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NEONATAL MORTALITY PREDICTOTS IN NEPAL: NEPAL DEMOGRAPHIC HEALTH SURVEY 2011

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Neonatal Mortality Predictors in Nepal: Nepal Demographic Health Survey 2011

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TABLE OF CONTENTS

Page No

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

ANC: Antenatal Care

AOR: Adjusted Odds Ratio

CB-IMCI: Community Based Integrated Management of Childhood Illness

CB-NCP: Community Based Newborn Care Package

CBS: Central Bureau of Statistics

CI: Confidence Interval

DHS: Demographic Health Survey

EAs: Enumeration Areas

FCHVs: Female Community Health Volunteers

HDI: Human Development Index

ICF: International Classification of Functioning Disability and Health

ICPD: International Conference on Population and Development

LBW: Low Birth Weight

MDG: Millennium Development Goal

MoHP: Ministry of Health and Population

NDHS: Nepal Demographic Health Survey

NMR: Neonatal Mortality Rate

OR: Odds Ratio

USAID: US Agency for International Development

SBA: Skilled Birth Attendant

SGA: Small for Gestational Age

SPSS: Statistical Package for Social Science

VDC: Village Development Committee

VHW: Village Health Workers

WHO: World Health Organization

ABSTRACT

Background: The neonatal period (0-28 days after delivery) in human life is critical and carries a high risk of mortality. According to the Nepal Demographic Health Survey (NDHS) 2011, Nepal has a Neonatal Mortality Rate (NMR) of 33/1000 live births which is one of the highest in the world. The neonatal mortality accounts for 61% of the under-five mortality. There has been very limited progress in reducing neonatal mortality in Nepal during the last decade. **Purpose of the study:** The purpose of the current study is to determine factors associated with neonatal mortality in Nepal. **Methodology:** Data from NDHS 2011 was used and the study included 4033 women who gave birth from 2006 to 2010. A study was performed to find associations between neonatal mortality and certain predictor variables. Associations were assessed by multivariate analysis, univariate and multivariate (backward LR) logistic regression. **Results:** The neonatal mortality in the study population was determined to be 33.4 per 1000 live births**.** Neonatal mortality was found higher among the neonates from younger women [age at delivery less than 20 years (OR: 1.94, CI: 1.18-3.20) compared to 20 or more years], high parity mothers [5 or more (OR: 3.50, CI: 1.82-6.74) compared to 1], mothers without health care decision autonomy [no (OR: 1.43, CI: 1.04-1.97) compared to yes] and mothers who deliver at health care center [healthcare center (OR: 0.65, CI: 0.46-0.92) compared to home]. Mothers' low education and poverty were found to be significantly associated with higher neonatal mortality after adjusting for age. **Conclusion:** High neonatal mortality was observed among mothers with younger age, high parity and mothers without healthcare decision autonomy.

CHAPTER I

INTRODUCTION

1.1 Background

Neonatal mortality is defined as the death of live-born baby within 28 completed days of birth. The neonatal period is a very significant four-week period in a human life because it carries a great risk of mortality (1). High-income countries have low neonatal mortality because they have high priority on neonatal health risk both in terms of mortality and morbidity. It has not been feasible to give these health issues the same priority in developing countries compared to high-income countries either during the neonatal period or among children under the age of 5 (2). Child survival programs in developing countries are primarily focused on diseases like pneumonia, malaria, diarrhea and vaccine preventable diseases, especially those affecting children over 1 month of age. Similarly, motherhood programs have tended to focus on the health issues directly related to mothers, leaving neonatal issues un-addressed (3). This indicates that, despite the urgent need, neonatal mortality has not received adequate attention within health programs (2).

Neonatal mortality requires specific consideration in terms of public health programs and policies on a global scale. As the epidemiology, cause of death distribution and health intervention in neonates and older children are different, a specific approach primarily focused on managing neonates health risk should be undertaken to respond to neonatal mortality (4). Neonatal mortality concerns must be addressed as a priority issue within child health programs.

The health interventions needed to address the major causes of neonatal mortalities generally differ from those needed to address under-five mortalities because the major causes of under-

five mortalities are from infectious diseases like pneumonia, diarrhea, zoonotic diseases like malaria and life style disease like malnutrition (4). According to a study at global level in 2008, the major causes of neonatal mortality are complication from preterm delivery[1], birth asphyxia[2], infection with sepsis and pneumonia. These causes are to a certain extent avoidable and are well addressed in high-income countries resulting in low Neonatal Mortality Rate (NMR). However, the unavoidable cause due to genetic and biological factors such as preterm delivery and congenital anomalies[3] are still prevalent and result in neonatal mortalities in these countries (3).

Neonatal mortalities may be directly linked to i) poor maternal health; ii) inadequate care during pregnancy or delivery; iii) poor hygiene and inappropriate management of complication during pregnancy, delivery and first critical hour after birth and v) lack of newborn care. These factors are partly determined by the status of women in a society, their nutritional status, early childbearing, parity, closely spaced pregnancies and harmful cultural practices during pregnancy and delivery (5). The program of action adopted at the 1994 International Conference on Population and Development (ICPD) claimed that improving the status of women also enhances their decision making capacity at all levels and in all spheres of life specially in the area of sexuality and reproduction. Thus, it is widely accepted that increased gender equality is a perquisite for improvement of maternal and child health (6).

The mortality rate for children under-five years shows significant improvement during the last decade globally. This coincides well with Millennium Development Goal (MDG) 4, which calls for a two third reduction in mortality of children younger than 5 years (under-five

[1] *Birth before 37 completed weeks of gestation*
[2] *Failure to initiate and maintain spontaneous respiration following birth*
[3] *Malformation of body organ by birth*

mortality) between 1990 and 2015 with a global target of mortalities no more than 32/1000 live births (5), equivalent to average annual reduction of 4.4% (2).

Despite the reduction in the under-five mortality rate, globally, the proportion of neonatal mortality within under-five mortality has increased from 36% in 1990 to about 43% in 2011 and the trend is expected to continue. However, in terms of numbers, the neonatal mortality is also decreasing (4).

Neonatal mortality is also associated with MDG 5, which targets reduction in the maternal mortality ratio (the ratio of the number of maternal mortality during a given time period per 100,000 live births during the same time-period) by three quarters between 1990 and 2015 (7). The World Health Organization (WHO) has defined maternal mortality as "The death of women while pregnant or within 42 days of termination of pregnancy, irrespective of duration or site of pregnancy, from any cause related to or aggravated by pregnancy or its management but not from accidental or incidental causes" (8). Maternal and newborn health is closely associated as problems and possible interventions during the perinatal period commonly involve both individuals (9). Better care for mothers during pregnancy and childbirth as well as improving newborn care will reduce neonatal mortality.

Similarly, low birth weight (LBW)[4] newborns are at a very high risk of mortality or morbidity and 60% to 80% of all neonatal mortalities are associated with LBW (10). Evidence from developed and low-middle income countries has indicated that increased care for LBW infants, including feeding, temperature maintenance, cord and skin care, early detection and treatment of infections and complications such as respiratory syndrome can substantially reduce mortality. Thus, provision of an effective maternal and neonatal health services is crucial in achieving both MDG 4 and MDG 5 (7).

