# DETERMINANTS OF EARLY BREASTFEEDING PRACTICES AFFECTING INFANT MORTALITY IN NEPAL

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## ABSTRACT

This study examines the determinants of early breastfeeding patterns of Nepalese women and infant mortality by using secondary data from the Nepal Demographic and Health Survey, 2001. A total of 4,721 women of reproductive age group who had given birth to their last child during the period 1997-2001 were analyzed to study the influence of maternal factors, utilization of maternal health services and socio-economic factors on early breastfeeding practices after birth and infant mortality of the index child.

The findings of the study show that maternal factors are significant determinants of breastfeeding within one hour after birth and infant mortality. When a mother's age increases, the likelihood of breastfeeding within one hour increases and infant mortality decreases, whereas infant mortality increases slightly if the mother's age at childbearing is more than 35 years. Breastfeeding within one hour decreases and infant mortality increases with the increase of birth order (parity). Preceding birth interval is indirectly associated with infant mortality via early breastfeeding after birth since breastfeeding within this period could significantly reduce infant mortality. This study identified that early breastfeeding after birth (preferably as early as possible but not later than one day) acts as an intervening variable for maternal factors. Utilization of maternal health services were not found to be strongly associated with breastfeeding within one hour, though logistic regression coefficients indicate that antenatal care is inversely related with infant mortality.

Some socio-economic factors such as mother's education, occupation, place of residence, and religion were found to be significantly associated with the initiation of breastfeeding within an hour of birth, but not directly associated with infant mortality except in the case of place of residence. This study found that early breastfeeding acts as an intervening variable between socio-economic factors and infant mortality in Nepal.

This study recommends an implementation of behavior change communication and counseling programs in connection with family planning programs and maternal and child health programs and to emphasize starting of breastfeeding as soon as possible after birth, preferably not later than one day. Special programs to emphasize marriage after 20 years and childbearing before age 35 years, increasing the birth interval and reducing high numbers of births, and an increase in accessibility of health services are recommended. Education and advancement of women may be effective instruments for the purpose.

KEY WORDS: MATERNAL FACTORS/MATERNAL HEALTH SERVICES/ EARLY BREASTFEEDING/INFANT MORTALITY

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# CHAPTER I

# INTRODUCTION

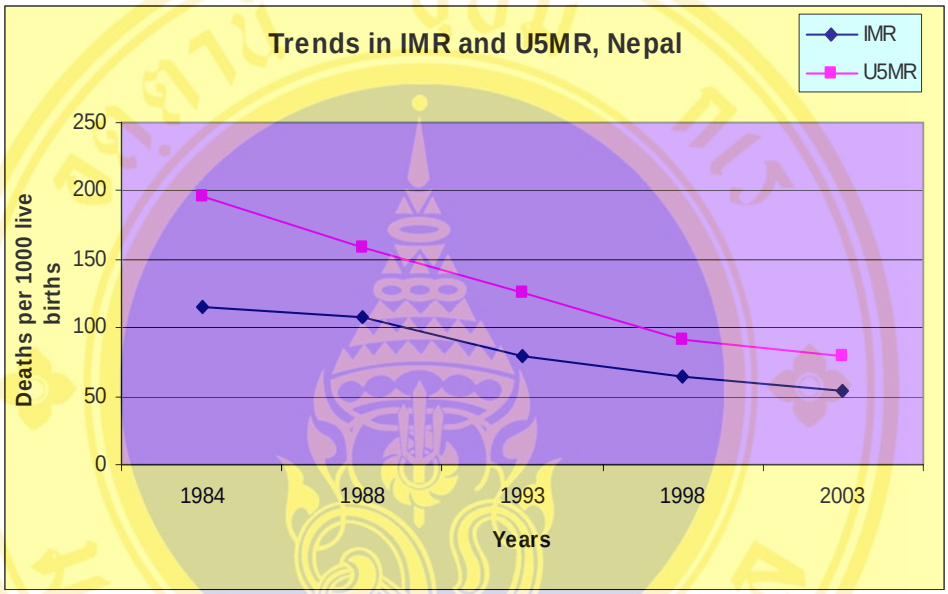
This chapter aims to describe the statement of the problem, the rationale of the study on infant mortality, government response and programs on infant and child health, research questions and objectives of the study.

## 1.1 Statement of the problem

Mortality is considered as an important component of population change regardless of the age at death. Infant and child mortality are the major health problem in many developing countries because of a major share of all losses of life. Infant mortality is an indicator that is used to measure the health status, level of utilization of maternal and child health services and the level of socio-economic development of a country (United Nations, 1999). Every year about 10.6 million children under age 5 die worldwide, most of these deaths could have been prevented (UNICEF, 2005). Among them, 8.2 million die before reaching first birthday. About 98 percent of infant deaths occur in developing countries. Among infant deaths, more than 40 percent deaths occur in Africa, about 30 percents in South East Asia (WHO, 2004). The estimated infant mortality rate (under one year) in the world is 57 per 1000 live births. The highest infant mortality rate is in Africa (94) followed by Asia (54), Oceania (29), Latin America (26), Europe (9) and North America (7) (World Population Prospects, 2004).

In Nepal also, where the health condition is poor, high level of child and infant mortality has been the major health problem. According to Nepal Family Health Survey(MOH, 1996), the under five child mortality rate was 118 per thousand live births in 1996 which lowered down to 91 per thousand live births in 2001 (MOH, 2001). The infant mortality rates for those two years were 79 and 64 per thousand live births respectively (MOH, 2001). The infant mortality rates are different according to

the place of residence in urban areas about 50 and in rural areas, about 79 deaths occur before first year of age per thousand live births (MOH, 2001). According to Nepal Demographic and Health Survey (MOH, 2001), the child mortality rate under age 5 and infant mortality rate are 91.2 and 64.4 respectively per thousand live births in Nepal. The following figure indicates the trend of Infant and Child mortality.




Source: Ministry of Health and Population, Nepal, 2005.

Fig. 1: Trend of Infant and child mortality rate in Nepal.

Nepal's infant mortality rate is comparatively higher among South Asian Countries. In addition, the estimated infant mortality rate for Nepal in the year 2005 is 54 deaths per thousand live births which is relatively higher than other many developing countries such as Bangladesh (49), Indonesia (38), Viet Nam (25), Thailand (17), and Sri Lanka (14) (World Population Prospects, 2004). Nepal is one of the poorest countries in the world, where more than 30 percents of the people live under poverty (CBS, 2004). The level of education is still lower (42% females and 63% males are literate) and there are still misconceptions and some socio-cultural taboos, which are reflected in the fertility behavior too. The total fertility rate is 4.1 per women and population growth rate is 2.2% annually. Early age at marriage and son preference causes early childbearing and higher number of childbearing.

The singulate mean age at marriage (SMAM) among males and females in Nepal are 22.9 and 19.5 years respectively (Population Census, 2001). The shorter birth interval is another problem for the health of mother and children in Nepal. The median period between two subsequent births is slightly around two years. 99 percent of currently married women know about contraception whenever the contraceptive prevalence rate is only 39.3 percent. About 67.1 percent of currently married Nepalese women want to use any methods of contraception for spacing and limiting births. There is still 27.8 percent unmet need of family planning indicating that the accessibility of family planning services is also poor in Nepal (MOH, 2001).

In Nepal, only 14% of the people live in urban areas. Besides, it is the country with geographical and cultural diversity. Physically it is less infra-structured and having some religious and traditional taboos, which may affect the mortality of children. The lack of maternal and child health care services such as antenatal care, delivery care, immunization etc. are the main factors affecting infant health in Nepal. Nepal has one of the highest maternal mortality rates in south Asia. The maternal mortality ratio is 539 per 100000 live births. Among the pregnancies, about 40 percent are considered to be risky in Nepalese women. Relatively few women use maternal health services during pregnancy. According to Demographic and Health Survey 2001, 51 percent of women did not receive any antenatal care during pregnancy. In addition, most children are delivered at home with the help of an untrained traditional attendant or family members. The utilization of postnatal services is also very low. Over 90 percent of births in Nepal are delivered at home, while only 9 percent are delivered at health facilities or hospitals, and only 12 percent of women receive postnatal care from a health professional (MOH, 2001).

Breastfeeding behavior of mother is also an important factor for the health of the baby. The first milk (colostrums) after delivery and the duration of breastfeeding are very important for the health of new born children. The World Health Organization has recommended to start breastfeeding within half an hour after birth in order to simulate colostrums feeding which may produce within one or two days after birth. But in some Nepalese society, there is a misconception about first milk that the baby should not be feed that milk because it is “heavy” and “not good for baby”. The government of Nepal has emphasized to increase the duration of breastfeeding and

also emphasized to feed the colostrums after delivery although the median duration of breastfeeding is going shorter and shorter however the rate of immediate breastfeeding is higher in urban areas. The median duration of breastfeeding is 29 months in Nepal (MOH, 2001)

In conclusion, maternal factors and behaviors such as age of mother at child birth, control over number of children born, and birth spacing by using contraception, breastfeeding behaviors, utilization of maternal health services such as antenatal care, delivery care, Vaccination of TT to mothers may play the vital role in infant mortality in Nepal. The socio-economic factors such as family income, education of mother, ethnicity, religion, place of residence etc, may have differential effects on such fertility behaviors especially on breastfeeding practices are of greater importance and are supposed to be necessary to incorporate in the study.

**1.2 Rationale of the study**

There is a close relationship between the breastfeeding behaviors and infant mortality. If the fertility level is higher, the condition of infant mortality will be higher. On the other hand, higher level of the utility of family planning and maternal health services help in reducing infant health and mortality. Relatively few Surveys and Studies indicated that Nepal has still a high level of fertility. Some socio-cultural misconceptions cause low level of the utilization of Family planning and maternal and child health services and high level of maternal and child mortality. Although there are numerous reasons for an infant death, one of the most important factors is the mother's behavior. The mother is the one who takes major responsibility for their children starting from the conception, pregnancy and after childbirth. Therefore maternal factors regarding to fertility patterns such as age at child birth, number of children delivered (parity) and interval between births and behaviors such as utility of maternal and child health care services, early starting of breastfeeding including colostrums feeding are crucial, and these behaviors depends on the readiness and the conditions of the mothers to handle situations that occur and make the right decisions in regard to familial and non familial issues. Also the health situation of mother and socio cultural contexts may affect the early breastfeeding practices which are not found analyzed by previous studies done in Nepal. In this regard it is supposed to be important to analyze

such determinant factors affecting early breastfeeding and infant mortality which may provide the proper and adequate information for policy makers on early breastfeeding practices and infant mortality.

Women have a key role in determining infant mortality because they are placed in the role of mothers. Women are primarily the decision makers in such matters as deciding on her fertility patterns and use of the health services during pregnancies. In recognition of the significant impact of women's behaviors, this certainly must play a part in explaining a high level of infant mortality in Nepal. The conditions and roles of maternal factors and behaviors such as use of health services and early breastfeeding practices in relation with infant mortality have been examined in this study.

In the context of Nepal, the study of infant mortality is considered important for a number of quite different reasons. The infant mortality occurs in early stage of life with a relatively higher level contributing to the total loss of life and also the causes of infant mortality are widely distinct from the mortality in older ages. The prevention of infant mortality has been a major concern of health authorities. From this study, it has been expected that the degree of success of infant health programs adopted in Nepal could be identified and it could provide a useful index of the status of health and standard of living of Nepalese society. There are inadequate researches to identify what factors and evidences related to maternal factors and behaviors that may have resulted in the higher level of infant mortality. Therefore it is necessary to find out the relationship between different factors and behaviors of women in reproductive ages in Nepal and infant mortality of their children and the effects of socio-economic differentials on infant mortality. In addition, it is expected that the study will be helpful to formulate and implement effective health policies and programs in the context of Nepal.

### 1.3 Government Response on Child Health

#### 1.3.1 Policy and Institutional Mechanism

In line with the international conference on population and development and to fulfill the commitment to achieve millennium development goals of reducing infant mortality to 35 per 1000 live births and child mortality rate to 54 per 1000 live births by the year 2015, the Ministry of Health and Population has adopted National

Neonatal Health Strategy (NNHS, 2004), and put it's efforts to improve the health and survival of new born babies in Nepal (MOHP, 2005). The NNHS has its major goal to achieve the sustainable increase of adoption of healthy new born care practices and strengthening the quality of promotive, preventive and curative maternal and neonatal health services at all levels of health facilities. In addition, formerly, the different periodic plans of Nepal had given importance in reproductive health care in order to reduce maternal and child mortality in Nepal. Current tenth five year plan of Nepal (2002-2006) has also emphasized to improve maternal and child health through the means of easy accessibility of reproductive health care services, encourage late marriage and promote breastfeeding throughout the country (NPC, 2002). Institutional arrangements have been made by establishing primary health centers, health posts, sub health posts and hospitals to deliver integrated health services. The plan has emphasized to establish new health posts and hospitals for improving the standard of health centers, widening of vaccination programs and family planning programs at all levels of health services in order to reducing infant and child mortality rate, improving health status of women through high priority on reproductive health and safe motherhood (NPC, 2002).

The National Reproductive Health Strategy (NRHS), 1998 emphasizes the existing safe motherhood, family planning, HIV/AIDS, STD, child survival and nutrition program with a holistic life cycle approach (MOHP, 2005). This strategy further emphasizes on community involvement, increasing access of health facilities through outreach, sub health posts, health posts, primary health care centers and district hospitals as well as establishing functional referral mechanisms between all levels (MOHP, 2005). Nepal's safe motherhood policy, 1998 has also focused on the improvement of maternity care services at all levels of health care delivery system and in community (MOHP, 2005).

### 1.3.2 Program Implementations

In conjunction with other programs, efforts are made to improve the general status of women by promoting program aimed at bringing about attitudinal, behavioral and societal changes regarding women's health concerns. The Family Health Division of the Ministry of Health and Population is identified as the agency responsible for the

implementation and collaboration of all maternal health related activities under the safe motherhood program. The program has ensured the provision of maternity care at the community level as close to people's home as possible and the availability of resources in terms of appropriately trained health care providers and necessary essential drugs and equipment at all levels of health service centers (MOHP, 2005). In addition, family planning programs are implemented and emphasized in order to increase birth interval and control higher order births as well as to control births in early and older ages of mothers. The active participation of NGOs in the implementation of family planning programs has been encouraged.

In order to address the new born care practices at the family and community levels, the Ministry of Health and Population has implemented national neonatal behavior change communication (BCC) package containing key messages promoting new born care. The package also aims to develop mass media BCC targeted towards women, husbands and mother in laws to encourage proper care of pregnant, delivering and post partum women and new born child. The package promotes the BCC activities through traditional birth attendants (TBA), female community health volunteers (FCHV), mother's groups and community groups with the involvements of husbands and families. The active participation of NGOs at the community level are also encouraged and the introduction and promotion of "kangaroo care" and other culturally appropriate practices for low birth weight babies at various levels of care are coordinated with the strengthening of National Maternal and Newborn Tetanus Elimination (MNTE) programs, national nutrition and other related programs (MOHP, 2005).

### 1.4 Research Questions

The research questions designed to study the factors and behaviors of Nepalese women and its impact on child mortality are as follows:

- Do the fertility patterns of Nepalese women affect early breastfeeding and infant mortality?
- Do the uses of maternal health services have any influence on early breastfeeding and infant mortality?
- Can early breastfeeding practices reduce infant mortality significantly?

## 1.5 Objectives of the Study

### 1.5.1 Ultimate Objective

To provide adequate information about the factors causing higher level of infant mortality for formulating and implementing effective population and reproductive health policies in Nepal.

### 1.5.2 Immediate Objectives

The immediate objectives of this study are:

- To examine the relationship between maternal factors with early breastfeeding and infant mortality.
- To examine the effects of the use of maternal health services on early breastfeeding and infant mortality.
- To examine the impact of early breastfeeding practices on infant mortality.

# CHAPTER II

# LITERATURE REVIEW

This chapter outlines various theoretical perspectives regarding the breastfeeding behaviors and infant mortality, correlates between maternal factors, utilization of maternal and child health services and socio-economic factors with infant mortality.

## 2.1. Theoretical Perspectives

Various models and theories are the basic frameworks for studying the behaviors of individuals from practices of fertility to the use of health services and the impact of such behaviors on the maternal as well as child health and mortality. Mosley and Chen framework is the basic conceptual framework for the study of maternal factors and behaviors related with infant mortality in Nepal.

