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## Neo-Natal Mortality in Uttar Pradesh: Socio-Economic and Health Care Determinants

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### **Abstract:**

*The paper attempts to study the major factors that influence neonatal mortality in Uttar Pradesh state. Neonatal mortality is a major burden comprising nearly two thirds of infants deaths. Nearly 5 million neonates die each year in the world, of which 96 percent are in developing countries. In India neonatal mortality contributes 60 percent in the infant mortality. Improvement in neonatal survival is priority health agenda in India. The Uttar Pradesh state which are demographically lagging behind have neonatal and infant mortality higher than the national average. The study has tried to assess the level and trends of neonatal mortality and also the relative impact of demographic and health care determinants on neonatal mortality. Data from Sample Registration System and Reproductive Child Health District Level (2002-2004) has been used. The results reveals confirm the need to focus on factors leading to high risk of neonatal deaths. The determinants of neonatal mortality were mother age birth, higher order births, short births intervals, low birth weight, nutritional level of mother antenatal checkup, Institutional delivery and postnatal care.*

### **1. Introduction**

Improvement in neonatal & perinatal survival is priority health agenda in India. Almost 1.3 million newborn infants die every year before completing first four weeks of life, amounting to the highest burden of newborn deaths for any country in the world. Infant and child mortality rates are unacceptably high in many developing countries and need to remain the focus of public policy to gain improvement in infant and child survival. Infant and child mortality rates are used as summary indicators of social development, quality of life, overall health, child health, maternal health and welfare. During the last quarter of the past century major focus has been on reducing infant and child mortality. Neonatal mortality is highest burden comprising nearly two thirds of infant mortality. In the past decade the number of children dying worldwide has fallen by 2.2 million, or by 18 percent, infant deaths have been reduced from 25 percent to 7 percent i.e. more than half. Reducing infant and child mortality is major goal of strategy to achieve health for all. During the last quarter of the century emphasis has been placed on reducing child mortality largely through RCH program (immunization, oral rehydration and control of acute respiratory infections). Consequently, deaths among children over one month of age have sharply declined in the last three decades. These changes, however, did not have a marked impact among neonates (deaths occurring during the four weeks after birth) leading to the shifting to infant mortality. Early neonatal deaths is a serious concern both in developing and developed countries. According to the WHO more than half of the approximately 7.5 million infant death in the world occur in the first four weeks after birth. Ninety eight percent of these neonatal deaths occur in developing regions, 28 percent in least developed countries. Overall, there are 30 neonatal deaths per 1000 live births, 5 per 1000 in developed, 33 per 1000 in developing regions, and 42 per 1000 in least developed countries. This states that in developing regions, the risk of deaths in neonatal period is more than six times that of developed countries. The highest number of neonatal deaths occurs in Asia, which is where most children are born as mortality is very high in the south-central Asia sub region. Over 40% of global neonatal deaths take place representing a formidable challenge. The International conference on population development (ICPD, 1994) focused on reproductive health with the objective of enabling women to go safely through pregnancy and

childbirths and providing couples with the best chance of having healthy infant. The millennium declaration in 2000 and the United Nations special session on children in 2002 has set development goals, one of them reducing infant and child mortality by two-thirds between 1990-2015.

Infant mortality in India was very high in the decades prior to 1970 and started declining steady after 1975. There was a major decline of infant mortality from 1981 to 1991 and currently it is 45 per 1000 live births (SRS, 2005). The Ninth Five year plan of India has included the goal of reducing infant mortality between 50-60 per 1000 live births by 2002. The steady decline of infant and child mortality in the mid 1980's and early 1990's indicated that the national goals were within reach despite large disparities in infant and child mortality levels and health determinants in various states. However recent data indicates that the decline in the infant and child mortality is slowing down. Realising the importance of neonatal health, the Government of India has introduced Essential Newborn Care in the Safe motherhood and Reproductive and Child health programmes.