[4] *Birth below 2500 gram (up to and including 2499g), regardless of gestational age*

Globally, there has been a 35% decline in under-five mortality from an estimated rate of 88/1000 live births in 1990 to 57/1000 live births in 2010; an annual decrease in under-five mortality of 2.2%. Despite the progress made, attaining the MDG 4 target seems unlikely. Furthermore, the progress made is not equally distributed. For example, the risk of a child, dying before 5 completed years of life in a low-income country is about 18 times higher than that of an under-five child in a high-income country. In addition, within a country, under-five mortality is higher among children living in rural areas, in communities with little education and poor households (11).

Out of the 130 million babies born every year worldwide, an estimated 4 million dies during the neonatal period (1). Among these mortalities, 50% occur within the first 24 hours of life. The risk of dying during the neonatal period is higher at early stages closer to birth and decreases gradually in the subsequent days (12). Out of these 4 million, 3 million mortalities occur in the early neonatal period (0-6 days). A child's risk of dying during the first 28 days of life is nearly 15 times higher than any other time before his/her first birthday (13).

Among the total global neonatal mortalities, 99% occur in low and middle-income countries especially in Africa and South Asia where there has been least progress in reducing neonatal mortalities (13). The risk of neonatal mortality is 8 times higher in low-income countries compared with high-income countries (12). The African and South-East Asian regions account for 70% of global neonatal mortalities (12). However, on a positive note, almost 3 million mortalities that occur during the neonatal period every year can be prevented by modest technology and low cost perinatal care (13).

Globally, the neonatal mortality has declined with an average of 1.8% per year, much slower than the under-five mortality (2.2%). In Eastern Asia, the region in the world with the highest reduction in under-five mortality, neonatal mortalities accounted for 57% of the under-five

mortality as in 2011. Neonatal mortality accounts for more than 50% of under-five mortality in southern Asia, and almost 30% of all global neonatal mortalities occurred in India alone in the same year. Sub-Saharan African countries account for 38% of global neonatal mortalities, and had the highest NMR of 34/1000 live births in 2011. Subsequently, this region has had the least progress in reducing under-five mortality (4). While the NMR is highest in sub Saharan Africa in-terms of numbers, most neonatal mortalities occur in south central Asia, namely an estimated 40% of the worldwide neonatal mortalities (5).

Neonatal Mortality in Nepal

Nepal, a mountainous landlocked country located in South Asia, between India and China, is a developing country with a population of 26.6 million (14). Nepal holds 157th position on the Human Development Index (HDI) and is below the South Asian regional average. Nepalese have a life expectancy of 68.8 years and the average length of education is 3.2 years (15).

Figure 1: Map of Nepal showing administrative division (16)

As in other developing countries, high maternal and child mortality in Nepal is a major public health concern. Practices of early marriage and adolescent pregnancies are common in Nepal (17). The NMR in the periods 1992-1996, 1997-2001, 2002-2006 was 49, 43 and 33/1000 live births respectively (18). During the last decades, there has been substantial improvement in neonatal mortalities but the rates are still high compared to other developing countries (19). In Nepal, the NMR is 33/1000 live births (during the years 2006-2010) and has remained constant since 2002. This NMR is one of the highest in the world according to latest Nepal Demographic Health Survey (NDHS) (20). Recently, there has been very limited progress in reducing neonatal mortality in Nepal.

Integrated primary health care (integration of health services at the point of delivery of primary health care) was introduced in Nepal in late 1970s with tertiary hospitals at the center, zonal and district hospital in the peripheries, and a hierarchy of primary health center, health post, and sub health post in the communities (17). The system suffers from unfilled positions, absenteeism, shortfall of medical equipment and drugs, limited support to community-based staffs and lack of new recruits training (17). Similarly, Community Based Integrated Management of Childhood Illness (CB-IMCI) was introduced in Nepal in 1997. This addresses the major childhood killer diseases in children between 2-59 months old in a comprehensive way. This program did not primarily focus on neonates. Therefore, to address the urgent need to reduce neonatal mortality, Ministry of Health and Population (MoHP) initiated a new program called Community Based Newborn Care Package (CB-NCP) as a pilot project in 2007 in 10 districts under a scheme called the National Neonatal Strategy 2004 (21). The results of this pilot project indicate that CB-NCP, delivered through government health workers can have a significant impact in improving the survival of newborns in Nepal (22). By the year 2011, the program has been scaled up to 35 districts (21).

Status of Women in Nepal

Nepal is a culturally diverse country with a population of 26.6 million (14). Many communities in Nepal are based on patriarchal values where sons inherit the fathers' property. As in other places in the world, women here find themselves at a disadvantage compared to men in terms of assets, employment, education, and health care (19). In Nepal, the women's social status and level of autonomy is low and they have limited ability to make decisions about their own lives causing disadvantages compared to men in terms of economics, politics and professional life. Women's average income in Nepal is half compared to men. Similarly, women's political participation in Nepal is less than one fourth (23). There is also a huge difference in literacy rate with male (75.1%) and female (57.4%) (14).

Women in rural areas are much less empowered than those living in urban areas and women residing in eastern development region are less empowered than those living in the western development region of the country (24).

In Nepalese society, marriage is considered a social contract and embodies many social elements. It is more than just a union of husband and wife. After marriage, a daughter-in-law is expected to perform household and domestic work under the supervision of the mother-in-law, who is usually the primary decision maker in matters related to child rearing and family care (6). Furthermore, newly wed women in particular are expected to play a subordinate, submissive and more conservative role, especially in rural areas (25).

These particular societal contexts of gender disparity and socially subjugated roles of women in Nepal are directly affecting the health of mother and children. Gender roles and status of women in families often restrict involvement in family decision-making including childbirth, which negatively affects maternal health care (23).

In summary, women in Nepal lag behind men in educational attainment, participation in decision-making, economic resources, health information and health service utilization. These socio-economic and cultural settings put them at a disadvantage in responding to risk relating to reproductive health outcome, including neonatal mortality (19).

1.2 Rationale of the study

Nepal has one of the highest NMRs in the world and thus, there is an urgent need to address this issue. Women in Nepal are less informed and empowered and they are expected to play a subordinate and submissive role in the family and society. It is likely that the given societal role and status of women may have influenced the NMR in Nepal. Therefore, it is important to understand all the factors influencing the neonatal mortality in order to reduce it and to ensure proper growth and development of children. This study will determine the neonatal mortality predictors in Nepal.

Ensuring healthy growth and development of children should be of primary concern in all societies as children represent the future. Newborns need specialized care, as they are more vulnerable to infections and are at high risk of mortality and morbidity. The findings of this study will be useful to both maternal and child-care health workers and perinatal care decision makers. This study will also be useful to other researchers as it yields valuable information regarding factors affecting neonatal mortalities in Nepal.

