Midwifery 52 (2017) 42–48

Contents lists available at ScienceDirect

Midwifery

journal homepage: www.elsevier.com/locate/midw

Antenatal and postnatal care practices among mothers in rural Bangladesh: A community based cross-sectional study

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ARTICLE INFO

Keywords:
Antenatal care
Postnatal care
Community-based study
Cross-sectional study, Bangladesh

ABSTRACT

Background: appropriate utilization of antenatal and postnatal care can prevent complications and ensures better maternal and child health care. Although under-five mortality in South Asia, including Bangladesh, has reduced substantially, the rate of neonatal mortality is still high. The study aims to identify factors associated with the practice of antenatal and/or postnatal care amongst mothers of newborns from a healthcare facility in a selected area of rural Bangladesh.

Research design/Setting: a community-based cross-sectional study was conducted among 360 postnatal mothers, who were within 42 days of delivery. The study was conducted at Madhupur Upazila (sub-district) in Tangail district of Bangladesh from January 2012 to June 2012. A structured questionnaire was used to collect relevant information from the study subjects.

Findings: only one in seven (14.2%) of the mothers visited health care facility for 4 or more times to receive antenatal care. A higher proportion of mothers delivered at home, thirty-five percent of the respondents experienced post-delivery complications. About 18% of mothers received postnatal care from the health care facility. Several variables revealed significant associations in bivariate analyses; few variables remained significant for antenatal care and post-natal care categories in the multinomial logistic regression analysis. The likelihood of receiving either antenatal care or post-natal care (OR =0.30, 95% CI =0.10–0.96) was significantly lower among mothers who had either no education or less education (1–5 years of schooling); and was found significantly higher for women who watched TV (OR = 2.79; 95% CI = 1.45–5.37); family income showed significant association for receiving both antenatal care and postnatal care services as well.

Conclusion: mother's education appears to have a strong and significant association with antenatal care and postnatal care practices in rural Bangladesh. Community based intervention and regular home visits by health care providers could enhance care for women and newborns including delivery of specific health messages. Counseling could be integrated during antenatal care visits to increase the postnatal care service further.

Introduction

Bangladesh is one of the low- income countries where poorer groups use less health care and there exists a poor-rich inequality in maternity care and maternal as well as child mortality (Houweling, 2007). Apart from this poor-rich inequality, social and cultural beliefs and practices regarding motherhood and childrearing also have the significant influence on maternal and child health (Chowdhury, 2003; Chakrabarty, 2002). Bangladesh has achieved noticeable progress since its independence in 1971 despite many constraints like environmental disasters, rapid population growth and limited resources. The declining trends of poverty, illiteracy and infant, child and maternal mortality, as well as increasing life expectancy are a few examples of achievement (Khan et al., 2011; Rubayet et al., 2012; WHO & UNICEF, 2007).

Globally, the primary causes of neonatal mortality are preterm birth complications (35%), intrapartum-related complications (23%) and sepsis or meningitis (13%), but the cause structure varies by setting (Baqui et al., 2016). Most neonatal deaths in developing countries still occur at home and are unattended by skilled healthcare professionals (Knippenberg et al., 2005). In Bangladesh, four major causes of

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http://dx.doi.org/10.1016/j.midw.2017.05.011
Received 29 June 2016; Received in revised form 17 May 2017; Accepted 20 May 2017