## 2. Determinants of Neonatal Mortality: A Review

Neonatal mortality is dominated more by bio-demographic and health care determinants rather than socio-economic determinants. The framework of Mosley and Chen (1984), focused on socio-economic, biological and environmental factors. All the socio-economic factors are expected to operate through these variables to effect alteration in child survival. However, recent frameworks have emphasized the critical role of health care and demographic factors as important determinants of neonatal mortality (Rutstein 2000). The direction and magnitude of the relationship between demographic and health care factors with neonatal mortality is as most populations that male mortality is generally found to be higher than female mortality at all ages. The males neonates are biologically weaker than the female and highly vulnerable to infectious diseases. The male mortality is pronounced in the first months of life i.e. in the neonatal period, diminishes considerably during post-neonatal period and essentially disappears in 12-59 months period (Bicego and Ahmad, 1996 and 2002). In India, female mortality is 14 percent lower than male mortality during the neonatal period however it is 19 percent higher than the male mortality in post-neonatal period (Pandey et al, 1998). The relationship between age of the mother and neonatal mortality is considered to be a "U" shaped. The data from National Family Health Survey I and II India shows higher risk of neonatal mortality among mothers less than 20 year of age. The same 'U' or 'J' shape relationship exists between birth order and neonatal mortality with lower changes of survival at both the extremes when women give births at a young age, they are at an increased risk of complications and child is also at increased risk of having low births weight and pre maturity. Increase in the percentage of births of mother under age 18 and over age 35 is associated with higher neonatal mortality. Other maternal factors such as then education and poor nutrition has negative impact on neonatal mortality.

## 3. Need for Study

Neonatal death is a serious problem requiring attention paid to understanding its causes and determinants especially in developing countries like India. The lack of interest in the study of neonatal mortality is due to variety of factors. Firstly, it is difficult to ascertain the causes of neonatal mortality in India where majority of deaths take place at home and are usually attended by untrained health personnel. Secondly, many factors contributing to neonatal mortality and morbidity have their origin long before a baby is born. These endogenous causes are primarily influenced by genetic makeup or circumstances arising before or during births. Infants suffering from congenital malformation, low births weight and prematurely etc leads to higher risk of neonatal deaths. Thirdly, neonatal deaths are often over shadowed by more popular indicators of health like infant and child mortality. The level of neonatal mortality is very high in Uttar Pradesh compared to other states in India and its reduction needs to be the central focus. Considering these factors, the present study attempts to the study the following objective.

## 4. Uttar Pradesh

Uttar Pradesh, the most populous Indian State is home to 166 million people or one sixth of the country's population. Uttar pradesh government has formulated its own policy level mandate related to RCH. The state population policy, plan on nutrition and programs for women, adolescents and the girl child focuses on various aspects of reproductive and child health.



## 5. Objectives

The specific objectives are:

- To study the level and trends in the neonatal mortality.
- To assess the impact of utilization of RCH services and its association with neonatal mortality.

## 6. Methods and Materials

The data from Reproductive Child Health Project District level house hold survey (DLHS-RCH ) and Sample Registration system (SRS, 1970-2004) have been used in the analysis. SRS gives the estimates of the levels of neonatal mortality for the state by rural and urban areas at annual basis.

It also provides information on utilization of maternal and child health services like antenatal care services, national care services and post natal care of the total house holds (72,050) interviewed in Uttar Pradesh, nearly 32 percent from urban area.

The results of the analyses are presented in three sections. First the level and trends of neonatal mortality in rural and urban of Uttar Pradesh are compared and discussed. Secondly part cover the differentials in neonatal mortality and levels of bio-demographic, health care factors using the tables and are discussed antenatal, antenatal and post natal care services have been described. Thirdly; mortality estimates for infant mortality, neonatal mortality and neonatal mortality in IMR have been analysed.

## 7. Analysis and Results

### 7.1. Levels and trends in neonatal mortality

The sample registration system (SRS) which is the main source of information on fertility and mortality indicators provides data at the national and state level. Neonatal mortality rates for the last 35 years are taken from SRS for UP state.

Level & Trends has been analyzed by making graphs. The trends in neonatal mortality has been presented the figure 1. In the last 34 year the UP state had consistent higher IMR as compared to India. Uttar Pradesh had the highest IMR and NMR in early 70's (IMR 94) but the declined faster from 1985 onwards (IMR 70) The trends of neonatal mortality (NMR) is oscillatory in nature. The declining trend of neonatal mortality is similar to the trend of infant mortality but decline is at a very slow rate but year between 1985-89 showed a faster decline when neonatal mortality was recorded as 70. Overall IMR and neonatal mortality decline shows similar trends in their decline in India and Uttar Pradesh.

The trend of neonatal mortality by type of residence indicates that neonatal mortality was always high in the rural areas as compared to the urban areas. For Uttar Pradesh as a whole, the neonatal death shows a declining trend in both in rural and urban areas year 1985 onwards. The neonatal mortality has fallen at a faster rate between 1970 and 2004 from 87 to 50. This implies that the share of neonatal mortality in infant mortality has increased over time. This is true the world over because neonatal mortality is inherently more difficult to reduce. Added to this is the fact that in large tracts of the country age at marriage and at childbearing among women continues to be unacceptably low, increasing the risk of complications at the time of childbirth for both the newborn and the mother.

