RISK FACTORS ASSOCIATED WITH

NEONATAL DEATH IN RURAL BANGLADESH

by

Sabine Volchok

A THESIS

Presented to the Department of Public Health and Preventative Medicine

and the Oregon Health & Science University School of Medicine

in partial fulfillment of the requirements for the degree of

Master of Public Health

May 2008

School of Medicine
Oregon Health & Science University

_____

CERTIFICATE OF APPROVAL

_____

This is certify that the Master's thesis of

Sabine Volchok

has been approved

Michelle Berlin MD MPH_____
Mentor/Advisor

Dawn Peters PhD_____
Member

Susan Bankowski JD MPH_____
Member

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ABBREVIATIONS

ANC .... Antenatal Care

CI............................ Confidence Interval

KAP........................ Knowledge, Attitudes and Practices

LAMB Project .... Non-Governmental Organization running a 50-bed hospital in North-Western Bangladesh as well as an Integrated Rural and Health Development Program

LBW........................ Low Birth Weight

MDG .... Millennium Development Goal

NGO .... Non-Governmental Organization

NMR....................... Neonatal Mortality Rate

OR .... Odds Ratio

PNC........................ Postnatal Care

PP .... Postpartum

TBA........................ Traditional Birth Attendant

TTBA .... Trained Traditional Birth Attendant

VHV .... Village Health Volunteer

WHO .... World Health Organization

LIST OF APPENDICES

ACKNOWLEDGEMENTS

ABSTRACT

Background: Worldwide, neonatal deaths (=deaths under 1 month of age) account for 38% of all deaths among children under 5 years of age. The Neonatal Mortality Rate (NMR) in Bangladesh is 41 per 1000 live births compared to only 4 per 1000 live births in most industrialized countries. Many of these deaths are preventable through improved home care practices and care-seeking behavior as well as through improved facility-based care. A thorough understanding of care practices that are predictive of neonatal death, especially in rural communities in Bangladesh, will provide the basis for developing effective strategies to focus outreach efforts.

Objective: To determine the factors associated with neonatal mortality among mothers of <2 year old children in a rural, underserved community of Bangladesh.

Methods: This study was a retrospective analysis of secondary, self-reported data from a 2006 Knowledge, Attitudes and Practices survey (KAP survey) conducted by researchers affiliated with the LAMB Project, a Non-Governmental Organization (NGO) working in rural Bangladesh. Simple and multiple regression analyses were performed to assess the association of explanatory variables related to demographics and antenatal, intrapartum and postnatal periods with the incidence of neonatal mortality.

Results: The NMR for the study sample was 75 per 1000 live births. The use of clean cord cutting tools was initially significantly associated with a decrease in risk of neonatal death (OR 0.305, 85% CI 0.149 – 0.624) but then in the multiple regression model confounded by the type of birth attendant used, the age at which a mother was married and whether or not she decided on place of delivery herself. Having a Village Health Volunteer (VHV) or a Trained Traditional Birth Attendant (TTBA) as a birth attendant compared to having a doctor or trained midwife at delivery was significantly associated with neonatal death (p-value = 0.025). Deciding on place of delivery herself was significantly associated with an increase in risk of neonatal death (p-value = 0.026). Being married at 15 or younger was only weakly associated with the risk of neonatal death (p-value = 0.131).

Conclusions: Using unclean tools for cord cutting, such as house knives and other means, and using a VHV or TTBA as birth attendants, who were associated with using unclean cord cutting tools, increases the risk for neonatal death significantly. Contrary to findings in the literature, in this study sample, being able to make decisions about place of delivery oneself actually increased the risk for neonatal death. Further analysis of this relationship in this community is warranted with better survey tools.

Public Health Implications: There is a need for health education and training about proper clean cord cutting techniques among the women in this community as well as among the VHVs and TTBAs. Particular attention should be placed on educating especially those women who get married at a very young age.

Risk Factors Associated with Neonatal Death in Rural Bangladesh

Sabine Volchok

"Su Nombre es Hoy" (His name is Today)
  "We are guilty of many errors and many faults, but our worst crime is abandoning the children, neglecting the fountain of life. Many of the things we need can wait. The child cannot. Right now is the time his bones are being formed, his blood is being made, and his senses are being developed. To him we cannot answer 'Tomorrow,' his name is today."

> **Gabriela Mistral** (1889 –1957
> Chilean poet, educator, diplomat and feminist and first
> Latin American to win the Nobel Prize in Literature in
> 1945

I. BACKGROUND and SIGNIFICANCE

Introduction

Worldwide, an estimated 11 million children die before they reach the age of five years every year (Lawn, 2005). Of those, approximately 4 million (38%) die during their first month of life, the neonatal period. The overwhelming majority of these deaths (99%) occur in the developing world. An estimated two-thirds of all neonatal deaths occur in only ten countries. In fact, neonatal mortality ratios constitute one of the largest discrepancies in any public health statistics between developed and developing countries: the neonatal mortality rate in South Asia was 38 out of 1000 live births compared with only 4 out of 1000 live births in high-income countries in 2005 (Lawn, 2005).

According to the Bellagio Child Survival Study Group (Jones, 2003), 55% of these

deaths are entirely preventable. Early success in preventing neonatal deaths can be achieved by emphasizing antenatal and postnatal care through family-community intervention strategies such as health education to improve home health care practices and care-seeking behavior (Darmstadt et al, 2005).

My thesis project, described here, examined the relationship between care practices among mothers during pregnancy and the neonatal period, and neonatal mortality in a limited resource setting in rural Bangladesh. The results of this study help fill the gap concerning knowledge, attitudes and practices regarding maternal and neonatal care practices and will inform the design of effective strategies to improve newborn health at the community level in this Bangladeshi county. It will provide the global health community with improved understanding of where to focus feasible, highly cost-effective intervention strategies that can be applied in other limited-resource settings in other Bangladeshi counties and beyond.

The Burden of Neonatal Death

At the UN Millennium Summit in 2000, a number of development goals were adopted to reduce extreme poverty in its many dimensions, including disease, by 2015 (UN Millennium Project, 2005). Millennium Development Goal number four (MDG-4) specifically aims to reduce child mortality (defined as deaths of under 5 years of age) by two-thirds by the year of 2015. As 38% of these deaths occur among neonates, there is a growing understanding within the international community that neonatal mortality must be addressed to reduce child mortality and to attain MDG-4.

Many developed countries have been able to improve their child mortality rates from 30 per 1000 in the 1950s to less than 10 per 1000 in the late 1990s (WHO, 2005). Neonatal

mortality rates have followed a similar trend. Progress in the reduction of neonatal mortality was made largely due to the introduction of free antenatal care, improved childbirth care, the availability of antibiotics and access to skilled birth attendants and midwives who provide postnatal care (Lawn, 2005).

In many developing countries, like Bangladesh and others in South Asia, advances in reducing child and neonatal mortality rates have been much less successful. While Bangladesh has been able to reduce its child mortality rates by one third from the early 1980s to those of the late 1990s (Ahmad et al, 2000), the decline in neonatal mortality rates has been significantly slower. The one-third reduction was largely due to focusing program efforts on addressing diarrhea, malaria, pneumonia and vaccine-preventable conditions which represent the main causes of death after the neonatal period in developing countries. In contrast, during that same time frame, Bangladesh has only been able to reduce its neonatal mortality rates by one-fifth: from 52 per 1000 to 41 per 1000 (WHO Child Health Profile).

Causes of Neonatal Deaths

According to the WHO's 2005 World Health Report, the three most common causes of neonatal mortality are complications of prematurity (including low birth-weight), complications during delivery (primarily birth asphyxia and birth injury) and severe infections including sepsis, pneumonia, tetanus and diarrhea. The distribution of these causes varies between countries as well as within countries.

In rural Bangladesh, approximately 94% of all births and neonatal deaths take place at home with little-to-no involvement of the formal healthcare system (Darmstadt et al, 2006). Three quarters of all births are attended by traditional birth attendants (TBAs), 88% have not

received any medical training.   Only 11.6% of deliveries are attended by medically-trained personnel (Darmstadt, 2006). The cause of neonatal death is often not recorded due to a deficient death-registration system. However, the Center for Health and Population Research in Bangladesh (Chowdhuri, 2005) reports in a study conducted in rural areas of the country that 30% of the neonatal deaths were due to prematurity, 26% due to birth asphyxia and 32% due to sepsis. These conditions are particularly critical among the poor and rural population where knowledge about these conditions and access to quality clinical services is scarce (Hong et al, 2007).

Contributing factors to all three conditions – prematurity, birth asphyxia and sepsis – are common in this setting. For example, prematurity and low birth-weight (LBW) are both associated with poor nutrition and anemia, conditions that are highly prevalent among rural women in Bangladesh (Chowdhuri, 2005). Prematurity and LBW also predispose infants to the development of neonatal sepsis. Home deliveries are common in Bangladesh and typically are conducted in poor hygienic conditions. In a study conducted in Dhaka, Bangladesh in 1998 by Ahmed et al, history of unclean vaginal examination was associated with a 10% incidence of severe infection. Home deliveries also were significantly related to birth asphyxia, which was highly prevalent in that study, and which, in turn, was associated with an increased risk of serious neonatal infection.

Effective Interventions to Reduce Neonatal Deaths

Though no single intervention can address all causes of neonatal deaths, a number of effective and low-cost interventions can help save the lives of newborn babies. Training to carry out these interventions can be delivered through outreach, family-community care and

facility-based clinical care (Darmstadt et al, 2005). Early success in reducing neonatal deaths is possible in settings with a high neonatal mortality rate and a weak health system such as rural Bangladesh (Darmstadt et al, 2005). Such success has been observed with delivering interventions through outreach (including routine antenatal care provided through visits within the community) and family-community care (including health education to improve home care practices and care-seeking behavior). For example, death in moderately premature babies can be prevented by teaching mothers to give extra attention to warmth, feeding and prevention or early treatment of infections (Lawn, 2005). Similarly, it has been demonstrated in rural India (Bang, 1999) that the incidence of neonatal sepsis can be successfully reduced with cost-effective health education and home based neonatal care provided by health workers.