**Mosley-Chen Framework:** Mosley and Chen (1984) indicated that various factors could influence infant and child mortality in developing countries. Commenting on traditional child mortality studies, they said that the sociological research focused on the relationship between socio-economic factors, such as income earned and education of mothers, religion, political economy, residence etc. with the level of infant and child mortality, without giving proper weight to other causes that may form a purely medical perspective. Medical research on the other hand, focuses its study on the biological and proximate components such as maternal factors, environmental contamination, personal injury and illness control that causes disease and may lead to death. They therefore created a new research paradigm for use in the study of influencing factors of infant and child mortality in developing countries. This new concept takes into consideration both socio-economic and biological factors. Therefore the infant and child mortality is conceptualized to depend on two types of factors: Socio-economic determinants and proximate determinants. This concept is based on the assumption that proximate determinants such as fertility behaviors of mothers may

have direct impact on illness and death while the socio-economic determinants will have an impact on child mortality only when it passes through the mechanism of biological and proximate determinant factors.

### 2.2. Definitions of Breastfeeding Behavior and Infant Mortality

**Breastfeeding Behavior:** Breastfeeding behavior is a case of fertility behavior which determines infant mortality significantly. Fertility behavior is the parental behavior with respect to childbearing practices and patterns of women in the reproductive ages as identified by Demeny (1987), and Wusu & Abanihe (2006). Madhavan, Adams and Simon (2003) define fertility behaviors as fertility decisions of couples occurred within specified social context. The practices and patterns of child bearing may have been changed when both society and individuals undergo a period of rapid change (Nahmias, 2004).

Since breastfeeding practices and patterns are related with the decisions, concepts, and experiments of reproductive women, their cultures and society, it is considered as an important fertility behavior. Exclusive breastfeeding, duration of breastfeeding, immediate breastfeeding after birth and colostrums feeding are commonly known behaviors of women regarding to breastfeeding. This study focuses the impact of early breastfeeding after birth on infant mortality. Therefore, for the purpose of this study, breastfeeding within one hour of birth and colostrums feeding are considered as breastfeeding behaviors of reproductive women in Nepal.

**Infant Mortality:** The infant mortality refers to the deaths of children between birth and first birthday. The most dangerous period of children in their life is the first year. Infant and child mortality are important issues that demographers, medical and public health personnel have been concerned as health indicators. Despite infant and child mortality rates in the world decreasing, these rates are still high in many developing countries and as compared to the increasing levels of development, there is concern that not much attention has been paid to infant and child mortality. This study also uses the cases of death of children within the age of first year of their life. For this study infant death includes the deaths occurred for the children from birth to their first birthday among the latest children of Nepalese women aged 15-49 years.

**2.3. Empirical Studies**

An ample number of empirical studies are available which reveal the idea on socio-economic, demographic and medical care determinants of infant and child mortality around the world. Some of them are cited below.

Mosley and Chen (1984) analyzed about proximate determinants like "maternal factors" and socio-economic characteristics like "environmental contamination" which may make little contribution on explaining the greater impact of mother's education on the survival of children. Pebley and Stupp (1987) indicated that the relationship may be U or J-shaped between mother's age and child mortality as well as number of children born (parity) and infant mortality. They found that the infant and child mortality corresponding to the first birth order and for mothers aged below 20 years increases sharply than for mothers aged 20-29. Similarly, the births from the mothers higher than 35 years and higher than fifth birth order would be in higher risks. According to Mahadevan et al. (1986), the bio-familial factors are the pre-dominant causes of infant mortality and familio-environmental factors are the important causes of child mortality and also classified the determinants of infant mortality under 12 groups. Similarly, Das Gupta (1990) revealed that the behavioral factors, biological factors, child care related variables, household social and economic status, sanitation and hygiene, clustering of child deaths in families, mother's education, autonomy which continue for high level of child mortality.

Bhuiya and Streatfield (1991) have investigated five independent variables such as sex of children, mother's education and mother's age at the time of the birth, household economic condition and health programme and Joshi (1991) added that besides these factors, child birth practices, prenatal care and the type of medical attention at the time of birth determine the level of infant mortality and influence IMR. Rajaretnam (2000) emphasized on the cultural and behavioral aspects of the household and parents than the biological and medical aspects of the child. He classified the determinants of infant and child mortality under cultural, environmental, socio-economic, demographic and MCH services whereas Bhattacharya (1999) emphasize nutrition, disease, maternal behavior and injury as major causes of infant mortality in India. Luther and Thapa (1999) found the effects of socioeconomic, demographic, and health care characteristics of children and mothers on infant and child mortality in

Nepal. London (2004) found that the maternal and new born care, tetanus vaccination, deworming, safe birthing kits are important tools to reduce the rate of early infant deaths in Nepal.

### 2.3.1. Maternal Factors and Infant Mortality

**1) Age of mother at child birth:** The age of mother while she was pregnant affects the risk of death of her child. Children born to mothers under age 20 and over age 35 are more likely to die before their first birthday. Babies born to young mothers are more likely to be pre-mature, have low birth weights, low nutritional stores associated with starting of breastfeeding immediately after birth and suffer from complications of delivery due to immatureness of reproductive system of mother (Hobcraft et al, 1984, Pebley and Stupp, 1987). Older mothers are more likely to give birth to children with congenital abnormalities, who may be less likely to survive childhood. The relationship between maternal age and infant mortality is U-shaped. Usually the children born to very young mothers (below 20 years) are at greater risk of death because their mothers are least likely to receive adequate prenatal care and to know how to care themselves during pregnancy however it is argued that if adequate prenatal care, diet and birth assistance were equally available to mothers of all ages, the experience of very young mothers might have more comparable chance of surviving children as other women (Pebley and Stupp, 1987).

A study in 28 developing countries showed that the children born to the mothers less than 20 years of age have 68 percent higher chance of dying before first year of birth whereas the children born to the mothers more than 30 years of age having 15 percent higher chance of dying in the same period as compared to the children born to the mothers aged 20-29 years (Sullivan et al. 1994). In Nepal, the infant mortality rates are 60 and 8 percent higher for the children born to the mothers with age less than 20 years and more than 29 years respectively as compared to the children born from the mothers aged 20-29 years (NDHS, 2001).

**2) Parity*:*** The association between birth order and infant and child mortality risks show upward trend with the increase of birth order from one to more than four. Mortality risks are high among first births, which are pre-dominantly to younger mothers. Similarly, higher order births belong to mothers of higher ages. There are at

least two reasons that cause higher risks of morbidity and mortality for the children born of higher order pregnancies. One is 'maternal depression syndrome' which is associated with the breastfeeding and maternal nutritional stores. The mothers of higher order children may be in poorer health prior to or during pregnancy as well as after birth and thus the maternal nutritional store will be less and produce less breast milk which can significantly affect early breastfeeding also. The second cause is associated with the resources. The higher order births are usually happen in those families which have fewer resources such as food, money, time and shelter and more children should be cared by those resources (Pebley and Stupp, 1987).

The higher order children get less time, attention and cares well as they should be survived in crowded environment which may cause the increased risk of contracting infectious diseases and thus the morbidity and mortality increases. Some literatures argue that women who go on to higher parities are more likely to have a higher risk in pregnancy. Children born in higher order are most often underweight because the mother is malnourished and a low birth weight child has higher than normal chance of dying within it's first year (Pichaisnith, 1987 cited in Teeraworn, 2002). A study in Holland showed that the infant mortality is 43 percent higher for birth order 2-5 and 94 percent for birth order 5+ compared to the first birth (Poppel et al., 2002) however in another study in India found the U shaped relationship between birth order and infant mortality. According to this study the infant mortality is found higher for birth orders first and more than six in most of the states of India (Pandey et al., 1998). In Nepal, the relationship between birth order and infant mortality is expected to have U-shaped relationship.

**3) Birth interval:** The interval between births is the most consistent reproductive factors associated with early breastfeeding and infant mortality. The effect of birth interval may relate either to the previous child referred as subsequent birth interval or to the next child referred as previous birth interval. Both the subsequent and previous birth intervals have been to have an effect on survivorship of the reference child, both in infancy and childhood. Children born after short intervals (less than two years) are more likely to die than children born after relatively long birth intervals (two or three years) (Bongaarts, 1987). A very short interval of birth is associated with rebuilding of nutritional stores, physiological recuperation of mothers and intrauterine growth,

which are further associated with poor health condition of mothers and immediate production of breast milk after birth. The births spaced very closely, each child of the subsequent births may not receive much care, attention and may have to compete among them in case of breastfeeding and having narrower age range, they may have higher chance of getting infectious diseases (Pebley and Stupp, 1987).

The comparative study using DHS data from 28 countries indicated that a short preceding interval was associated with a 57 percent lower mortality risk for the intervals higher than two years (Sullivan et al., 1994). A study conducted in India found that the neonatal and post neonatal mortality are more than twice for the children who born with less than two years of preceding birth interval (Pandey et al., 1998). Pebley and Stupp (1987) analyzed from a study in Guatemala that the previous birth spacing less than 24 months is 61 percent more likely to have infant mortality than the birth interval more than 24 months. From a descriptive analysis of infant mortality, it is found in case of Nepal; the infant death rate is 83 percent higher for birth intervals less than two years compared to the infant death for the birth interval grater than 2 years (NDHS, 2001).

### 2.3. 2. Utilization of Maternal Health Services and Infant Mortality

**1) Antenatal care**: Medical care taken during the pregnancy of a child constitute an important dimension of maternal and child health care on which the survival of the child depends. It is very essential that the mother get proper care right from the conception. Matthews et al. (2001) suggested that the possibility of complication may occur potentially so serious and routine check ups are highly desirable during pregnancy. Shiffman (2000) argued that antenatal care enables health personnel to provide women with information about immediate starting of breastfeeding and colostrums feeding for children after delivery, hygiene and about signs of obstetric complications that may suggest problems requiring medical care. It is further argued that the complications of pregnancy (obstetric complications) frequently occur among women with no risk factors, and therefore some complications can not be predicted, although many may be prevented (Maine, 1993 cited in Shiffman, 2000).

Magadi et al. (2000) suggested that the use of adequate antenatal care visits during pregnancy is an important factor for safety outcomes. WHO (2002) emphasizes

that women should have at least four antenatal care visits during pregnancy. Finch (2003) found from a study done in USA that the infant mortality significantly increased with inadequate antenatal care visits compared to adequate visits. Nepal family Health Survey, 1996 shows that around 56 percent of women didn't receive any antenatal care during pregnancy and about 40 percent pregnancies are considered to be risky among Nepalese women. London (2004) emphasized on increasing women's access to prenatal and obstetric care in order to decrease high level of infant mortality in Nepal.

**2) Delivery care:** The care taken during delivery of a baby is an important determinant of the survival of the baby. Deliveries taken at hospitals at the attendant of trained medical personnel are expected to significantly reduce the risks of mothers and new born. On the other hand, the deliveries occurred in homes with the help of untrained traditional birth attendants or without any help are expected to have higher risks for both mother and children. Mitra et al. (1997 cited in Hawladar and Bhuiyan, 1999) suggested that the increased proportion of babies delivered in proper health facilities can reduce health risks for mothers and children. Proper medical attentions and hygienic conditions during delivery can reduce the risks of infections and facilitate management of complications that can cause death or various illnesses for the mother and the new born child. The literatures further argue that proper medical care at delivery can reduce the risk of death from birth injury and tetanus. Delivery at hospitals or health facilities may support to breastfeed the child soon after delivery which may cause the chance of feeding colostrums instead of throwing it out.

Pandey et al. (1998) found in India that the children born at hospitals are less likely to die in their early age than the children born at homes however the effect disappeared when socio-economic factors are adjusted. This evidence may suggest that the socio economic factors are also associated for delivery care. In Nepal, proper delivery care is not highly accessible. Nepal Demographic and Health Survey (2001) reveals that more than 90 percent of births are delivered at home with the help of untrained traditional attendant or family members, while only 9 percent are found delivered at health facilities or hospitals.

**3) Vaccination of T.T.**: Tetanus is one of the major causes of neonatal (infant) mortality in developing countries. The pregnant women of such countries are highly

recommended to receive at least two doses of 'tetanus toxoid' vaccine (Dastur et al., 1993 cited in Pandey et al., 1998). Tetanus toxoid vaccinated mothers transfer their tetanus immune to their babies and this vaccine can protect nearly 100 percent the mothers and new born against the tetanus diseases (Jain and Visaria, 1998).

In India, tetanus immunization to pregnant mothers was found substantial effect to reduce neonatal mortality. The result was statistically significant in 14 states out of 19 intervention states of India (Pandey et al., 1998). A study conducted in one district of Nepal found that tetanus vaccination is an important tool to save mother and new born children from tetanus diseases (London, 2004). These findings suggest that immunization of mothers during pregnancy is an important health care factor for reducing infant mortality. The neonatal tetanus is one of the major causes of infant death in Nepal however only 45% of pregnant women took two doses of Tetanus Toxoid during their pregnancies (NDHS, 2001).

### 2.3.3. Breastfeeding Behavior

**Early breastfeeding after birth**: Breastfeeding is one of the most important nutritional factors for the survival of children. Breast milk can provide the major nutrient source and also the significant contributor to the child's immunologic defense system, increasing resistance to diseases (Huffman and Lamphere, 1984). Medically, it is necessary to breastfed immediately after birth for the new born children which can have the significant effect in reducing infant mortality as well as for the mental and physical development because the immediate breast milk contain colostrum which is extensively important for physical and mental development of children. Colostrum helps children to fight against the diarrhea and infectious diseases which is the main cause of infant deaths in many countries. The first breast milk containing colostrums and antibodies has immunological properties that provide protection against gastro-intestinal and respiratory diseases however there is a belief in some traditional societies that colostrums is harmful for the baby (Forste, 1994, Vu T.H., date unknown).

Breastfeeding is also considered as the health status of mother because as mother is healthier, the more is the production of breast milk immediately after delivery which may be affected by the age of mother, parity and birth interval. Very

young mothers and older aged mothers may have lower quantity of breast milk because of their physical capacity to produce milk and lack of awareness about nutrition. Higher parity occurs in higher ages and breast milk will be lower (Mason and Lotfi, 2005). Some literatures argue that the utilization of maternal and child health care services consults mothers to feed colostrum which is very much important for the health and survival of a baby (Khan, 1990). Evidences from India and Nepal show that colostrum helps the children to fight with infectious diseases because it saves from the contaminated food (Khan, 1990, Retherford et al., 1989). Also those mothers who utilize MCH services are expected to breastfed their children immediately after birth because they are more likely aware about colostrum feeding for child health. In case of Nepal, the period of breastfeeding is still higher and exclusive breastfeeding until 4 months after birth is commonly practiced. But Nepalese women do not feed colostrum to their babies because of the concept that the colostrum is heavier to digest for the new born baby. Hospital deliveries may be extensively effective for the colostrum feeding due to proper care and counseling from health professionals for the health of new born children. A study in Vietnam found that mother's age at child birth, parity, and socio-economic status of mother are related with initial breastfeeding (Vu, T.H., date unknown)

### 2.3.4 Socio-economic Factors and Infant Mortality

**1) Mother's Education**: Education is considered to be one of the most important variables for personal advancement. It provides an opportunity to acquire new knowledge, new outlook and creates a desire to be free from traditional beliefs, thinking and superstition. Maternal education is an important determinant of child survival and child mortality. Educated women might be more likely to receive appropriate and timely care, related to contraception, nutrition, breastfeeding, hygiene, preventive care and disease treatment (Mosley and Chen, 1984) and they do reach a health facility, either because they are in a better position to pay for the acre or because, by virtue of their status, they are more likely to be well treated.

A research conducted in 22 developing countries of different parts of the world indicated that mother's education is important for the healthcare of children, their feeding and immunization (Desai and Alva, 1998). Another study during 21 years in

Brazil showed that mother's education had emerged as a key factor to provide women with the knowledge, means and ability to raise healthy children and reduce infant and child mortality (Sastry, 2004). In Nepal, it is found that the women with primary and higher education are more likely to utilize health facilities than those women with lower than primary education (Matsumura and Gubhaju, 2001).

