisted by medically trained providers than their poorest counterparts. Moreover, 77% of urban women with good formal education and wealth status had their delivery assisted by professionals, whereas, the figure was deplorable 5 % for rural women with no formal education and poorest wealth.

Conclusion: To reduce the burden of maternal mortality, focus should be given more to the socio-economic determinants responsible for the unequal utilization of these services.

Key words: Determinants, delivery care, postnatal care, maternal health care utilization, perinatal care, Bangladesh.

INTRODUCTION

Maternal and child health care is an important issue for the progress of a country like Bangladesh. In order to reduce the burden of maternal morbidity and mortality gender and socioeconomic inequalities and cultural barriers must be overcome, as it prohibits vast majority of Bangladeshi women from getting skilled and emergency obstetric care. [1] In last two decades, the health care system has improved and expanded significantly although the health status still remains poor. The roots of the problems related to health care system runs deep into the society and major structural changes are needed for their transformation.

Despite several attempts for understanding the equity issues in Bangladesh, many issues still remains unsolved. [2] More than 70 percent of maternal deaths are caused by five major obstetric complications [3] and MDG 5 target was to achieve 75% reduction of maternal mortality rate (MMR) within 2015, globally MMR has been reduced by 45% whereas Bangladesh has achieved only 40% reduction of maternal mortality until 2010 and the country lagged behind to achieve MMR target of 2015. [4] In Sub-Saharan Africa region, MMR was accounted for 62% and followed by Southern Asia (24%) and MMR was 14 times higher for developing region compared to developed region. [5] However, it is predicted that industrialized countries can reduce MMR by early awareness of the extent of the crisis, recognizing that majority of maternal deaths are preventable. [6] Some countries already achieved their target but Bangladesh was in the pathway with average decline rate as 3.3 percent per year. [7] The decline rate was not satisfactory to reach the target by the stipulated time. Alternatively speaking, achievement of country level targets is not enough if under-privileged populations within the nation like the less-educated, the poor, and the rural community do not get the benefits of the progress. [8] These situations might be partly explained by the disparities in utilization of maternal health care services which includes the antenatal care services, delivery care and postnatal care services. [8]

Antenatal care is the entry point to reduce the maternal and neonatal mortality by identifying the at-risk pregnancy and by handling the associated risks. [9] Delivery care is another very important part to decrease overall maternal mortality and perinatal mortality. [10] Hemorrhages after delivery is the leading cause of MMR among all other complications during delivery. [11] The risk for undesirable maternal and infant health outcomes is amplified by deliveries in the hands of untrained TBAs at home. One of the main essentials of successful safe motherhood interventions is better availability of skilled birth attendant, birthing facilities and relevant specialists. [6,12] UNICEF's 2014 estimates shows that facility-based delivery rates are still unacceptably low in some regions, including 48% in sub-Saharan Africa, 44% in South Asia, and 71% in the Middle East and North Africa. [13]

Obstetric and postnatal care can be considered as an important aspect to save the lives of mother and the child. After analyzing different models to reduce the MMR in developing countries, it was found that deliveries with professionals can help to decrease MMR to 50 or even less per 100 thousand. [12] Maternal service utilization inequality is existing in different forms and dimensions. Economic disparities still persist in case of facility use although it is decreasing with time. Other factors along with economic status are also related with the maternity care use and these are - area of residence, number of antenatal visits, birth order, maternal education and age, and year of delivery. [10,14,15] To accomplish the target, Bangladesh govt. has taken several steps to improve the health service system for mass people. [2] Facilities are also provided by non-govt. organizations and private sectors. [16] Health facilities become available within two kilometers in slum and non-slum areas in urban regions. [17] Different public health policies may have been the reason to this development. Bangladesh has taken on health, nutrition, and population sector programs with distinct national strategies for more than one decade in order to reduce maternal mortality, with particular focus on early detection and proper referral of complications, and advancement of the quality of care. Despite of these measures, significantly more women from more affluent families delivered at health facilities, while women from financially inferior households often delivered with untrained conventional birth attendants. [8]

In order to evaluate the development toward the reduction of MMR which mostly rely on universal access to reproductive

health, it is essential to monitor inequalities in the utilization of maternal care services including delivery and postnatal care. This paper attempts to identify the related factors and their magnitude of effects on the unequal utilization of perinatal care which involves delivery assistance services and postnatal care services.