Preventive community-based interventions such as outreach and family-community care are highly cost-effective (Adam, 2005) and alone can avert approximately 18-37% of neonatal deaths (Darmstadt et al, 2005). Simultaneous improvement in facility-based clinical care could avert up to 72% of all neonatal deaths (Darmstadt et al, 2005).

However, dissemination and use of these interventions is vastly inadequate in Bangladesh. For example, only 6% of newborn babies receive thermal protection with drying and wrapping-up in dry clothes and are not given a bath for 3 days. Among newborns with acute respiratory illness only 23% of were taken to a qualified health care provider (Government of Bangladesh, 2006). A challenge identified by the Bangladeshi government is to increase awareness on sound neonatal practices for mothers, families and primary care providers.

Care Practices in Rural Bangladesh

Little is known about the knowledge, attitudes and care practices among mothers living

in rural Bangladesh. To develop successful strategic interventions more understanding of local practices and beliefs is needed to prevent neonatal deaths in these communities. A review of the literature concerning antenatal, intrapartum and postpartum care practices for mothers and newborns in Bangladesh yielded the following:

A. General

The decision-maker in the family is typically the husband or mother-in-law, especially in regards to care-seeking outside of the home. Most rural populations favor village doctors and TBAs (Gayen, 2007), who are lay persons without medical training. These practitioners are cheaper, more accessible and their practices are considered more culturally acceptable compared with medical doctors and trained midwives working at government hospitals or clinics. Only when delivery complications are anticipated or are encountered is medically trained personnel for childbirth sought (Paul, 2002).

B. Antepartum

According to Darmstadt et al in their 2006 review of home maternal and newborn care practices in rural Bangladesh, only 51% of women received any antenatal care. Of those, only 49% were received from a medically trained provider. Antenatal care is typically sought late in pregnancy (median was at 5.2 months). There is a general reluctance to prepare for delivery or to seek care for danger signs encountered as these are considered "embarrassing". Often, danger signs are being recognized but not seen as life-threatening. The knowledge about complication among traditional birth attendants (TBAs) tends to be high but they are reluctant to refer a woman and often only do so when the mother is near death.

It is a common belief in Bangladesh that pregnancy affords no special entitlement to food and it follows Bangladeshi culture that children and men will be given priority over women for

food. Thus, poor nutritional status among women is common (Darmstadt et al, 2006).

C. Intrapartum

The majority of births (94%) in rural Bangladesh occur at home in unhygienic conditions attended by relatives and untrained TBAs (referred to in Bangladesh as "dais") (Paul et al, 2002). The focus during the intrapartum period is on the delivery of the placenta as it is believed to have spiritual powers. The newborn baby is often left unattended until the placenta is delivered. The baby is usually bathed within several hours of delivery and the baby's head is shaved.

D. Postpartum

Postnatal care is considered not customary often due to both a concern for cost and a strong custom of postpartum confinement and seclusion of both mother and baby. In fact, only 12 % of all newborns received a check up by a trained health care provider within the first 2 days of delivery (Darmstadt, 2006).

Many women consider colostrums to be "dirty" and hence, only 24% of women breastfeed within 1 hour of birth and often breastfeeding is delayed for 3 days. While there is a strong breastfeeding culture in Bangladesh in general, only 23.1% of women exclusively breast feed for 5 months.   In many cultures, including Bangladesh, it is common practice to give babies other substances to drink within the first days of life. When such fluids are given before lactation is established, they are known as prelacteal feeds (WHO, 1997). These prelacteal feeds, consisting of palm sugar water, are often given when poor sucking is perceived or for a LBW baby for the first 40 days. Receiving these non-nutritive drinks predisposes the infants to diarrhea and acute respiratory infections (Arifeen, 2001).

The goal of this study is to explore the relationship between selected behaviors and care

practices and the incidence on neonatal death in a rural community in Bangladesh, using data collected by the LAMB project in 2006. Focusing on the household level is important in this population not only because that is where the majority of all births and neonatal deaths take place but also because of a strong culture of maternal and neonatal confinement during the neonatal period. Improved understanding of factors that are predictive of neonatal death will provide the basis for developing effective strategies to improve neonatal survival in this community and similar rural communities in Bangladesh and beyond.

METHODS

Overview

The goal of this study was to determine factors that are associated with neonatal mortality (=death under 1 month of age) among mothers of <2 year-old children in a rural, underserved, poor population of Bangladesh. The factors examined included demographics and factors associated with the antenatal, intra-partum and postnatal period. Based on previous research regarding risk factors for neonatal mortality associated with these different periods as well as certain demographics of the mothers, it was hypothesized, that some of the factors that were examined in this study would also be significantly associated with the dependent variable - neonatal death in the past year.

The study was a retrospective analysis of secondary, self-reported data from a 2006 Knowledge, Attitudes and Practices survey (KAP survey) administered by researchers affiliated with the LAMB Project, a Non-Governmental Organization (NGO) working in rural Bangladesh. Simple and multiple logistic regression analyses were performed to assess the association of explanatory variables with the incidence of neonatal mortality.

The LAMB Project

The LAMB project works to improve rural health and development in North West Bangladesh and has been in existence since 1955. The LAMB project runs a 50-bed hospital which provides primary, secondary and tertiary health services especially to the poor in NW Bangladesh and, working together with the Government of Bangladesh, the organization conducts various community health projects and provides education.

KAP Survey Data Source

One of those projects was a KAP survey in November/December, 2006 of 300 women of under 2-year old children in Damadorpur, a county in NW Bangladesh located approximately 28km of the hospital run by the LAMB project. A sample size of 300 was chosen as this was the sample size used previously for other KAP surveys performed by the LAMB project research group.

Study Population

All mothers with biological children that were <2 years old were chosen for this survey. Mothers whose child or children had died were included as well. The study sample comprised 300 women who met the inclusion criteria.

KAP Survey

The KAP survey (Appendix A) was initially designed to identify knowledge, attitudes and practices related to maternal/child and reproductive health in a rural underserved poor population of mothers of <2 year-old children. The survey consists of 39 questions and was conducted over 5 days using 3 staff members and 7 outside workers. These 10 surveyors were instructed to conduct 6 surveys per day. Each survey took approximately one hour.

Sampling Methods

The KAP survey was administered using a cluster-randomized sampling strategy. The survey was conducted in Damardopur county (referred to as "union" in Bangladesh) in NW Bangladesh. This county has approximately 90 so-called "paras" which are parts of a village

made up of a cluster of houses. A sequence of random numbers was created and from those 90 "paras", 30 were chosen that matched with a para from the random number sequence:

4,6,7,9,10,11,16,24,25,26,33,34,37,40,45,50,53,58,64,66,68,71,77,79,80,81,83,84,86,88

It was known that in each of the "paras" a mother of an <2 year child lived in approximately every third "bari" (defined as a household "where everyone eats together"). The goal for the surveyors was to contact at least 30 baris to reach 10 mothers per para. To insure randomness, the surveyors were instructed to go to the center point of a para, then to divide the para roughly into equal parts where each part contained approximately 25-35 baris. The surveyors then chose the part of the para to survey by spinning a pen on the ground and surveying all households in the portion of the para indicated by the spun pen.

Data Management and Confidentiality

Verbal consent was obtained from each mother interviewed, with assurance that all answers were completely confidential (including no linkage of names to the responses provided). The survey was conducted in the privacy of each interviewee's home. As most of the mothers in this part of the country are illiterate, the questions were read to her and the surveyors were instructed not to provide any answer choices. They then chose the answer that most closely matched the choices on the survey. The responses were recorded on an answer sheet and later entered into a spreadsheet using the Microsoft Access format which did not include any personal identifiers (e.g. no names or specific household address) but contained a unique identification number for each record. Data cleaning consisted of double-key data entry by the researchers at the LAMB project, who checked for duplicates and missing data and ensured logical consistency. Photocopies of the answer sheets were then secured and locked in cabinets in the LAMB project

facility. The final data in Microsoft Access format was de-identified. The compact disc with the data was hand-carried by an associate of the LAMB project to the U.S. and was delivered to me. I then copied and transferred the data into SPSS for analysis, using the SPSS Student version 14.0 as the statistical package of choice.

.

Analysis Method

SPSS (student version 14.0) was used to generate the frequencies of all variables including the dependent variable. SPSS was then used to generate cross tabulations, odds ratios, univariate and multivariate regression modeling.

Dependent and Independent Variables

Dependent Variable

For the dependent variable, a binary variable was created, rated as a "1" if a respondent had a neonatal death in the past year and rated as "0" if there was no neonatal death that occurred during the past year. Questions 4a and 4c were combined to determine the occurrence of neonatal death during the year preceding the survey. An answer of "1-2 children" to question 4a: "In the past year, how many of your children died?" was combined with either an answer "<7days" or "8 days to a month" in response to question 4c. This created the "1" group of the binary variable. An answer "none" to 4a "In the past year, how many of your children died?" made up the referent group of the dependent variable rated as "0". The latter included mothers who experienced a child death at any age that occurred prior to the year preceding the survey as well as mothers who experienced a death of child older than 1 month during the year preceding

12

the survey. There were 37 missing responses to 4a and these non-respondents were excluded

from the analyses. This resulted in a preliminary data set of 263. Of these 263 respondents, 31

had an infant die within the past year that was under 1 month old.

Independent Variables

The 16 independent variables selected for analyses were based on an extensive literature

search documenting their relevance in relationship to neonatal mortality. The following

discussion of individual variables selected for analysis groups them according to whether they

are expected to provide information about demographics or the antenatal, intrapartum or

postnatal period.   Re-categorizing of some of the variables became necessary because either the

literature search pointed to specific categories commonly used or because of sparseness of data

in some categories.