neonatal mortality are sepsis, perinatal asphyxia, and prematurity, as well as low birth weight (Ahmed and Chowdhury, 2006). The majority (75%) of early neonatal deaths without immediate newborn care takes place within seven days of birth (Newborns: reducing mortality 2012). The knowledge of initial care and care seeking behaviors for newborn babies vary depending on location, availability of skilled professionals, education, socioeconomic status, culture, taboos and traditional beliefs of the societies. For instance, neonatal mortality declined from 64.5 to 31.3 million during 1990–2010 (Rajaratnam et al., 2010) which is still high compared to many other countries in the world and is still a noticeable public health concern in Bangladesh. There are concerns in rural areas in particular because of higher poverty, illiteracy, limited healthcare facilities and other healthcare barriers (Khan et al., 2013; Syed et al., 2006). This indicates that timely and appropriate care, including care seeking behaviors for newborn babies, depends on the attitudes and knowledge of mothers/caregivers at home (Ahmed et al., 2006). In Bangladesh, about two-thirds of all births and three quarters of births in rural areas occur at home (Shahjahan et al., 2012). Therefore, understanding routine newborn care practices at home is necessary to design and prioritize interventions for reducing neonatal morbidity and mortality in rural Bangladesh.

Optimal use of antenatal care (ANC) and good delivery practice helps to prevent complications in childbirth and ensures healthy mothers and children. In Bangladesh, antenatal care stands for pregnancy related care provided by a health care professional in a health care setting or in home (Kabir and Khan, 2013). The postnatal care (PNC), defined as the time immediately after the birth up to six weeks (42 days), is critical for the newborn and the postnatal mother. Immediately after birth, bleeding and infection pose the greatest risk to the mother's life, while preterm birth, asphyxia and severe infections pose the greatest risks to newborns (Matthews et al., 2010). Two thirds of all neonatal deaths arise from such complications (Bhutta et al., 2014) while inappropriate feeding and cultural practices during the postnatal period may pose further risks to the life of the newborn. It has widely accepted that maternal mortality, the second-most common cause of death among women aged 15–44 years worldwide, is responsible for 14.6% of all deaths in this age group (de Zoysa, 2010) and most deaths occur during labor, delivery, and in the immediate postpartum period (Ronsmans et al., 2006) due to postpartum hemorrhage, infection, unsafe abortion, and eclampsia (Wichaidit et al., 2016). All these maternal and neonatal problems could be reduced if women receive appropriate postnatal care (Matthews et al., 2010). The timing of postnatal care is also crucial to the well-being of the mother and baby. Bangladesh is a developing country with very high neonatal mortality. In Bangladesh, pregnancy and child care issues are considered as very culturally sensitive. Essential care for mother and child during and after pregnancy is very important to health of the mother and child (Kabir and Khan, 2013). Though Bangladesh improved a lot in health arena but still maternal mortality and neonatal mortality remain unacceptably high and requires urgent attention (Wichaidit et al., 2016). A study identified that Bangladesh has very high neonatal mortality rates of 25–35 deaths per 1000 live births (Fottrell et al., 2015).

The use of ANC in developing countries is low compared to developed countries (97%) (WHO & UNICEF, 2007). The Bangladesh Demographic and Health Survey (BDHS) showed that 78% of women with a birth in the three years preceding the survey received ANC at least once from any medically trained provider (BDHS, 2014). About 16.2% of pregnant women received 2 antenatal visits, about 13.2% received 3 visits, and 31.2% received four or more (BDHS, 2014). In Bangladesh, 36% of women received a postnatal checkup from a trained health service provider, and 34% received it within the first two days after giving birth (BDHS, 2014). Considering this background, this study is important in exploring the in detail scenario of service-use. Until recently little was known about factors that determine practices of mothers in caring for newborns in Bangladesh. Therefore, the study aims to identify factors associated with use of antenatal and/or postnatal care amongst mothers of newborns from healthcare facilities in selected areas of rural Bangladesh.

Definition of antenatal care

Care provided to improve the health of the pregnant woman and her baby by monitoring the progress of the pregnancy and detecting and managing any problems.

Definition of postnatal care

involves care of the mother and baby following birth, and provides the opportunity to assess the mother for any medical, mental, emotional and social issues, and early assessment of risk factors and physical problems in the baby.