MATERIALS AND METHODS

The study utilized 2011 Bangladesh Demographic and Health Survey (BDHS) data obtained from the Measure DHS website. The BDHS is a five-year periodic survey used to collect information from women and men aged 15-49 years about demographic and health status conducted under the authority of the National Institute for Population Research and Training (NIPORT) of the Ministry of Health and Family Welfare, Government of the People's Republic of Bangladesh. The present study used data from women's questionnaire which included questions about their socioeconomic and demographic characteristcis, reproducive histroy, nutrition, maternal health care service utilization and family planning which provides invaluable resuources (population and health data) to researchers, policy makers and program managers to plan, monitor, evaluate the progress of these sectors. [18] The 2011 BDHS survey was based on two-staged stratified & clustered sample of households and the sampling procedure of BDHS can be obtained from Measure DHS Guide. [19] In the present study, inoformation of 8,753 women with their latest birth within last five years preceding the BDHS survey was considered.

Variables

The primary concern of the present study was to assess whether mothers received delivery assistance and postnatal care within 41 days after delivery by medically trained providers or not. Therefore, mothers who had delivery assisted by medical trained provider and had postnatal checkups were considered to receive perinatal health care services and

two outcome variables in the study includes: utilization of delivery assistance and postnatal checkup service. Delivery assistance and postnatal checkup from medically trained providers referred to the services provided by qualified medical doctors, nurses, midwives, family welfare visitors (FWV) or community skilled birth attendant; however, medical assistants (MAs) and sub-assistant community medical officers (SACMOs) were also considered as medically trained providers for postnatal care. [18] Traditional birth attendants, health assistants, family welfare assistants and others were not considered sufficiently medically trained.

The study attempted to identify factors and their effect on the utilization of delivery assistance service and postnatal care service considering available scientific evidences and existing literatures on the topics itself and tried to narrow down the effect of following important factors: mother's education, their area of residence, household wealth index, partner's education and occupation on the outcome variables. To control the effect of other related variables which might have a say on the outcome variables were: mother's age, birth order, religion and administrative division were also considered to minimize their contribution on the associations.

Statistical analysis

In descriptive analyses, frequency and percentage distributions were performed to analyze and to describe the data distributions of different variables. Moreover, percentage distribution of different explanatory variables according to outcome variables also calculated and chi-square test (p-value) were employed to test their varied association across groups which described the pattern of the delivery and postnatal care service utilization in Bangladesh as well as how the services utilization differed according to their socioeconomic characteristics.

Bivariate logistic regression was employed to estimate the effect of unadjusted and crude effect of explanatory

variables on outcome variable. Multivariate logistic regression (MLR) was also used to estimate the adjusted effect of the variables had on outcome; moreover, variables which might have an effect on the considered association were also controlled in MLR. Odds ratios (OR) were calculated with 95% confidence interval and level of significance was 5%. Furthermore, predicted probabilities of the outcome variables according to their household wealth status were also calculated from regression analysis to assess the statistical predicted probabilities of outcome variables. SPSS software version 20 was used to analyze the data.

RESULTS

The descriptive analyses exhibited that only 30.6% of the deliveries were assisted by skilled health care medical providers and the percentage of mothers for postnatal check-up by skilled medical providers even dropped further (29.6%).

Mothers who had secondary or higher education tend to have better chance of getting assisted delivery and postnatal check-ups than their non-educated counterparts, the rates for assisted delivery being 45.6% and 10.5% respectively and for postnatal check-ups 43.0% and 11.0% respectively. Mother's place of residence also had strong effects on the utilization of delivery and post natal care. The study revealed that only 22.0% of the mothers living in rural areas had assisted delivery by skilled providers, whereas, the figure was 50% for urban mothers which showed a marked difference of utilization. The likelihood of receiving of postnatal care for rural and urban mothers more or less demonstrated the same picture.