Demographics

Q1: "At what age did you marry?"		
KAP Survey		*Re-Coding*
a. < 15 yrs.		1 = 15 years or younger
b. 16-17 years		
c. 18-21		
d. 22-25		2 = 16 or older
e. > 25 yrs.		

The decision to recode this variable was made based on literature findings indicating a

significant association of young maternal age and an increased risk of neonatal death (Alam,

2000). The suggestion has been made that physical immaturity, particularly being 15 years old or

younger, may be an important risk factor for these deaths.

Q2: "How many times have you been pregnant?"		
KAP Survey		*Re-Coding*
a. none		
b. 1-2	→	1
c. 3-4	→	2
d. 5-6		
e. >6	→	3 = 5 times or more

For this variable it became necessary to re-categorize because of sparseness of data.

Answer choices d and e were collapsed into one category to be both coded as "3 = 5 times or more". Mercer et al (2006) found in their study a higher proportion of mothers who had a neonatal death compared to those who did not had more than five pregnancies. Similarly, Chowdhury et al (2005) found that mothers with more than three pregnancies had a significantly higher early neonatal mortality compared to primiparous women.

Q3: "How many living children do you have?"		
KAP Survey		*Re-Coding*
a. none		
b. 1-2	→	1 = <3
c. 3-4		
d. 5-6	→	2 = 3 or more
e. >6		

This re-coding of the variable became necessary also due to sparseness of data. According to the Child Health Research Project Special Report (1999), the risk for neonatal mortality decreases with an increasing number of siblings within a single family.

Q5b: "Did you decide about delivery place?"		
KAP Survey		*Re-Coding*
a. yes	→	1
b. no	→	2

Das Gupta in her study on determinants of child mortality in India (1990) showed that

children of women who had greater decision-making authority in the household were less likely to die.

Antenatal Factors

Q6a: "Which pregnancy or delivery danger signs do you know?"		
KAP Survey		*Re-Coding*
a. bleeding		
b. fits		
c. something other than head comes out first		2 = know some
d. headache		
e. fever		
f. prolonged labor		
g. none.		1 = know none

Re-coding became necessary as data was sparse. In a study conducted in a "Saving Newborn Lives, Save the Children" area in rural Bangladesh by Syed et al (2006) it was noted that knowledge and awareness of potentially life-threatening conditions during pregnancy, during delivery or after delivery is low among the women contributing to a high number of neonatal deaths.

Q6b: "If any of these arise, what would you do?"		
KAP Survey		*Re-Coding*
a. go to hospital or clinic		1 = go to hospital or clinic
b. go to village practitioner (kobiraj, village doctor, etc.)		
c. go to village health volunteer		2 = village practitioner, VHV or other
d. other.		

Again, re-coding became necessary due to sparseness of data. Because the use of skilled providers for antenatal care, during and after delivery is a key proximate determinant of infant outcomes including mortality (Reynolds et al, 2006), I decided to re-categorize by skilled

providers (who commonly practice in hospitals and clinics) and un-skilled providers (village practitioners and providers and other).

Q7: "Where did you go for antenatal care during your last pregnancy?"		
KAP Survey		*Re-Coding*
a. hospital b. NGO clinic c. private clinic		1 = hospital or NGO clinic or private clinic
d. local practitioner (kobiraj, village doctor, etc.) e. other		2 = local practitioner or other
f. none.		3 = nowhere

The need to re-categorize here was again based on sparseness of data. This question combines both findings from the discussion above for Q6b and the discussion below from Q8a: receiving skilled antenatal care from a provider at a hospital or clinic is associated with preventing neonatal mortality and morbidity when compared to receiving un-skilled care (local practitioner) or no care.

Q8a: "How many ANC visits during your last pregnancy?"		
KAP Survey		*Re-Coding*
a. none		3
b. 1-2		1
c. 3 or more.		2

Hong and Beltram (2007) found in their study on the impact of antenatal care (ANC) on child survival in Bangladesh that infant death was more than two times more likely when the mother did not receive any antenatal care compared to those who did. Antenatal care can improve certain outcomes through the detection and management of and referral for potential complications. Adequate antenatal care may improve birth weight, may prevent, identify and treat anemia and malaria. The provision of antenatal care also presents an opportunity to teach how to recognize and respond to the signs of obstetric complications and improves care-seeking

for sick newborns (Reynolds et al, 2006).

Intrapartum Factors

Q11a: "Where did you deliver?"		
KAP Survey		*Re-Coding*
a. home	→	1 = home
b. clinic		
c. hospital	→	2 = clinic or hospital

Re-coding became necessary due to sparseness of data. According to the Population Reference Bureau (June 2003), it is the presence of skilled birth attendants, commonly practicing in hospitals and clinics, that can save newborn lives. It is understood that there is a paucity of skilled birth attendants available for home births in rural Bangladesh.

Q11b: "Who was the birth attendant?"		
KAP Survey		*Re-Coding*
a. relative		
b. TBA	→	2 = TBA
c. VHV/TTBA	→	3 = VHV/TTBA
d. doctor or trained midwife	→	4 = doctor or trained midwife
e. self		
f. other	→	1 = self or relative or other

Sparseness of data made re-coding necessary for this variable as well. Please refer to discussion and literature references provided under Q6b and Q7 regarding the impact on neonatal outcomes when having skilled versus unskilled birth attendant at time of delivery.

17

Q13a: "What type of trouble did you have at time of delivery or within 42 days?"		
KAP Survey		*Re-Coding*
a. bleeding		
b. fits		
c. something other than head comes out first		1 = had trouble
d. headache		
e. fever		
f. prolonged labor		
g. none.		2 = did not have trouble

Again, sparseness of data made re-coding necessary. Complications during labor are an important determinant of fetal and neonatal survival. In general, intrapartum risk factors are associated with greater increases in risk of neonatal death (Lawn et al, 2005).

Q15: "How was the cord cut after the child was born?"		
KAP Survey		*Re-Coding*
a. boiled blade		
b. new blade		1 = boiled or new blade
c. house knife		
d. other.		2 = house knife or other

Sparseness of data made re-categorizing necessary here as well. According to the Center for Health and Population Research in Bangladesh (Chowdury, 2005) 26% of all neonatal deaths are due to sepsis and clean cord care practices can prevent most of the infections responsible for neonatal deaths (Save the children, 2006).

Postnatal Factors

Q12: "Did any health care person visit you at home after delivery?"		
KAP Survey		*Re-Coding*
a. yes		2
b. no		1

Reductions in neonatal mortality can be achieved through skilled postpartum care for the

newborn (WHO, 1997). A challenge in this part of the world is that cultural norms dictate that movement outside of the home for mother and newborn during the first month postpartum is restricted. Home visits will provide the only means for postpartum care for these mothers and their infants.

Q14: "How long after delivery did you bathe the newborn?"		
KAP Survey		*Re-Coding*
a. < 6 hrs		
b. 7-12 hrs		1 = <24 hrs
c. 12-24 hrs		
d. > 24 hrs		2 = >24 hrs

The decision to recode this variable was based on physiological reasons found in the literature. Physiologically, maximum cases of hypothermia among newborns are found within the first 24 hours of birth (Agarwal et al, 2007) and it is therefore suggested for optimal thermal protection to delay baby's bath as long as possible.

Q25: "After delivery, when were colostrums or breast milk given to feed?"		
KAP Survey		*Re-Coding*
a. < 1 hour		
b. 1-2 hours		
c. 3-5 hour		2 = within 24 hrs
d. 5 hr.-1 day		
e. >1 day		3 = more than 24 hrs
f. not given.		1 = none given

The rationale for this re-coding was derived from the literature where immediate initiation of breast feeding within 24 hours after birth was significantly associated with a reduction in the incidence of neonatal deaths (London, 2006).

Q26: "What is given a newborn to eat after birth?"	
KAP Survey	*Re-Coding*
a. honey	
b. sugar water	1 = honey or sugar water
c. colostrums	2 = colostrums
d. cow's milk	3 = cow's milk
e. other.	4 = other

Here again sparseness of data required appropriate re-categorizing. Immediate and exclusive breastfeeding (here indicated by answer choice c. colostrums) has been shown to be protective for newborns and improves their chances for survival (Bhutta et al, 2003).

Summary of Recoded Independent Variables for Univariate Logistic Regression Table 1

Question	Independent Variable	Referent Group	Comparison Group
Q1	Age married	2 = 16 years or older	1 = <15 years or younger
Q2	Times pregnant	3 = 5 or more	1 = 1-2 2 = 3-4
Q3	Nr. of living children	2 = 3 or more	1 = < 3
Q5b	Delivery decision last delivery	2 = no	1 = yes
Q6a	Know which delivery danger signs	2 = know some	1 = know none
Q6b	Where go if danger signs occur	2 = village practitioner or VHV	1 = hospital or clinic
Q7	ANC where last pregnancy	3 = nowhere	1 = hospital or NGO clinic or private clinic 2 = local practitioner or other
Q8a	Nr. of ANC visits	3 = none	1 = 1-2 2 = >2
Q11a	Where deliver	2 = clinic or hospital	1 = home
Q11b	Birth attendant	4 = doctor or trained midwife	1 = self or relative or 2 = TBA 3 = VHV or TTBA
Q12a	PP visit by health care provider	2 = yes	1 = no
Q13a	Delivery trouble and 42 days after	2 = had no trouble	1 = had trouble
Q14	Baby bath	2 = >24 hours	1 = < 24 hours
Q15	Cord cut how	2 = house knife or	1 = boiled or new blade
Q25	Newborn food when	3 = after 24 hours	1 = none given 2= within 24 hours
Q26	Newborn food what	4 = other	1 = honey or sugar water 2 = colostrums 3 = cow's milk

III. STATISTICAL ANALYSIS

Descriptive Analysis

Frequencies of all variables including the dependent variable were generated as were cross tabulations of each independent variable with the dependent variable. This allowed for exploration of the independent variables and their relationship to the outcome variable.

