



H-7 (7)

HEALTH

BRAC Research Report

December 2008

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ABSTRACT

This study aimed to describe newborn care practices in an area where maternal, neonatal and child health (MNCH) intervention is being implemented, and to assess the effect of such intervention on newborn care. A cross sectional survey was carried out on 600 mothers to describe newborn care practices in Nilphamari district of Bangladesh. Logistic regression was used to identify socio-demographic, ante-natal and delivery care factors that were associated with newborn care practices. Mothers who had at least three ante-natal care visits had significantly better newborn care practice. Likewise, the presence of an individual trained in newborn care management was significantly associated with better newborn care. The association between 'newborn care practices' with 'ante-natal care visits' and 'presence of trained person in delivery' suggests that evidence-based newborn care practices can be promoted through community-based health worker with existing health services.

INTRODUCTION

Under-five and infant mortality rates have been declining over the past four decades. However, global neonatal mortality rate remains high and poses a serious public health problem (Lawn *et al.* 2005; Al-Sabir *et al.* 2003; Tinker *et al.* 2005). About two-thirds of all infant deaths and 38% of all under-five deaths occur during the neonatal period, resulting in about four million deaths in the first four weeks of life per year globally (Al-Sabir *et al.* 2003; WHO 2003; Lawn *et al.* 2004; Lawn *et al.* 2005). The primary causes of neonatal deaths are believed to be the complications associated with pre-term birth (27%), sepsis and pneumonia (26%), birth asphyxia (23%), tetanus (7%), congenital anomalies (7%) and diarrhoea (3%) with low birth weight contributing to a large proportion of deaths (Lawn *et al.* 2005). In Bangladesh, neonatal mortality remains an alarming public health problem. Data from the Bangladesh Demographic Health Survey (BDHS) 2007 show that more than 70% of all infant deaths and 56% of all under-five deaths occur during the neonatal period (BDHS 2009). About 153,000 newborns die each year in Bangladesh alone, accounting for about 4% of global neonatal deaths (Lawn *et al.* 2005).

Newborn care practices immediately following delivery contribute to reduce a newborn's risk of morbidity and mortality (WHO 1996; Al-Sabir *et al.* 2003; Moss *et al.* 2002; Dramstadt *et al.* 2005). A set of practices that reduce neonatal morbidity and mortality have been outlined as essential newborn care practices (WHO 1996; Dramstadt *et al.* 2005; Marsh *et al.* 2002). These practices, which have been identified as proven interventions that save newborn lives include clean cord care, thermal care, and initiation of breastfeeding within the first hour after childbirth (Bhutta *et al.* 2005; Dramstadt *et al.* 2005; Baqui *et al.* 2007).

Most neonatal deaths in developing countries occur at home, and attended by unskilled health practitioners (Lawn *et al.* 2004; Knippenberg *et al.* 2005). In Bangladesh, 89% of births in rural areas occur at home (BDHS 2009). Therefore, understanding routine newborn care practices at home is necessary to design and prioritize interventions to reduce neonatal morbidity and mortality. This paper aims to describe selected newborn care practices related to cord care, thermal care and breastfeeding in the rural Nilphamari district of Bangladesh where a maternal, neonatal and child health (MNCH) project has been in operation since 2005, and to explore its socio-demographic and other correlates.

MATERIALS AND METHODS

The MNCH initiative is a community-based health intervention to improve MNCH status across rural Bangladesh. In August 2005, BRAC, the largest non-governmental organization in the world, introduced this initiative as a pilot project in Nilphamari district, 385 km north of Dhaka, the capital city of Bangladesh. BRAC's community health workers, known as *Shasthya Shebikas* (SS), are trained to provide essential newborn care, which includes cord care, thermal care, encouragement of early initiation of breastfeeding and prolonged exclusive breastfeeding, etc.

SAMPLING

The study was conducted in six rural *upazilas* (sub-district) of the Nilphamari district. Data were collected as part of a follow-up of the project. A multi-stage random sampling procedure was used. From each *upazila*, four unions were selected randomly. Ten villages were randomly selected from these four unions. The households were surveyed anti-clockwise from the entry point in the village until 10 women were identified in a given village who have had a live birth in the preceding 12 months. The women were then referred to as recently delivered women. Thus, from six *upazilas* a total of 600 recently delivered women were interviewed about the care they received during pregnancy and delivery, their newborn care practices at home, and their socio-demographic factors.