Moreover, the perinatal health care utilization of mothers were also greatly influenced by household wealth and it showed that the likelihood of receiving proper delivery care and postnatal check-ups increased with the improvement of household amount of wealth as the result showed marked differences between the

poorest and richest group. Only 11.0% of mother's deliveries were assisted by medically trained personnel if they were from poorest wealth group, whereas, the figures rose up to 64.0% for the mothers of richest wealth group (Table 2).

Table 1: Characteristics of socioeconomic and demographic variables

Socioeconomic and demographic variables	Number	Valid percent
Mother's education level		
Illiterate	1687	19.3
Primary[1]	2684	30.7
Secondary[2] or higher	4382	50.1
Place of residence		
Rural	6079	69.5
Urban	2674	30.5
Wealth index		
Poorest	1935	22.1
Poorer	1711	19.5
Middle	1661	19.0
Richer	1722	19.7
Richest	1724	19.7
Partner's education level		
Illiterate	2462	28.1
Primary	2553	29.2
Secondary or higher	3732	42.7
Partner's occupation level		
Day laborer	6295	71.9
Professional	521	6.0
Business	1937	22.1
Delivery assistance		
Non-medical providers	6061	69.4
Medically trained providers	2675	30.6
PNC check-up		
Non-medical providers/ no one	6185	70.7
Medically trained providers	2568	29.3

Missing values were not considered in the study, so, total number may not add up to same; [1] = completing grade 5, [2]= completing grade 10.

Partner's education and occupation also found to be associated with the perinatal health care service utilization. Delivery and post natal care assisted by skilled medically trained providers increased when the husband of the pregnant women were highly educated and had professional job.

In bivariate analyses, mother's who had secondary or higher education showed very higher odds of delivery assistance and postnatal check-ups compared to the mothers who had no formal education (OR[c]: 7.1; 95% CI: 6.0-8.4). Furthermore, urban mothers had higher odds ratio of receiving assisted delivery care and postnatal checkups than rural women. Women who came from richest wealth group had very high odds ratio of receiving delivery care than their poorest counterparts. Women

belonged in richest household wealth group had 14.5 times (OR[c]: 14.5; 95% CI: 12.2-17.2) higher chance of receiving delivery care assisted by medically trained providers.

Table 2: Socioeconomic and demographic factors according to dependent variables

Socioeconomic and demographic factors	Delivery assistance		Chi-square (p-value)	PNC check-up		Chi-square (p-value)
	Non-medical Provider	Medical Provider		Non-medical Provider/no one	Medical Provider	
	Number (%)	Number (%)		Number (%)	Number (%)	
Mother's education						
Illiterate	1507 (89.5)	176 (10.5)		1498 (89.0)	189 (11.0)	
Primary[1]	2170 (81.0)	504 (19.0)	<0.001	2181 (81.3)	503 (18.7)	<0.001
Secondary[2] or higher	2384 (54.4)	1995 (45.6)		2506 (57.0)	1876 (43.0)	
Place of residence						
Rural	4727 (78.0)	1339 (22.0)		4757 (78.0)	1322 (22.0)	
Urban	1334 (50.0)	1336 (50.0)	<0.001	1428 (53.4)	1246 (46.6)	<0.001
Wealth index						
Poorest	1718 (89.0)	213 (11.0)		1715 (88.6)	220 (11.4)	
Poorer	1442 (84.6)	262 (15.4)		1437 (84.0)	274 (16.0)	
Middle	1233 (74.0)	427 (26.0)	<0.001	1255 (75.6)	406 (24.4)	<0.001
Richer	1052 (61.0)	665 (39.0)		1095 (63.6)	627 (36.4)	
Richest	616 (36.0)	1108 (64.0)		683 (40.0)	1041 (60)	
Partner's education						
Illiterate	2139 (87.0)	319 (13.0)		2132 (86.6)	330 (13.4)	
Primary	1976 (77.6)	570 (22.4)		1989 (78.0)	564 (22.0)	
Secondary or higher	1941 (52.0)	1785 (48.0)	<0.001	2059 (55.0)	1673 (45.0)	<0.001
Partner's occupation						
Day laborer	4743 (75.5)	1540 (24.5)		4786 (76.0)	1509 (24.0)	
Professional	158 (30.0)	362 (70.0)	<0.001	201 (38.6)	320 (61.4)	<0.001
Business	1160 (60.0)	773 (40.0)		1198 (62.0)	739 (38.0)	

*reflects statistical significance at <0.005 level (p-value derived from chi-square test); Missing values were not considered in the study, so, total number may not add up to same; [1] = completing grade 5, [2]= completing grade 10.