Univariate Logistic Regression Analysis

A univariate logistic regression with each of the independent variables and the dependent variable was performed. Crude odds ratios (ORs) and their 95% confidence intervals (95% CI) were generated in this way. Upon completion of the univariate analyses, significant variables based on a significance level of $p < 0.15$ were identified and selected for the multivariate analysis. Using a level of <0.15 as a screening criterion for the selection of candidate variables is based on the work of Mickey & Greenland (1989) on logistic regression. This allowed for more variables to be included in a model.

Due to missing data for variables selected based on the univariate models, 15 respondents were removed leaving 248 respondents for the mulitvariate modeling. For variables with a larger number of missing data, rather than remove those respondents, a new category was created whereby the missing data points became an additional category termed "no answer". This allowed for keeping the data set as large as possible without removing any further respondents. The univariate logistic regression models were then re-run on this subset of the original sample.

Multivariate Logistic Regression Analysis

I fitted a multivariate model with independent variables identified as significant based on a significance level of <0.15 in the final univariate regression analysis. I chose a forward selection method to select variables for inclusion or exclusion from the final model in a sequential fashion based on statistical criteria. Using a significance level of < 0.10, I proceeded beginning by including the variable with the most significant p-value.

Confounding was assessed by comparing the odds ratios (OR) at every step of variable inclusion.

IV. RESULTS

Descriptive Analysis

Frequencies of all 16 Independent Variables and the Dependent Variable

A. Dependent Variable

Table 2

DEPENDENT VARIABLE		
Independent Variable	*Frequency*	*Percentage*
Neonatal Death in past year		
Yes	34	12.9%
No	229	87.1%

The preliminary data set of n=263, after removal of 37 non-respondents, revealed that a total of 34 neonatal deaths occurred during the year preceding the survey resulting in an incidence proportion of 12.9 % in this sample of 263 mothers of under 2 year-old children.

B. Independent Variables

The following discusses the frequency results for the 16 independent variables chosen for the analysis and refers to the preliminary data set of n=263.

Table 3

DEMOGRAPHICS		
Independent Variable	*Frequency*	*Percentage*
Age married		
< or = 15	71	27.0%
16 and older	188	71.5%
missing	4	1.5%
Times pregnant		
1-2 times	145	55.1%
3-4 times	88	33.5%
5-6 times	26	9.9%
> 6 times	4	1.5%
Nr of living children		
<3	180	68.4%
3 or more	83	31.6%
Decision about delivery place		
Yes	158	60.1%
No	47	17.9%
missing	58	22.1%

Demographic characteristics of the mothers in the study population are shown in Table 3 above. 27% of mothers were married at age 15 or younger whereas 71.5 % of mothers were married at age 16 and older. More than half (55.1%) of the mothers described having been pregnant 1-2 times, 33.5% had been pregnant 3-4 times, 9.9% 5-6 times and 1.5% 7 times or more. 68.4% are mothers with < 3 living children and 31.6% are mothers with 3 or more living children. 60.1% of mothers made their own decision of place of delivery whether 17.9% did not.

Table 4

ANTENANATAL FACTORS		
Independent Variable	*Frequency*	*Percentage*
Know pregnancy/delivery danger signs		
know some	172	65.4%
know none	89	33.8%
missing	2	0.8%
Where go if danger signs occur		
hospital or clinic	156	59.3%
village practitioner or VHV or other	49	18.6%
missing	58	22.1%
ANC where last pregnancy		
hospital or NGO clinic or private clinic	93	35.4%
local practitioner or other	69	26.2%
nowhere	94	35.7%
missing	7	2.7%
Nr. of ANC visits		
1-2 visits	123	46.8%
>2	58	22.1%
none	76	28.9%
missing	6	2.3%

Table 4 above describes variables relating to the antenatal period. Almost 2/3 of the mothers (65.4%) were able to describe some danger signs pertaining to pregnancy and delivery, whereas 1/3 of the mothers (33.8%) were not able to. 59.3% of the mothers would seek care at a hospital or clinic if they identified any danger signs and 18.6% would go to the village practitioner, village health volunteer or others for care. As far as routine antenatal care is concerned, 1/3 of the mothers (35.4%) sought care from a hospital, a NGO clinic or a private clinic whereas close to 1/3 of the mothers (26.2%) sought care from a local practitioner. Another 1/3 (35.7%) did not receive any antenatal care. Almost half of the mothers (46.8%) received an average of 1-2 visits and 22.1% received more than 2 visits.

Table 5

INTRAPARTUM FACTORS		
Independent Variable	*Frequency*	*Percentage*
Where deliver		
home	239	90.9%
clinic or hospital	24	9.1%
Birth attendant		
self or relative or other	115	43.7%
TBA	21	8.0%
VHV or TTBA	37	14.1%
doctor or trained midwife	79	30.0%
missing	11	4.2%
Delivery trouble		
had trouble	126	47.9%
had no trouble	130	49.4%
missing	7	2.7%
Cord cut how		
boiled or new blade	237	90.1%
house knife or other	25	9.5%
missing	1	0.4%

Table 5 describes frequencies of selected variables pertaining to the intrapartum period. 90.9% of all mothers delivered at home and only 9.1% delivered in a clinic or hospital. Close to half of the mothers (43.7%) delivered by themselves or with the help of a relative or other person. Only 8% delivered with a TBA and 14.1% with a VHV or TTBA compared with 30% who delivered with either a doctor or trained midwife.

Half of the mothers (47.9%) described having had trouble during delivery such as bleeding, seizures, fevers, prolonged labor or breech presentations. The other half (49.4%) did not have any trouble.

90.1% of the mothers described that a boiled or new blade was used for cutting the umbilical cord whereas 9.5% admitted that a house knife or some other means was used.

Table 6

POSTNATAL FACTORS		
Independent Variable	*Frequency*	*Percentage*
PP visit by health care provider		
yes	177	67.3%
no	84	32.3%
missing	1	0.4%
Baby bath		
<24 hours	203	77.2%
>24 hours	60	22.8%
Newborn food when		
none given	30	11.4%
within 24 hours	170	64.6%
after 24 hours	12	4.6%
missing	51	19.4%
Newborn food what		
honey or sugar water	29	11.0%
colostrums	31	11.8%
cow's milk	103	39.2%
other	95	36.1%
missing	5	1.9%

Table 6 above describes variables that are associated with the postnatal period. 2/3 of the

mothers (67.35) received a postpartum visit by a health care provider whereas 1/3 (32.3%) did

not. More than three quarter of the mothers (77.2%) bathed their newborn within 24 hours of

birth. Two thirds of neonates (64.6%) are being breast-fed immediately after delivery.

Knowledge of what to feed a neonate after delivery revealed that 39.2% of the mothers stated

cow's milk, 11.8% said colostrums, 11% would feed either honey or sugar water and 36%

responded with other foods.

Preliminary Univariate Analyses

The following univariate analyses and cross tabulations with the dependent variable refer to the initial data set with n=263. The p-values of significant variables based on a significance level of p < 0.15 are in bold.

Table 7

DEMOGRAPHICS					
Independent Variable	*Neonatal Death*		*OR*	*85% CI*	*p-value*
	Yes	*No*			
Age married					
15 and younger	13 (18.3%)	58 (81.7%)	1.782	(1.025 - 3.100)	**0.133**
16 and older	21 (11.2%)	167 (88.8%)	referent		
Times pregnant					0.58
1-2 times	16 (11%)	129 (89%)	0.62	(0.278 - 1.383)	0.391
3-4 times	13 (14.8%)	75 (85.2%)	0.867	(0.379 - 1.982)	0.803
5 times or more	5 (16.7%)	25 (83.3%)	referent		
Nr of living children					
<3	23 (12.8%)	157 (87.2%)	0.959	(0.544 - 1.689)	0.915
3 or more	11 (13.3%)	72 (86.7%)	referent		
Decision about delivery place					
No	2 (4.3%)	45 (97.7%)	0.307	(0.103 - 0.917)	**0.12**
Yes	20 (12.7%)	138 (87.3%)	referent		

Table 7 above describes the cross tabulations of the independent variables giving information on demographics with the dependent variable, neonatal death. Additionally, it provides the results of the univariate regression analysis. 18.3% of mothers who were married at 15 or younger experienced a neonatal death in the past year compared to 11.2% of mothers who were married at 16 and older. This result had a   p-value of 0.133 and states that the odds of women who are married at 15 or younger experience a neonatal death is 1.782 times that of women who are married at 16 and older.

11% of those mothers who had been pregnant 1-2 times and14.8% of those having been

pregnant 3-4 times experienced a neonatal death compared to 16.7% of those who had been pregnant 5 times or more.   The results from the univariate analysis showed that the two lower parities when compared to the highest parity group (5 times or more) were not significantly associated with the outcome neonatal death.

12.8% of women who had had less than 3 children had a neonatal death compared to 13.3% of women who had 3 or more children. This result was not significant (p-value = 0.915).

12.7% of mothers who decided on place of delivery did experience a neonatal death compared to only 4.3% who did not. The odds of experiencing a neonatal death among women who did not make the decision on place of delivery is only one third (p-value 0.12) compared to women who were able to make the decision about place of delivery themselves.

In summary, 2 of the 4 variables describing demographics - Age married and Decision about Delivery place- were found to be significantly associated with the outcome neonatal death at the chosen significance level of p < 0.15 and will be included in the preliminary final model.