**2) Mother's Occupation**: Mother's occupation is another important variable which determine the extent of care that a women for the new born infant. Some literatures argue that if the occupation of mother is outside the household (workers), there will be less care and breastfeeding for the new born and the survival chances of the infant is very less, however the knowledge about importance about colostrum and breastfeeding would be higher compared to others so that they would be more likely to breastfeed to their children immediately after delivery. In case of housewives (non workers), there is possibility to devote their times towards new born, to take special care in the rearing of children (Sivakami, 2003). However other arguments emphasize that women who earn cash income are presumed to have greater control over household as well as reproductive decisions (Hage, 1995). The working women have generally a lower level of fertility than non working women. Also working women, compared to women who do not work are likely to care for female and male infants equally (Basu and Basu, 1991; Murthy et al., 1995). The working women are more likely to use contraceptive and aware of their children's health so that the infant mortality of children of such women would be less (Hogan et al., 1999). In Nepal, due to different socioeconomic status and different performance of women with different occupation, it is expected that the infant mortality differs with the occupation of mothers. Those mothers who are employees are expected to have lower level of infant mortality in their children compared to the children of mothers with other occupational status.

**3) Place of residence**: The place of residence usually in the rural urban dichotomy has generally been regarded as an important area where meaningful differences in breastfeeding practices and infant mortality can be observed. Industrial development, public services, financial and commercial activities and political decisions are concentrated in larger towns, which are generally more advanced in the process of "modernization" and have better living conditions and knowledge about breastfeeding

including colostrums feeding is comparatively higher due to exposures to media and other health related services. The infant in urban areas are much lower than that in rural areas. This is not surprising as because urban residents are relatively better off than their rural counterparts in terms of their economic conditions as well as their access to medical and educational facilities (Pandey et al, 1998).

The literatures argue that in urban areas, the accessibility of health care services is higher and people can access the health services easily. A comparative study in Morocco and Tunisia identified that urban residence was positively associated with the use of maternal health care services. The residence was strong predictor of the antenatal and postnatal care in Morocco (Obermeyer, 1993). Similarly a study in Kenya found the association between place of residence and frequency of visits to medical care and immunization of mothers and children (Magadi et al, 2000). Even in USA, the infant mortality level is found different in urban and rural areas among blacks (Hummer, 1993).

**4) Household Economic Status:** In the context of developing world, the socio-economic differences often persist within different living conditions. The household economic status is associated with source of drinking water, type of sanitation facilities and average monthly consumer expenditure on food, clothing, fuel, education, housing and medical care. Women in the families in higher economic status would be more healthier and their products would also have healthier so that they can produce sufficient breast milk immediately after delivery due to their own health and children being healthier can suck up breast milk compared to lower economic status women.

Some literature suggested that high standard of living and high level of income is not necessary condition for the creation of child mortality because income is not a significant determinant for health seeking behavior. In many developing countries, women are reluctant to seek health care from the health centers, even they are provided free of charge (Rahman et al; 1997). The others argue that family income is an important determinant for health seeking behaviors and relatively higher economic status women are exposed to the health care facilities. A study in Guatemala found that higher socio-economic status (including income) women are more likely to use prenatal and delivery care and childhood immunization (Pebley et al; 1996). Similarly

a study in Brazil suggested that child mortality is associated with the household wealth in terms of sanitation and water supply and higher household wealth reduce child mortality raising the level of women's education (Sastry, 2004). In Nepal women with higher economic status are expected to have higher exposures to the use of health services as well as they are more aware about child health.

**5) Religion:** Religion is also an important factor that may have influence in breastfeeding practices and infant mortality because of differences in socio-economic characteristics. Religious differentials in mortality could also be due to genetic differences especially when religion coincides with ethnicity (Poppel et al., 2002). Different religious groups may have different beliefs, social norms and life styles and hence can perform different behaviors of child bearing and health cares of mothers and children. In most of the religious cultures, people belief in the patriarchal society and son preference. This culture and belief may cause bias between son and daughter and comparatively less care may be given to daughters and hence the infant mortality may have been increased.

A study conducted in Holland indicated that the post neonatal mortality of Catholics was 23 percent higher than that of the reference group (Dutch reformed) and Jewish infant mortality was found more than 30 percent below the reference group and the infant mortality of other religious groups was found even less (Poppel et al.). In Nepal, infant mortality may be observed influenced by religious norms, beliefs and practices of fertility and health cares. All religious groups in Nepal belief in Patriarchal society however the Socio-economic development of Hindus is higher compared to other religious groups. There is no research found to observe which religious group is more likely to have lower infant mortality level though it can be expected that Hindus are more likely to have lower level of infant mortality since their education, socio-economic status and utilization of health care services are relatively higher.

## 2.4 Conceptual Framework

The literature review demonstrated that maternal factors related to fertility such as age, parity, and birth interval are some of the well established explanatory variables, responsible for determining the incidence and pattern early breastfeeding (Within one

hour after birth) of infant mortality. There are sufficient evidences that persistent and strong associations of infant mortality with those variables are consistently related by the practice of health service utilization. Improved health care during pregnancy such as antenatal care, delivery care, by mothers may have effects on infant mortality through the means of breastfeeding behavior. Also the socio- economic factors such as education and occupation of mother, place of residence, household economic status and religion may affect on initial breastfeeding and infant mortality. Therefore the conceptual framework for this study is derived as the following figure.

**Conceptual Framework**

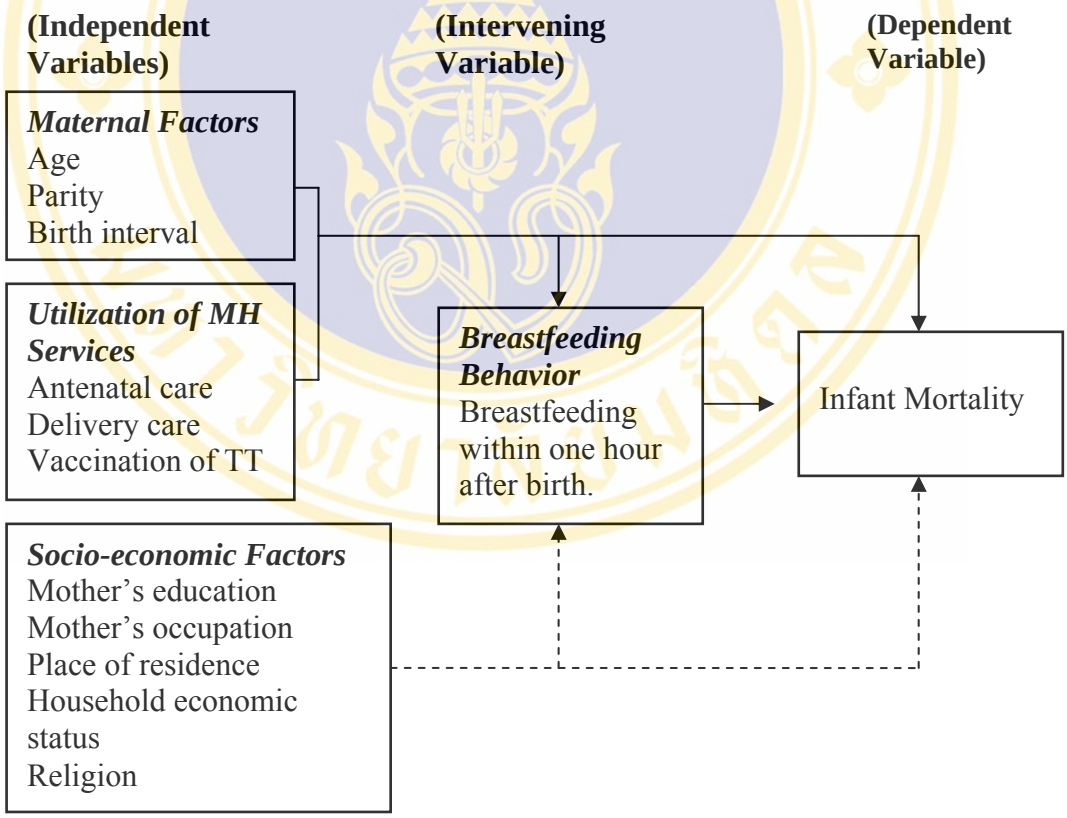



Fig 2: Conceptual framework showing the relationship between maternal factors, utilization of maternal health services, socio-economic factors, breastfeeding behavior and infant mortality

## 2.5 Hypothesis

1. Children born to very young (less than 20 yrs.) and older (more than 35 yrs.) mothers are more likely to have higher infant mortality than mothers aged 20-34 years old.
2. The higher order children (parity) and shorter birth interval are more likely to have infant mortality.
3. Mothers who utilize health care during pregnancy are less likely to have infant mortality than the mothers who don't utilize health care.
4. Maternal factors and utilization of health services are important determinants of early breastfeeding practices.
5. Early breastfeeding can reduce infant mortality significantly.

# CHAPTER III

# METHODOLOGY

This part describes the methodology of the study including data source, sample design, unit of analysis, method of analysis, operational definitions and operationalization of all dependent, independent, intervening and control variables.

## 3.1. Source of Data

This study is a cross-sectional study using secondary data from the Nepal Demographic and Health Survey (NDHS, 2001). The survey was implemented within a collaborative effort of Family Health Division, Department of Health Services (DOHS) of the Ministry of Health (MOH), New Era (a research institute) and ORC Macro, USA. The field work was conducted on 2001 and the coverage of the survey was all over the country. The principle objective of this survey was to provide reliable data on fertility and family planning, the infant and child mortality, children's and women's nutritional status, the utilization of maternal and child health services and knowledge of HIV/AIDS.

## 3.2. Sampling Design

The survey was conducted using two stage stratified sampling covering all 75 districts of Nepal. The 1991 population census provided the list of villages and list of households which were used as sampling frame. In first stage, 257 (42 in urban and 215 in rural areas) primary sampling units (PSU) were selected by using systematic sampling with probability proportional to size. The PSUs were the wards of village development committees and sub wards of municipalities. A complete household listing operation was carried out in all the selected PSUs to provide a sampling frame for the second stage selection of households. In second stage, 34 households per PSU on average were selected by using systematic sampling.

### 3.3. Unit of Analysis

The purpose of this study is to investigate the relationship between fertility patterns and behaviors of Nepalese mothers and infant mortality of their children. Therefore the unit of analysis is mothers aged 15-49 years, who gave latest birth to children within last five years. In the survey, the questionnaire was filled from a total number of 8726 ever married women in the age group 15-49. Among them, a total of 4721 women gave at least one birth between the periods from five years preceding the survey. The practices and patterns related to fertility of these women and the infant mortality experience of their children will be used for this study. The last birth is considered as the index birth for the analysis.

### 3.4. Method of Analysis

A bivariate analysis has been done to show the relationship between the dependent and the explanatory and intervening variables. Similarly a multivariate inferential analysis is performed to examine the effects of independent variables (maternal fertility behaviors, use of MCH services) on infant mortality. Also the relationship is studied between independent variables and intervening variable and further between intervening variable and dependent variable by multivariate method. The socio-economic factors are used in the multivariate model as control variables.

The binary logistic regression model is used to examine the effect of each independent variable on each intervening and dependent variables and effects of intervening variables on dependent variables by the use of Statistical Package for Social Science (SPSS)

The logistic regression models is given by,

Logit ($\pi$) = $\alpha + \beta_i X_i$.

Where,

$\pi$ = p/1-p p = probability of infant death.

$\alpha$ = Constant

$\beta_i$ =Regression coefficient of $X_i$ variables, i = 1,2,3,……,k.

$X_i$ = $i^{th}$ variable, i = 1, 2, 3,……., k.

From the above equation, we can get the ratio of probability of occurring (p) to the probability of non occuring (1-p) of an event can be obtained as,

$p/1\text{-}p = \exp\{\alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \ldots\ldots\ldots\ldots + \beta_kX_k\}$

Or, $p/1\text{-}p = e^z$

Where $z = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \ldots\ldots\ldots\ldots + \beta_kX_k$

The probability of event is, $P(\text{event}) = e^z/1+ e^z = 1/1+e^{-z}$

In this study, event refers to early breastfeeding after birth and infant mortality.

### 3.5. Operational Definitions of Variables

#### 3.5.1. Dependent Variable

**Infant Mortality:** Infant mortality refers to the death of child between birth and first birthday. The infant mortality will be used in this study as dichotomous variable whether or not the child died before one year after live birth.

#### 3.5.2. Independent Variables

#### 3.5.2.1. Maternal factors

**Age:** This variable refers to the respondent's (mother's) age in completed years at the time of child birth which is grouped into different age groups as a categorical variable such as 15-19, 20-24, 25-29, 30-34 and 35+.

**Parity:** This variable indicates the total number of live births and still births that mothers had delivered in her lifetime and is categorized into: less than 3 children; 3-5 children and more than 5 children.

**Birth interval:** This variable refers to the duration (time) between two subsequent births which is categorized into four categories: first birth (no previous birth interval) less than 2 years, 2-4 years and 5+ years.

#### 3.5.2.2. Utilization of maternal health services

**Antenatal care:** This variable refers to the frequency of visits in any health services in order to care about pregnancy related cases which is categorized into adequate visits (four and more visits), some visits (less than four and at least one visits) and no visit during pregnancy.

**Delivery care:** This variable refers to the delivery at hospital. Here in this case hospital refers to governmental, semi governmental, non governmental and private health institutions. This variable is divided into two categories yes or no i.e. whether the delivery was in hospitals or not.

**Immunization:** Immunization of mothers during pregnancy is very important for the survival of child. This variable refers to the immunization (tetanus toxoid) of mothers at least two times during pregnancy and will be categorized in to two nominal cases yes and no.

### 3.5.3. Intervening Variable

#### 3.5.3.1. Breastfeeding behavior

**Breastfeeding within one hour after delivery:** Refers to the action that mothers breastfeed their babies within an hour after delivery which is categorized into two categories. If the child was started to breast feed within one hour after delivery, it is said to be breastfed within one hour, otherwise not breastfed within one hour after delivery.

### 3.5.4. Control Variables

#### 3.5.4.1. Socio-economic Variables

**Mother's education:** Mother's education variable measures the level of education that a mother has completed. The variable is taken ordinal and is categorized into 4 categories as: no education, primary level, secondary level including school leaving certificate (SLC) and higher level according to the categorization of the available data set.

**Mother's occupation:** Mother's occupation refers the daily work of mother that she was engaged for. It is categorized into 4 nominal categories: housewives, employee, agriculture and others.

**Place of residence:** Place of residence means the usual place of residence at the time when the child born. It is categorized as urban and rural. Urban represents the municipal areas whereas rural represents village development committees. This variable is dichotomous. The purpose of this variable is to measure geographical proximity and its impact on infant mortality.

**Household economic status:** The index of household amenities and possessions is used to measure the socio economic status of women. Household having more than or equal to three facilities among 'Radio, TV, Telephone, bicycle, and Electricity' is considered "high" economic status. Similarly, having at least one facility is considered as "middle" and not having any facilities is considered as "low" economic status. The household assets are considered as the proxies of the household economic status since there is not any variable regarding the economic status of the household in the survey.

**Religion:** Religion means the religious and cultural belief of household. Most of the people are Hindus followed by Buddhists and other religious groups in Nepal. Therefore this variable is categorized as Hindus, Buddhists and others.