Table 3: Determinants of the utilization of maternal health care services (logistic regression analysis)

Socioeconomic and demographic factors	Delivery assistance		PNC check-up	
	Univariate analysis	Multivariate analysis[a]	Univariate analysis	Multivariate analysis[a]
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Mother's education				
Illiterate	1	1	1	1
Primary	1.9 (1.6-2.3)*	1.3 (1.1-1.6)*	1.8 (1.5-2.2)*	1.4 (1.1-1.6)*
Secondary or higher	7.1 (6.0-8.4)*	2.4 (2.1-3.0)*	6.0 (5.0-7.0)*	2.4 (2.0-2.9)*
Place of residence				
Rural	1	1	1	1
Urban	3.5 (3.2-3.8)*	2.0 (1.8-2.2)*	3.1 (2.8-3.4)	1.8 (1.6-2.0)*
Wealth index				
Poorest	1	1	1	1
Poorer	1.4 (1.2-1.8)*	(0.9-1.4)	1.4 (1.2-1.8)*	(0.9-1.4)
Middle	2.8 (2.3-3.3)*	1.6 (1.3-2.0)*	2.5 (2.1-3.0)*	1.4 (1.2-1.8)*
Richer	5.1 (4.3-6.1)*	2.4 (1.9-3.0)*	4.4 (3.8-5.3)*	2.2 (1.8-2.8)*
Richest	14.5 (12.2-17.2)*	4.7 (3.8-6.0)*	12.0 (10.0-14.0)*	4.2 (3.4-5.3)*
Partner's education				
Illiterate	1	1	1	1
Primary	1.9 (1.6-2.2)*	(0.9-1.3)	1.8 (1.6-2.1)*	(0.9-1.3)
Secondary or higher	6.1 (5.3-7.1)*	1.6 (1.4-2.0)*	5.2 (4.6-6.0)*	1.6 (1.3-1.9)*
Partner's occupation				
Day laborer	1	1	1	1
Professional	7.0 (5.8-8.5)*	2.1 (1.6-2.6)*	5.0 (4.0-6.0)*	1.5 (1.2-1.9)*
Business	2.0 (1.8-2.2)*	1.0 (0.9-1.2)	2.0 (1.8-2.2)*	1.0 (0.9-1.2)

[a]= Multivariate analysis controls for all the variables included in the table plus mothers age, birth order (parity), religion and administrative division; *= significant at 0.005 level, OR=Odds ratio, CI= Confidence interval

The multivariate analyses adjusted for all the factors considered in the bivariate regression analysis plus the final model also controlled the effect of the following factors: mother's age at delivery, birth order (parity), religion and administrative divisions. The effect of mothers education were found to be a strong predictor of utilization of skilled delivery care and postnatal care; women who completed only secondary education or higher education had 2.4 fold (OR[a]: 2.4; 95% CI: 2.1-3.0)

greater chance of delivering their babies assisted by skilled medical providers and women who completed just primary education had 1.3 (OR: 1.3; 95% CI: 1.1-1.6) fold greater chance compared to their illiterate counterparts. The multivariate analyses of postnatal care showed that the chances of receiving postnatal care by medically trained providers also were 2.4 times (OR[a]: 2.4; 95% CI: 2.0-2.9) higher for the women who had secondary or higher education than the reference group. Women resided in urban areas enjoyed 2 times (OR[a]: 2.0; 95% CI: 1.8-2.2) higher chance of receiving delivery care service than rural women and the same trend also found in case of postnatal care utilization.