Table 8

ANTENANTAL FACTORS					
Independent Variable	*Neonatal Death*		*OR*	*85% CI*	*p-value*
	Yes	*No*			
Know delivery danger signs					
know none	13 (14.6%)	76 (85.4%)	1.23	(0.712 - 2.125)	0.586
know some	21 (12.2%)	151 (87.8%)	referent		
Where go if danger signs					
hospital or clinic	5 (10.2%)	44 (89.8%)	0.929	(0.429 - 2.014)	0.891
village practitioner or VHV or other	17 (10.9%)	139 (89.1%)	referent		
ANC where					0.504
hospital or NGO clinic or private clinic	11(11.8%)	82 (88.2%)	1.012	(0.527 - 1.946)	0.979
local practitioner or other	12 (17.4%)	57 (82.6%)	1.589	(0.829 - 3.043)	0.305
none	11 (11.7%)	83 (88.3%)	referent		
Nr of ANC visits					0.533
1-2 visits	18 (14.6%)	105 (85.4%)	1.69	(0.857 - 3.332)	0.266
> 2 visits	7 (12.1%)	51 (87.9%)	1.353	(0.599 -3.054)	0.593
none	7 (9.2%)	69 (90.8%)	referent		

Table 8 lists 4 independent variables describing antenatal factors and their relationship to the outcome variable neonatal death. Of note, none of the 4 variables, knowledge of pregnancy and delivery danger signs, place of care sought if danger signs should occur or place or number of antenatal visits was significantly associated with the dependent variable, neonatal death.

Among those mothers who knew at least one danger sign of pregnancy or delivery, 14.6% had experienced a neonatal death compared with 12.2% of mothers who did not know a danger signs. 10.2% of mothers, who said they would seek care at a hospital or clinic if they identified these danger signs, experienced a neonatal death compared to 10.9% who said they would seek care from village practitioner or village health volunteer or another person.

Of the mothers who did not receive any antenatal care, 11.7% experienced a neonatal death compared to 11.8% of those who received their antenatal care at a hospital, a NGO clinic or a private clinic and 17.4% of those who went to a local practitioner.

14.6% of those who had 1-2 antenatal care visits and 12.1 % of those who had more than 2

antenatal care visits had a neonatal death compared to 9.2% of those who did not report any visits.

In summary, none of the 4 variables related with the antenatal period were significant and hence, none of them will be included in the preliminary final model.

Table 9

INTRAPARTUM FACTORS					
Independent Variable	*Neonatal Death*		*OR*	*85% CI*	*p-value*
	Yes	*No*			
Where deliver					
home	32 (13.4%)	207 (86.6%)	1.7	(0.567 - 1.700)	0.486
clinic or hospital	2 (8.3%)	22 (91.7%)	referent		
Birth attendant					0.015
self or relative or other	10 (8.7%)	105 (91.3%)	0.741	(0.369 - 1.488)	0.536
TBA	2 (9.5%)	19 (90.5%)	0.819	(0.250 - 2.679)	0.808
VHV/TTBA	11 (29.7%)	26 (70.3%)	3.291	(1.591 - 6.805)	**0.018**
Doctor or trained midwife	9 (11.4%)	70 (88.6%)	referent		
Delivery trouble					
had trouble	18 (14.3%)	108 (85.7%)	1.278	(0.745 - 2.190)	0.513
had no trouble	15 (11.5%)	115 (88.5%)	referent		
Cord cut how					
boiled or new blade	27 (11.4%)	210 (88.6%)	0.331	(0.163 -0.669)	**0.024**
house knife or other	7 (28%)	18 (72%)	referent		

Table 9 provides information about the 4 variables related to the intrapartum period. 13.4% of mothers who delivered at home experienced a neonatal death compared to 8.3% of those who delivered in a hospital or clinic. When comparing the incidence proportions of neonatal death among various birth attendants, 29.7% of mothers who had a VHV or TTBA at the delivery had a neonatal death compared to 11.4% of those who delivered with a doctor or trained midwife. The odds of experiencing a neonatal death when having a village health volunteer or a trained traditional birth attendant at the delivery were 3.291 times that compared with having a doctor or trained midwife present (p-value 0.018). 8.7% of those who delivered by

themselves or with a relative and 9.5% of those who delivered with a TBA had a neonatal death. Surprisingly though, the odds of having a neonatal death when delivering by oneself or with a relative or a TBA were not significantly higher when compared with delivering with a doctor or trained midwife.

Among the mothers who described having had delivery trouble such as bleeding, prolonged labor, fever, seizures or breech presentations 14.3% experienced a neonatal death compared to 11.5% of those who did not have any trouble.

11.4% of mothers who described that the cord was cut with either a boiled or new blade experienced a neonatal death compared to 28 % of mothers where a house knife or other means were used. The odds of experiencing a neonatal death when using a boiled or new knife was only one third of the odds when using a house knife or other means (p-value of 0.024).

In summary, 2 of the 4 variables related to the intra-partum period, cord cutting and birth attendant, were significantly associated with neonatal mortality at the $p < 0.15$ significance level and will be included in the preliminary final model.

Table 10

POSTNATAL FACTORS					
Independent Variable	*Neonatal Death*		*OR*	*85% CI*	*p-value*
	Yes	*No*			
PP visit by health care provider					
no	23 (13%)	154 (87%)	1.005	(0.571 - 1.769)	0.99
yes	11 (12.9%)	74 (87.1%)	referent		
Babybath					
<24 hours	27 (13.3%)	176 (86.7%)	1.162	(0.606 - 2.227)	0.741
>24 hours	7 (11.7%)	53 (88.3%)	referent		
Newborn food when					0.317
not given	5 (16.7%)	25 (83.3%)	0.6	(0.182 - 1.974)	0.537
within 24 hrs	19 (11.2%)	151 (88.8%)	0.377	(0.136 - 1.049)	0.17
after 24 hrs	3 (25%)	9 (75%)	referent		
Newborn food what					0.451
honey or sugar water	2 (6.9%)	27 (93.1%)	0.467	(0.150 - 1.46)	0.336
colostrums	2 (6.5%)	29 (93.5%)	0.435	(0.140 - 1.356)	0.292

Table 10 describes independent variables related to the postnatal period. Of the mothers

who did not receive a postpartum visit by a health care provider, 13% had a neonatal death

compared to 12.9% who did receive a visit.

13.3% of mothers who bathed their child within the first 24 hours after birth had a

neonatal death compared to 11.7% among those who waited until after 24 hours had passed.

Of the mothers who answered that a newborn should be fed colostrums or breast milk

within 24 hours, 11.2% experienced a neonatal death, compared to 25% who answered to wait

after 24 hours.

Of the mothers who answered that honey or sugar water or food needs to be given to

newborns after birth, 6.9% experienced a neonatal death. 6.5% of those who said colostrums was

the food of choice for newborns immediately after birth, experienced a neonatal death as

compared to 15.5% of mothers who answered cow's milk. 13.7% of the mothers who answered

something other than colostrums, cow's milk, honey or sugar water had a neonatal death.

In summary, none of the variables related to the postnatal period were significantly associated with neonatal death.

Final Univariate Analyses

The final univariate analyses are based on a data set with n=248 respondents after additional respondents with missing answers were removed. 216 respondents (87.1%) did not experience a neonatal death and 32 (12.9%) did experience a neonatal death in the past year. Based on live birth data for Damodopur County for the year 2006 (total of 428 births) provided by the researchers from the Lamb Project, I calculated a Neonatal Mortality Rate (NMR) of 75 per 1000 for the study sample.

Table 9 (below) describes the new frequencies, cross tabulations with the dependent variable, neonatal death as well as the results of the new univariate analyses. Based on a significance level of $p < 0.15$, variables in bold are considered significant and were included for the final multivariate analysis.

Table 11

DEMOGRAPHICS							
Independent Variable	*Frequencies*	*Percentages*	*Neonatal Death*		*OR*	*85% CI*	*p-value*
			Yes	*No*			
Age married							
15 and younger	68	27.4%	13 (19.1%)	55 (80.9%)	2.003	(1.139 - 3.523)	**0.077**
16 and older	180	72.6%	19 (10.6%)	161 (89.4%)	referent		
Decision about delivery place							
Yes	152	61.3%	20 (13.2%)	132 (86.8)	3.258	(1.088 - 9.758)	**0.121**
No answer	51	20.6%	10 (19.6%)	41 (80.4%)	5.244	(1.646 - 16.702)	*0.039*
No	45	18.1%	2 (4.4%)	43 (95.6%)	referent		
INTRAPARTUM FACTORS							
Independent Variable	*Frequencies*	*Percentages*	*Neonatal Death*		*OR*	*85% CI*	*p-value*
			Yes	*No*			
Birth attendant							**0.018**
self or relative or other	111	44.8%	10 (9%)	101 (91%)	0.77	(0.383 - 1.548)	0.59
TBA	21	8.5%	2 (9.5%)	19 (90.5%)	0.819	(0.250 - 2.679)	0.808
VHV/TTBA	37	14.9%	11 (29.7%)	26 (70.3%)	3.291	(1.591 - 6.805)	**0.018**
Doctor or trained midwife	79	31.9%	9 (11.4%)	70 (88.6%)	referent		
Cord cut how							
boiled or new blade	224	90.3%	25 (11.2%)	199 (88.8%)	0.305	(0.149 - 0.624)	**0.017**
house knife or other	24	9.7%	7 (29.2%)	17 (70.8%)	referent		

In the final univariate analysis (Table 11), among the mothers who were married at 15 and younger, 19.1% had a neonatal death compared with 10.6% of mothers who were married at 16 and older. The odds of experiencing a neonatal death when married at 15 and younger was twice (OR 2.003) that of being married at 16 and older (p-value of 0.077).

13.2% among those mothers who decided on place of delivery had a neonatal death compared to 4.4% among those who did not decide. The odds of having a neonatal death among those mothers who decided on place of delivery themselves was more than three times (OR=3.258, p=0.121) that of those who did not decide for themselves.

9% of mothers who delivered by themselves or had a relative or other person present and 9.5% of the mothers who had a TBA present had a neonatal death. Among the mothers who had a VHV or TTBA present, 29.7% experienced a neonatal death compared to 11.4% who delivered

with a doctor or trained midwife. The odds of experiencing a neonatal death when delivering with a VHV or TTBA was more than three times (OR = 3.291) that of delivering with a doctor or trained midwife (p = 0.018). However, the odds of experiencing a neonatal death when delivering by oneself or with a relative or with a TBA was not significantly increased when compared with delivering with a skilled provider, such as a doctor or midwife.