1.3 Purpose of the study

1.3.1 General objective

- The general objective of the study is to determine the factors associated with neonatal mortality in Nepal

1.3.2 Specific objectives

- To determine the neonatal mortality rate in the study population
- To identify maternal factors influencing neonatal mortality

1.3.3 Research hypothesis

Null hypothesis (H0): There is no association between neonatal mortality and specific maternal factors[5]

Alternative hypothesis (H1): There is an association between neonatal mortality and specific maternal factors

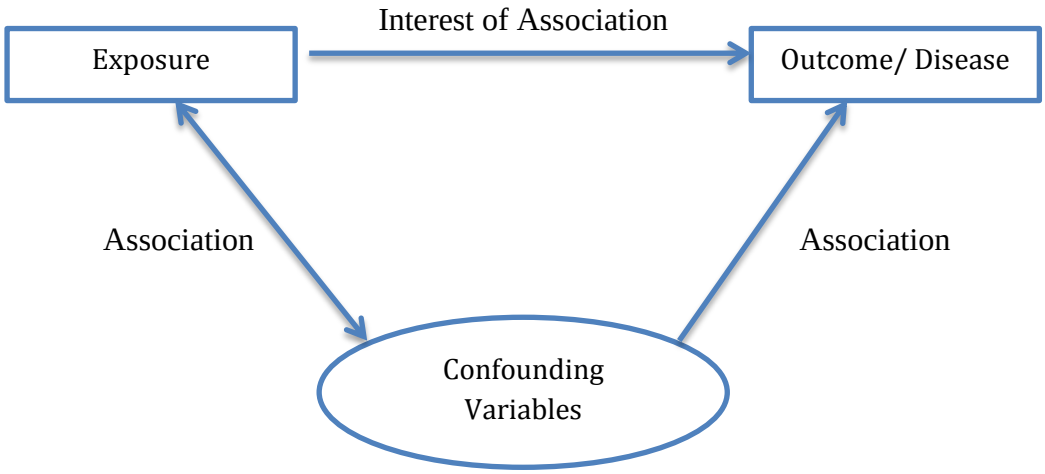
1.3.4 Possible confounders

Several studies have shown that the neonatal mortality is influenced by maternal factors such as maternal age at delivery, education, place of residence, autonomy on health care decision, parity, economic status, delivery setting and professional assistance during delivery (26-32). These associations can be a real associations or the association could be due to the presence of confounders.

In epidemiological studies, confounders are not part of the real association between exposure and outcome but predict the outcome and are unequally distributed between exposure groups. Only known and measurable confounders can be controlled for in the analysis.

[5] *Specific maternal factors includes age at delivery, residence, education, parity, health care decision autonomy, ANC visit, delivery setting, tobacco use, wealth index and assistance by SBA*

Confounders can be illustrated in the figure as follows:



Studies have shown that the neonates from younger age mothers are at increased risk of mortality compared to neonates from older mothers (26,29,31,32). Similarly, younger age mothers are likely to be poor and uneducated. A study done in Nepal showed that the younger age mothers were more likely to be from marginalized group (for example Madheshi ethnic group), less educated or illiterate and from low socioeconomic status (31). Furthermore, studies have also shown that poverty and illiteracy influences the neonatal mortality. The Demographic Health Survey (DHS) data from 20 sub-Saharan African countries and 3 south Asian countries showed consistently higher NMRs for those in poorest 20% of household than for those in the top quintile (1). Also, risk of neonatal mortality was found to be higher among the newborn born from uneducated mothers compared to newborn from educated mothers (26,32). These findings showed that the age, education, economic status of mother has an effect on neonatal mortality and influences each other. In a similar way education, health care decision autonomy, professional assistance during delivery are also interrelated and influences each other and also affects neonatal mortality (6,20). However, this effect might not be the direct effect, as each of them influences each other. Therefore, the variables may act as

confounders while accessing the independent effect of any of these variables on neonatal mortality.

Study findings have shown that higher NMR among the younger mothers is mediated primarily through preterm birth, LBW and Small for Gestational Age (SGA)[6] (31). However, these factors are not measured and may have acted as confounders as their effect cannot be adequately controlled in this study. Furthermore, a study conducted in Nepal showed a strong association between women's secondary education in relation to use of health care (6). Many women in Nepal are illiterate or have low education and do not have the decision making power within themselves, thus, most of the deliveries take place at home. Use of Skilled Birth Attendant (SBA) and utilization of health care services for children and newborn is rare in rural parts of Nepal and is least preferred option, and often women are taken to health facility when it's already too late (20). As the health-seeking behavior of mothers is not measured in this study and its effect on neonatal mortality cannot be adequately controlled, it may have acted as a confounder in this study.

[6] *Infants born with a birth weight below the 10th percentile for his/her gestational age*

CHAPTER II

STUDY DESIGN AND METHODS

2.1 Data source

The data used in this study is taken from the NDHS 2011. This was the fourth comprehensive survey conducted in Nepal as a part of worldwide MEASURE DHS project which was carried out under the aegis of the Population Division of the MoHP. Approval to use data was obtained through an online registration process on the MEASURE DHS[7] web site.

The sampling procedure of the NDHS survey was a two-stage stratified random sampling of households. The procedure was developed by the DHS project. For sampling, NDHS 2011 used a partial update of the 2001 census frame because the 2011 census report was not disseminated while sampling was being done for NDHS 2011 study. There are 75 districts in Nepal that are divided into Village development committees (VDCs) and municipalities. These VDCs and municipalities were further divided into wards. The wards in rural areas were taken as Enumeration Areas (EAs). However, larger wards of urban areas were divided into sub wards and these sub wards were considered as EAs.

[7] *MEASURE DHS project is funded by the US Agency for International Development (USAID), other donors and participating countries and is implemented by International Classification of Functioning Disability and Health (ICF). This project has provided technical assistance to more than 260 surveys in over 90 countries advancing global understanding of health and population trends in developing countries (33).*