**Table 3.1: Operationalization of variables and measurements**

| Variable Name | Description | Measurement Scale |
|---|---|---|
| **Dependent Variable:** | | |
| Infant Mortality | Children died before first birthday. | Nominal<br>1 = Died<br>0 = Not died |
| **Intervening Variables:** | | |
| Early breastfeeding behavior | Time of first starting of breastfeeding after delivery | Ordinal<br>1 = Within one hour<br>2 = Within one day<br>3 = After one day |
| **Independent Variables:** | | |
| Maternal Factors: | | |
| Age of mother at child birth | Age of mother in five year age group | Ordinal<br>1 = 15-19<br>2 = 20-24<br>3 = 25-29<br>4 = 30-34<br>5 = 35+ |
| Parity | Number of children born | Ordinal<br>1 = 1-2<br>2 = 3-5<br>3 = 6 and over. |
| Birth interval | Time between the births of previous child and the index child. | Ordinal<br>1 = Less than 2 years<br>2 = 2-4 years<br>3 = 5+ years |

**Table 3.1: Operationalization of variables and measurements (cont.)**

| Variable Name | Description | Measurement Scale |
|---|---|---|
| Health Care During Pregnancy: | | |
| Antenatal Care | Frequency of antenatal care visits by women during pregnancy | Ordinal<br>0= Never visit<br>1= some visits (1-3)<br>2 = Adequate visits (4 and more) |
| Delivery Care | Delivery in the hospital | Nominal<br>1 = Yes<br>0 = No |
| Mother's Immunization | Immunization of TT vaccine to mother at least two times during pregnancy | Nominal<br>1 = Yes<br>0= No |
| Socio-economic factors: | | |
| Mother's Education | Mother's highest level of education completed | Ordinal<br>0 = No education<br>1 = Primary Level<br>2 = Secondary Level<br>3 = SLC and Higher |
| Mother's Occupation | Mother's daily engagement for the work | Nominal<br>1 = Housewives<br>2 = Employee<br>3 = Agriculture<br>4 = Others |
| Place of Residence | Usual place of residence when the children born | Nominal<br>1 = Urban<br>2 = Rural |
| Household Economic Status | Household having none, at least one and three or more among TV, Radio, Electricity, Telephone, Bicycle etc. | Ordinal<br>0 = Low<br>1 = Medium<br>3 = High |
| Religion | Religious belief of household | Nominal<br>1 = Hindu<br>2 = Buddhists<br>3 = Others |

### 3.7. Limitation of the Study

The study has some limitations. Since, it is based on secondary data constrained by framework of the previously resolved sample size and questionnaires.

Obviously there are many factors influencing infant mortality in Nepal, but this study has focused on some selected factors entirely depending up on the information available in the mentioned data set.

Moreover the infant mortality may be influenced by many other factors such as environmental factors, Sanitation, nutritional factors etc. But this study is limited to an assessment of maternal factors and behaviors on early breastfeeding and infant mortality. However some socio-economic factors are used as control variables, these are also not sufficient control variables to assess the effects on infant mortality. Besides, some proxy variables are used to measure some factors, which are important in the model such as household economic status.

# CHAPTER IV

# RESEARCH FINDINGS

This chapter outlines the results of analysis on infant mortality from Nepal Demographic and Health Survey, 2001. The research findings are presented on the basis of Univariate, Bivariate and Multivariate analysis and relationships between explanatory, control, intervening and dependent variables as discussed in chapter two.

## 4.1 Introduction

As discussed in chapter two, maternal factors related with fertility such as age of mother at child birth, birth order and preceding birth interval are important determinants of infant death. In addition, utilization of maternal health services, such as antenatal care, delivery care and vaccination of tetanus toxoid are also necessary and important to analyze while studying the infant mortality. Behaviors of women are closely related with breastfeeding practices and further related with infant mortality. This chapter describes the relationships between the factors discussed above with the breastfeeding within one hour and infant mortality. The socio-economic factors are considered as the control variables on the assumption that these variables have strong relationships with infant death as described by Mosley and Chen in 1984.

## 4.2 Univariate Analysis

### 4.2.1 Time of First Breastfeeding

This variable is computed from the information of the duration of first breastfeeding after delivery of the child. Among index births, 33 percent mothers found to feed their breast milk to their new born child within the first hour of birth, 38 percents put their children to the breast milk within the period one hour to one day after birth whereas 29 percent did not feed breast milk within one day after birth. This study mainly focuses on breastfeeding within one hour after birth however it is categorized into three categories for comparison purpose.

**Table 4.1 Percentage Distribution of First Breastfeeding after Delivery**

| | Percent | Number |
|---|---|---|
| Breastfed before one hour | 33.0 | 1559 |
| Breastfed within one day | 37.7 | 1773 |
| Not Breastfed before one hour | 29.4 | 1389 |
| Total | 100 | 4,721 |

### 4.2.2 Infant Mortality in Nepal

The children died before one year of age is calculated from the variable age at death (months imputed) in the dataset. The deaths occurred from zero to eleven months are considered as infant deaths. Table 4.2 shows the percentage distribution of infant death observed for the last birth during 1997-2001 selected for the analysis. Among 4,721 last births occurred in the period, 165 died before the age of one year that is 3.5% of total live births analyzed.

**Table 4.2 Percentage Distribution of Infant Mortality**

| | Percent | Number |
|---|---|---|
| Died before one year | 3.5 | 165 |
| Not died before one year | 96.5 | 4,556 |
| Total | 100 | 4,721 |

### 4.2.3 General Characteristics of Women Studied

Table 4.3 shows the general characteristics of mothers who gave birth to the index child. There are 4,721 women of reproductive age who gave at least one birth during last five years of the survey as the last child. Only last birth is selected for analysis in order that the sample would not be biased towards more fertile women. In this section, general characteristics of those women are described which includes

maternal factors, health care factors, breastfeeding behavior and socio-economic factors.

#### 4.2.3.1 Maternal factors

Mothers' age at child birth, birth order and preceding birth interval are closely related factor with the breastfeeding as well as the health of a new born child. In this study, among 4,721 mothers, the majority of mothers are in the age group 20-24 years (33%) followed by the age group 25-29 years. Since these two age groups are also considered as the appropriate age groups for childbearing, the percentages of women are quite large in these age groups as compared to other age groups. However, almost 13.2 percent had their last child when they were aged less than 20 years, while 13 percent had their last child after age 35 years. The mean age of mothers at last birth is 26.2 years. In order to compute the exact age of mother at the time when their last child was born, duration of the survey from last birth converted in years is subtracted from the current year of mother at the time of survey.

The parity (birth order) is categorized into three groups less than 2, 3-5 and more than 6. Among 4,721 mothers, about 43 percent are in the category with parity less than two and 41 percent of them with parity from three to five. About 16 percent of women had given birth to more than 5 children. The largest number of birth order is 13 with an average parity at last birth is 3.4. This study has categorized the previous birth interval into four categories such as no previous birth interval (First birth), less than 2 years, 2-4 years and more than 4 years. Highest percentage of mothers is in the category 2-4 years and average previous birth interval was approximately 3 years (37.7 months). The previous birth interval is converted from months to years from the original dataset and the mothers who had only one birth in their life during last five years is considered as no previous birth interval.

#### 4.2.3.2 Utilization of maternal health services

Health care during pregnancy including antenatal care, place of delivery, and vaccination of tetanus toxoid (T.T.) are also the proximate determinants of infant mortality. The antenatal care visits are divided into three categories. 51.5 percent of mothers did not visit any antenatal care during their last pregnancies however 34 percent visited 1-3 times (some visits) and only 14.5 percent visited 4 or more times

(adequate visits) for antenatal check up during the pregnancy of index birth. Among the deliveries, 90.3 percent of deliveries occurred at home whereas only 9.7 percent occurred at hospitals. In this variable hospital refers to governmental, non governmental, private etc. health institutions including national and district level hospitals, heath centers, health posts, private clinics and NGO/INGO clinics. This analysis shows that only 43.8 percent of mothers received at least two doses of T.T. vaccine before the birth of their index child.

**4.2.3.3 Socio-economic factors**

The socio-economic status of Nepalese women seems backwards from many aspects. Effects of education on women's status have been widely discussed in many research findings. Education provides knowledge about child care for the mothers. Similarly mother's occupation is also said to be closely related with the survival of children. In this study among 4,721 mothers, more than 72 percent has no education, about 14.3 percent has completed primary level, 12 percent has completed secondary level including School Leaving Certificate (SLC) examination and only 1.1 percent has completed the higher level of education. Considering the occupation of mothers, 14.5 percent are in the category housewives who did not work outside of the household. 79.2 percent worked in agriculture including agriculture employee and agriculture self employee, only 1.3 percent worked as employee which includes professional workers, technical workers, managers, clerical and services and 4.8 percent worked in other sectors such as sales, domestic workers and skilled and unskilled manuals.

By place of residence, 90.2 percent of women live in rural (non municipal) areas whereas only 9.8 percent live in urban (municipal) areas. The household economic status is categorized as low, medium and high depending up on the criteria having none, 1-2 and 3 or more respectively of the household assets among electricity, radio, television, bicycle and telephone. The category "not de-jure residence" is taken as a separate category from the dataset used since this category has a large number of cases. Those women who did not live in their own households are in this category. By this category, 36 percent of mothers are in the low economic status, 47.2 percent in medium and 10.8 percent in high economic status. In Nepal, there are different

religion and cultures. This study has categorized these religious groups into three categories. By religion, 84.6 percent mothers are under the Hindu religious group whereas 7.9 percent under Buddhists and 7.5 percent were under other religious groups (Muslims, Christians and others). The survey report reveals that about 85 percent of the respondent in the survey were Hindus.

**Table 4.3: Percentage distribution of background characteristics of mothers.**

| General Characteristics | Percentage | Number of live births |
|---|---|---|
| **1. Maternal Factors** | | |
| **Age at child birth** | | |
| 15-19 years | 13.2 | 625 |
| 20-24 years | 33.0 | 1557 |
| 25-29 years | 25.5 | 1204 |
| 30-34 years | 15.4 | 727 |
| 35 years and above | 12.9 | 608 |
| Mean age = 26.2 years, min/max = 14/48 | | |
| **Parity (Birth order)** | | |
| Parity 1-2 | 43.3 | 2016 |
| Parity 3-5 | 40.5 | 1,914 |
| Parity 6 and above | 16.1 | 761 |
| Mean = 3.4, min/Max = 1/13 | | |
| **Previous birth interval** | | |
| First child | 20.8 | 981 |
| Less than 2 years | 19.7 | 931 |
| 2-4 years | 43.6 | 2057 |
| More than 4 years | 15.9 | 752 |
| Mean = 37.7 months, min/max = 9/204 months | | |
| **2. Utilization of maternal health services** | | |
| **Antenatal care visits** | | |
| Never Visit | 51.5 | 2433 |
| Some Visits (1-3 times) | 34.0 | 1604 |
| Adequate Visits (4 and more times) | 14.5 | 684 |
| Mean Visits = 1.7 | | |
| **Place of Delivery** | | |
| Home | 90.3 | 4263 |
| Hospital | 9.7 | 458 |
| **Injection Tetanus Toxoid (TT) before birth** | | |
| Less than two times | 56.2 | 2655 |
| At least two times | 43.8 | 2066 |

**Table 4.3: Percentage distribution of background characteristics of mothers (cont.).**

| General Characteristics | Percentage | Number of live births |
|---|---|---|
| **3. Socio-economic factors** | | |
| **Mother's education Level** | | |
| No education | 72.3 | 3415 |
| Primary level | 14.3 | 675 |
| Secondary level | 12.2 | 576 |
| Higher level | 1.2 | 55 |
| **Mother's occupation** | | |
| Housewives | 14.5 | 683 |
| Employee | 1.3 | 63 |
| Agriculture | 79.2 | 3738 |
| Others | 5.0 | 237 |
| **Place of residence** | | |
| Rural | 90.2 | 4258 |
| Urban | 9.8 | 463 |
| **Household economic status** | | |
| Low | 36.0 | 1700 |
| Medium | 47.2 | 2229 |
| High | 10.8 | 510 |
| Not de-jure residence | 6.0 | 282 |
| **Religion** | 84.6 | 3993 |
| Hindus | 7.9 | 374 |
| Buddhists | 7.5 | 354 |
| Others | | |
| **Total** | **100** | **4,721** |

## 4.3 Bivariate Analysis

This section examines the relationship between background characteristics with breastfeeding within one hour of birth and infant mortality. In this study, since breastfeeding within one hour is considered as intervening variable, the relationships of different independent variables and breastfeeding within that period is also described. Similarly the bivariate relationship between intervening variable and infant mortality is also explained. The significance of the relationship is examined by using chi-square test and the relationship is established at the 0.1, 0.05 and 0.01 significance level.

### 4.3.1 Breastfeeding within One Hour after Delivery

According to WHO recommendation, immediate breastfeeding after delivery is considered most important due to higher amount of colostrums which may help children for their physical development as well as their immune to fight against infectious diseases. This section describes the bivariate relationship between different background characteristics and breastfeeding within one hour after delivery.

#### 4.3.1.1 Relationships between maternal factors and breastfeeding within one hour after birth

In this study, breastfeeding is categorized into two categories whether the index child was breastfed within one hour after birth or not on the assumption that breastfeeding within one hour, might contain a lot of colostrums in the breast milk. Since, the immediate breastfeeding is likely to be affected by maternal factors and it further affects the survival of the children up to the age of one year by affecting the health status of mothers and children; it is studied as an intervening variable in this study.

**Mothers age at child birth**: Breastfeeding within one hour after birth is found substantially different with the age of mother at child birth ($P<0.01$) as shown in the table 4.4. Twenty seven percent of women in the age group 15-19 years put their new born child to the breast milk within first hour. This percentage increased to 36 percent for the mothers aged 20-24 which further reduced to 31 percent for the mothers aged 30 years and more. This relationship indicates that mothers in the age group 15-19 have less proportion to feed breast milk compared to other age groups and after age 20-24 the pattern seems to be decreased. For the first child, the mothers might not be aware about immediate breastfeeding as well as the flow of their breast milk might not be flown immediately that they did not feed within one hour after birth as identified by Masom and Lotfi (2005).

**Birth order:** Birth order does not have significant difference on breastfeeding within one hour after birth. Thirty three percent mothers with parity 1-2 and 33.5 percent with parity 3-5 breastfed their child within an hour after birth. This percent has been decreased to 30.7 percent for mothers having more than six parities. Generally, birth order may be increased with the increase of the age of mother.

**Previous birth interval:** Table 4.4 shows that the breastfeeding within one hour is significantly different (Chi square, $p<0.05$) among the children born after certain preceding birth interval. Twenty nine percent mothers of first born child put them to the breast milk within one hour which is comparatively higher among other categories.

**Table 4.4: Percentage breastfeeding within one hour after birth by maternal factors.**

| Maternal Factors | Percentage breastfeeding within one hour after birth | | |
|---|---|---|---|
| | Yes | No | Total (Number) |
| **Age at child birth*** ** | | | |
| 15-19 years | 27.0 | 73.0 | 100 (625) |
| 20-24 years | 35.9 | 64.1 | 100 (1557) |
| 25-29 years | 34.2 | 65.8 | 100 (1204) |
| 30-34 years | 31.2 | 68.8 | 100 (727) |
| 35 years and above | 31.6 | 68.4 | 100 (608) |
| **Parity (Birth order)** | | | |
| Parity 1-2 | 33.4 | 66.6 | 100 (2046) |
| Parity 3-5 | 33.5 | 66.5 | 100 (1914) |
| Parity 6 and above | 30.7 | 69.3 | 100 (761) |
| **Previous birth interval**** | | | |
| First child | 29.8 | 70.2 | 100 (981) |
| Less than 2 years | 34.6 | 65.4 | 100 (931) |
| 2-4 years | 34.6 | 65.4 | 100 (2057) |
| More than 4 years | 31.6 | 68.4 | 100 (752) |
| **Total** | **33.0** | **67.0** | **100 (4,721)** |

****p<0.05 ***p< 0.01**

#### 4.3.1.2 Relationship between utilization of maternal health services and breastfeeding within one hour after birth

Health care during pregnancy can provide knowledge and can improve the health status of mothers so that they can produce and feed sufficient breast milk immediately after delivery. Health care is supportive for the supplementation of iron/folate tablet which is very much effective to improve the health status of women and save mother from anemia which could be effective for the production of breast milk. Table 4.5 shows the bivariate relationship between maternal health care during pregnancy and breastfeeding within the first hour of birth.

**Antenatal care:** The bivariate analysis of antenatal care by timing of breastfeeding shows the significant difference among number of visits for antenatal care (P<0.01). Adequate antenatal care visit have the highest effect (38 percent) on breastfeeding within one hour of birth whereas some visits have the lowest rate (29 percent) of such breastfeeding.

**Delivery care and T.T injection:** Table 4.5 shows that delivery care has significantly different effect on breastfeeding within one hour after birth. Mothers with hospital deliveries are more likely (35.2%) to breastfeed their children within one hour after birth than mothers with home deliveries (32.8%). The relationship is significant (p<0.01) of chi square test. The bivariate relationship between T.T. injection breastfeeding is not analyzed on the assumption that T.T. injection doesn't directly affect on initial breastfeeding to new born children.