Methods

Setting and study design

The community-based cross-sectional study was conducted at Madhupur Upazila (sub-district) in Tangail district of Bangladesh from January to June 2012. It is 140 km northwest of Dhaka with a population of 308,846 and 48.87% are female. There are 74,984 households with 192,109 persons aged 18 years or more and a total area 500.67 km². Around 9% of households are tribal and the average literacy rate was 30.50% (7+ years). Most of the population (80%) lives in rural areas and depend on agriculture (BDHS, 2014). The study area was selected as a considerable portion of the population was tribal and prefers to retain traditional practices, though they have easy access to healthcare facilities.

Study subjects

The study subjects were postnatal mothers and the Antenatal care practice information was collected from the same respondents. Study enrolled postnatal mothers who visited the Expanded Program on Immunization (EPI) centers for the vaccination of newborn babies.

Sample size

The sample size was determined based on the information (particularly using the prevalence (30%)) of postnatal mothers who visited healthcare facilities for Postnatal Care from the Bangladesh Demographic and Health (BDHS, 2007) using the following formula:

$$n = \frac{Z^2 P(1-P)}{d^2}$$

Where, P = the proportion of postnatal mother visited healthcare facilities = 0.30

$1\text{-}P$ = 0.70.

d = precision level = 0.05.

Z = 1.96 at 5% level of significance.

Based on the above formula, a sample of 323 postnatal women is needed. Assuming 10% non-response rate, the sample size increase to 360.

Sampling process

Expanded programme on Immunization (EPI) is a national immunization programme that maintains a register operated by Family Welfare Assistant (FWA), the last tier of health workers, to record all postnatal mothers visiting for newborn vaccinations. The Upazila consists of 5 Unions where 40 FWAs are working. Twelve FWAs were

randomly selected and their registers were used to make the sampling frame. Moreover, thirty postnatal mothers were systematically identified for inclusion from the catchment area of each of the selected FWAs to achieve the target sample.

Instrument development and data-collection

A structured questionnaire was developed with simple, accessible language and compiled by adapting questions from published studies with appropriate modifications and/or improvements. The questionnaire included maternal socioeconomic factors as exposure/independent variables where ANC and PNC factors as dependent variables. Two variables, namely "Did you receive ANC during pregnancy from any health care facility (yes, no)?" and "Did you receive PNC from any healthcare facility (yes, no)?" were combined to make our outcome/dependent variable for detailed analyses. We combined these variables based on the assumptions that the determinants are same for both. We named this combined variable 'receiving ANC and/or PNC from health care facilities' and divided into three categories: received no care, received either ANC or PNC, and received both ANC and PNC. Briefly, the study used one outcome variable (called ANCPNC) with three categories. All other variables are either treated as independent variables or used to provide more information about newborn and delivery practices. On the other hand, independent variables covered maternal age, age at marriage, maternal education, maternal occupation, religion, total number of living children, family income, type of housing, type of toilet used, communication exposure, having an NGO membership, wealth index, number of health care facilities within 2–3 km area, distance to reach the nearest healthcare facility, transportation cost to reach the nearest health care facility, and type of transport used to reach the nearest health care facility. The questionnaire was first prepared in English and then translated into Bengali before use in the field. The translated questionnaire was piloted with 20 respondents (who were not included in the study) in a community with similar demographic characteristics to the study community to gather feedback about understandability, timing and consistency of the questions. The questionnaire was updated and finalized after necessary modifications based on the findings from the pretest.

Data were collected through face to face interview by 10 locally recruited trained interviewers who knew the local language well and were familiar with the local culture. We hired 2 experienced field supervisors who monitored field-level quality control. Three day training was conducted to refresh the data collectors' basic skills and to familiarize them with the questionnaires.

Statistical analyses

Descriptive analysis was used and the results are presented by percentage, while bivariate analyses were performed to test the association between two categorical variables. A multinomial logistic regression analysis was performed to estimate the odds ratio to identify major determinants of ANC and PNC. In order to select the independent variables for the logistic regression, the exposure variable was selected by the testing bivariate association having $p < 0.20$ with the dependent variable. Data were analyzed using SPSS 17.0.