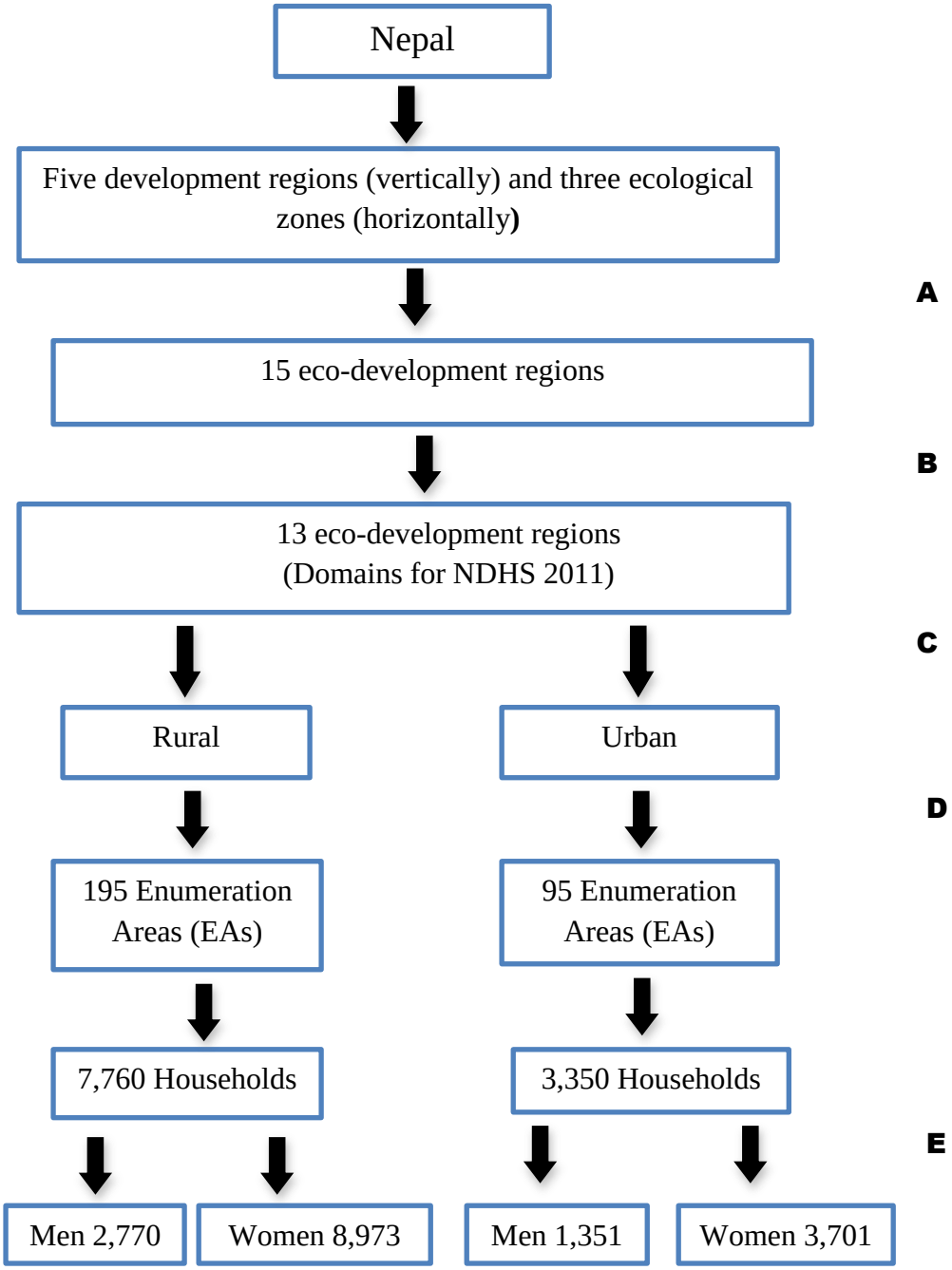


Figure 2: Sampling procedure

A: Cross section of development regions and ecological zones
B: Three eco-development regions on mountain region combined because of small populations
C: Probability proportion to size with ratio of urban to rural roughly 1:2
D: 40 households per EAs on rural area and 35 households per EAs in urban area were randomly selected
E: Women between ages of 15-49 years were interviewed. Men between ages of 15-49 from every second household were interviewed.

2.2 Study design

This study is a cross-sectional study based on data from NDHS 2011.

2.3 Study variables

2.3.1 Dependent variable

The dependent variable in this study was neonatal mortality, recorded as a binary variable. Mothers who had experienced one or more neonatal mortalities were categorized as either "yes" or "no".

Variable	**Description**	**Measurement scale**
Neonatal Mortalities	Respondent was asked if she had given live birth to a child and later died during the last 5-year period. Respondent was also asked age at death of the newborn. If the child died within complete 28 days of birth, it is categorized as "Yes" or else "No".	0= no 1= yes

2.3.2 Predictor variables

A literature search was performed in order to find possible predictors for neonatal mortality. The following were included in this study:

Variable	Measurement Scale
Age at delivery	0= 20 years or more; 1= Less than 20 years
Place of residence	0= Urban; 1= Rural
Education	0= No education; 1= Primary; 2= Secondary or above
Parity	0= 1 child; 1= 2-4 children; 3= 5 or more children
Healthcare decision autonomy	0= Yes; 1= No
Antenatal visits	0= No visit; 1= less than 4 visits; 2= 4 or more visits
Delivery setting	0= Health care facility; 1= Home
Tobacco use	0= No; 1= Yes
Wealth Index	0= Poor; 1= Middle; 2 = Rich
Delivery assisted by SBA	0= Yes; 1= No

Note: see annex for description of variables used

2.4 Study population

2.4.1 Assessing determinants of neonatal mortality

The sampling unit in this study was mothers. The NDHS 2011 survey interviewed 12674 mothers. Out of 12674 mothers, 4079 of those who gave live birth from 2006 to 2010 were eligible for the study. Out of the total eligible mothers, 46 mothers were excluded because of missing values on predictor variable. Thus, total 4033 mothers were included in the study.

2.4.2 Assessing neonatal mortality

Total number of live births (n= 5255) and neonatal mortalities (n= 176) from the mothers included in the study (n= 4033) was used.

2.5 Statistical analysis

The data in this study is processed and analyzed using MS Excel and Statistical Package for Social Science (SPSS) version 19 (34). Statistically significant associations between the dependent variable and predictor variables were assessed using multivariate logistic regression adjusted for age (as continuous variable) and then univariate and stepwise (backward LR) multivariate analysis (all predictors). The logistic model fitness was checked by Hosmer-Lemeshow goodness-of-fit test (P>0.05 will show the data adequately fit in the model). The Confidence Interval (CI) was set at 95%, and significance level was set at 0.05. Odds Ratio (OR) was used to estimate the risk.

2.6 Ethical clearance/consent

Approval to use the data was obtained from MEASURE DHS. NDHS 2011 survey data are open access data and has no restriction to use. So, no ethical clearance/consent was required.

CHAPTER III

RESULTS

3.1 Neonatal mortality

In the survey, mothers were asked how many live births they had during the last 5-years period. Of 4033 mothers selected for this study; 2931 mothers had given birth to one child, l987 mothers had given birth to 2 children, 111 mothers had given birth to 3 children, 3 mothers had given birth to 4 children and 1 mother gave birth to 5 children, resulting in a total of 5255 live births. 148 mothers had experienced 1 neonatal death, 11 mothers had 2 neonatal deaths and 2 mothers had 3 neonatal deaths during the same period. Thus, there were total 161 mothers who lost their newborn during the neonatal period with total of 176 neonatal mortalities.

Neonatal mortality was calculated using the following formula:

NMR = (Total neonatal mortalities in a population during a given period /Total live births in a same population during the same period)*1000

= (176/5255) * 1000

=33.4

Hence, neonatal mortality is determined to be 33.4/1000 live births in this study population.