**Table 4.5: Percentage breastfeeding within one hour after birth by utilization of maternal health services**

| Utilization of maternal health services | Percentage breastfeeding within one hour after birth | | |
|---|---|---|---|
| | Yes | No | Total (Number) |
| **Antenatal care visits*** ** | | | |
| Never Visit | 34.0 | 66.0 | 100 (2433) |
| Some Visits (1-3 times) | 29.4 | 70.6 | 100 (1604) |
| Adequate Visits (4 + times) | 37.9 | 62.1 | 100 (684) |
| **Delivery care*** ** | | | |
| Home | 32.8 | 67.2 | 100 (4263) |
| Hospital | 35.2 | 64.8 | 100 (458) |
| **Total** | **33.0** | **67.0** | **100 (4,721)** |

***p<0.01

### 4.3.1.3 Relationship between socio-economic factors and breastfeeding within one hour after birth

As discussed in chapter II of this study, Socio-economic factors are closely related with the practices of breastfeeding for the new born child. In this section, the bivariate relationship between socio-economic factors and breastfeeding within one hour after birth is analyzed and discussed the findings shown in table 4.6.

**Mothers' education:** Result shows that breastfeeding practices of mothers within one hour after birth is extensively increased as the education level of mother increased. In

this study 32 percent of mothers who were not educated are found breastfed their children within one hour of birth whereas this rate is increased to 32.3 percent for primary level, 39.1 percent for secondary level and 40 percent for the mothers with higher level of education ($P<0.01$). This result indicates that the rate is broadly different for primary and secondary levels of education.

**Mothers' occupation:** Mothers' daily work is also related with the breastfeeding practice to the infant immediately after birth mainly due to the exposure to different media and gain of knowledge about the importance of colostrums feeding. The result shows that housewives who usually stay at homes are found least (25 percent) to put their child to breast milk immediately after birth. 46 percent of employee mothers put their child to breast milk within one hour from birth and this rate is around 35 percent for those mothers who work in agriculture and 28 percent for those who work in other occupations.

**Place of residence:** Relatively urban women as compared to the rural women are more knowledgeable and aware about breastfeeding and colostrums feeding to their child worldwide. In Nepal also the expectation is similar. The bivariate relationship support this expectation that 36 percent of urban mothers found to put their child to the breast milk whereas 32.7 percent of rural women put on breast milk within one hour after birth ($P<0.01$).

**Household economic status:** In this study, it is found that the rate of immediate breastfeeding is increased from low economic status to medium status and again decreased for high economic status and for those who don't have de-jure residence however this result is not statistically significant (see table 4.6).

**Religion:** Different religious groups may have different concepts and cultures about colostrums feeding to the child. In some cultures of Nepal, women throw their first milk instead of feeding it to their children. Analysis found that 34.7 percent Hindu and 26.2 percent Buddhist mothers found to put their last child to the breast milk within first hour of birth and this rate is only 21.5 percent for other religious mothers.

**Table 4.6 Percentage breastfeeding within one hour after birth by socio-economic factors**

| Socio-economic Factors | Percentage breastfeeding within one hour after birth | | |
|---|---|---|---|
| | Yes | No | Total (Number) |
| **Mother's Education Level**** | | | |
| No education | 32.0 | 68.0 | 100 (3415) |
| Primary | 32.3 | 67.7 | 100 (675) |
| Secondary | 39.1 | 60.9 | 100 (576) |
| Higher | 40.0 | 60.0 | 100 (55) |
| **Mother's Occupation***** | | | |
| Housewives | 25.0 | 75.0 | 100 (683) |
| Employee | 46.0 | 54.0 | 100 (63) |
| Agriculture | 34.6 | 65.4 | 100 (3738) |
| Others | 27.8 | 72.2 | 100 (237) |
| **Place of Residence** | | | |
| Rural | 32.7 | 67.3 | 100 (4258) |
| Urban | 36.1 | 65.9 | 100 (463) |
| **Household Economic Status** | | | |
| Low | 32.1 | 67.9 | 100 (1700) |
| Medium | 34.0 | 66.0 | 100 (2229) |
| High | 33.3 | 66.7 | 100 (510) |
| Not de-jure residence | 30.5 | 69.5 | 100 (282) |
| **Religion***** | | | |
| Hindus | 34.7 | 65.3 | 100 (3993) |
| Buddhists | 26.2 | 73.8 | 100 (374) |
| Others | 21.5 | 78.5 | 100 (354) |
| **Total** | **33.0** | **67.0** | **100 (4,721)** |

****p<0.01 ***p<0.001**

Note: other occupation includes sales, domestic workers and skilled and unskilled manuals.

Not de-jure residence refer to those who don't live in their legal residence

Other religion refers to Muslims, Christians and others

### 4.3.2 Infant Mortality

This section describes the bivariate relationship between infant mortality and various background variables, maternal factors, health care, socio-economic factors and breastfeeding within one hour of birth. The bivariate analysis is compared by computing the relationship between breastfeeding within the period of one hour and one day after birth with infant mortality.

#### 4.3.2.1 Relationship between maternal factors and infant mortality

Table 4.7 presents the estimates of infant mortality differentials for selected variables. The results are presented in terms of percentage as well as in numbers of infant deaths. The results reveal that there were few infant deaths among mothers who delivered their last child during the period 1997-2001. Among 4,721 live births studied, only 165 children are found died before reaching to the first birth day among index children in this study.

**Age of mother at child birth**: Maternal age at child birth has found a significant effect ($p<0.05$) on infant mortality: the higher the age of mother, lower the infant mortality of her children at least for the broad age groups considered. From table 4.7 it can be observed that mothers' age from 20 years to 34 years is appropriate to give birth in order to save their children from infant mortality.

**Table 4.7: Percentage infant mortality by maternal factors.**

| Maternal factors | Percentage Infant Death | | |
|---|---|---|---|
| | Died | Not died | Total (Number) |
| **Age at child birth**** | | | |
| 15-19 years | 5.1 | 94.9 | 100 (625) |
| 20-24 years | 3.1 | 96.9 | 100 (1557) |
| 25-29 years | 3.0 | 97.0 | 100 (1204) |
| 30-34 years | 2.8 | 97.2 | 100 (727) |
| 35 years and above | 4.6 | 95.4 | 100 (608) |
| **Parity (Birth order)** | | | |
| Parity 1-2 | 3.2 | 96.8 | 100 (2046) |
| Parity 3-5 | 3.4 | 96.6 | 100 (1914) |
| Parity 6 and above | 4.5 | 95.5 | 100 (761) |
| **Previous birth interval** | | | |
| First birth | 4.0 | 96.0 | 100 (981) |
| Less than 2 years | 4.2 | 95.8 | 100 (931) |
| 2-4 years | 3.2 | 96.8 | 100 (2057) |
| More than 4 years | 2.8 | 97.2 | 100 (752) |
| **Total** | **3.5** | **96.5** | **100 (4,721)** |

****p<0.05**

**Birth order:** The infant death is not found significantly differentiated with birth order of the index child. The proportion of infant mortality for the birth orders from 1 to 2

and from 3 to 5 seems similar; however the proportion is slightly increased for birth order 6 and higher. In fact, mothers' age at child birth and birth order are highly correlated factors (correlation= 0.74). Since mother's age is negatively correlated with infant mortality, the effect of birth order may not be seen as expected.

**Preceding birth interval:** The length of preceding birth interval also doesn't seem to have significantly different results on infant mortality however; the proportion of infant mortality is found decreased when the birth interval was increased from less than 2 years to 2-4 years and more. As in the case of birth order, since birth interval increase with maternal age, and since infant death affects birth intervals, the effects of maternal age and birth interval are difficult to extricate.

#### 4.3.2.2 Relationship between utilization of maternal health services and infant mortality

This study has considered antenatal care, delivery care and vaccination of tetanus toxoid to the pregnant women as the health care during pregnancy which might have a substantial effect on infant mortality as discussed in chapter II of this study. Table 4.8 reveals the bivariate analysis of such factors and infant mortality in Nepal from the data of Nepal Demographic and Health Survey 2001.

**Antenatal care:** The result shows that number of antenatal care visit by mothers have a significant (Chi square $p<0.01$) effect on infant mortality of their children. The higher the number of antenatal visit, lower the infant mortality. For the mothers who never visit for antenatal checkup, 4.5 percent of the children born to them are found to be died before the age of one year. This rate has been found gradually decreased to 2.7 percent for those mothers who visit some (one to three) times for antenatal check up and 1.8 percent for those mothers who were adequately visit (4 and more times) for antenatal check up. Adequate antenatal care visit may be effective to provide the knowledge about pregnancy complications and its management among pregnant women so that women could be careful about their own health and their children within uterus which could be associated with mortality after birth.

**Delivery care:** Infant mortality is found to be nearly two times higher among those having delivery at home when compared to delivery at health service facilities or hospitals (table 4.8). Among total births 3.7 percent children died within one year

when they were born at home without help or with some help of traditional birth attendants (TBA) whereas 1.7 percent children died when they born at health facilities. However, this result is significant only at the level of P<0.05 (Chi square), it can be said clearly from the data that delivery care is very much important for the survival of new born child. It is because of the delivery at home without any help or by the help of TBA involves a higher risk than delivery by a health officer at the health service outlets where delivery facilities are readily available.

**Table 4.8: Percentage infant mortality by utilization of maternal health services.**

| Maternal Health care | Percentage Infant Death | | |
|---|---|---|---|
| | Died | Not died | Total (Number) |
| **Antenatal care visits*** ** | | | |
| Never visit | 4.5 | 95.5 | 100 (2433) |
| Some visits (1-3) | 2.7 | 97.3 | 100 (1604) |
| Adequate visits (4+ times) | 1.8 | 98.2 | 100 (684) |
| **Delivery care**** | | | |
| Home | 3.7 | 96.3 | 100 (4263) |
| Hospital | 1.7 | 98.3 | 100 (458) |
| **Injection TT before birth*** ** | | | |
| Less than two times | 4.2 | 95.8 | 100 (2655) |
| At least two times | 2.6 | 73.4 | 100 (2066) |
| **Total** | **3.5** | **96.5** | **100 (4,721)** |

****p<0.05 ***p<0.01.**

**Vaccination of tetanus toxoid**: Tetanus is one of the major causes of infant death in developing countries and at least two doses of T.T. vaccination for pregnant women are recommended (Pandey et al, 1998). In this study, mothers were categorized into two categories accordingly whether they were received at least two doses of T.T. vaccine before the birth of index child. The result shows that 2,655 mothers did not receive at least two doses of T.T. whereas only 2,066 mothers received it at least twice before the birth of their latest children. Mothers, who received at least two doses of T.T. vaccine are found significantly different (P<0.01) from the mothers who did not receive at least two doses of the vaccine. About 4.2 percent of women who did not receive two doses and 2.6 percent of mothers who received the desired number of T.T. Vaccine encountered the death of their children in the infancy.

#### 4.3.2.3 Relationship between socio-economic factors and infant mortality

In this study, the socio-economic factors are found related with infant mortality as identified by Mosley and Chen (1984) however the relationship is not statistically significant except for place of residence. Table 4.9 shows the bivariate relationship between socio-economic factors and infant mortality in Nepal.

**Mothers' education:** The infant mortality of the children whose mothers had no education is around 3.8 percent while it is nearly 2.8 percent for those children whose mothers had studied primary and secondary levels of education. Mothers having higher level of education did not experience any infant mortality of their last children born during last five years of the survey. Here, the important point to be noted is that the sampled women in this category are only1.2 percent of total sample size of the study.

**Mothers' occupation:** Infant mortality varied with different occupation groups of mothers. Mothers who worked in agriculture experienced the highest proportion (3.7 percent) of mortality of their children before the first birthday which is followed by mothers in the category housewives (2.9 percent) and other (2.5 percent). Employee mothers experienced the less proportion (1.6 percent) of dying among their youngest children however this relationship is not statistically significant.

**Place of residence:** When the relationship between place of residence and infant mortality is studied, 3.7 percent of rural children and 1.3 percent of urban children are found died before one year of age. The difference of infant mortality between urban and rural residence is found statistically significant ($p<0.01$).

**Household economic status:** The percentage distribution of household economic status by infant mortality indicates that the infant mortality is found slightly higher in low status households or those mothers who stay in non de-jure residences i.e. who do not live in their legal residences than in medium or high economic status households. This result is statistically significant ($p<0.1$).

**Religion:** Bivariate analysis shows that, the infant mortality is not significantly different for different religious groups as categorized in this study. Buddhists mothers experienced comparatively less proportion of infant mortality among their children than Hindus and other mothers.

**Table 4.9: Percentage infant mortality by socio-economic factors**

| Socio-economic Factors | Percentage Infant Death | | |
|---|---|---|---|
| | Died | Not died | Total (Number) |
| **Mother's education Level** | | | |
| No education | 3.8 | 96.2 | 100 (3415) |
| Primary | 2.8 | 97.2 | 100 (675) |
| Secondary | 2.8 | 97.2 | 100 (576) |
| Higher | 0.0 | 100.0 | 100 (55) |
| **Mother's occupation** | | | |
| Housewives | 2.9 | 97.1 | 100 (683) |
| Employee | 1.6 | 98.4 | 100 (63) |
| Agriculture | 3.7 | 96.3 | 100 (3738) |
| Others | 2.5 | 97.5 | 100 (237) |
| **Place of residence**** | | | |
| Rural | 3.7 | 96.3 | 100 (4258) |
| Urban | 1.3 | 98.7 | 100 (463) |
| **Household economic status*** | | | |
| Low | 4.1 | 95.9 | 100 (1700) |
| Medium | 3.2 | 96.8 | 100 (2229) |
| High | 2.2 | 97.8 | 100 (510) |
| Not de-jure residence | 5.0 | 95.0 | 100 (282) |
| **Religion** | | | |
| Hindu | 3.5 | 96.5 | 100 (3993) |
| Buddhists | 2.9 | 97.1 | 100 (374) |
| Others | 4.2 | 95.8 | 100 (354) |
| **Total** | **3.5** | **96.5** | **100 (4,721)** |

***p<0.1 **p<0.01**

Note: other occupation includes sales, domestic workers and skilled and unskilled manuals.

Not de-jure residence refer to those who don't live in their own legal residence

Other religion refers to Muslims, Christians and others

### 4.3.2.4 Relationships between early breastfeeding after birth and infant mortality

Breastfeeding after birth are imperative factors to save children from morbidity and mortality soon after births. This factor is associated with the maternal health status. Table 4.10 describes the bivariate relationship of breastfeeding within one day of birth with the infant mortality. Breastfeeding within one hour after delivery is significantly effective to reduce infant mortality (Chi square, $p< 0.01$). 2.3 percent of children died if they were put to the breast within one hour of birth and 4.1 percent

died if they were not put on breast milk within one hour. For comparison, the early breastfeeding is categorized into three categories and has studied the effects of starting breastfeeding within one day of birth. If the mothers were started breastfeeding between the period one hour and one day after birth, 2.0 percent of their children are found died. In addition if they were started breastfeeding after one day of birth, 6.7 percent are found died within one year. From this relationship, it can be expected that the colostrums feeding has a substantial effect on the survival of the child which is similar to the findings of Forste (1994), since the breastfeeding within one day after birth is used as a proxy variable of the breastfeeding with colostrums in this study.

**Table 4.10: Percentage infant mortality by breastfeeding within one hour after birth.**

| Breastfeeding Behaviors | Percent Infant Death | | |
|---|---|---|---|
| | Died | Not died | Total (Number) |
| **First Breastfeeding*** ** | | | |
| within one hour | 2.3 | 97.7 | 100 (1559) |
| Between one hour to one day | 2.0 | 98.0 | 100 (1773) |
| After one day of birth | 6.7 | 93.3 | 100 (1389) |
| **Total** | **3.5** | **96.5** | **100 (4,721)** |

***p<0.01

## 4.4 Multivariate Analysis

From the bivariate analysis, it is found that most of the background characteristics are significant differentials of breastfeeding within one hour after birth as well as the infant mortality of the index child studied. In this section, the study has examined the specific effects of each independent variable on intervening variable and dependent variable respectively controlling Socio-economic factors. Since the intervening and dependent variables are categorized in to binary outcome variables, binary logistic regression is used to study the effects of each category of background variables on both intervening and dependent variables.