Findings

Out of 360 samples, a total of 225 (62.5%) postnatal mothers received ANC and only 64 (17.8%) mothers received PNC. Socioeconomic characteristics of the postnatal mothers (n = 360) by ANCPNC status are presented in Table 1. The mean age for the total sample was 24 years with a standard deviation of 4.5 years. The majority of postnatal mothers were younger than 25 years old (69.5%), most of the mothers were housewives (95.6%), and 81.9% were Muslim. About 33.9% of the postnatal mothers had primary education (1–5 years) and equally 40.0% of them fell in the 'poor', as well as 'rich' wealth index. Wealth index was prepared by principle component analysis by using demographic and health survey tools. About seventeen percent read newspapers/magazines, 9.7% listened to radio while 60.3% watched television (TV), and 45.6% had mobile phones. About three-fourths of the respondents generally use locally available vehicles such as van/rickshaw/bus/auto rickshaw to reach the nearest health care facility. The transportation cost to reach the nearest health care facility was 10 Taka or less, which consists more than 72.7% of the respondents.

About 14.2% of the respondents visited health care facilities 4 or more times, which is adequate for a pregnant mother during their ANC period (Table 2). More than half of (57.8%) the newborns were male and the weight at birth was measured for 21.9% cases. About 31.1% of the newborns suffered from health problems within 42 days of delivery. The majority of the postnatal mothers (80.3%) delivered at home and about one-third (31.1%) of the umbilical cords were cut by the untrained or Traditional Birth Attendants (TBAs), where 8.6% (n=31) of them developed umbilical cord infection and 20 were treated. More than two-thirds (66.9%, n=241) of the newborns were breastfed within 30 minutes of birth. Approximately one-third (37.5%) of the mothers had knowledge about the necessity of PNC visits. Though a high proportion of mothers delivered their baby at home, about 35.0% of the mothers experienced post-delivery problems.

Bivariate and multivariate results

According to the bivariate analyses in Table 1, many variables revealed a significant association with the dependent (ANC/PNC) variable. Maternal education, wealth index, reading newspapers/magazines, watching TV, and having a mobile phone revealed a positive association with the dependent variable. In contrast, some variables, namely maternal age and transportation cost, indicated a negative association with the ANC/PNC variable. Variables like occupation, family income and time to reach the nearest health care facility provided mixed results. Use of ANC/PNC was higher among non-Muslims than Muslims and among respondents who normally walk to reach the healthcare facility.

Many variables revealed significant associations in bivariate analyses while education, religion, toilet type, watching TV, and transport type remained significant for ANC/PNC categories in the multinomial logistic regression analysis (Table 3). For example, the likelihood of receiving either ANC or PNC (OR =0.30, 95% CI =0.10–0.96) was significantly lower among mothers who had either no education or 1–5 years of schooling (OR = 0.28, 95% CI = 0.09–0.81) as compared to mothers with 9+ years of education. Similar results were found for both ANC and PNC (OR =0.13, 95% CI =0.02–0.67) for the no education category; (OR = 0.25, 95% CI = 0.07–0.95 for 1–5 years of schooling category). The likelihood of receiving either ANC or PNC (OR = 2.79; 95% CI = 1.45 – 5.37) was significantly higher for those women who watched TV as compared to the reference (those who do not watch TV) category. A similar result was found for the category of receiving both ANC and PNC (ANC/PNC) services (OR = 5.39; 95% CI = 1.97 – 14.76). Reading newspapers/magazines remained significant only for either the ANC or PNC category (OR = 3.54, 95% CI = 1.20 – 10.48). Family income showed significant association for receiving both ANC and PNC services as well.