### 7.2. Trends of Neonatal Mortality in Uttar Pardesh by type of Residence 1970-2005

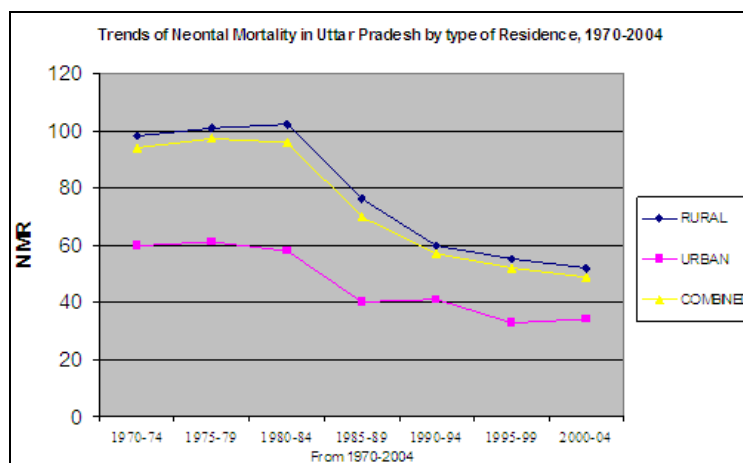


Figure 1: Neonatal Mortality Estimates for Uttar Pardesh by Rural – Urban Residence 1970-2004

### 7.3. Utilization of Maternal Care and Reproductive Health Services

The maternal care and reproductive health services to ensure safe motherhood is one of the Reproductive and child health (RCH) programme. The DLHS-RCH programme on antenatal care, includes at least three antenatal care visit, iron prophylaxis for pregnant and lactating women, at least one dose of tetanus toxoid vaccine, detection and treatment of anemia in mothers, and management an referral of high risk pregnancies, natal care, that is encouragement of safe delivery, post-natal care, and management of unwanted pregnancies. In rural areas, the government delivers reproductive health and other health services through its network of Sub-Centres. Primary Health Centre (PHCs) and other health facilities. The National Population Policy

(NPP), 2000 adopted by the Government of India reiterates the Government's commitments to the safe motherhood programme within the

Characteristics	15-19	20-24	15-24	25 +	All women
<b>Antenatal Check-up</b>					
At home by health worker	11.2	10.5	10.7	10.1	10.3
Out reach	49.8	51.8	51.4	44.8	47.5
Number of ANC visits					
No visit	39.1	37.6	37.9	45.1	42.1
1	14.4	10.0	11.0	8.8	9.7
2	23.4	25.2	24.8	22.6	23.5
3+	23.1	27.2	26.3	23.5	24.7
<b>Registration of pregnancy</b>					
No antenatal check-up	39.1	37.6	37.9	45.1	42.1
First trimester	19.8	24.9	23.8	20.7	22.0
Second Trimester	32.5	28.7	29.6	25.8	27.3
Third Trimester	8.6	8.7	8.7	8.5	8.6
Missing	0.0	0.1	0.1	0.0	0.0
<b>TT Injection</b>					
No TT	24.7	25.2	25.1	33.8	30.2
1	11.0	8.5	9.1	7.2	8.0
2+	64.1	66.0	65.6	58.6	61.5
Do not remember	0.2	0.2	0.2	0.3	0.2
<b>IFA tablets</b>					
No IFA/Syrup	47.1	48.5	48.2	56.8	53.2
Received but not consumed	8.3	6.7	7.1	5.6	6.2
Consumed one IFA per day	29.7	28.6	28.8	24.4	26.2
Received 100+ IFA tablets/syrup	6.7	9.6	9.0	8.5	8.7
Full antenatal Check-up	3.0	5.1	4.6	4.2	4.4
Number of women	2,826	9,975	12,801	18,335	31,137