DATA COLLECTION

Data were collected during September-October 2007 by 15 interviewers and three supervisors, all social science graduates with previous experiences in similar work. Socio-demographic information that was collected from recently delivered women included age, level of education, religion, birth order of the reference child, and any NGO membership. Place of delivery was coded into two categories: home and others (institution or on the way). Four programmatic factors were assessed- a) receiving an ante-natal check-up (ANC); b) home visit by BRAC health worker; c) practice on thermal care, delayed bathing, breastfeeding, and clean cord care; and d) having an attendant present during delivery who has been trained in newborn care management (doctor, nurse, BRAC community health volunteer or trained TBAs) in keeping with BRAC recommendations.

OPERATIONAL DEFINITIONS

'Delivery preparedness' was defined as the recently delivered women or her family members planning for transport and money required for any emergency during the pregnancy period. An 'antenatal check-up' is considered to have taken place if the woman reported that she have received any sort of antenatal care during her pregnancy. BRAC has initiated an intensive MNCH programme in this area since 2005 and 'home-visit' is one of the core components of the intervention. Therefore, if a BRAC health worker visited a woman anytime during pregnancy at home, it was defined as a 'home-visit'. Therefore, 'ANC' and 'home-visits' were separate categories; ANC signified provision of physical examinations or health education or provision of iron-folate tablets or tetanus immunization, whereas home-visits by BRAC health workers were only a proxy to reflect BRAC MNCH programme activities. Recently

delivered women were asked about essential newborn care practices including a) what type of instrument was used to cut the umbilical cord and whether the instrument had first been sterilized by boiling; b) whether the newborn was dried and wrapped soon after delivery, c) how many hours or days after birth the newborn was first given bath (standard: three days for normal birth weight neonate and seven days for low birth weight neonate), d) whether any pre-lacteal food or drink was given, and e) how many hours or days after birth breastfeeding was initiated.

The dependent variable 'Good newborn care' was constructed by adding the correct responses to the four selected newborn care practices. Four care practices were coded as follows:

- i. Use of new/or boiled blade in cord cutting (not used=0, used=1)
- ii. Thermal care (not dried and wrapped soon after birth=0, dried and wrapped soon after birth=1)
- iii. Delayed bathing (before three days for normal birth weight baby or seven days for low birth weight baby=0, after three and seven days=1), and
- iv. Initiation of early breastfeeding (more than one hour=0, within one hour=1).

Good newborn care was constructed from these scores ranging from 0 to 4. The score 3-4 was labeled as 'taken good newborn care' and the score 0-2 was labeled as 'not taken good newborn care'.

DATA ANALYSIS

Standard descriptive analysis was conducted. The combination of four newborn care practices as described above was coded as a binary outcome and used as the dependent variable. Explanatory variables included: maternal age category, maternal education level, birth order of reference newborn, household landholding, religion, and uptake of three antenatal care and delivery care variables. Chi-square tests were performed to compare the levels of newborn care practice within the socio-demographic and antenatal and delivery care categories. A multiple logistic regression model was constructed using all the explanatory variables. We also used the probability of predicted values to measure the outcome. Data were entered by data operators, and then checked for consistency. Data were analyzed using SPSS 11 and STATA.

Limitations

Sex of the children was not collected, although it is known to be a factor in such analyses. Moreover, in terms of umbilical cord cutting, the thread that was used to tie up the cord was not included due to incomplete data collection.

RESULTS

Six hundred women were interviewed. We explored the newborn care practices among 506 women who gave birth at home. Levels of socio-demographic factors and coverage with maternal care are presented in Table 1. Nearly four in every five women received at least three antenatal check-ups. The mean age of the reference child was 5.9 ± 3.3 months, while that of the mothers was 22.4 ± 5.2 years.