Discussion

Antenatal delivery and postnatal care are important for reducing the harm for both mother and newborn child. Home deliveries are common in Bangladesh like in other developing countries and a high proportion of pregnant women have not received the proper antenatal care, as well as a postnatal check-up. The study results documented that 18% mothers received PNC within 42 days of delivery while 62.5%

Table 1
Background information of postnatal mothers (n=360) by ANCPNC status.

Variable	Category	Sample		Received ANC and/or PNC from healthcare facility		
				Yes, either ANC or PNC	Yes, both ANC and PNC	*P* value
		n	**%**	**%**	**%**	
Maternal age (years)	16 – 20	105	29.2	57.1	20.0	0.019
	21 – 25	145	40.3	48.3	14.5	
	26 +	110	30.6	42.7	12.7	
Mean age(± SD), Years	24 ± 4.5					
Age at marriage (years)	10 – 16	140	38.9	49.3	15.7	0.550
	17 – 18	132	36.7	52.3	12.1	
	18+ years	88	24.4	44.3	20.5	
Maternal Education (years)	0	88	24.4	40.9	4.5	< 0.001
	1 – 5	122	33.9	47.5	13.9	
	6 – 8	89	24.7	50.6	21.3	
	9 +	61	16.9	62.3	26.2	
Maternal Occupation	Housewife	344	95.6	49.4	14.0	< 0.001
	Service/agriculture/Else	16	4.4	43.8	50.0	
Religion	Islam	295	81.9	47.8	12.2	< 0.001
	Hinduism/Christianity	65	18.1	55.4	30.8	
Total number of living children	1	151	41.9	51.7	21.2	0.002
	2	115	31.9	53.9	12.2	
	3+	94	26.1	39.4	10.6	
Family income (Taka*)	≤ 5000	122	33.9	52.5	11.5	0.176
	5001– 10,000	189	52.5	48.1	15.3	
	10,001+	49	13.6	44.9	26.5	
Type of household for living	Pucca/semi-pucca	32	8.9	62.5	18.8	0.077
	CI sheet/Tin	163	45.3	43.6	19.0	
	Katcha/mud	165	45.8	52.1	11.5	
Toilet type	Katcha/open field	151	41.9	49.7	12.6	< 0.001
	Sanitary	78	21.7	55.1	29.5	
	Ring-slab	131	36.4	45.0	10.7	
Wealth Index	Poorest/poor	144	40.0	44.4	11.1	0.023
	Middle	72	20.0	48.6	16.7	
	Rich/richest	144	40.0	54.2	19.4	
Reading newspapers/magazine	Yes	63	17.5	63.5	25.4	< 0.001
	No	297	82.5	46.1	13.5	
Listening to radio	Yes	35	9.7	40.0	25.7	0.197
	No	325	90.3	50.2	14.5	
Watching TV	Yes	217	60.3	54.8	21.2	< 0.001
	No	143	39.7	40.6	7.0	
Having mobile	Yes	164	45.6	45.7	22.6	0.003
	No	196	54.4	52.0	9.7	
NGO membership	Yes	195	54.2	49.7	15.9	0.922
	No	165	45.8	48.5	15.2	
Number of healthcare facility with 2–3 km	1	214	59.4	48.6	14.5	0.662
	2+	146	40.6	50.0	17.1	
Walking time to the nearest healthcare facility	0–30 min	271	75.3	52.8	16.6	0.024
	31–60 min	63	17.5	36.5	11.1	
	61+ min	26	7.2	42.3	15.4	
Transportation cost to reach the nearest healthcare facility*	0–5 taka	135	37.5	57.8	20.0	< 0.001
	6–10 taka	126	35.0	50.0	13.5	
	11+ taka	99	27.5	36.4	12.1	
Type of transport to reach the nearest healthcare facility	On foot	85	23.6	64.7	20.0	< 0.001
	Van/rickshaw/else	275	76.4	44.4	14.2	

Results were expressed as n (%), *77BDT =1 USD.

Table 2
Selected variables for antenatal care, newborn and postnatal care (n=360).