3.2 Risk of neonatal mortality

Table 1: Socio-demographic characteristics of the studied population (N= 4033)

Socio-demographic characteristics of mother	Frequency	Percentage	National percentage
Age at delivery			
20 years or more	3456	85.7	
Less than 20 years	577	14.3	
Residence			
Urban	888	22	16.3*
Rural	3145	78	83.7*
Education			
No education	1740	43.1	42.6*
Primary	810	20.1	57.4*
Secondary or above	1483	36.8	
Parity			
1	1238	30.7	
2	1147	28.4	
3	682	16.9	
4	437	10.8	
5 or more	529	13.2	
Healthcare decision autonomy			
No	1594	39.5	
Yes	2439	60.5	
Antenatal Care (ANC) visit			
No visit	602	14.9	15**
Incomplete visit	1302	32.3	36.5**
Complete visit	2129	52.8	48.5**
Delivery setting			
Healthcare center	1665	41.3	37**
Home	2368	58.7	63**
Tobacco use			
No	3658	90.7	
Yes	375	9.3	
Wealth Index			
Poorest	1142	28.3	
Poor	820	20.3	
Middle	733	18.2	
Rich	671	16.6	
Richest	667	16.5	
Assist by Skilled Birth Attendant (SBA)			
Yes	1616	40.1	42.6**
No	2417	59.9	58.4**

*Note: * Source CBS 2011 report (14), ** Source Annual report 2010/11 (21)*

Table 1 shows the socio-demographic characteristics of the study population. Most mothers were 20 years or older at the time of their latest delivery, only 14.3% of mothers below the age of 20 gave birth.

Similarly, 78% of the mothers were from rural areas and 22% of the mothers were from urban areas. The data also reveals that most of the mothers were uneducated, 43.1% did not attend school and only 20.1% completed their primary schooling. However, 36.8% mothers had completed secondary education or above.

Mothers with parity 1 or 2 were highest and comprise 59.1% of total population studied. There were 16.9% of studied mothers with parity 3, 10.8% mothers had parity 4 and 13.2% mothers had parity 5 or more.

In case of decision making relating to their health, 60.5% of mothers said that they have autonomy on decisions about their own health whereas, other 39.5% depend on their family members' decision on whether they should go for health checkup or not. Also, 52.8% of the mothers had visited health facility at least 4 times for the antenatal checkup whereas 32.3% had less than 4 visits for antenatal checkup during pregnancy. Further, 14.9% mothers respond that they never had any antenatal checkup during pregnancy.

Likewise, 58.7% of mothers delivered child at home whereas 41.3% had delivered child in health facility, either public or private. Majority of mother said that they do not use tobacco while 9.3% said they smoke cigarette or *Bidi.*

With regard to wealth index, 28.3% of mothers were from poorest household followed by poor (20.3%), middle (18.2%), rich (16.6%) and richest (16.5%) household. Most of the mothers (59.9%) did not receive assistance from SBA during delivery whereas; SBA assisted 40.1% mothers during delivery.

Furthermore, as can be seen from the table, the data used in this study are comparable to demographic characteristics of national female population, and the data fits the general women population of Nepal. Also, the data represents the general Nepalese women characteristics. Thus, the finding of the study can be generalized to Nepal or other similar settings.

Table 2: Age-adjusted association between neonatal mortalities and predictor variables (n= 4033)

Socio-demographic characteristics	Multivariate	
	Adjusted Odds Ratio (AOR)	**95% Confidence Interval (CI)**
Residence		
Urban (**ref)**	1	
Rural	1.50	0.98-2.30
Education		
No education	1.56	1.06-2.27*
Primary	1.21	0.76-1.90
Secondary or above **(ref)**	1	
Parity		
1**(ref)**	1	1
2-4	3.51	2.20-5.61***
5 or more	6.27	2.97-13.25***
Healthcare decision autonomy		
Yes **(ref)**	1	
No	1.4	1.02-1.92*
ANC visit		
No visit	1.09	0.67-1.75
Incomplete visits	1.08	0.76-1.54
Complete visits **(ref)**	1	
Delivery setting		
Healthcare center (**ref)**	1	
Home	0.95	0.69-1.32
Tobacco use		
No (**ref)**	1	
Yes	1.18	0.68-2.04
Wealth Index		
Poor	1.51	1.04-2.20*
Middle	1.31	0.81-2.11
Rich **(ref)**	1	
Assist by SBA		
Yes **(ref)**	1	
No	1.07	0.77-1.48

Note: ***significant at P<0.001; ** significant at P<0.01 and * significant at P<0.05

Table 2 shows the association between neonatal mortalities and predictor variables after adjusting for mother's age at delivery. Of 9 variables included in the analysis, 4 variables: educations, parity, autonomy on decision-making and wealth index are significantly associated with neonatal mortality. Residence, Antenatal care (ANC) visits, delivery setting, tobacco use and assistance by SBA showed no significant association.

Mother's education was found to be significantly associated with neonatal mortalities. Neonates from uneducated mothers are 1.56 times (AOR: 1.56, CI: 1.06- 2.27) more likely to die compared to neonates from mothers with secondary or higher education

Parity was also found to be significantly associated with neonatal mortality (P<0.001). Mothers with parity 5 or more are 6.27 (AOR: 6.27, CI: 2.97-13.25) times more likely to experience neonatal mortality compared to primiparous mothers.

There was a significant association between healthcare decision autonomy and neonatal mortalities. Neonates from the mothers without autonomy on self-healthcare are 1.4 times (AOR: 1.4, CI: 1.02-1.92) more likely to die compared to mothers with the autonomy on decision on self-healthcare.

Wealth index was also found to be the determinant of neonatal mortalities. Neonates of mothers from poor household are at high risk compared to the neonates of mothers from rich household. Compared to rich household, neonates from poor household are 1.51 times (AOR: 1.51, CI: 1.04-2.20) more likely to die.

Table 3: Association between neonatal mortalities and predictor variables (n=4033)

Hosmar-lameshow test for goodness of fit was performed, the data adequately fit in the model with Chi-square value of 9.56 and, P value of 0.275.

Socio-demographic characteristics	**Neonatal Mortalities**		**Univariate**		**Multivariate**	
Age at delivery	**No**	**Yes**	**Odds Ratio (OR)**	**95% CI**	**OR**	**95% CI**
20 years or more **(ref)**	3320	136	1		1	
Less than 20 years	552	25	1.10	0.71-1.71	1.94	1.18-3.20**
Residence						
Urban **(ref)**	862	26	1		1	
Rural	3010	135	1.48	0.97-2.27	1.53	0.97-2.39
Education						
No education	1660	80	1.41	0.98-2.02		
Primary	778	32	1.20	0.76-1.89		
Secondary or above **(ref)**	1434	49	1			
Parity						
1**(ref)**	1213	25				
2-4	2154	112	2.52	1.22-3.91***	3.55	2.16-5.85***
5 or more	505	24	2.30	1.30-4.07**	3.50	1.82-6.74***
Healthcare decision autonomy						
Yes **(ref)**	2355	84	1		1	
No	1517	77	1.42	1.03-1.95*	1.43	1.04-1.97*
ANC visit						
No visit	578	24	1.02	0.64-1.62		
Incomplete visits	1248	54	1.06	0.75-1.51		
Complete visits **(ref)**	2046	83	1			
Delivery setting						
Healthcare center **(ref)**	1596	69	1		1	
Home	2276	92	0.93	0.68-1.28	0.65	0.46-0.92*
Tobacco use						
No **(ref)**	3513	145	1			
Yes	359	16	1.08	0.63-1.83		
Wealth Index						
Poor	1873	89	1.46	1.00-2.13*		
Middle	703	30	1.31	0.81-2.12		
Rich **(ref)**	1296	42	1			
Assist by SBA						
Yes **(ref)**	1553	63	1			
No	2319	98	1.04	0.75-1.43		

Note: *** Significant at P<0.001, ** Significant at P<0.01, * Significant at P<0.05

Table 3 shows the association between neonatal mortalities and the predictor variables by univariate and multivariate logistic regression analysis. Backward LR was performed in the multivariate analysis with all variables included at a time.