Fifty-six percent of the respondents received 'Good new born care practices' (Table 1). The levels of different newborn care practices are presented in Figure 1. In this study, a clean cutting instrument was used in 90% of home deliveries. The proportion of the newborns that received thermal care was 24%. Sixty-seven percent of newborns were breast-fed within first hour of birth, though 33% of all the neonates were given pre-lacteal food. Delayed bathing practice was observed in more than half of the respondents.

Table 1. Characteristics of the study population (n=600)

Socio-demographic characteristics	n	%
Maternal age (years)		
14-19	201	33.5
20-29	331	55.2
30-40	68	11.3
Age of the reference child		
0-6 months	323	53.8
7-12 months	277	46.2
Maternal education		
No formal education	194	32.3
Primary	183	30.5
Middle school or higher	223	37.2
Religion		
Muslim	506	84.3
Others (Hindu)	94	15.7
Any NGO membership		
Yes	281	46.8
No	319	53.2
BRAC Village organizer		
Yes	104	17.3
No	496	82.7
Land holding		
<50 decimal	424	70.7
≥50 decimal	176	29.3
Sells labour		
Yes	290	48.3
No	310	51.7
Received at least three antenatal care visits		
Yes	456	76
No	144	24
Home delivery		
Yes	506	84.3
Else where (hospital/on the way)	94	15.7
Newborn care practices (those delivered at home), n=506		
Good care (scored 3-4)	222	56
Not good care (scored 0-2)	284	44

Bivariate comparison of 'Good newborn care' practices by the socio-demographic, antenatal and delivery care factors are presented in Table 2. No significant differences were observed by mother's age and education, reference child's birth order, religion and birth preparedness in levels of 'good newborn care' practices. However, significant differences in levels of 'good newborn care' were observed by landholding, three ANC visits (yes/no), visit by BRAC health worker during pregnancy (yes/no), and presence of 'newborn care management trained personnel' during delivery (yes/no).

Figure 1. Neonatal care practices at home delivery

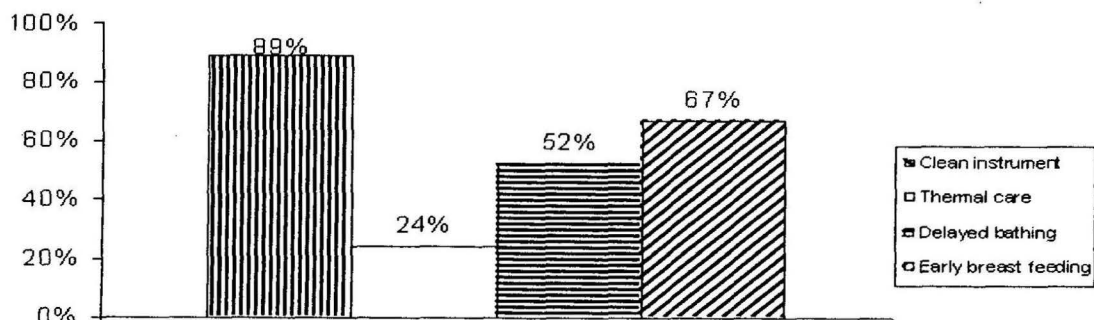


Table 2. Levels of newborn care practices by socio-demographic and antenatal and delivery care factors (n=506)

	Newborn care		
	n	%	χ^2 , Prob
Mother's age (years)			
14-19	77	45.0	.336
20-29	126	45.0	
30-40	19	34.5	
Maternal education			
None	73	41.2	.179
Primary	66	40.7	
Middle+	83	49.7	
Birth order			
1	87	43.1	.360
2-5	114	46.3	
6 or more	21	36.2	
Land holding (decimal)			
<50	153	41.5	.046
≥50	69	50.4	
Religion			
Muslim	195	44.8	.173
Others	27	38.0	
3 ANC visits			
No	43	33.6	.004
Yes	179	47.4	
Visited home during pregnancy by BRAC health worker			
No	25	31.3	.009
Yes	197	46.2	
Delivery preparedness			
No	181	42.9	.190
Yes	41	48.8	
Health worker present in delivery, who is			
Not trained in newborn care management	102	38.8	.010
Trained in newborn care management (TBA, SS or Skilled)	120	49.4	