Variable	Category	Sample	
		n	%
Received ANC from healthcare facility	Yes	225	62.5
	No	135	37.5
Received PNC from healthcare facility	Yes	64	17.8
	No	296	82.2
Received ANC and/or PNC from healthcare facility (combined)	No	127	35.3
	Yes, only ANC or PNC	177	49.2
	Yes, both ANC and PNC	56	15.6
Number of ANC visits	0–3	309	85.8
	4+ (adequate)	51	14.2
Newborn sex	Male	208	57.8
	Female	152	42.2
Measured newborn weight	Yes	79	21.9
	No	281	78.1
Newborn baby suffered from any problem within 40 days of birth	Yes	112	31.1
	No	240	68.2
Place of birth	Home	289	80.3
	Govt./district sadar hospital	31	8.6
	NGO/private clinics/ others	40	11.1
Persons who assisted to cut umbilical cord	Doctor/nurse	72	20.0
	Untrained TBA	112	31.1
	Trained TBA	70	19.4
	Neighbors/relatives/ else	106	29.4
History of any cord infection	Yes	31	8.6
	No	329	91.4
Treatment for cord infection (n=31)	Yes	20	65.5
	No	11	35.5
Time to initiate breastfeeding	0–30 min	241	66.9
	31–60 min	41	11.4
	61+ min	78	21.7
Any supplementary good was given	Yes	130	36.1
	No	230	63.9
Do you know that regular PNC is necessary	Yes	135	37.5
	No	225	62.5
Immediately face any post-delivery problem	Yes	126	35.0
	No	234	65.0

Results were expressed as n (%).

of the respondents received ANC. The result indicated that compared to the use of ANC services from healthcare facilities, the use of PNC is very poor in rural Bangladesh. It needs to be mentioned that high maternal and neonatal mortality still remains a big challenge in developing countries, including Bangladesh (Begum and Khan, 2010). Therefore, the study emphasized the necessity of increasing PNC services among rural mothers. The study results again showed that maternal education is strongly associated with the ANC and PNC visits ($p < 0.001$), which is comparable to a similar study conducted in Nepal, where the educational status of mothers was significantly associated with ANC visits and place of delivery (Pradhan et al., 2014). Religion is often thought to influence beliefs, norms and values in relation to pregnancy, childbirth and utilization of services (Gabrysch and Campbell, 2009). One of the findings of this study is that religion (Muslim vs. others) is an important predictor of antenatal care and postnatal care utilization ($p < 0.004$). There was significant variation in the utilization of maternal health care by religion. Muslim women, compared to non-Muslim women, exhibit greater use of maternal health care services than women who follow the traditional practice. For example, between 25% and 28% of the former group received antenatal care from a health care professional, compared with 11% of women from the latter group (Mekonnen and Mekonnen, 2002).

The study results also revealed that 80% of births occur at home. This might be linked with economic and pragmatic reasons since delivery costs with a midwife or at a health care facility were perceived as unaffordable by the respondents. Physical distance and transportation is also a major constraint that prevented women from accessing the health facility. The high proportion of home births is consistent with the findings of previous studies conducted in Nepal, e.g. the rate of home delivery was 90% in Makawanpur district, Nepal (Osrin et al., 2002) and 81% in Ganda Community, Nepal (Thakur and Kumar, 2012). In rural Tanzania, 84% of women who gave birth at home intended to deliver at a health facility but did not due to distance and lack of transportation (Winch et al., 2005). About 62% percent of births are delivered at home (BDHS, 2014). The accessibility and location of health care facilities and the type of transport play a major role in the utilization of services.