11.2% among those who reported that a boiled or new blade was used during delivery had a neonatal death compared to 29.2% who admitted that a house knife or other means were used. The odds of neonatal death when using a boiled or new blade compared to using a house knife or other means was 0.305 (p-value = 0.017).

Multivariate Analysis

Final Model

Table 12

	OR	*90%CI*	*p-value*
Age married			
15 and younger	2.051	(0.939-4.483)	0.131
16 and older	referent		
Decision about delivery place			**0.084**
Yes	5.966	(1.591-22.372)	**0.026**
No answer	4.254	(1.040-17.404)	0.091
No	referent		
Birth attendant			**0.011**
self or relative or other	0.685	(0.297-1.582)	0.457
TBA	0.714	(0.180-2.839)	0.688
VHV/TTBA	3.842	(1.520-9.714)	**0.017**
Doctor or trained midwife	referent		
Cord cut how			
boiled or new blade	0.457	(0.176-1.183)	0.176
houseknife or other	referent		

The final model in table 12 was arrived at by forward selection. A significance level of p < 0.10 was chosen. Means of cutting the cord was initially significant at p = 0.017. The odds of

neonatal death when the cord was cut with a boiled or new blade was 0.344 that of cutting the

cord with a house knife or other means. When the variable "birth attendant" was added to the

variable "Cord cut how", a greater than 10% change from the crude to the adjusted odds ratio

(OR) for "Cord cut how" was observed. This indicated that there is a confounding effect due to

"birth attendant", explained by the association of means of cord cutting used among different

providers: For example, the odds of using a house knife as a means of cutting the cord among

VHVs and TTBAs is 1.6 times that among doctors or trained midwives.

Having a VHV or TTBA as a birth attendant when compared to having a doctor or trained

midwife as a birth attendant was significantly associated with neonatal death (p-value = 0.025).

The odds of neonatal death when having a VHV or TTBA as a birth attendant were more than

three times (OR = 3.145) those of having a doctor or trained midwife attending the birth.

However, the odds for neonatal death are not significantly increased when comparing birth

attendants such as the mother herself, a relative or a TBA to having a doctor or midwife as a

birth attendant.

In the next step, when the variable "Age married" was added to this model, again, an

increase of greater than 10%   in the odds ratio for "cord cut how" was observed, indicating that

there is a confounding effect due to "Age married". Here also, the association observed between

the age at which a woman was married and means of cord cutting showed that the odds of using

a house knife among those who were married at 15 years or younger was three times (OR 3.128,

95% CI   1.473 – 6.642) that of those married at 16 and older.

In the univariate analysis the age at which a mother was married was significantly

associated with the risk for neonatal death, however, became non-significant in the multivariate

model. "Age married" was left in the final model because it confounded the association of means

of cord cutting with neonatal death.

In the final step, "Decide about delivery place" was added to the model as the last independent variable. The odds of a mother experiencing a neonatal death when she decided on place of delivery herself was actually close to 6 times that (OR 5.966, p-value 0.026) of mothers who did not decide for themselves. During this step, the odds ratios of all three previously included variables changed by more than 10%, indicating here that "Decide about delivery place" confounds the association with neonatal death of all three other variables. Among the mothers who were able to decide on delivery themselves, they were 1.4 times more likely to have been married when <15 years of age and 1.5 times more likely to use a house knife as a means for cutting the cord. However, those mothers who had a doctor or trained midwife at delivery were twice as likely to have decided on place of delivery themselves when compared to those mothers who had a VHV or TTBA as a birth attendant.

V. DISCUSSION

This study has shown that the neonatal mortality rate in this sample was very high at 75 per 1000 live births compared with 41 per 1000 for Bangladesh as a whole as reported by the WHO (WHO Child Health Profile). This is almost twice as high, however, the NMR for Bangladesh as a whole includes urban and rural areas of the country and the higher rate found in this sample could be representative of the discrepancies in care coverage found when comparing urban and rural areas.

A vast majority of the mothers in this sample (90.1%) delivered at home which was consistent with but slightly less than common findings in the literature documenting that in rural Bangladesh approximately 94% of women deliver at home (Darmstadt et al, 2006).

Parity status of women was not a significant predictor of neonatal death. This result was contrary to the findings Mercer et al (2006) found in their study on risk factors for neonatal mortality in rural Bangladesh. In their study, a higher proportion of women who experienced a neonatal death had been pregnant more than 5 times. However, a suggestion has been made that the relationship between high parity and neonatal mortality is not causal but rather that women who experience high numbers of neonatal deaths self-select to higher parities (Child Health Research Project Special Report, 1999).

Means of Cord Cutting

This study showed that the use of clean cord cutting tools was significantly associated with a decrease in risk of neonatal death in the rural community studied in Bangladesh. However, this association was confounded not only by the type of birth attendant that was used during delivery but also by the age at which the mothers were married and whether or not they decided

on the place of delivery themselves. In this study, VHVs and TTBAs were more likely to use a

house knife to cut the cord than doctors or trained midwives. Additionally, in this study, mothers

who were married at age 15 or younger were also more likely to use house knife as a means to

cut the cord compared to mothers married at an older age. Surprisingly though, mothers who

decided on delivery place themselves were more likely to have used a house knife compared

with those not having decided for themselves.

One of the three major causes of neonatal death in Bangladesh and other developing

countries are severe infections including sepsis, tetanus, pneumonia and diarrhea (WHO, 2005).

In fact, severe infection accounts for 32% of all neonatal deaths in Bangladesh (Chowdhuri,

2005).   Particularly neonatal tetanus and sepsis are related to events occurring during the

intra-partum period and shortly after birth. For that reason, WHO in their guidelines on

"Essential Newborn Care" (WHO, 1996) stresses the importance of hygienic practices during

delivery and one of the "five cleans" recommended is clean cord tie. For example, the use of a

new blade to cut the cord is widely promoted to prevent neonatal tetanus. A study conducted in

rural Bangladesh (Hlady et al, 1992) showed that the risk was reduced by using a clean

cord-cutting tool. The protective nature of this practice likely extends to non-tetanus-related

infections and clean cord care practices can prevent most of the infections responsible for

neonatal deaths (Save the Children, 2006).

Birth Attendant

While the result of this study in regards to the strength of association of the type of birth

attendant with the incidence of neonatal death varies when comparing the different unskilled

providers, it is well established that having a skilled birth attendant at the delivery is vital to

saving lives of newborns and mothers (WHO, 2007). In this sample of mothers, 30% stated that they delivered with a doctor or trained midwife which is a much higher attendance by a skilled birth attendant than the commonly cited 11.6%.

Per the WHO, the term skilled attendant refers to an "accredited health professional - such as a midwife, doctor or nurse - who has been educated and trained to proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth and the immediate postnatal period, and in the identification, management and referral of complications in women and newborns" (WHO, 2004). Commonly, TBAs – trained or not – are excluded from the category of skilled birth attendant. In this context, the term TBA refers to traditional, independent (of the health system), non-formally trained and community-based providers of care during pregnancy, childbirth and the postnatal period (WHO, 2004). VHVs fall under a similar category. Consistent with this, this study showed that the odds of experiencing a neonatal death when the birth attendant was a VHV or trained TBA was higher as compared to having a skilled birth attendant present. It would have followed from this that the results for having an untrained TBA present or delivering oneself or with a relative would have yielded a similar significant association; however, this was not the case. Some explanations for this could include the preferential selection of a VHV or TTBA in the case of a delivery showing some signs of trouble and therefore increasing the odds for a bad outcome. Additionally, there might be a particular practice specific to VHVs or TTBAs that the survey did not explain and could have lead to complications.

<u>Age Married</u>

The age at which women were married was initially significant in the univariate analysis, however became insignificant when adjusted for factors such as means of cutting the cord, types of birth attendants and decision-making about place of delivery. It was left in the final multivariate model because of confounding the relationship between means of cutting the cord and incidence of neonatal death. An association of preferential use of a house knife or other means among those married at 15 or younger was documented. Possible explanations for this include lack of education about clean delivery practices at an adolescent age and possibly lack of access to skilled providers.

Previous studies have shown that infants born to the youngest maternal age group, 15 years old and younger, are at an increased risk of death after birth compared with infants born to older mothers (Phibbs et al, 2002 and Alam, 2000). It is also known that nuptiality norms in rural Bangladesh favor birth during the teenage years. Unfortunately, in this study, it cannot be delineated with certainty what age the mothers surveyed were who experienced a neonatal death. The survey did not ask the women for their age at the time of the survey.   Some assumptions can be made, however, when looking at the distribution of women who married <15 years of age, their parity and experience of a neonatal death in the past year: Approximately, 68 women (27.4%) in the final model did marry <15 years of age. 13 of them experienced a neonatal death in the past year. Of those 13 women, 8 reported having been pregnant only 1-2 times. Since it is not customary in most rural communities in Bangladesh and South Asia as a whole to delay child-bearing after marriage (Alam, 2000), these results would suggest that these neonatal deaths in the past year likely occurred when these women were still very young.

The prevalence of adolescent marriage, young maternal age and increased likelihood of

neonatal deaths in this community needs to be further examined with better survey tools.

Decision-Making on Place of Delivery

The proportion of mothers in this study who decided on the place of delivery was unusually high at 60.1% for South Asia where women often are not decision-makers for their own health. This is especially true for younger women, in whose lives the husband and elders in the family are key decision- makers. However, this was also not consistent with findings in this study where those mothers who decided on place of delivery were actually more likely to be married at 15 or younger. Because of this relationship decision-making confounded the association of Age married and neonatal death in the final multivariate model.

An unexpected finding of this study was the fact that mothers who decided on the place of delivery themselves were actually associated with a significantly higher risk of neonatal death (p-value = 0.026) compared to those mothers who did not decide for themselves (OR = 5.966, 90%CI 1.591 – 22.372). This is contrary to findings in the literature where decision-making ability as an indicator of increased women's autonomy is associated with favorable health outcomes such as decreased neonatal mortality (BDHS, 2004). Additionally, those mothers who made decisions about place of delivery were actually more likely to have had a doctor or midwife as their birth attendant which in turn was associated with a decreased risk in neonatal death.