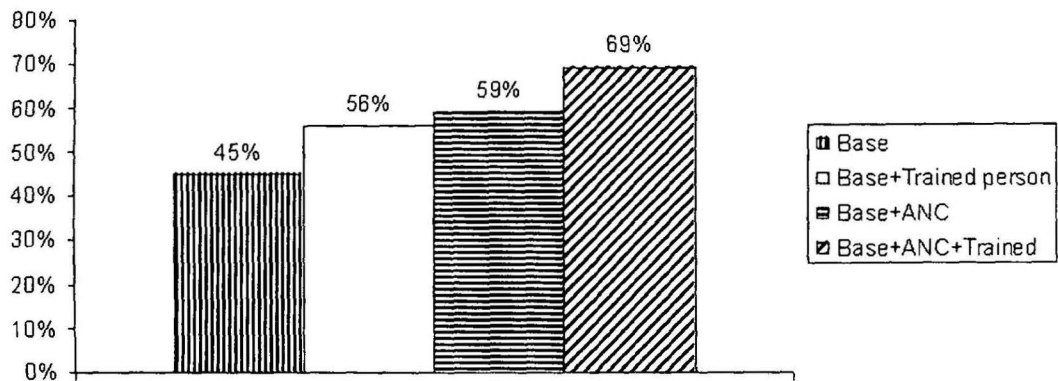
Odds ratios (OR) and 95% confidence intervals (CI) of the multivariate logistic regression models are presented in Table 3. In this model, the socio-demographic factors, education, and landholding were not significant predictors of newborn care, while mother's age was a significant predictor. Younger mothers were doing better in newborn care practices. Newborn care was significantly positively associated only with receiving ANC visits and the presence of a health worker during delivery who was trained in newborn care management. Birth orders of reference child and delivery preparedness were not predictors of newborn care.

While the coefficients of ordered logit regressions give the direction of influence of the variables, the values are not readily interpretable. Therefore, predicted values are often used to interpret the outcome. For this purpose, we constructed a positive base case for a MNCH household, where the mother's age was 20-29 years, having formal education (middle or high), having land more than 50 decimal, with the reference child not being the first child, the mother taking delivery preparation and the household is a member of an NGO. Using estimates of the first regression, such a household has a 45% probability of taking 'good newborn care practices' (Fig. 2).

Table 3. Odd ratio (95% Confidence interval) for selected newborn care practices by socio-demographic, antenatal and delivery care factors

	Odds ratio
Mother's age (years)	
14-19	1
20-29	0.79 (0.49-1.28)
30-40	0.46 (0.22-0.98)
Maternal education	
None	1
Primary	0.96 (0.60-1.52)
Middle+	1.15 (0.70-1.88)
Birth order	
1	1
2 or more	1.47 (0.91-2.37)
Land holding	
<50 decimal	1
≥50	1.33 (0.86-2.05)
At least 3 ANC visits	
No	1
Yes	1.75 (1.13-2.71)
Delivery preparedness	
No	1
Yes	1.14 (0.70-1.85)
Any NGO membership	
No	1
Yes	1.33 (0.92-1.92)
Newborn care management trained health worker present in delivery	
No	1
Yes	1.55 (1.08-2.24)

Figure 2. Predicted probability of newborn care



Adding one advantageous variable to the base case, i.e. presence of trained health worker during delivery or three ANC visits increases the predicted probability of being in newborn care practice to 56%, and 59%, an increase of over 24% and 31% respectively from the base case. Moreover, when we combined these two variables added them to the base case, we find that the probability of newborn care practices increases to over 53%. Thus, the intervention with minimum three ANC visits and presence of trained health worker (in newborn care management) show a much higher chance of resulting in proper newborn care practice, suggesting a strong impact of the MNCH programme in newborn care practices.

DISCUSSION

This study has described four essential newborn care practices in Nilphamari district after a year of MNCH intervention, and examined their association with socio-demographic and delivery care factors. Three ANC visits and presence of trained health workers in newborn care management during delivery have high probability of improving newborn care irrespective of any other variables.