Of 10, the variables considered for analysis, 3 variables: parity, healthcare decision autonomy and wealth index were found to be significantly associated with the neonatal mortality and the other 7 variables were found to have no significant association while performing univariate logistic regression. The variables that showed no significant association with neonatal mortality on univariate logistic regression were age at delivery, residence, education, ANC visit, delivery setting, tobacco use and assistance by SBA.

While running stepwise multivariate logistic regression (Backward LR), 4 variables: age at delivery, parity, healthcare decision autonomy and delivery setting were found to be significantly associated with neonatal mortality, other 6 variables: residence, education, ANC visit, tobacco use, wealth index and assist by SBA showed no significant association with neonatal mortality.

There is a significant association between mothers' age at delivery and neonatal mortality. Infants from adolescent mother are 1.94 times (OR: 1.94, CI: 1.18- 3.20) more likely to die during neonatal period compared to adult mothers.

Also, there was a highly significant association between parity and neonatal mortalities. Mothers with parity 5 or more are 3.5 times (OR: 3.50, CI: 1.82-6.74) more likely to have neonatal mortalities compared to primiparous mothers.

Mother's healthcare decision autonomy was another predictor of the neonatal mortalities. Mother's autonomy on health care decision was found to be significantly associated with the neonatal mortality. Neonates from mothers without the autonomy on decision on own health

is found to be 1.43 times (OR: 1.43, CI: 1.04-1.97) more likely to die compared with the neonates from mothers with autonomy on health care decision.

There was a significant difference between delivery setting and neonatal mortality. The result showed neonates from mother who gave delivery at home are 35% less likely (OR: 0.65, CI: 0.46-0.92) to die compared to mothers who gave birth at healthcare centers.

CHAPTER IV

DISCUSSION

In line with the main objective of the current study, this research has identified various maternal characteristics associated/ not associated with neonatal mortality in Nepal. This study identified mother's age at delivery, health care decision autonomy of mothers, parity and delivery setting as predictors of neonatal mortalities. But, this study showed no significant association between neonatal mortalities and factors such as residence, education, antenatal care visit, tobacco use, wealth index and delivery assisted by skilled birth attendant. High neonatal mortality was observed among the mothers with high parity and mothers without health care decision autonomy. Low maternal education and poverty were also found to be important predictors of neonatal mortalities after adjusting for maternal age at delivery.

Global statistics relating to NMR shows a clear pattern of high-income countries having significantly lower NMRs than low-income countries. For example, high-income countries such as Norway, Japan, United Kingdom, United States of America, Sweden, and Switzerland have NMRs between 1 and 4/1000. On the other hand, low-income countries such as India, Ghana, and Ethiopia have NMRs of 32, 30 and 31/1000 respectively (4). Furthermore, neonatal mortality was determined to be 33.4/1000 live births in this study, which is in line with the other low-income countries NMR.

Predictors significantly associated with NMR in Nepal

This study has identified association of neonatal mortalities in Nepal with various predictors. Factors identified as significant predictors for neonatal mortalities in Nepal are discussed below:

i) Age at Delivery

This study showed that children born from mothers below 20 years are at higher risk of neonatal mortality. This might be the result of different social and cultural practices such as early marriage. In Nepal, usually girls get married at an early age and get pregnant early when they are still biologically immature, this can lead to adverse pregnancy outcomes. Also, the young age pregnancy is associated with preterm birth, LBW and newborn being SGA (35), the strong predictor of neonatal mortality (1,5,10). Besides, the high risk of neonatal mortality can be the result of relatively disadvantaged socio economic background, low quality of prenatal visits and lack of family support (36,37) to mothers who often face subjugation in family and society especially in rural areas.

The association between age at delivery and neonatal mortality has been established and discussed in numerous studies, which found similar result of high-risk neonatal mortality among younger mother (26,29,30,35,36).

Despite significant association between neonatal mortalities and age at delivery found in majority of studies, some studies have contrasting findings. For instance, a hospital based study in Nigeria showed no statistically significant association between teenage mothers and neonatal mortalities (28). This contrasting result might be because of study settings and different socioeconomic and cultural background of the respondent.

In summary, the findings of this study and the majority of existing studies showed that the mother's age at delivery is significantly associated with neonatal mortalities. Thus, mother's age at delivery is a significant predictor of neonatal mortalities in Nepalese context.

ii) Autonomy in Health Care decision making

This study showed that neonatal mortality is significantly higher among those mothers who do not have autonomy over health care decisions. As mentioned earlier, women in Nepal often face subjugation in both family and society. Their families make all the decisions regarding health and health care. Also, in a societal context, women that have autonomy in health care decision-making are usually better off socio-economically. Basically, women who are educated and independent are found to have autonomy in health care concerns. Thus, these women are aware of contraceptive use, prolonged intervals between pregnancies and lower fertility, reproductive and prenatal health, which significantly lowers their risk for adverse reproductive outcomes including neonatal mortality (38). Women's autonomy in health care decision-making in Nepal implies various aspects, such as a better socio-economic position than women from the general population, financial independence, higher education and equitable family structure.

A study done in Nepal has shown concurrent finding, i.e. newborns from mothers who have health care decision autonomy were at significantly lower risk of infant mortality compared to those who do not have health care decision autonomy (19). Another study conducted in Bangladesh, has shown similar result with more autonomous women likely to have positive impact on health and survival of newborns (39).

The findings of this study suggest women's autonomy in health care decision is significant predictor of neonatal mortalities in Nepal. However, resultant factors underlying the very existence of autonomous position of women, in relation to health care is also pivotal in the analysis.

iii) Parity

This study shows that there is an increase in neonatal mortality with increase in parity. The reason behind this might be that the mothers with many children are more likely to have shorter birth intervals, which can result in increased risk of adverse perinatal outcome and neonatal mortalities (39). Similarly, the mothers with high parity are likely to be older which increases the risk of pregnancy related complications. The risk of obstetric complication increases markedly from parity 4 (40) thus; there is higher risk of both maternal and newborn mortalities. However, in this study there are lack of enough participants in the group parity 5 or more (n= 529; 13.2%), which might have yield broad confidence interval and thus, made the comparison with parity (1 and 2-4) statistically uncertain.