The inconsistencies in the results for the association of decision-making about place of delivery and neonatal death and its confounding relationship with all three variables raises concerns on whether the question was actually fully understood by the women and whether or not they in fact had the ability to decide and had access to choices on place of delivery. This is in

light of the finding in this study as well as supported by country statistics from Bangladesh as a whole that over 90% of women deliver in their home.

Factors Related to Antenatal and Postnatal Periods

Surprisingly none of the antenatal or postnatal risk factors were significantly associated with a risk for neonatal death.   In this sample, more than 60% of mothers received antenatal care which exceeds the proportions found in other studies by 10% (Darmstadt et al, 2006) as does the number of mothers in this population seeking care from a medically trained provider. Regarding practices during the postnatal period, more than 70% of the women bathed their infant within the first 24 hours which was consistent with findings in other studies on neonatal care practices in Bangladesh. 64.6% of mothers stated that they breastfed their newborns within the first 24 hours after birth which is a much higher number of immediate breastfeeding compared to the commonly reported 24% (Darmstadt, 2006). However, when asked about what type of food should be given to a newborn immediately after birth, only 11.8% answered "colostrums". Many literature sources recommend immediate breastfeeding after delivery to protect infants by providing nutrients and essential immunities from disease (Tinker and Ransom, 2002).

Exclusive breastfeeding, not supplemented with other foods or liquids is particularly effective at preventing infections in newborns but traditional practices of giving foods other than breast milk are still prevalent (Tinker and Ransom, 2002). This appears to be the case in this study sample as well where almost half of the mothers (47.1%) admitted to giving sugar water or honey or other foods besides breast milk or cow's milk.

Conclusions

The overall results of this analysis has important implications for community education efforts in promoting clean delivery practices among the women in this rural area of NW Bangladesh as well as among birth attendants such as the VHVs and the TTBAs.

The lack of findings of this study in the areas of antenatal care, birth preparedness and postnatal care does not necessarily negate previous study findings but could be related to poor data quality and survey design and a small sample size. Still, particular attention needs to be given to the critical childbirth and early neonatal periods – when women and children in developing countries are most likely to die and a vital window of opportunities to save lives exists. Low-cost proven interventions covering improved maternal, obstetric and newborn care should be delivered through the framework of ongoing healthcare programs. Interventions are needed to motivate rural communities to seek timely and proper care for mothers and neonates. In rural areas of developing countries such as Bangladesh, the main challenge today is to transfer what is already known into action and to deliver the known interventions to the children, mothers and families who need them.

VII. STRENGTHS AND LIMITATIONS

Strengths

This is a community-based study that attempts to determine risk factors for neonatal deaths related to care practices among mothers during pregnancy and delivery and the early neonatal period. Community-based studies are important in a country like Bangladesh with large number of home births and lack of access to skilled providers and high quality facility-based care. To date, there is a paucity of information in the existing literature on the impact of these care practices in rural Bangladesh on neonatal health and this study attempts to fill that gap. Unlike many other international studies, attention was paid to attempted randomness and to reducing selection bias. The time period of incidence of neonatal death was limited to one year from the survey, avoiding large changes in knowledge, attitudes and practices and also limiting recall bias.

Limitations

This study had a small sample size and consequently resulted in poor precision of estimates and low power for detection of associations between potential risk factors and neonatal death. This prevents from reaching a firm conclusion regarding factors predicting an increased risk for neonatal death. The incomplete and missing data lead to some data point deletions, introducing the chance of selection bias. Generalizing to other or larger populations based on conclusions drawn about this population is limited. Some possible and perhaps important predictors were not assessed through the survey. For example, age and parity at the time when the neonatal death occurred was not asked about. Similarly the education level of mother and father, the health status of the mother, the delineating cause of neonatal death and the exact

number of other neonatal death prior to last one were not assessed through this survey.

VII. FUTURE RESEARCH

A larger sample size will be required in the future to improve the predictive ability and precision of estimates. I would also attempt to collect more specific demographic data on mothers, such as age at time of survey and information on their health status including hemoglobin status and other indicators of their nutritional status as well as immunization status. Because maternal health is one of the most important determinants of neonatal outcome, this information would aid in exploring this relationship further and its implications for focusing outreach efforts.

Because this study delineated a number of confounding relationships, stratifying mothers by demographic characteristics would be another strategy during the analysis to strengthen the data. This again would of course require a much larger data set.

Clearly the decision-making power among mothers in this study sample needs to be further analyzed to clarify any association with neonatal death and other variables such as choice of delivery place, birth attendant and care practices in general. Perhaps re-formulating the question would enhance the logical consistency of the results by exploring the decision-making structure within each household regarding other decisions as well. Perhaps other indicators of women's autonomy such as education level, ability to make other reproductive choices such as number and timing of births and family planning methods could be used to explore this variable further.

Further research could also include an in-depth assessment of knowledge and practices among the different types of birth attendants and their specific relationship to neonatal outcomes. Assessing those care practices related to the intrapartum period as well as the immediate postnatal period would have important implications for being able to improve the capacity of

these attendants in providing improved quality of care in the home. The causes of barriers to access of care including barriers to antenatal care attendance, birth-preparedness and hygienic birth practices as well as the reluctance of local practitioners to refer appropriately need to also be further looked into.

VIII. REFERENCES

Adam et al. *Cost effectiveness analysis of strategies for maternal and neonatal health in developing countries*. BMJ. 2005. 331(7525): 1107

Ahmad OB et al. *The decline in child mortality: A reappraisal*. Bulletin of the World Health Organization. 2000. 78. pp1175-1191

Alam N. *Teenage motherhood and infant mortality in Bangladesh: maternal age-dependent effect of parity one*. Journal of Biosocial Science. Apr 2000. 32(2): 229-36

Argawal S et al. *Maternal and newborn care practices among the urban poor in Indore India: gaps, reasons and possible program options*. Urban Health Resource Center (UHRC). New Dehli. 2007

Arifeen et al. *Exclusive breastfeeding reduces acute respiratory infection and diarrhea deaths among infants in Dhaka slums*. PEDIATRICS. Oct. 2001. Vol. 108 No. 4

Bang AT et al. *Effect of home-based neonatal care and management of sepsis on neonatal mortality: field trial in rural India*. Lancet. Dec. 1999. Vol. 354 pp. 1955-1961

Child Health Research Project Special Report. *Reducing perinatal and neonatal mortality*. May 1999. Baltimore/Maryland. Vol.2 No.1

Chowdhury ME et al. *Neonatal Mortality in Rural Bangladesh: An exploratory study*. J Health Popul Nutr. March 2005. 23 (1): 16-24

Darmstadt GL et al. *Evidence-based, cost-effective interventions: how many newborn babies can we save?* Lancet. March 2005. Vol. 365 pp 977-988

Darmstadt GL et al. *Review of domiciliary newborn-care practices in Bangladesh.*. J Health Popul Nutr. Dec.2006. 24(40) 380-393

Gayen K, Raeside R. *Social networks, normative influence and health delivery in rural Bangladesh*. Social Science & Medicine. 2007. Vol 65 pp 900-914

Government of Bangladesh. Ministry of Women and Children Affairs. *"Plus 5" review of the 2002 special session on children and world fit for children plan of action*. Dec. 2006. www.unicef.org/worldfitforchildren/files/Bangladesh_WFFC5_Report.pdf
Accessed Jan. 5, 2008

Gurewitsch et al. *The descent curve of the grand multiparous woman*. Oct. 2003. American Journal of Obstetrics & Gynecology. 189(4): 1036-1041

Heinonen S. *Reproductive risk factors of fetal asphyxia at delivery: a population based analysis*. Journal of Clinical Epidemiology, Volume 54, Issue 4, Pages 407-410

Hong et al. *Impact of Prenatal Care on Infant Survival in Bangladesh*. Matern Child Health J. 2007. 11: 199-206

Jones et al. *How many child deaths can we prevent this year?* Lancet. July 2003. Vol. 362.pp 65-71

Paul, BK et al. *Utilization of health facilities and trained birth attendants for childbirth in rural Bangladesh: an empirical study.* Social Sciences & Medicine. 2002. (54) pp.1755-65

Lawn et al. *4 million neonatal deaths: When? Where? Why?* Lancet. March 2005.Vol. 365. pp 891-900

Mercer et al. Risk factors for neonatal mortality in rural areas of Bangladesh served by a large NGO programme. Health Policy and Planning. 2006.

Martines et al. *Neonatal survival: a call for action*. Lancet. March 2005. Vol.365 pp.1189-1197

Mickey J. et al. A *study of the impact of confounder-selection criteria on effect estimation*. American Journal of Epidemiology. 1989. 129 pp. 125-137

Parlato et al. *Saving Newborn Lives.* Save the children. 2004. pp 1-52

Paul BK, Rumsey DJ. *Utilization of health facilities and trained birth attendants for childbirth in rural Bangladesh: an empirical study*. Social Science & Medicine. 2002. Vol. 54 pp 1755-1765

Phibbs et al. *Maternal age and postnatal death*. ACOG. Sept. 2002. Vol. 100 Nr.3. pp. 481-86

Population Reference Bureau. Bhutta et al. *Using evidence to save newborn lives.* June 2003. Accessed March 31, 2008. http://www.prb.org/Publications/PolicyBriefs/UsingEvidencetoSaveNewbornLives.aspx

Shrestha BM. Perinatal and neonatal statisticis in Lumbini Zonal Hospital. 2000. Butwal, Nepal. Accessed March 31, 2008. http://www.jnps.org.np

Syed et al. *Immediate and early postnatal care for mothers and newborns in rural Bangladesh.* Dec. 2006. Journal of Health, Population and Nutrition. Vol.24 Nr.4 pp.508-518

UN Millennium Project. 2005. *Investing in development: A practical plan to achieve the Millennium Development Goals*. New York

Winch PJ et al. *Local understandings of vulnerability and protection during the neonatal period in Sylhet district, Bangladesh: a qualitative study*. Lancet. Aug. 2005. Vol. 366 pp 478-485

WHO. *Child Health Profile: Bangladesh*. Compiled by the Department of Child and Adolescent

Health Development (CAH).
www.who.int/entity/child_adolescent_health/data/media/cah_chp_bangladesh.pdf
Accessed Jan. 4, 2008

WHO. *Essential newborn care. Report of a technical working group..* Geneva: WHO, Division of Reproductive Health (Technical Support); 1996.