The result revealed that women who came from richest household wealth group had 4.7 (OR[a]: 4.7; 95% CI: 3.8-6.0) times and 4.2 (OR[a]: 4.2; 95% CI: 3.4-5.3) times greater chance of getting skilled delivery care and postnatal care respectively compared to the women who came from lowest household wealth group. The significant effect of husband's education and occupation on receiving the services varied across groups in multivariate analyses; therefore those factors cannot be marked as strong predictors for receiving delivery and postnatal care assisted by medical providers.

Table 4: Differences in utilization of medical care during perinatal period: at opposite ends of the socioeconomic spectrum

Status	Delivery assistance	PNC check-up
Urban women with secondary or higher education in the highest asset quintile	77.0%*	72.0%*
Rural women with no education in the lowest asset quintile	5.0%*	7.0%*

*reflects statistical significance at <0.005 level (chi-square test; cross tabulation)

The result of the differences in the utilization of skilled delivery and postnatal care in two different socioeconomic groups (urban women with secondary or higher education and in the highest asset quintile versus rural women with no formal education and in the lowest asset quintile) showed huge disparity of usage of these important maternal services. Only 5% and 7% of the rural women who did not attend school and belonged in the lowest household wealth group received delivery and postnatal care respectively by medically trained providers; whereas, for urban mothers the figures were 77% and 72% respectively who had secondary or higher

education and also belonged in the highest wealth group.

Predicted probabilities of dependent variables according to wealth index:

The predicted probabilities calculation of delivery care and postnatal care utilization in accordance with household wealth status of women delineated clearly that the likelihood of receiving delivery care and postnatal care increased with the improvement of household wealth. Women who had the better household economic, wealth and income status the greater chance they had to get delivery assistance and postnatal checkups.
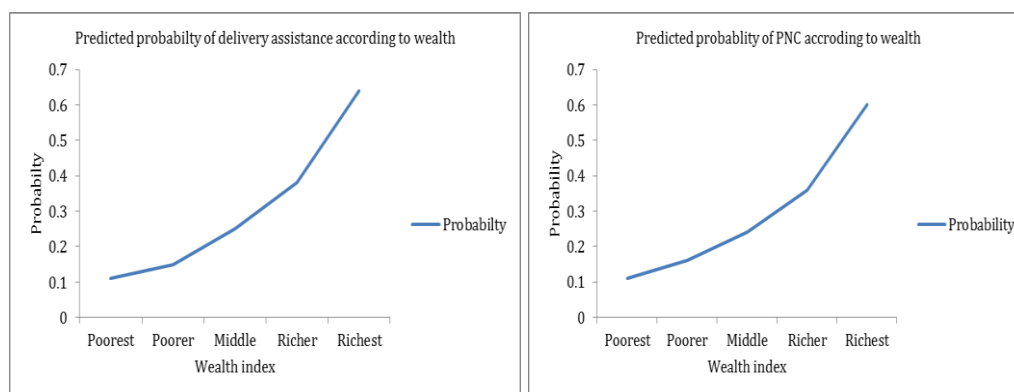

Figure 1: Predicted probabilities of delivery assistance and PNC assistance according to wealth index. Predicted probabilities for each dependant variables were calculated from logistic regression equation and then all the values were put against wealth index

DISCUSSION

This study provides the most important determinants of perinatal health care utilization as household wealth status of the women, educational status of both women and their husband and mother's place of residence.

This study revealed that medically trained personnel assisted the deliveries of 64 percent women from richest households while only 11 percent women from poorest households can get access of it. This should mark as huge difference and an agreement with previous study findings. An ICDDR'B study also discovered that only 3.4 percent of mothers from the poor quintile households had skilled assistance at delivery, whereas for the least poor mothers it was 37.3 percent. For this indicator, rich-poor ratio was 11.6. [14] Poor women from under-privileged areas suffered more problems than others during pregnancy and post-natal period. Other researchers also pointed out that poverty and ill-health are very much related, as poverty and marginalization being fundamental causes of inequality of access to health care services. [2,20]