The result is however supported by many studies. A study conducted in California had similar findings i.e. mothers with more than three live births had increased risk of neonatal mortalities by 1.3 times compared to those mothers with less than three live births (29). Another study conducted in Australia showed that the risk of neonatal mortalities increases sharply from parity 4 (or 5^{th} children) (40).

iv) Delivery Setting

This study has shown a significant association between delivery setting (home and health care center) and neonatal mortality. Mothers who delivered at home were 35% less likely to experience a neonatal mortality than mothers who deliver at health care settings both governmental and private.

A possible explanation might be that the seeking health care at the right time may have acted as a confounder. In Nepal, women literacy rate is very low (57.4%) (14) and people usually avoid utilizing health facilities and delivery is mostly conducted at home. Seeking care from a qualified provider at a health facility is the least preferred option (41). Thus, due to this

there might be a delay in seeking medical help for high-risk pregnancies as they are taken to health facilities too late. Furthermore, lack of access, distance and cost are also major barriers in seeking health care for most women, which might result in serious complications (41). In Nepal, the use of home remedies was found to be a significant factor to cause delay in seeking modern health care (41,42), which may worsen mothers and child health condition that can be attributable to low literacy rate. Thus, these factors explain that since women use the health facilities only in emergencies, there are higher neonatal mortalities for deliveries in health care setting.

On a positive note, there has been some progress in reducing neonatal mortality for home deliveries. A study done in a rural setting in South Asia showed that appropriate use of a clean delivery kit at home could reduce neonatal mortality (43). Also, the initiation of the CB-NCP program at community level has had significant impact on newborn survival through clean delivery practice, essential newborn care, identification and management of newborn infection, low birth weight by mobilizing Female Community Health Volunteers (FCHVs) (22).

Further analysis and research are needed to explore whether increased delivery at health institutions has an impact on newborn mortality in Nepal.

Predictors with non-significant association with neonatal mortalities

Among the predictors analyzed in this study, some did not show any particular association with neonatal mortality. While some predictors were significant after adjusting for maternal age at delivery.

i) Maternal Education

This study found no association between maternal education and neonatal mortality. However, a significant association was found between maternal education and neonatal mortality after adjusting for maternal age at delivery. This implies that the age at delivery along with some of the other variables such as wealth index included in the multivariate analysis might have acted as confounders and have showed no significant association between maternal education and neonatal mortality in multivariate analysis.

The statistical significant increase in neonatal mortalities among the uneducated mothers compared to educated mothers might be because educated mothers are more likely to be independent, and have decision making autonomy in seeking health care and can make right health-care decisions at right time. They have better knowledge about contraceptive practices and other sexual and reproductive health issues.

Several studies reveal that the higher the maternal education, the lower the risk of neonatal mortality (26,32,44). Mothers with secondary or higher education had significant low risk of neonatal mortalities compared to uneducated mothers (26). In contrast, studies conducted in Indonesia and Nigeria found no significant association between maternal education and neonatal mortality (27,28). This contrast finding might be due to difference in study settings.

ii) Wealth Index

This study found no association between wealth index and neonatal mortality. However, the study showed a significant increase in neonatal mortality among mothers from poor household compared to rich household after adjusting for maternal age at delivery. This implies that the age at delivery along with some of the other variables such as education included in the multivariate analysis might have acted as confounders which have affected the result in multivariate analysis. The other explanations could be that in this study, few

mothers (n=733; 18.2%) were from middle wealth index group, which could have made the comparison with rich and poor wealth index group statistically unstable.

There was a significant increase in neonatal mortality among mothers from poor household compared to rich household which might be because mothers from rich household tend to have a balanced diet, are more likely to be educated, have access to health facility, which consequently leads to decreased risk of neonatal mortality. These mothers might also be educated and have health care decision autonomy, so that they can go to health facility without any delay in case of any danger signs during pregnancy or after childbirth.

Similar result was found in DHS data from twenty sub-Saharan African countries and three south Asian countries which showed consistently higher NMRs for those in poorest 20% of household than for those in the top quintile (1). Population based cohort study done in Missouri also found that low socioeconomic status increases infant mortality by increasing the risk of preterm births, thus, resulting in higher neonatal mortality (30).

iii) Antenatal Care visit

This study showed no significant association between ANC visit and neonatal mortality. This might be due to lack of enough participants in no ANC visit group (n=602; 14.9%), which could have made the comparison with ANC visit (complete and incomplete) statistically unstable. This finding is concurrent with result found in a study done in Bangladesh (32). However, several studies have shown contrasting result where number of ANC visit was associated with lower neonatal mortality (46,47).

A study done in Indonesia has shown no beneficial effect of ANC visit in the first and second trimester on neonatal mortality. In contrast, greater number of ANC visits in the third semester significantly lower the neonatal mortality (47). Furthermore, this study result suggests more frequent visit (more than seven) is required for better newborn survival (47).

iv) Residence

This study found no association between neonatal mortality and place of residence. The reason behind this might be that there is no relative difference in proportion of neonatal mortalities among the rural residence and urban residence, which might have caused no significant association. Similar result was also observed in the study done in Bangladesh where no significant association was found between neonatal mortality and place of residence (32).

v) Tobacco use

There was no association found between tobacco use and neonatal mortalities in this study. However, several studies have shown different health effect of smoking during pregnancy. Nepal has a diverse community with certain social rules and regulations. Women in majority of community tend to hide their smoking habit due to cultural norms. They do not expose their smoking habit especially in front of an outsider in fear of their society. This might have resulted in under-reporting of smoking habit by mothers in Nepal, which might have caused information bias. In contrast, a study done in California showed a significant increase in infant mortality associated with tobacco use during pregnancy (29). This might be due to difference in study settings and smoking behavior pattern.

vi) Assistance by Skilled Birth Attendant

No association between neonatal mortality and delivery assisted by SBA was found in this study. This might be because in Nepal, usually people seek medical help only in the emergencies. As a result, this health seeking behavior of the population might have acted as confounder resulting in no significant association between neonatal mortalities and delivery assisted by SBA. Similar finding was shown in the study done in Bangladesh (26). Further

researches are needed to investigate whether assisted delivery by SBAs really has an impact on neonatal mortality in Nepal.

Strengths and limitations

The information used in this study is based on retrospective birth history of children and reported background characteristics of mother, children and household. Mothers may remember the important life events such as birth and death, however; they might not recall certain events such as frequency of ANC visits. Thus, there might be a possibility of recall bias. Other limitation of the study is the presence of residual confounding. As surviving mothers were interviewed, this might have resulted in underestimation of neonatal mortality, as neonatal mortality is closely linked to maternal mortality. This could also have led to the information bias by underestimation of the effect of some of the associated factors such as place of residence and delivery setting.

In order to measure effects, a final model should have adjusted for age, premature birth and LBW. However, as a secondary data set is used in this study, data for premature birth, LBW or SGA was not available which are certainly important predictors in this study. Also, there may have been a problem in accurately reporting neonatal mortalities or stillbirths in home deliveries. Mothers with no formal education may call a neonatal mortality as stillbirth and do not report it unlike educated mothers, thus, this might have caused information bias by underestimating the effect of some of the related factors such as delivery setting. Further, wealth index derived from NDHS were based on current information. Therefore, the variable might not capture the true level of household wealth if the child was born several years before the survey date.