The study results showed that walking time to the nearest health care facility ($p < 0.024$), transportation costs ($p < 0.001$) and type of transport ($p < 0.001$) are associated with receiving ANC and/or PNC from a health care facility. The scarcity of vehicles, especially in remote areas, and dilapidated road conditions can make it extremely difficult for women to reach even relatively nearby facilities. Some studies revealed that walking is the primary mode of transportation, even for women in labor (Bicego et al., 1997). The movement of mother and baby is culturally restricted for about 40 days after delivery (Bang et al., 2001). Postnatal complications can be detected and treated by health workers through proper follow-up visits of mothers. In the present study, 31% of the newborns had suffered from different health problems within 42 days after delivery, and 9% developed umbilical cord infection. In rural India, it was demonstrated that infection may account for up to 40% of neonatal mortality (Talukder, 2000).

The WHO observes that TBAs can potentially improve maternal and newborn health at the community level and noted that they are generally not trained to deal with complications (Carroli, Rooney, and Villar, 2001). In this study, 19% of umbilical cords were cut by a trained TBA. Again, breastfeeding practices play an important role in reducing child mortality and morbidity. In this study, 67% of the cases initiated breastfeeding within 30 minutes and about 80% within one hour of birth. Our findings are consistent with the findings of some studies conducted elsewhere which documented about 62% of the Ganda Community mothers initiated breastfeeding within 2 hours (Thakur & Kumar, 2012) and 64% of mothers initiated breastfeeding within 24 hours of birth in Andhra Pradesh, India (Ramakrishna, 2000).

The sample of the study area is a limitation for the external validation of these study findings. This rural area comprises a population with the varied cultural background (General and Tribal population) which may not represent the scenario of a traditional rural area in the country. As the samples were drawn from selected areas, several factors like tribal beliefs, values, and norms may have influenced the results as to limit its generalizability.

Conclusions

In light of the study discussion, our study obtained important community-level information about delivery and newborn care practices in rural Bangladesh. The study results also revealed a lower

Table 3
Multinomial logistic regression analysis for estimating the odds ratios and confidence intervals for the combined variable of ANC and PNC (n=360).

Variable	Category	Received ANC and/or PNC from healthcare facility					
		Yes, only ANC or PNC			Yes, both ANC and PNC		
		OR	95% CI	*P* value	OR	95% CI	*P* value
Maternal age (years)	16 – 20	2.71	0.93 – 7.91	0.068	3.29	0.75 - 14.48	0.116
	21 – 25	0.92	0.41 – 2.01	0.801	1.06	0.33 - 3.34	0.930
	26 + (R)						
Maternal Education (years)	0	0.30	0.10 – 0.96	0.043	0.13	0.02 – 0.67	0.015
	1 – 5	0.28	0.09 – 0.81	0.020	0.25	0.07 – 0.95	0.042
	6 – 8	0.46	0.15 – 1.40	0.171	0.58	0.16 – 2.17	0.421
	9 + (R)				Ref.		
Maternal Occupation	Housewife	0.42	0.04 – 4.93	0.489	0.15	0.01 – 1.92	0.144
	Serv./agri./else						
Maternal Religion	Islam	0.27	0.10 – 0.74	0.011	0.16	0.05 – 0.56	0.004
	Hindu./Christ. (R)						
Total number of living children	1	1.25	0.48 – 3.20	0.648	2.25	0.55 – 9.17	0.259
	2	1.70	0.75 – 3.82	0.202	1.72	0.50 – 5.94	0.393
	3+ (R)						
Family income (Taka*)	≤ 5000	0.57	0.20 – 1.61	0.291	0.16	0.04 – 0.60	0.007
	5001–10000	0.97	0.37 – 2.50	0.944	0.47	0.14 – 1.53	0.207
	10001+ (R)						
Type of household for living	Pucca/semi-pucca	1.10	0.31 – 3.92	0.884	0.89	0.17 – 4.64	0.887
	CI sheet/Tin	1.12	0.58 – 2.15	0.741	1.95	0.77 – 4.95	0.162
	Katcha/mud (R)						
Toilet type	Katcha/open field	1.30	0.65 – 2.60	0.461	1.63	0.58 – 4.55	0.352
	Sanitary	2.82	1.14 – 7.00	0.025	5.63	1.75 – 18.11	0.004
	Ring-slab (R)						
Reading newspaper/magazine	Yes	3.54	1.20 – 10.48	0.022	1.66	0.44 – 6.29	0.453
	No (R)						
Listening to radio	Yes	0.43	0.14 – 1.39	0.160	0.71	0.17 – 2.94	0.640
	No (R)						
Watching TV	Yes	2.79	1.45 – 5.37	0.002	5.39	1.97 – 14.76	0.001
	No (R)						
Having mobile	Yes	0.64	0.33 – 1.24	0.187	1.52	0.61 – 3.82	0.373
	No (R)						
Wealth Index	Poorest/poor	0.90	0.41 – 1.99	0.791	1.35	0.42 – 4.34	0.610
	Middle	0.86	0.38 – 1.95	0.712	1.07	0.34 – 3.37	0.903
	Rich/richest (R)						
Walking time to reach the nearest healthcare facility	0–30 min	1.77	0.43 – 7.34	0.433	1.88	0.26 – 13.72	0.535
	31–60 min	1.68	0.44 – 6.49	0.452	1.80	0.26 – 12.68	0.555
	61+ min						
Transportation cost to the reach nearest healthcare facility	0–5 taka	1.72	0.56 – 5.29	0.346	2.48	0.52 – 11.80	0.255
	6–10 taka	2.02	0.83 – 4.95	0.124	1.72	0.48 – 6.18	0.410
	11+ taka (R)						
Transport type to reach the nearest healthcare facility	On foot	7.00	2.41 – 0.31	< 0.001	9.13	2.26 – 36.86	0.002
	Van/rick./else						