The results of background variables on early breastfeeding (within one hour) after birth are shown in Table 4.11. Similarly, the special effects of independent and intervening variables on dependent variable (infant mortality) are shown in Table 4.12. The effects of independent variables are tested in each case by using different models of logistic regression. When the influence of background characteristics on infant mortality is studied, the influence of intervening variable has also been studied by accumulating this variable in a logistic regression model. The breastfeeding practices of Nepalese women are categorized into three categories to compare the effects of early breastfeeding (within one hour after birth) on infant mortality (table 4.12).

The standard errors and odds ratios are shown in Tables 4.11 and 4.12, which examine the effects of each independent variables and control variables on time of first breastfeeding and infant mortality respectively. Predicted probabilities of breastfeeding within one hour (early breastfeeding) and infant mortality are calculated only for selected variables, which have strongly significant effects and are most important determinants of infant mortality among background variables. As in the case of bivariate analysis, the specific effects are tested at the significance levels 0.1, 0.05, and 0.01.

**Table 4.11: Logistic regression results: factors affecting breastfeeding within one hour after birth**

| Variables | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| | S.E. | Odds Ratio | S.E. | Odds Ratio | S.E. | Odds Ratio |
| Constant | **0.094** | **.352*** ** | **.102** | **.376*** ** | **.152** | **.212*** ** |
| **Maternal Factors** | | | | | | |
| Mother's age group | | | | | | |
| 15-19® | ----- | ----- | ----- | ----- | ----- | ----- |
| 20-24 | .115 | 1.431*** | .116 | 1.386*** | .118 | 1.367*** |
| 25-29 | .136 | 1.380** | .136 | 1.325** | .139 | 1.321** |
| 30-34 | .158 | 1.284 | .159 | 1.216 | .162 | 1.217 |
| 35+ | .182 | 1.390* | .183 | 1.313 | .186 | 1.338 |
| Birth order | | | | | | |
| 1-2® | ----- | ----- | ----- | ----- | ----- | ----- |
| 3-5 | .090 | .855* | .091 | .865 | .093 | .888 |
| 6+ | .142 | .766* | .144 | .744* | .146 | .805 |
| Preceding birth interval | | | | | | |
| No preceding birth interval® | ----- | ----- | ----- | ----- | ----- | ----- |
| Less than 2 years | .116 | 1.260** | .117 | 1.293** | .119 | 1.302** |
| 2-4 years | .108 | 1.245** | .110 | 1.279** | .112 | 1.283** |
| More than 4 years | .131 | 1.104 | .131 | 1.123 | .134 | 1.120 |
| **Utilization of Maternal Health Services** | | | | | | |
| Antenatal care | | | | | | |
| Never Visit® | | | ----- | ----- | ----- | ----- |
| Some visits (1-3 times) | | | .071 | .794*** | .074 | .788*** |
| Adequate visits (4+ times) | | | .103 | 1.142 | .111 | 1.099 |
| Place of delivery | | | | | | |
| Home® | | | ----- | ----- | ----- | ----- |
| Hospital | | | .117 | 1.027 | .128 | 1.027 |
| **Socio-economic Factors** | | | | | | |
| Mother's education level | | | | | | |
| No education® | | | | | ----- | ----- |
| Primary | | | | | .095 | 1.042 |
| Secondary | | | | | .113 | 1.465*** |
| Higher | | | | | .307 | 1.372 |
| Mother's Occupation | | | | | | |
| Housewives® | | | | | ----- | ----- |
| Employee | | | | | .278 | 2.028*** |
| Agriculture | | | | | .108 | 1.815*** |
| Others | | | | | .174 | 1.119 |
| Place of residence | | | | | | |
| Rural® | | | | | ----- | ------ |
| Urban | | | | | .124 | 1.308** |

**Table 4.11: Logistic regression results: factors affecting breastfeeding within one hour after birth (contd.)**

| Variables | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| | S.E. | Odds Ratio | S.E. | Odds Ratio | S.E. | Odds Ratio |
| Household economic status | | | | | | |
| Low® | | | | | ------ | ------- |
| Medium | | | | | .071 | 1.116 |
| High | | | | | .132 | .960 |
| Not de-jure residence | | | | | .148 | 1.017 |
| Religion | | | | | | |
| Hindu® | | | | | ----- | ------ |
| Buddhists | | | | | .124 | .669*** |
| Others | | | | | .137 | .596*** |
| **-2 Log likelihood** | **5963.415** | | **5945.550** | | **5859.974** | |
| **Degree of freedom** | **9** | | **12** | | **23** | |

***P<0.1 **P<0.05 ***P<0.01**

**® = Reference Category**

**N = 4721 = Number cases included in the models.**

**S.E. = Standard error**

Note: other occupation includes sales, domestic workers and skilled and unskilled manuals.

Not de-jure residence refer to those who don't live in their own legal residence

Other religion refers to Muslims, Christians and others

**Table 4.12: Logistic Regression Results: Factors Affecting Infant Mortality**

| Variables | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|---|---|---|---|---|---|---|---|---|
| | S.E. | Odds Ratio | S.E. | Odds Ratio | S.E. | Odds Ratio | S.E. | Odds Ratio |
| Constant | .191 | .055*** | .211 | .082*** | .311 | .087*** | .346 | .143*** |
| **Maternal Factors** | | | | | | | | |
| Mother's age group | | | | | | | | |
| 15-19® | ----- | ------ | ----- | ----- | ----- | ----- | ----- | ----- |
| 20-24 | .274 | .540** | .276 | .581** | .276 | .577** | .281 | .606* |
| 25-29 | .341 | .42*** | .347 | .440** | .348 | .432** | .352 | .471** |
| 30-34 | .410 | .33*** | .414 | .33*** | .416 | .32*** | .421 | .352** |
| 35+ | .446 | .510 | .453 | .497 | .454 | .487 | .459 | .528 |
| Birth order | | | | | | | | |
| 1-2® | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| 3-5 | .246 | 1.86** | .267 | 1.676* | .269 | 1.681* | .271 | 1.571* |
| 6+ | .383 | 2.47** | .387 | 2.101* | .388 | 2.125* | .394 | 1.834 |
| Preceding b. interval | | | | | | | | |
| Only one birth® | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- |
| Less than 2 years | .303 | .980 | .306 | .914 | .308 | .950 | .314 | 1.058 |
| 2-4 years | .298 | .756 | .300 | .690 | .302 | .711 | .307 | .773 |
| More than 4 years | .367 | .672 | .369 | .627 | .370 | .644 | .374 | .693 |
| **Health Care during Pregnancy** | | | | | | | | |
| Antenatal care | | | | | | | | |
| Never Visit® | | | ----- | ----- | ----- | ----- | ----- | ----- |
| Some visits | | | .224 | .621** | .228 | .645* | .223 | .677* |
| Adequate visits | | | .371 | .472** | .386 | .511* | .381 | .636 |
| Place of delivery | | | | | | | | |
| Home® | | | ----- | ----- | ----- | ----- | ----- | ----- |
| Hospital | | | .396 | .727 | .412 | .840 | .417 | .958 |
| Vaccination of T.T. | | | | | | | | |
| Less than two times® | | | ----- | ----- | ----- | ----- | ----- | ----- |
| At least two times | | | .220 | .889 | .221 | .866 | .217 | .691* |
| **Socio-economic Factors** | | | | | | | | |
| Mother's edu. Level | | | | | | | | |
| No education® | | | | | ----- | ----- | ----- | ----- |
| Primary | | | | | .260 | .866 | .262 | .933 |
| Secondary & higher | | | | | .311 | 1.058 | .309 | 1.156 |
| Mother's occupation | | | | | | | | |
| Housewives® | | | | | ----- | ----- | ----- | ----- |
| Agriculture | | | | | .264 | 1.002 | .266 | 1.428 |
| Others | | | | | .482 | 1.110 | .488 | 1.405 |
| Place of residence | | | | | | | | |
| Rural® | | | | | ----- | ----- | ----- | ----- |
| Urban | | | | | .453 | .428* | .461 | .526 |

**Table 4.12: Logistic Regression Results: Factors Affecting Infant Mortality (contd.)**

| Variables | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|---|---|---|---|---|---|---|---|---|
| | S.E. | Odds Ratio | S.E. | Odds Ratio | S.E. | Odds Ratio | S.E. | Odds Ratio |
| HH economic Status | | | | | | | | |
| Low® | | | | | ----- | ----- | ----- | ----- |
| Medium | | | | | .176 | .869 | .178 | .849 |
| High | | | | | .371 | 1.035 | .370 | .866 |
| No de-jure residence | | | | | .319 | 1.414 | .321 | 1.265 |
| Religion | | | | | | | | |
| Hindu® | | | | | ----- | ----- | ----- | ----- |
| Buddhists | | | | | .322 | .785 | .329 | 1.102 |
| Others | | | | | .284 | 1.175 | .287 | 0.959 |
| Breastfed after birth | | | | | | | | |
| Within one hour | | | | | | | .208 | .308*** |
| Within one day | | | | | | | .210 | .267*** |
| After one day® | | | | | | | ----- | ----- |
| **-2 Log likelihood** | **1411.395** | | **1394.338** | | **1385.927** | | **1332.198** | |
| **Degree of freedom** | **9** | | **13** | | **23** | | **25** | |

***P<0.1 **P<0.05 ***P<0.01**

**® = Reference Category**

**N = 4721 = Number cases included in the models**.

**S.E. = Standard Error**

Note: other occupation includes sales, domestic workers and skilled and unskilled manuals.

Not de-jure residence refer to those who don't live in their own legal residence

Other religion refers to Muslims, Christians and others

### 4.4.1 Results from Logistic Regression

#### 4.4.1.1 Breastfeeding within one hour after birth

As shown in Table 4.11, Model 1 presents the effects of each variable of maternal factors after controlling for other two variables on the time of first breastfeeding after birth. Model 2 indicates the specific effects of each variable on the time of first breastfeeding controlling for all other variables included in the model. In this model, maternal factors and health care factors during delivery are included. Similarly Model 3 indicates the effects of each variable of maternal factors and health care while adjusting the socio-economic factors as including all variables in the same model.

As indicated by model 1, the age group of mother, has the positive effect with the time of first breastfeeding within one hour after birth of child compared to the age group 15-19 years of mother. The predicted likelihood of breastfeeding within one hour after birth are 43, 38, 28 and 39 percents higher for the age groups 20-24, 25-29, 30-34 and 35 and over years respectively as compared to the age group 15-19 years. Birth order of index child is negatively related with the time of first breastfeeding when compared with the birth orders first and second and preceding birth interval of less than two years is 26 percent more likely to put the child to the breast milk within one hour as compared to first child (no preceding birth interval). The predicted outcome on breastfeeding within one hour for child with preceding birth interval 2-4 years is 24 percent more than for first child and for more than 4 years is 10 percent more than first child as indicated by odds ratios, however the last prediction is not statistically significant.

Model 2 also indicates the similar pattern of effects of age of mother, birth order and preceding birth interval on breastfeeding within one hour. The effect of age group 30 and over doesn't seem to be significantly effective due to the effects of other controlling variables. As indicated by this model, adequate antenatal care visit have positive effect (14 percent more likely) while some visit have negative relationship on breastfeeding within one hour after birth as compared to never visit of antenatal care. Delivery at hospitals is only 2 percent more likely to put the child to the breast milk within one hour after birth comparing to the delivery at homes.

Model 3 indicates the effects of each factor on initial starting of breastfeeding within one hour of birth when all maternal factors, health care factors and socio-economic factors are controlled. This model of logistic regression reveals that the socio-economic factors are also equally important for the initial starting of breastfeeding within one hour of birth since most of the socio-economic factors included in the model show statistically significant effect on the breastfeeding within one hour of birth. When socio-economic factors are added in the logistic regression model, the relationship between age of mother and breastfeeding within first hour of birth is still appeared similar relationship as in the previous models. Preceding birth interval is still significantly related and birth order is also related but not significant with breastfeeding within one hour of birth and the relationship is almost similar to the effects as in previous models.

Among socio-economic factors, mother's educational level is positively related with the initial starting of breastfeeding to their children within one hour of birth. The mothers whose educational level is primary are 4 percent more likely to start breastfeeding within one hour of birth as compared to the mothers with no education. Similarly mothers with secondary level of education are 1.46 times more likely and those with higher level of education are 1.37 times more likely to breastfeed their children within one hour of birth as compared to the mothers with no education. Secondary level of education has the significant effect on breastfeeding within one hour after birth. Mother's occupation is also having significant effect on the time of initial breastfeeding. Employee mothers are 2 times more likely; mothers working in Agriculture are 1.81 times more likely and mothers with other occupation are 1.19 times more likely to breastfeed their children within one hour after birth comparing to the housewife mothers. Urban mothers are 30 percent more likely to breastfeed within one hour of birth than rural mothers.

The odds ratios of household economic status indicates that mothers with medium economic status are 11 percent more likely and those in high economic status are 4 percent less likely to breastfeed within one hour of birth of their children as compared to mothers in low economic status. Mothers who are not living in their own households (not de-jure residences) are as likely as the mothers of low economic status. Religion has substantial effects on initial breastfeeding. In comparison to

Hindus, Buddhist mothers are 33 percent less likely and mothers in other religious groups are about 40 percent less likely to breastfeed their children within one hour after birth as indicated by the odds in model 3 (Table 9.11).

#### 4.4.1.2 Infant mortality

Table 4.12 indicates the results of binary logistic regression presenting the effects of maternal factors, health care factors, socio-economic factors and breastfeeding within an hour of birth on infant mortality in different four models. Model 1 presents the effects of each maternal factor on infant mortality controlling for other factors in the model. Model 2 presents the net effects of each variable of maternal and health care factors while controlling for all other variables included in this model. In model 3, the Socio-economic factors are added in the model to test the effects of each variable of maternal factors and health care factors while controlling for all other variables included in the model. Model 4 presents the effects of maternal factors, health care factors, Socio-economic factors and breastfeeding within one hour after birth while controlling for all other variables included in this model.

As model 1 indicates, the infant mortality decreases when the age of mother increases up to the age 34 years and it increases after age 35 years. While taking the first age group as reference, the odds ratios indicate that infant mortality is 46 percent less likely to occur for mothers who are in the age group 20-24 which further is significant less likely by 59 and 67 percents for age groups 25-29 and 30-34 years respectively. When the age of mother rises above 35 years, infant mortality increases as compared to the age 20-34 years which is still lower than that of age group 15-19 years, however it is not significant. When the parity of mother increases, the infant mortality significantly increases which is 1.86 times higher for parity 3-5 and 2.47 times higher for parity 6 and higher as compared to the parity less than three. Previous birth interval has been found negatively associated with infant mortality when first birth (no previous birth interval) is taken as the reference category however it is not significant.

Model 2 indicates that when health care factors are included nesting the maternal factors, the log odds of infant mortality found increased means that the likelihood of infant mortality increases compared to the previous model and similar

kind of relationship appears for birth order and birth interval. The effect of antenatal care seems to be significant and inverse relationship with infant mortality. Delivery care and vaccination of tetanus toxoid are also negatively associated with infant mortality. This model indicates that infant mortality is 38 percent less likely when mothers go to some antenatal care visits and 53 percent less likely when they go to adequate antenatal care visits as compared to no antenatal care visit. Delivery at hospital predicts the reduction of infant mortality by 28 percent than the delivery at home and vaccination of tetanus toxoid predicts 12 percent reduction of infant mortality however the odds ratios of hospital delivery and vaccination of T.T. are not statistically significant.

When maternal and health care factors are nested with the socio-economic factors in model 3, it is found that the odds ratios of the effects of maternal factors on infant mortality are almost same but slightly changed as compared to that of previous model and level of significance is also almost similar. This finding suggests that maternal factors still have strong relationship with infant mortality while socioeconomic factors are controlled. Here the socio-economic factors are acting as suppressor variables for the likelihood of infant mortality. The likelihood of infant mortality is found decreased for health care during pregnancy such as antenatal care, delivery at hospitals and vaccination of tetanus toxoid in this model, indicating that the effects have been controlled by socio-economic factors (Table 4.12).

Among socio-economic factors, mother's education level shows surprising but not significant results that primary education is negatively related with infant mortality whereas secondary and higher education has positive effect on mortality. The possible cause of such surprising result might be due to educated mothers go outside home for work and could not give sufficient time for care of their children which is further supported by the odds ratios of mother's occupation. As compared to the housewives, mothers who work outside homes are 5 percent more likely to the occurrence of infant mortality for their children whereas agriculture workers are equally likely for infant mortality as that of housewives. Urban place of residence have marginally significant ($p<0.1$) negative effect on infant mortality whereas household economic status and religion are not significantly associated with infant mortality.