WHO. Hypoglycemia of the Newborn: A review of literature. Geneva 1997. Accessed March 31, 2008.
http://alianzaipss.org/reproductivehealth/docs/hypoglycaemia_newborn.htm

WHO. Skilled attendant at birth. Update 2007.
http://www.who.int/reproductive-health/global_monitoring/skilled_attendant.html. Accessed March 31, 2008

WHO. *The World Health Report 2005: Make every mother and child count.*
http://www.who.int/whr/2005/en/index.html.   Accessed Dec. 18, 2007.

WHO. *Health Profile of Bangladesh*. (http://www.whoban.org/country_health_profile.html, accessed on February 3, 2008)

IX APPENDIX A

Knowledge, Attitudes and Practices (KAP) Survey

1. At what age did you marry?
   a. < 15 yrs.
   b. 16-17 years
   c. 18-21
   d. 22-25
   e. > 25 yrs.

2. How many times have you been pregnant?
   a. none
   b. 1-2
   c. 3-4
   d. 5-6
   e. >7

3. How many living children do you have?
   a. none
   b. 1-2
   c. 3-4
   d. 5-6
   e. >7

4A. In the past 1 year, how many of your children died?
   a. none
   b. 1-2

4B. How many children have died any time?
   a. none
   b. 1-2
   c. 3-4
   d. 5-6
   e. >7

4C At what age did your most recent child death happen?
   a. < 7 days
   b. 8 days to 1 month
   c. >1 month to 12 months
   d. 13 month to 5 yrs.
   e. 5-10 years, f. 11 to 19 years

4D   If possible, give cause of death or symptoms before death of the most recent death:
   a.   Pneumonia?
   b.   Diarrhea?
   c.   Seizures?
   d.   Within 1 week of birth?
   e.   Accident/injury?
   f.   EPI disease? (Tetanus or measles)

5A..   Prior to last delivery, did you make any decisions about your delivery as family with
     husband, children, and yourself?
     a. yes
     b. no

5B.   Did you decide about delivery place (bari, SDU, hospital, other)?
     a. yes
     b. no

6A.   Which pregnancy or delivery danger signs do you know?
     a.   bleeding
     b. fits
     c. something other than head comes out first
     d. headache e. fever
     f. prolonged labor
     g.   none.

6B. If any of these arise, what would you do?
     a. go to hospital or clinic
     b. go to village practitioner (kobiraj, village doctor, etc.)
     c.   go to village health volunteer
     d. other

6C.   From whom did you learn these danger signs?
     a. husband
     b. VHV
     c. CHW
     d. nurse/doctor
     e. neighbor
     f. other)

7.   Where did you go for antenatal care during your last pregnancy?
     a. hospital
     b. NGO clinic
     c. private clinic
     d. local practitioner kobiraj, village doctor, etc.)
     e. other
     f. none

8A..   How many ANC visits during your last pregnancy?
   a. none
   b. 1-2
   c. 3 or more

8B.   Who encouraged you to go for ANC?
   a. husband
   b. mother/father-in-law
   c. parents,
   d. VHV
   e. CHW
   f. neighbor
   g. own decision

9A.   Was there a problem with money during the delivery?   Yes/no

9B.   Who made the decision about money at that time?
   a. Husband
   b. in-laws
   c. parents
   d. self
   e. other

10A.   What transport was used if went to hospital or clinic?
   a. Rickshaw or van
   b. micro
   c. other

10B.   How long did it take?
   a. 30 min
   b. 1 hr.
   c. 2 hrs.
   d. 3 hrs.
   e. longer time

10C. Who decided how to go?
   a. Husband
   b. in-laws
   c. parents
   d. self
   e. other

11A.   Where did you deliver?
   a. home
   b.clinic
   c. hospital.

11B.   Who was birth attendant?
   a. relative
   b. TBA
   c. VHV/TTBA
   d. doctor or trained midwife
   e. self
   f. other

12A.   Did any health care person visit you at home after delivery?   Yes/no

12B.   Who?
   a. Government worker
   b. other NGO
   c. other

13A.   What type of trouble did you have at time of delivery or within 42 days?
   a. bleeding
   b. fits
   c. something other than head comes out first
   d. headache
   e. fever
   f. prolonged labor
   g.   none.

13B. Where did you go for help?
   a. SDU
   b. LAMB
   c. local practitioner (kobiraj/homeo/village doctor)
   d. TBA
   e. hospital
   f. other

14.   How long after delivery bath the newborn?
   a. < 6 hrs
   b. 7-12 hrs
   c. 12-24 hrs
   d. > 24 hrs

15.   How was cord cut after child was born?
    a. boiled blade
    b. new blade
    c. house knife
    d. other

16. Who cut the cord?
    a. VHV
    b. TBA
    c. relative
    d. doctor/nurse
    e. other

17. What was health of baby after birth?
    a. good
    b. medium
    c. not good

18A.   Does the child have a growth card?   Yes/no

18B.   If yes, at what age was last weighed
    a. at birth
    b. up to 3 months
    c. 3-6 months
    d. 6-12 months
    e. 1-2 years
    f.   not weighed

19.   If your child is 1 year old, had it had measles and all other EPI? Yes/No (confirm with card)

20A.   What serious illness did the newborn have at the time of delivery?
    a. none
    b. unable to suck or take breast milk
    c. chest indrawing or trouble breathing
    d. body very hot or cold
    e. vomit 5 or more times per day
    f. seizure
    g. other

20B.   What did you do for this problem?
    a. go to hospital or clinic
    b. go to village practitioner (kobiraj, village doctor, etc.)
    c. go to village health volunteer
    d. other

21A.   During pregnancy or delivery were you injured by anyone? Yes/No

21B. Who?
    a. Husband
    b. in-laws
    c. family
    d. other

21C.   Do you still have any physical problems from this?   Yes/No

22.   What family planning method do you use?
    a. none
    b. Injection
    c. OCP
    d. condom
    e. ligation
    f. vasectomy
    G. traditional
    H. IUD

23.   Where are methods available?
    a. don't know
    b. Hospital
    c. dokan
    e. from FP staff,
    f. VHV

24. How are gonorrhea, syphilis, AIDS spread?
    a. intercourse
    b. intercourse in bad place,
    c. by blood
    d. injection
    e. don't know
    f. other

25. After delivery, when was colostrum or breast milk given to feed?
    a. < 1 hour
    b. 1-2 hours,
    c. 3-5 hour
    e. 5 hr.-1 day
    f. >1 day
    g. not given

26. What is given a newborn to eat after birth?
    a. Honey
    b. sugar water
    c. colostrums
    d. cow's milk
    e. other

27. After what age is child given solids to eat?
    a. 4 mo.
    b. 6 mo.
    c. 10 mo.
    d. other month

28. For the baby to gain weight, what food is given after 6 months?
    a. Breastmilk
    b. table food
    c. sujji/barley
    d. cow's milk
    e. other

29. What do you feed an under 5 year old child with diarrhea?
    a. Saline,
    b. saline and medicine
    c. jhar-fuk
    d. nothing or less than normal
    E. increased fluid, more than normal
    F. don't know

30. What are signs of pneumonia?
    a. Chest indrawing
    b. difficulty breathing
    c. fast breathing
    d. runny nose
    e. fever
    f. other
    g. don't know

31. Where do you bring your child for care of pneumonia?
    a. Village practitioner: doctor, kobiraj, other,
    b. government hospital
    c. LAMB clinic
    d. LAMB Hospital
    e. private MBBS doctor
    f. other

32. Where did you bring your child for care with other serious illness?
    a. Village practitioner: doctor, kobiraj, other
    b. government hospital
    c. LAMB clinic
    d. LAMB Hospital
    e. private MBBS doctor
    f. other

33A.   What do you wear on your feet when going to latrine?
    a. Sandals
    b. khorom
    c. nothing

33B.   How many times per day do you wash your hands with soap after using latrine?
    a. none
    b. 1-2
    c. every time

33C.   How many times per day before eating?
    a. none
    b. 1-2
    c. every time

34. Where can disabled persons receive treatment or advice?
    a. LAMB Hospital
    b. other hospital
    c. private doctor
    d. don't know
    e. other

35A.   How many women in your family have leaking urine all the time after difficult delivery?
    a. none
    b. 1 or more

35B. Is there any treatment available for this problem?
    a. yes b. no

36A.   Have any of your pregnancies ended because of abortion in the past year?   Yes/No

36B. How?
   a.   iccha
   b. spontaneous.

36C. If you have had an abortion, who performed the abortion or gave medicine to noshto the pregnancy?
   a. dai/TBA
   b. village doctor, or kobiraj
   c. government health worker in hospital or clinic
   d. government health worker in home
   e. private doctor
   f. other.

36D. How did you know where abortion help was available?
   a. female relative
   b. husband
   c. parents
   d. neighbor
   e. health care provider
   f. other

37A. What government health services did you use in the last year?
   a.   EPI
   b. FP
   c. Hospital
   d. OPD
   e. Other

37B. How many times?
   a.   none
   b.   1-2
   c.   3-4
   d.   5-6
   e.   >7

38. Did your child receive Vitamin A in last 6 months?   Yes/no

39. Education of young adults

AGE (yrs)	GENDER	Completed	
		Primary School	Secondary School
15-19	F	A. yes/no	E. yes/no
15-19	M	B. yes/no	F. yes/no
20-30	F	C. yes/no	G. yes/no
20-30	M	D. yes/no	H. yes/no