CORD CARE

Cord cutting has been identified as risk factors for neonatal infection and studies suggest low coverage of clean cord care practices among home deliveries in Nepal and India (Baqui *et al.* 2007). Barnett found the use of clean instrument in rural Bangladesh around 60%, which was high compared to Hoque's findings (13% in 1996) (Bernett *et al.* 2006; Hoque and Selwyn 1996). According to mothers' report in the present study, 90% cases of home deliveries used clean/new instruments to cut the umbilical cord, but we were unable to collect data on boiling thread for cord tie. Therefore, we are unable to report on the total clean cord care, rather only reporting the use of clean instrument in cord cutting. Moreover, we did not inquire into how long the blades were boiled. Boiling may have been insufficient or items may have been re-contaminated before being used, so this figure may overestimate the prevalence of effective use of clean instrument in cord cutting. The true estimate is expected to be much lower than that has been estimated above, though SNL 2002 baseline survey reported similar estimate (Syed *et al.* 2006).

THERMAL CARE

The drying and wrapping the newborn after birth that is reported here (21%) is not consistent with previous studies. Findings in this study are low compared to others (Bernett *et al.* 2006; Syed *et al.* 2006). One study showed that after 2 years of SNL intervention the proportion of newborns dried and wrapped immediately after birth increased from 14 to 55% (Syed *et al.* 2006). This implies that the present MNCH project also might be in achieving the targeted proportion over time. Receiving information about thermal care was predictive of the practice, though this information was not well reflected in the present study findings. Therefore, the importance of newborn thermal care should be communicated to health care providers and pregnant women.

DELAYED BATHING

Ideally, infants should not be bathed until at least 24 hours after delivery to maintain body temperature and minimize the risk of hypothermia. Across the study area, 53% of the infants were bathed at least after 3 days. Another study of rural Bangladesh found 65% of infants were bathed within 24 hours of birth (Bernett *et al.* 2006). In this case, the findings are encouraging and closer to the MNCH target.

EARLY INITIATION OF BREASTFEEDING

Pre-lacteal feeding was almost universal, and it was common to delay breastfeeding initiation for several days (Baqui *et al.* 2007). Many studies from South Asian countries have indicated that women commonly wait for several days after birth to begin breastfeeding, avoid giving colostrums, or supplement breastfeeding with other foods and liquids (Talukder 2000; Huffman *et al.* 2001; Engle 2002). Culturally appropriate behaviour change communication strategies can increase rates of immediate breastfeeding (Bhutta *et al.* 2005). Although breastfeeding practice in Bangladesh is almost universal, putting the newborn to the breast within one hour of birth estimated at 39% in baseline survey of SNL project (Syed *et al.* 2006), and later after the intervention it rose to 76%. Findings from the present study found similar rates to recent studies from Pakistan and Bangladesh, which show early breastfeeding initiation rates of 73% and 70% respectively (Fikree *et al.* 2005; Holman and Grimes 2001).

Paul and Deorari observed that factors contributing to the high newborn mortality rates in South Asia include widespread LBW, lack of skilled health care at birth, and low levels of exclusive breastfeeding in the initial months of life (Paul and Deorari 2002). Overall, studies suggest that most neonatal deaths in Bangladesh or other developing countries are preventable through interventions that have been proven efficacious (Dramstadt *et al.* 2005; Bhutta *et al.* 2005; Jones *et al.* 2003). The challenge is to develop appropriate strategies to ensure that these interventions reach wider segments of the population (Knippenberg *et al.* 2005). The most promising finding of the present study is the positive association between existing health services and several of the newborn care practices. These findings offer further evidence that expanding trained personnel in newborn care management and to ensure at least three ANC visits can be viewed as an effective strategy to promote essential newborn care, as well as to intervene in delivery complications, as other studies have concluded (Dramstadt *et al.* 2005; Bhutta *et al.* 2005). Previous community-based trials to promote essential newborn care practices might be improved through appropriate behaviour change interventions (Dramstadt *et al.* 2005; Bang *et al.* 1999). Bang showed dramatic success in reducing neonatal morbidity and mortality through home-based care delivered by village health workers (Bang^a *et al.* 2005; Bang *et al.* 1999; Bang^b *et al.* 2005). The present study suggest that community intervention, including ante-natal care visits and trained community health worker is a promising strategy for improving neonatal health and survival in low resource developing country settings.

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