Model 4 is the multivariate analysis of factors affecting infant mortality after adjusting breastfeeding factor in model 3. In this model, when breastfeeding is added, the predicted probabilities of dying by maternal age are found to be slightly increased in all age groups. Similarly the effects of parity are also found increased by around 3 percents. The significant level of relationship is found almost same as in the previous model. The predicted likelihoods of dying relating to previous birth interval are also increased however the effects are not significant in any model. This study has been found that when mothers breastfeed their children within one hour after delivery; they are 70 percent less likely to die within one year compared to those who were breastfed after one day of birth. In addition, if the children were started breastfeeding within one day after birth, they are found 73 percent less likely to die compared to the reference category (breastfed after one day of birth). Here it can be noted that breastfeeding within one hour or within one day after birth have nearly similar effect on infant mortality. Here the important point to remember is that starting of breastfeeding within one hour after birth simulates the breastfeeding within one day which has strong effect on child survival. Another important point to be noted is that when breastfeeding behavior is added in the model, the effects of maternal factors and health care factors on infant survival are weaker than in previous models and that of breastfeeding within one hour and within one day after birth are significantly strong to reduce infant mortality. In this concern, early breastfeeding is acting the role of intervening variable for maternal and health care factors except for vaccination of tetanus toxoid. Almost similar pattern of relationship has been found between socio-economic factors, early breastfeeding and infant mortality (Table 4.12).

### 4.4.2 Predicted Probabilities

The predicted probabilities for the breastfeeding within one hour after delivery and infant mortality are calculated in order to improve the understanding of effects of various independent and control variables on these intervening and dependent variables. The probabilities are calculated for selected independent variables that are statistically significant at the level 0.1 in the full model of logistic regression. The calculation of predicted probabilities is shown in appendix 1. The predicted probability of breastfeeding within one hour of birth for those mothers whose age is 15-19 yrs,

keeping all other variables constant at mean value, is 36.8 percent ($p=1/1+exp^{-[-1.490+0.955]}$, where 0.955 is a constant value when other variables are fixed at mean value). The predicted probability of breastfeeding for those mothers, whose age is 20-24 yrs, keeping all other variables constant on mean value is [$p=1/1+exp^{-[-1.490+0.955+0.296]}$] = 0.44 = 44%. Similarly the predicted probabilities of breastfeeding within one hour after delivery for mothers aged 25-29, 30-34 and more than 35 years are 42, 39 and 40 percents respectively (see appendix 1). Predicted probabilities of breastfeeding within one hour of those mothers who did not visit any antenatal care is 47 percent, for those who visited some antenatal care is 41 percent and for those who visited adequate antenatal care is 50 percent. It should be noted here that some antenatal care visits are not effective for immediate starting of breastfeeding.

It is predicted that the probability of infant mortality for mothers aged 15-19 years is 5.7 percent [$p = 1/1+e^{-2.422-0.366}$, where -0.366 is the constant value when other variables are kept constant on mean value]. Predicted probabilities calculated from similar methods, for the children of those mothers who are aged 20-24, 25-29, 30-34 and 35 and more years are 3.1, 2.3, 1.6 and 2.34 respectively. Predicted probabilities of infant mortality for antenatal care visits keeping all other variables constant are found 2.4 percent and 2 percent respectively if mothers had gone to some and adequate antenatal care visits respectively compared to 4.2 percent for no antenatal care visit.

The figure of predicted probabilities (fig. 3) indicates that mothers aged 20-24 are most likely for breastfeeding within one hour. It is slightly increased after age 35 years. Infant mortality decreases as mother's age decreases and after 35 years it is increased. Similarly some antenatal care visit is not sufficient to predict breastfeeding within one hour however it predicts infant mortality. Adequate antenatal care shows effect on both breastfeeding and infant mortality. From the figure, it can be observed that breastfeeding within one hour can intervene infant mortality however the effects of other factors can not be underestimated. The effects of birth order and previous birth interval are also should be considered in these matters (appendix1).

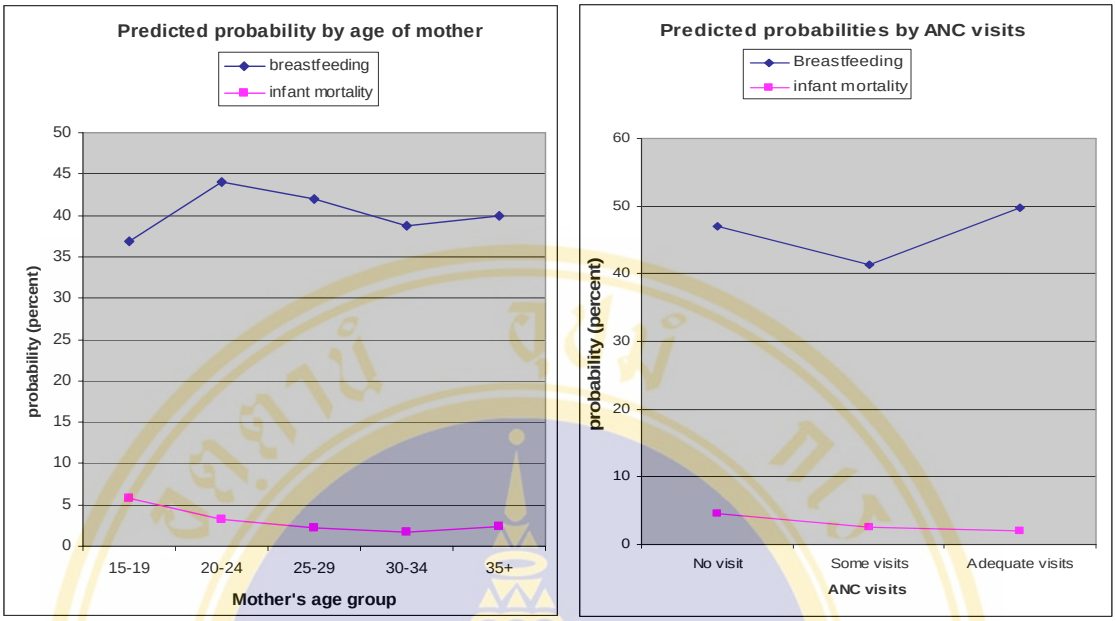



Fig.3: Predicted probabilities of breastfeeding within an hour of birth and infant mortality by age of mother and antenatal care visits

## 4.5 Summary of Findings

From both the bivariate and multivariate analysis, it is found that the maternal factors such as age of mother at child birth, birth order and preceding birth interval are the important determinants of breastfeeding within an hour after delivery and infant mortality in Nepal. Among utilization of health care during pregnancy related variables, antenatal care is found significantly effective for both of intervening and outcome variables. Even the effects of hospital delivery on both mediator and outcome variables and the effect of tetanus vaccination to mothers are not significant in this study; the coefficients indicate that the impacts of these variables on reducing infant mortality and to breastfeed new born children within an hour could not be underestimated. Similar but partially significant relationships between socio-economic factors and breastfeeding within an hour after delivery as well as infant mortality have been observed from this study. Strong evidences of the negative relationship between breastfeeding within one hour after delivery and infant mortality has been found from bivariate, multivariate analysis which is further supported by the calculation of predicted probabilities of breastfeeding and infant mortality in different situations of explanatory variables.

# CHAPTER V

# CONCLUSION AND RECOMMENDATION

This chapter discusses about the results obtained from this study and concludes the overall scenario of infant mortality and the determinant factors. Also this chapter focuses on some recommendations for the policy making bodies in Nepal in order to surmount the existing problems of immediate breastfeeding and infant mortality as enquired by this study.

## 5.1 Introduction

The infant mortality in Nepal is still high which reflects existing health problems. This retrospective study of infant mortality in Nepal using the secondary data from Nepal Demographic and Health Survey 2001, aims to examine the effects of maternal factors and health care behaviors of women in the reproductive ages on the breastfeeding within an hour of birth and infant mortality of their latest born children. This study is done on the ground of different policies and programs has been formulated and implemented from the side of the government of Nepal as outlined by ICPD and millennium development goals. The cultural and socio-economic differentials are playing vital importance to differentiate the practices of breastfeeding within one hour after birth however the government of Nepal has emphasized mothers to feed their breast milk immediately after birth. Besides, in order to improve the health status of mothers and children and reduce infant mortality to 34 per thousand live births by the year 2015, different programs have been implemented connecting with maternal and child health programs and family planning programs (MOHP, 2005). This study has been expected to suggest further improvements on formulation and implementation of population and reproductive health policies and programs regarding to maternal factors and behaviors in order to reduce infant mortality to the targeted level.

## 5.2 Discussion

Both, bivariate and multivariate analysis found that early breastfeeding (within one hour) after delivery is significantly associated with maternal factors and utilization of health care services during pregnancy which might be the cause of improving health status of mothers whereas infant mortality is found significantly affected by age of mother at child birth and birth order. In addition, early breastfeeding after birth is very much important for the survival of a new born child which is also proved from the analysis discussed in the previous chapter. Even if all other variables are controlled to see the effect of early breastfeeding (both within an hour and within one day after birth however both categories have almost similar effects) on infant mortality it is found significant at the level 0.01. This association demonstrates that starting of breastfeeding as earlier as possible after birth but not later than one day is considerably important for survival of the children which might be the effect of colostrums found in the first milk of mother. Also the mothers who can produce milk soon after the child birth might be healthier than others and children born from healthier mothers might also be healthier and could suck the breast milk soon after birth.

Maternal factors such as age of mother at the time of child's birth, and previous birth interval are found significantly and positively associated with breastfeeding within one hour after birth whereas parity (birth order) is negatively associated in comparison to the reference categories. When age is increased, breastfeeding has been decreased however age over 35 is exceptional. This finding is similar to the findings of many previous researches (Pebley and Stupp, 1987; Mason and Lotfi, 2005). The main causes of decreasing breastfeeding within an hour of birth might be due to maternal depression syndrome associated with maternal nutritional stores as a consequence of frequent number of births which is found supported by previous birth interval. If the birth spacing is higher, probably the less would be the number of children born. Also the mothers who practiced longer birth spacing might be healthier and effectively their child might also be stronger to suck up breast milk immediately after birth. The increment in the likelihood of breastfeeding within one hour after age 35 years might be due to the effects of longer previous birth intervals and other socioeconomic factors.

Surprisingly, negative effects of some antenatal care visits on breastfeeding within one hour after birth has been observed however the effects of adequate antenatal care and delivery at health facility has positive, though insignificant effects on breastfeeding within an hour of birth. This result indicates that some antenatal care visits are not sufficient to maintain the maternal health and nutritional store during pregnancy and at least 4 antenatal care visits are necessary. Also delivery care can support to breastfeed children within one hour after delivery.

The effects of maternal factors on infant mortality are found inversely as those found on breastfeeding within an hour of birth. When the effects of maternal factors on breastfeeding within one hour are increased infant mortality is found decreased. Also the effect of breastfeeding on infant mortality is negative and significant while controlling all other variables. This interesting fact suggests that breastfeeding within one hour after birth acts as an intervening variable between maternal factors and infant mortality.

The direct effects of maternal factors on infant mortality are also found noteworthy in this study. The decrease in infant mortality while increasing the age group of mothers up to the age group 30-34 and again increase on infant mortality after age 35 years support the findings of previous studies done by Hobcraft et al (1984) and Pebley and Stupp (1987). The positive relationship between parity and infant mortality supports the findings of many scholars that higher parities have higher chance of infant dying due to pregnancy risks, underweight caused by malnutrition, lack of adequate care and environmental effects (Pichaisnith, 1987; Poppel et al, 2002). The relationship between previous birth interval and infant mortality has been found negative, but not significant. Though the relationship is not statistically significant, the logistic regression coefficients describe that longer the duration of previous birth interval, lower the chance of infant mortality which justifies the findings of many previous researches (Bongaarts, 1987; Pebley and Stupp, 1987; Pandey et al, 1998). As indicated by these scholars, the cause of higher infant mortality for shorter birth interval might be associated with the rebuilding of physiological recuperation of mothers, intrauterine growth of children and higher chance of getting infectious diseases due to lack of care.

Utilization of maternal health care services and infant mortality are also found negatively linked however the effects of delivery at hospitals and vaccination of tetanus toxoid are not found significant in multivariate analysis. Adequate antenatal care visit may be effective to provide the situation of child within the uterus and provide knowledge about pregnancy complications and its management among pregnant women so that women could be careful about the health of themselves and their children within uterus which could be associated with mortality after birth. The insignificance of the results for hospital delivery and vaccination of tetanus toxoid might be due to the effects of other maternal factors including antenatal care which were controlled in the logistic regression. Besides, the cases of hospital delivery are comparatively very low. Even the effects of health care factors are significant or not, the coefficients of logistic regression indicate the similar relationships found in many previous literatures. The possible causes of such relationships might be associated with the knowledge of pregnancy conditions, management of complications, delivery assistance of trained health personnel and security of mothers and children from postpartum tetanus (Shiffman, 2000; Mathews et al, 2001; Mitra et al, 1997; Jain and Visaria, 1998).

From multivariate analysis, it is found that mothers education level specially secondary level of education have significant effect on breastfeeding within one hour after birth, which indicates that when the mothers are educated (secondary level), they are more likely to breastfeed their children immediately after birth and ultimately might be effective to reduce infant mortality. A surprising result is found from multivariate analysis that secondary and higher education have positive relationship with infant mortality which may be due to child care factors since educated mothers go for work and can not care and breastfeed on time. This is further justified from the results observed for working mothers compared to housewives, which is similar to the findings of Sivakami (2003). Mother's occupation is also effective for immediate breastfeeding after birth however it has positive, but not significant relationship with infant mortality.

Urban place of residence has the significant positive effect on breastfeeding within an hour of birth and infant mortality. The root cause is that urban (municipal) areas of Nepal are comparatively more advanced and modernized. The accessibility of

health services and socioeconomic status of people are also in better condition in urban areas whereas on the other hand, most of the rural areas are too much backward and remote form health service accessibility, awareness, nutrition and advancement. Also the reproductive health programs do not easily reach to those mothers who live in these remote areas.

The coefficients from logistic regression indicate that the mothers in high economic status are less likely to breastfed within one hour and infant mortality is more likely to occur for children of those mothers though the relationship is not statistically significant. This surprising result might be due to the fact that even the household economic condition is good, the mothers are not aware much about colostrums and care of children and also might be reluctant for maternal and child health care as indicated by Rahman et al (1997). In addition, women in higher economic status might be working outside the household and could not give adequate time to care their children because their economic condition indicates that they might be involved in some income generating works.

Religious difference has significant distinction on breastfeeding within one hour as found from multivariate analysis however the effect on infant mortality is not significant. Here also colostrums feeding plays imperative role to reduce infant mortality among children of different religious mothers since early breastfeeding (both within one hour and one day after delivery) is significantly associated with infant mortality. Different beliefs, cultures and behaviors about child bearing, breastfeeding, nutrition among boys and girls and different social norms and lifestyles among different religious groups are the causes of such differentials.

### 5.3 Conclusion

From the results found in this study, the following statements of hypothesis have been supported. Children born to the mothers less than 20 years of age and more than 35 years of age are more likely to die before reaching the age of one year. The birth order of children (parity of mother) is positively associated with infant mortality that is higher order births are more likely to die than lower order births. The previous birth intervals are negatively, but not significantly associated with infant mortality. At least some antenatal care visits are important and adequate antenatal care visits are

most important to reduce infant mortality significantly. Deliveries at hospitals and vaccination of tetanus toxoid to mothers do not have significant effect however they are important to reduce infant mortality.

Maternal factors and antenatal care during pregnancy are most important factors for breastfeeding within one hour after delivery and breastfeeding within one hour as well as within one day after delivery are significantly important for a new born to save them from death before one year as compared to those children who started breastfeeding only after one day of birth.