Furthermore, the unavailability of data showing the trend of neonatal mortality and under-five mortality, this study could not estimate the neonatal mortality from under five mortality

rate that could more accurately estimate the neonatal mortality using the following statistical model:

$$\text{Log (NMR/1000)} = \alpha 0 + \beta 1 * \log (\text{U5MR/1000}) + \beta 2 * ([\log (\text{U5MR/1000})]^2$$

with random effect intercept parameters for both country and region (48).

Despite these limitations, the strength of the study is that it is an adequate sample size survey with stratified random sampling. Thus, the result can be generalized in context of Nepal. This study recommends for the further research to investigate whether the hospital delivery and delivery assisted by SBAs really has impact on neonatal mortality in Nepal. This study can also be a reference for other future epidemiological studies conducted in a similar setting.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

This study aimed to identify predictors of neonatal mortality in Nepal utilizing the data from NDHS 2011. A total of 4033 mothers from age 15-49 years who gave birth in last 5 years preceding the survey were included in the study. Most of the mothers were living in rural areas, were uneducated and poor.

The neonatal mortality was found to be 33.4/1000 live births. Current study established mother's age at delivery, parity and mother's autonomy on self-health care as strong predictors of neonatal mortalities in Nepal. Maternal education and poverty were also found to be important determinants of neonatal mortalities after adjusting for maternal age at delivery. High neonatal mortality was observed among mothers with younger age, high parity and in mothers without healthcare decision autonomy. A well educated, independent and healthy adult mother with healthcare decision autonomy has a better chance of fulfilling important factors such as infant feeding, general care, hygiene, adequate use of preventive and curative health services that can improve newborn survival.

Recommendations

- Health care services relating to maternal and child health should be made more accessible, affordable and equitable.
- The knowledge and access to family planning methods should be provided to delay the age at first pregnancy.
- Female literacy program should be conducted and strengthened for the empowerment of women.

- Health education and awareness campaigns should be conducted more effectively to encourage mothers for antenatal visit and hospital delivery.
- The maternal and child health care program should focus on rural areas as majority of women who are oppressed live here.
- Female Community Health Volunteers (FCHVs) and Village Health Workers (VHWs) should be mobilized to ensure the appropriate and timely antenatal and postnatal service utilization.
- Routine research on maternal and child health should be done in order to prioritize and implement the programs.
- Programs targeting socio-economic empowerment of women must be undertaken in rural parts of Nepal.
- CB-NCP should be strengthened and scaled up to all 75 districts of the country.

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ANNEX 1

Operational definition of predictor variable and their measurement

Variable	Description	Measurement scale
Mothers age at delivery	The current age of respondent (mother) and child was asked. Child current age was subtracted from mother's current age to get the mothers age at delivery. 20 years was made a cutoff point as the legal age at marriage is 20 years in Nepal	0= 20 years or more 1= less than 20 years
Residence	Type of place of the respondent residence was asked during the identification of residence as urban or rural	0=Urban 1= rural
Education	Highest attained education of mother was asked as no education, primary, secondary and higher. No education refers to without any formal education or below primary, primary education refers to completed 5^{th} grade in school and secondary or higher education refers to completed school level or higher education.	0= no education 1= primary 2= secondary or higher
Parity	The total number of children ever born were asked	1= 1 child 2= 2-4 child 3= 5 or more
Healthcare decision autonomy	Decision on health care for mother herself was coded as respondent alone, respondent and husband/partner, respondent and other, husband/ partner alone, someone else and other. And it was categorized as 0= respondent involved in decision and 1= respondent not involved.	0= Yes 1= No
ANC visits	Number of antenatal visit were asked to the respondent and categorized as 0= no visit, 1= less than 4 visit and 2= 4 or more visit	0= No visit 1= Incomplete visit 2= Complete visit

Delivery setting	Respondent were asked where they had their delivery. If the delivery was at respondent home or any other home was categorized as home and if the delivery was at any public or private healthcare facility was coded as health care center.	0= Healthcare center 1=Home
Tobacco use	Whether the mother smoked cigarette, *bidi* or snuff was asked and yes to at least 1 item was coded as 1= yes else 0 = no	0= No 1= Yes
Wealth index	In NDHS 2011 survey, the economic index was constructed using household asset data including ownership of a number of consumer items ranging from a television to a bicycle or car as well as dwelling characteristics such as source of drinking water, sanitation facilities and type of material used for flooring. Each asset is assigned a weight (factor score) generated through principal components analysis and the resulting asset scores were standardized in relation to a normal distribution with a mean of zero and standard deviation of one. Each household was then assigned a score for each asset and the scores were summed for each household; individuals were ranked according to the score of the household in which they reside. The sample was then divided into quintiles from one (lowest) to five (highest) (16) and coded as 1= poorest, 2= poor, 3= middle, 4= rich and 5= richest.	1=poor (poorest and poor) 2= middle 3= rich (rich and richest)
Assist by SBA	Whether doctor, nurse or midwife assisted mother in delivery was asked. And response yes was coded as yes and response no was coded as no.	0= Yes 1= No

ANNEX 2

Nepal Demographic and Health survey 2011: Women's questionnaire – Questions related with this study

Identification

City/Town/Rural

103. How old were you at your last birthday?

Age in completed years…..

109. Have you attended school? Yes……..

No……

110. What is the highest grade you completed? Grade…….

201. First I would like to ask about all the births you have had during your life. Have you ever given birth? Yes……..

No……

206. Have you ever given birth to a boy or girl who was born alive but later died?

Yes……..

No……

220 In what month and year was born? Probe: when is his birthday?

Month……..

Year…….

225. If dead: how old was when he/she died? Record days if less than 1 month; months if less than two years; or years

Days……

Months……

Year……

232. Check 220 and enter the number of births in 2062 B.S. (2006 A.D.) or later.

Number of Births.....

None.....

408. Did you see anyone for antenatal care?

Yes.....

No.....

412. How many times did you receive antenatal care?

Number of times …….

Don't know ……..

427. Who assisted you with the delivery?

Health personnel

Doctor..... Nurse/midwife……. Health asst. /AHW ……

MCHW..... VHW.....

Other person

Traditional Birth attendant …… FCHV..... Relative/friend…….
Other……..

428. Where did you give birth?

Home

Your home…… Other home…….

Govt. Sector

Govt. Hospital …….. PHC center…… Health

Post……. Sub-Health Post …… Other govt…….

Non Govt. Sector

FPAN..... ADRA..... UMN.....
Other NGO……

Private med. Sector

Pvt. Hospital/clinic/home..... Other private……

819. Who usually makes decisions about health care for yourself: you, your (husband/partner), you and your (husband/partner) jointly, or someone else?

Respondent.....

Husband/partner.....

Respondent and husband/partner jointly……

Someone else.....

Other……..

1006. Do you currently smoke or use any (other) type of tobacco?

Yes……..

No…….

1007. What (other) type of tobacco do you currently smoke or use?

Pipe……. Bidi…… Chewing Tobacco……

Snuff……