Furthermore, education has positive impact on delivery care and postnatal services use. This study showed that the rates for assisted delivery for educated and non-educated mothers being 45.6% and 10.5% respectively and for postnatal check-ups 43.0% and 11.0% respectively. As found elsewhere, this study also indicates that educated women are better capable of understanding the need of looking for care during delivery as well as has increased ability of making good use of services. [2,9,21-22] In another study in Bangladesh, it was found that more educated women use facility based delivery and skill birth attendance services to a higher extent than non-educated counterparts which is similar findings like other countries. [1,8]

In the present study findings, wide urban-rural differentials were observed in case of service utilization. Urban mothers used skilled delivery services twice than rural mothers. Distance can be regarded as an important factor for the utilization of delivery care services [23] as accessing proper delivery care in rural areas are still meager compared to the cities. Decentralization of the obstetric centers and equity services are necessary to ensure. In 2004, another study from Matlab areas in Bangladesh showed that 26.8 percent of births were attended in urban areas by skilled medical professionals, as compared to only 8.4 percent in rural areas. [14]

After the trend analysis regarding facility use (1995 to 2010) of Bangladesh, Hajizadeh concluded that rural women improved their facility based delivery utilization over time but the urban-rural gap had been increased. [8] The demand barrier (e.g., user fees and lack of information, lack of transportation) is a challenge for the women lived in rural areas. In Nigeria, similar disparity was found in urban and rural areas facility utilization as 63 percent and 23 percent respectively. [9] Similar findings was found in Ethiopia as only 20.9% rural women used institutional delivery compared to 35.9% for urban women [3] In case of low-income countries health care financing programs (e.g. free or subsidized care, cash transfer and voucher schemes) are reportedly helpful in minimizing inequalities in the use of institutional deliveries, postnatal care and trained birth attendants. [24]

There was great socioeconomic and regional disparity when it comes to the use of reproductive health services. The study clearly recognizes the necessity of institutional delivery services which will provide delivery assistance and required postnatal checkups by proper medically trained health providers and the importance of having using these services has been mentioned in different studies as well. [25-28] In order to advance the utilization of these two indicators, steps has to be taken like targeting rural women and those with less education as well as generating demand for health facility delivery. This study indicates that women

who came from the most affluent household wealth group had 4.7 times and 4.2 times more possibility of receiving skilled delivery care and postnatal care respectively as opposed to the women coming from the lowermost household wealth group. Similar findings were reported by Collin in 2007 that 86% of live births among the richest urban women with secondary or higher education received attendance by health professionals whereas it is only 2% in case live births among the poorest rural women without formal education. [1]

Limitations

The study considered women who had a child in the last five years preceding the survey which leaves a possibility of recall bias if mothers had troubled remembering the information. Moreover, from the study design it would be implausible to make a strict causal-relationship of factors as the cross-sectional snapshot study data limits the opportunity. Furthermore, the study used un-weighted data of the variables as the primary concern of the study was to describe the effect of determinants has on outcome and regression analysis does not require weighted data, therefore, descriptive statistics provided were merely for un-weighted data. The study also focused only on major socioeconomic determinants and avoided other factors like cultural barriers, superstitions, quality of the providers, and distance to health care centers within cities or rural areas, access to media, women decision making capabilities on her families and so on.

CONCLUSION

The central findings of the study concluded that the delivery care and postnatal care utilization in Bangladesh was inadequate and there was evidence of unequal utilization of perinatal care services across different socioeconomic groups. To achieve required health service utilization, maternal health should be regarded as a top priority and should be focal point of central policy and programme and better intervention focusing more on socioeconomic determinants should be implemented where poor, disadvantaged, uneducated and rural people would be benefitted.

Declaration:
Authors' contributions:

Kabir MR raised the research questions, designed and coordinated research activities, methodology setting, analyzed, interpreted the data and conducted the whole writings and research activities.

Mokbul M contributed in literature reviews, made comparisons, collected relevant evidences concerning the research and assisted the process of writings.

All authors contributed to early drafting of manuscripts and read and approved the whole process. The authors certified that the manuscript have not been published or submitted for publication elsewhere.

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Abbreviations:
BDHS: Bangladesh Demographic and Health Survey
MMR: Maternal mortality rate
MDG: Millennium development goals
TBA: Traditional birth attendants
OR: Odds ratio
CI: Confidence Interval

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