The study concludes that not only single variable can affect the breastfeeding within one hour and infant mortality, the combination of different variables and factors may affect the immediate breastfeeding and infant mortality in Nepal however maternal factors such as age, parity, birth spacing and health care during pregnancy such as antenatal care are important factors. Socioeconomic factors such as mother's education, occupation, place of residence and religion can affect infant mortality not directly but intervene by time of breastfeeding after delivery. Breastfeeding immediately after birth (preferably within one hour) has the dominant importance to reduce infant mortality in Nepal.

## 5.4 Policy Recommendation

Based on the findings of this study, following important recommendations are identified for policy implications in order to emphasize the starting of breastfeeding immediately after birth to a new born child and to reduce infant mortality. Limited resources and geographical difficulties of the country are also taken in to consideration before suggesting for these policy implications.

1. Counseling for immediate breastfeeding after birth with colostrums should be incorporated in MCH programs. Counseling through mother's groups, community based organizations, are also suggested. Starting of breastfeeding within one hour should be advertised through mass media for the simulation of breastfeeding within a day after birth.
2. Strengthening of behavior change communication (BCC) programs in order to increase awareness on early breastfeeding, increase age at marriage and increase the use of family planning methods to control births, reduce higher parity and

increase birth spacing. Special awareness creation in partnership of governmental, non governmental and community based organizations are recommended.

3. Maternal and child health care services and family planning services should make accessible and affordable all over the country. Health care facilities, equipped and trained manpower, and supply of medications and micronutrients are highly recommended to be ensured at least in each primary health care centers with special attention to remote areas.

### 5.5 Recommendation for Future Research

Various determinant factors of infant mortality such as environmental factors, nutrition, care etc. are the proximate and important determinants of initiation of breastfeeding and infant mortality which are not analyzed in this study due to lack of adequate information as the secondary data is used.

A separate survey focusing on child health and mortality and its determinant factors is recommended to be conducted. The precise and comprehensive study concerning on all determinant factors could provide more reliable and appropriate results on infant mortality.

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# APPENDIX

# APPENDIX

## 1. Calculation of Predicted Probabilities

Logistic regression coefficients used to predict probability of breastfeeding within one hour of birth and infant mortality.

| Variables | Logistic regression coefficients | |
|---|---|---|
| | Breastfeeding within one hour of birth | Infant mortality |
| Age (15-19 years) | - | - |
| $X_1$ 20-24 years | 0.296 | -0.630 |
| $X_2$ 25-29 years | 0.211 | -0.962 |
| $X_3$ 30-34 years | 0.081 | -1.306 |
| $X_4$ 35+ years | 0.128 | -0.944 |
| Birth order (1-2) | - | - |
| $X_5$ 3-5 | - | 0.420 |
| $X_6$ 6+ | - | 0.721 |
| Previous birth interval (first birth) | - | - |
| $X_7$ Less than 2 years | 0.209 | - |
| $X_8$ 2-4 years | 0.204 | - |
| $X_9$ More than 4 years | 0.095 | - |
| Antenatal care visits (No visit) | - | - |
| $X_{10}$ Some visits | -0.226 | -0.546 |
| $X_{11}$ Adequate visits | 0.107 | -0.761 |
| Mother's education (No educ.) | - | - |
| $X_{12}$ Primary | 0.049 | - |
| $X_{13}$ Secondary | 0.391 | - |
| $X_{14}$ Higher | 0.324 | - |
| Mother's occupation (Housewives) | - | - |
| $X_{15}$ Employee | 0.725 | - |
| $X_{16}$ Agriculture | 0.594 | - |
| $X_{17}$ Others | 0.115 | - |
| Place of residence (Rural) | - | - |
| $X_{18}$ Urban | 0.246 | - |
| Religion (Hindu) | - | - |
| $X_{19}$ Buddhists | -0.401 | - |
| $X_{20}$ Others | -0.522 | - |
| Breastfeeding (After 1 hour of birth) | - | - |
| $X_{21}$ Before one hour of birth | - | -0.567 |
| Constant | -1.492 | -2.422 |

Where,

$X_1$ = 1 if age = 20-24 yrs & 0 else
$X_2$ = 1 if age = 24-25 yrs & 0 else
$X_3$ = 1 if age = 30-34 yrs & 0 else
$X_4$ = 1 if age = 35+ yrs & 0 else
$X_5$ = 1 if birth order = 3-5 & 0 else
$X_6$ = 1 if birth order = 6+ & 0 else
$X_7$ = 1 if birth interval < 2 years & 0 else
$X_8$ = 1 if birth interval = 2-4 yrs & 0 else
$X_9$ = 1 if birth interval = 5+ yrs & 0 else
$X_{10}$ = 1 if antenatal visit = 1-3 times & 0 else
$X_{11}$ = 1 if antenatal visit = 4+ times & 0 else
$X_{12}$ = 1 if primary education & 0 else
$X_{13}$ = 1 if secondary education & 0 else
$X_{14}$ = 1 if higher education & 0 else
$X_{15}$ = 1 if employee mother & 0 else
$X_{16}$ = 1 if work in agriculture & 0 else
$X_{17}$ = 1 if other occupation & 0 else
$X_{18}$ = 1 if urban residence & 0 else
$X_{19}$ = 1 if Buddhist religion & 0 else
$X_{20}$ = 1 if other religion & 0 else (Hindu ref.)
$X_{21}$ = 1 if child was breastfed within one hour of birth & 0 else

Predicted Probabilities of Breastfeeding within one hour by age group of mother keeping all other variables constant at mean value.

If mother's age is 15-19 years

**P=1/1+e**[-{-1.492+0.296(0)+0.211(0)+0.081(0)+0.128(0)+0.209(0.5)+0.204(0.5)+0.095(0.5)-0.226(0.5)+0.107(0.5)+0.049(0.5)+0.391(0.5)+0.324(0.5)+0.725(0.5)+0.594(0.5)+0.115(0.5)+0.246(0.5)-0.401(0.5)-0.522(0.5)}] = **0.368**

If mother's age is 20-24 years

**P=1/1+e**[-{-1.492+0.296(1)+0.211(0)+0.081(0)+0.128(0)+0.209(0.5)+0.204(0.5)+0.095(0.5)-0.226(0.5)+0.107(0.5)+0.049(0.5)+0.391(0.5)+0.324(0.5)+0.725(0.5)+0.594(0.5)+0.115(0.5)+0.246(0.5)-0.401(0.5)-0.522(0.5)}] = **0.440**

If mother's age is 25-29 years

**P=1/1+e**[-{-1.492+0.296(0)+0.211(1)+0.081(0)+0.128(0)+0.209(0.5)+0.204(0.5)+0.095(0.5)-0.226(0.5)+0.107(0.5)+0.049(0.5)+0.391(0.5)+0.324(0.5)+0.725(0.5)+0.594(0.5)+0.115(0.5)+0.246(0.5)-0.401(0.5)-0.522(0.5)}] = **0.419**

If mother's age is 30-34 years

**P=1/1+e**[-{-1.492+0.296(0)+0.211(0)+0.081(1)+0.128(0)+0.209(0.5)+0.204(0.5)+0.095(0.5)-0.226(0.5)+0.107(0.5)+0.049(0.5)+0.391(0.5)+0.324(0.5)+0.725(0.5)+0.594(0.5)+0.115(0.5)+0.246(0.5)-0.401(0.5)-0.522(0.5)}] = **0.387**

If mother's age is 35+ years

**P=1/1+e**[-{-1.492+0.296(0)+0.211(1)+0.081(0)+0.128(0)+0.209(0.5)+0.204(0.5)+0.095(0.5)-0.226(0.5)+0.107(0.5)+0.049(0.5)+0.391(0.5)+0.324(0.5)+0.725(0.5)+0.594(0.5)+0.115(0.5)+0.246(0.5)-0.401(0.5)-0.522(0.5)}] = **0.399**

Predicted Probabilities of Breastfeeding within one hour by previous birth interval keeping all other variables constant at mean value.

If only one birth (no birth interval)

**P=1/1+e**[-{-1.492+0.296(0.5)+0.211(0.5)+0.081(0.5)+0.128(0.5)+0.209(0)+0.204(0)+0.095(0)-0.226(0.5)+0.107(0.5)+0.049(0.5)+0.391(0.5)+0.324(0.5)+0.725(0.5)+0.594(0.5)+0.115(0.5)+0.246(0.5)-0.401(0.5)-0.522(0.5)}] = **0.393**

If birth interval is less than two years

**P=1/1+e**[-{-1.492+0.296(0.5)+0.211(0.5)+0.081(0.5)+0.128(0.5)+0.209(1)+0.204(0)+0.095(0)-0.226(0.5)+0.107(0.5)+0.049(0.5)+0.391(0.5)+0.324(0.5)+0.725(0.5)+0.594(0.5)+0.115(0.5)+0.246(0.5)-0.401(0.5)-0.522(0.5)}] = **0.444**

If birth interval is 2-4 years

**P=1/1+e**[-{-1.492+0.296(0.5)+0.211(0.5)+0.081(0.5)+0.128(0.5)+0.209(0)+0.204(1)+0.095(0)-0.226(0.5)+0.107(0.5)+0.049(0.5)+0.391(0.5)+0.324(0.5)+0.725(0.5)+0.594(0.5)+0.115(0.5)+0.246(0.5)-0.401(0.5)-0.522(0.5)}] = **0.442**

If the birth interval is more than 4 years

**P=1/1+e**[-{-1.492+0.296(0.5)+0.211(0.5)+0.081(0.5)+0.128(0.5)+0.209(0)+0.204(0)+0.095(1)-0.226(0.5)+0.107(0.5)+0.049(0.5)+0.391(0.5)+0.324(0.5)+0.725(0.5)+0.594(0.5)+0.115(0.5)+0.246(0.5)-0.401(0.5)-0.522(0.5)}] = **0.416**

Predicted Probabilities of Breastfeeding within one hour by antenatal care visits keeping all other variables constant at mean value.

If only one birth (no birth interval)

**P=1/1+e**[-{-1.492+0.296(0.5)+0.211(0.5)+0.081(0.5)+0.128(0.5)+0.209(0.5)+0.204(0.5)+0.095(0.5)-0.226(0)+0.107(0)+0.049(0.5)+0.391(0.5)+0.324(0.5)+0.725(0.5)+0.594(0.5)+0.115(0.5)+0.246(0.5)-0.401(0.5)-0.522(0.5)}] = **0.470**

If only one birth (no birth interval)

**P=1/1+e**[-{-1.492+0.296(0.5)+0.211(0.5)+0.081(0.5)+0.128(0.5)+0.209(0.5)+0.204(0.5)+0.095(0.5)-0.226(1)+0.107(0)+0.049(0.5)+0.391(0.5)+0.324(0.5)+0.725(0.5)+0.594(0.5)+0.115(0.5)+0.246(0.5)-0.401(0.5)-0.522(0.5)}] = **0.414**

If only one birth (no birth interval)

**P=1/1+e**[-{-1.492+0.296(0.5)+0.211(0.5)+0.081(0.5)+0.128(0.5)+0.209(0.5)+0.204(0.5)+0.095(0.5)-0.226(0)+0.107(1)+0.049(0.5)+0.391(0.5)+0.324(0.5)+0.725(0.5)+0.594(0.5)+0.115(0.5)+0.246(0.5)-0.401(0.5)-0.522(0.5)}] = **0.496**

Predicted Probabilities of infant mortality by age group of mother keeping all other variables constant at mean value.

If mother's age is 15-19 years

**P=1/1+e**[-{-2.422-0.630(0)-0.962(0)-1.306(0)-0.944(0)+0.420(0.5)+0.721(0.5)-0.546(0.5)-0.761(0.5)-0.567(0.5)}] = **0.0578**

If mother's age is 20-24 years

**P=1/1+e**[-{-2.422-0.630(1)-0.962(0)-1.306(0)-0.944(0)+0.420(0.5)+0.721(0.5)-0.546(0.5)-0.761(0.5)-0.567(0.5)}] = **0.0317**

If mother's age is 25-29 years

**P=1/1+e**[-{-2.422-0.630(0)-0.962(1)-1.306(0)-0.944(0)+0.420(0.5)+0.721(0.5)-0.546(0.5)-0.761(0.5)-0.567(0.5)}] = **0.023**

If mother's age is 30-34 years

**P=1/1+e**[-{-2.422-0.630(0)-0.962(0)-1.306(1)-0.944(0)+0.420(0.5)+0.721(0.5)-0.546(0.5)-0.761(0.5)-0.567(0.5)}] = **0.016**4

If mother's age is 35+ years

**P=1/1+e**[-{-2.422-0.630(0)-0.962(0)-1.306(0)-0.944(1)+0.420(0.5)+0.721(0.5)-0.546(0.5)-0.761(0.5)-0.567(0.5)}] = **0.0234**

Predicted Probabilities of infant mortality by birth order keeping all other variables constant at mean value.

If birth order is 1-2
**P=1/1+e**[-{-2.422-0.630(0.5)-0.962(0.5)-1.306(0.5)-0.944(0.5)+0.420(0)+0.721(0)-0.546(0.5)-0.761(0.5)-0.567(0.5)}] = **0.012**

If birth order is 1-2
**P=1/1+e**[-{-2.422-0.630(0.5)-0.962(0.5)-1.306(0.5)-0.944(0.5)+0.420(1)+0.721(0)-0.546(0.5)-0.761(0.5)-0.567(0.5)}] = **0.019**

If birth order is 1-2
**P=1/1+e**[-{-2.422-0.630(0.5)-0.962(0.5)-1.306(0.5)-0.944(0.5)+0.420(0)+0.721(1)-0.546(0.5)-0.761(0.5)-0.567(0.5)}] = **0.026**

Predicted Probabilities of infant mortality by birth order keeping all other variables constant at mean value.

**P=1/1+e**[-{-2.422-0.630(0.5)-0.962(0.5)-1.306(0.5)-0.944(0.5)+0.420(0.5)+0.721(0.5)-0.546(0)-0.761(0)-0.567(0.5)}] = **0.042**

If birth order is 1-2
**P=1/1+e**[-{-2.422-0.630(0.5)-0.962(0.5)-1.306(0.5)-0.944(0.5)+0.420(0.5)+0.721(0.5)-0.546(1)-0.761(0)-0.567(0.5)}] = **0.024**

If birth order is 1-2
**P=1/1+e**[-{-2.422-0.630(0.5)-0.962(0.5)-1.306(0.5)-0.944(0.5)+0.420(0.5)+0.721(0.5)-0.546(0)-0.761(1)-0.567(0.5)}] = **0.020**

**2. Questions Related with the Study**

**Household Questionnaire:**

Household identification

District/Village/Municipality/Ward number/Cluster number/Household number

24. Does your household have?

Electricity (Yes/No)

A radio (Yes/No)

A television (Yes/No)

A telephone (Yes/No)

A bicycle (Yes/No)

**Women's Questionnaire:**

Section 1: Respondent's background

106. How old were you at your last birthday? (age in completed years)

107. Have you ever attended school? (Yes/ No)

108. What is the highest grade you completed? (Grade…….)

116. What is your religion? (Hindu, Buddhists, Christian, Muslim, other (specify))

Section 2: Reproduction

214 Line number of birth

215. Think back to the time of your first pregnancy. Was that a single or multiple pregnancies? (single/Multiple)

216. Was the baby born alive, born dead, or lost before birth? (Born alive, born dead, lost before birth)

217. Did that baby cry, move or breathe when it was born? (Yes/ No)

218. What name was given to that child?

220. In what month and year was (name) born? (Month….., Year….)

221. Is (name) is still alive? (Yes/ No. If no go to 225)

225. How old was (name) when he/she died? If 1 yr, probe: how many months old was (name)? Record days if less than 1 month; months if less than two years. (Days……, months……..., years……)

Section 4A: Pregnancy, Postnatal Care and Breastfeeding

For last birth only:

408. How many times did you receive antenatal care for this pregnancy? (No. of times……., don't know)

415. During this pregnancy, were you given an injection in the armto prevent the baby from getting tetanus, that is, convulsions after birth? (Yes/No/Don't know)

416. During this pregnancy, how many times did you get this injection? (Times…./Don't know)

For last two births:

424. Where did you give birth to (name)?
(Home: your home/ other home?; Government sector: govt. hospital/ primary health care center/health or sub health post/other govt.?; Non governmental sector: UMN/Red cross hospital/other NGO?; Private medical sector: private hospital/nursing home/other private?; Other……..)

439. How long after birth you first put (name) to the breast? (Immediately, hours….., days……)

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