Significant at p-value < 0.05 levels, CI = Confidence Interval, OR = Odd Ratio, *77 BDT =1 USD.

proportion of mothers who received PNC within 42 days of delivery and thus indicated the very poor maternal care of newborns in rural Bangladesh. An increase in health education like counseling for mothers to address various risks and raise awareness and transportation should be available for pregnant mothers. Programs should also be included to improve social support for the mothers as a long-term. Importance of adequate antenatal and postnatal care should be prioritized with the existing Maternal and Child Health (MCH) facilities. Since the postnatal period is often considered as a time of seclusion for the mother and baby, Community Health Care Providers (CHCPs) visits the home could be offered as an opportunity to care for both mother and baby. Specific health messages could be developed which consider the culturally sensitive context and counseling sessions could be integrated during ANC visits to increase the postnatal care service.

Ethical considerations

This study was approved by the National Ethics Committee of the Bangladesh Medical Research Council (BMRC). Research ethics have been addressed throughout the study period. Informed consent was obtained in Bengali from the participants ensuring that their participation is voluntarily. The consent form also included a description of the study objectives, clear instructions for opting out of any portion of the questioning, length of the interview and no remuneration for their time. It was assured that all information and records would be kept confidential and not be used for any purpose other than the study. Each subject's name was paired with a code number and the code number was appeared on all written materials.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

Md Shahjahan contributed to conceptualizing and designing the research, sketch analytical plan, interpretation of results, drafting the article and final approval of the version to be published. **Hasina Akhter Chowdhury** participated in the data analysis, drafting of the article. **Ahmed Y. Al-Hadhrami** revised the manuscript for important content and worked on advanced analysis with interpretation. **Golam Dostogir Harun** participated in the data analysis, drafting and review the manuscript and contributed to review the manuscript critically and finalize the article with intellectual thought. All authors read and approved the final manuscript.

Acknowledgements

We are indebted to the postnatal mothers of the Madhupur upazila of Tangail district who took part in the study. Special thanks to Research Assistants (data collectors) for their tremendous to collect quality data from the field. Our special thanks go to the Bangladesh Medical Research Council (BMRC) for financial support under World Bank Research Program.

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