Table based on women who had their last live/still birth since 1-1-1999/1-1-2001

Table 2: Antenatal Care Services

wider context of reproductive health. Among the national socio-demographic goals for 2010 specified by the policy, several goals pertain to safe motherhood that 80 percent of all deliveries should take place in institutions by 2010, hundred percent deliveries should be attended by trained personnel, and the maternal mortality rate should be reduced to a level below 100 per 100,000 live births and reduce IMR to below 30 per 1000 live births. Empowering women for improved health and nutrition is one of the 12 strategic themes identified in the policy to be pursued either as stand-alone programmes or as inter-sectoral programmes. In District Level Household Survey- Reproductive and Child Health phase – I, to all the eligible women who had their last pregnancy after January 1, 1999 a separate section on the status of maternal health and utilization of maternal health care services was canvassed. In DLHS-RCH Phase-II, the same section was canvassed to all the eligible women who had their last pregnancy after January 1, 2001. The women whose last pregnancy terminated into live/still birth were asked about the details of antenatal, natal and post-natal care they received; pregnancy, delivery and post-delivery complications they suffered from and the treatment seeking behaviour in case of complications. Women whose last pregnancy terminated into abortion, either spontaneous or induced, were asked about the utilization of safe abortion services and the post-abortion complications they experienced. The presents information on antenatal care services, natal care services, and post-natal care services received by women whose last pregnancy had terminated during the three years preceding the survey as live birth or as stillbirth.

#### 7.4. Antenatal Care Services

The information on antenatal care (ANC) services was collected from women who had given a birth during the three year preceding the survey. They were asked whether they had gone for antenatal check-ups outside the home, and what type of service provider had given them during the check-ups Table 2 percent the percentage of women who had given birth during the three years preceding the survey and information regarding the antenatal check-ups they had by preceding the survey, and information regarding antenatal check by age group.

### 7.5. Antenatal Check-ups

The women who received any kind of antenatal checkup during the pregnancy is 58 percent. Antenatal check ups are more common among younger women age below 25 year than among older women. The antenatal checkup at home by health worker (10.3 percent) and out of 47.5 percent. The approximate 42 percentage of women who had given live / still births during the three years preceding the survey and who did not receive any antenatal check-ups cited the main reason for not seeking check-ups as non availability of health facility in the village. To assess whether the women had received all the care during pregnancy, information was collected regarding number of antenatal visits, timing of the first visit, tetanus toxoid injections and supplement iron folic acid tablets. The results are presented in table 2. In Uttar Pradesh 25 percent under age group 25 received three or more check-ups, than 25 yrs it is 23.5 percent. The first antenatal check-ups shows that about one fifth (22 percent) of the women received their first antenatal check-up in the first trimester of pregnancy, and 27.3 percent received their first checkup in the second trimester, and 9 percent of women received their first check-up in the third trimester. A relatively higher proportion of women in the age group 20-24 (25 percent) as compared to the age group more than 25 (20 percent) had a check-ups in the first trimester pregnancy. A relatively higher proportion of women in the age group 15-19 (33 percent) received first antenatal care in second trimester compared to 28.7% the age group. Table 2 show that 62 percent of the women received two or more tetanus toxoid injections. Coverage of two or more TT injections is slightly higher in age group 20-24 (66 percent) than age group 15-19 (64 percent). The coverage of at least one tetanus toxoid is for age group 15-19 (11 percent) age group 20-24 (8.5 percent); and age group 25+ (7.2). 30.2 percent women did not received TT. The nutritional problem among women is an important concern because of their biological role in the reproduction. Low birth weight babies constitute a major public health problem in India. Nutritional deficiencies in women are often exacerbated during pregnancy because of the additional nutrient requirement of foetal growth, therefore a pregnant women needs six times more iron than a non-pregnant women. The information on receiving iron folic acid tablets/ syrup during pregnancy is also collected. Table 2 shows that women in UP consumed one IFA per day women is (26 percent) 6.7 percent in age group 15-19 and 9 percent in year 20-24 age group received full 100 tablets course. The percentage of women who received full antenatal care (that is, at least three antenatal check-ups, at least one tetanus toxoid injection and supplementary iron in the form of IFA tables daily for 100 days as recommended by the RCH programme) has been presented in table 2. Only 4 percent of women in Uttar Pradesh received full antenatal care.

### 7.6. Natal Care Services

Characteristics	15-19	20-24	15-24	25 +	All women
<b>Delivery characteristics</b>					
Normal	93.6	92.0	92.4	94.1	93.4
Caesarean	2.7	4.9	4.4	3.8	4.1
Assisted	3.7	3.0	3.1	2.0	2.5
<b>Place of delivery</b>					
Health institution	20.7	25.0	24.1	21.3	22.4
Public	9.7	9.8	9.8	7.7	8.5
Private	11.0	15.2	14.3	13.6	13.9
Home	78.9	74.5	75.5	78.4	77.2
Other	0.4	0.4	0.4	0.3	0.4
<b>Assistance during home delivery</b>					
Doctor	2.0	2.2	2.1	1.8	1.9
ANM/Nurse/LHV	7.5	7.5	7.5	5.3	6.2
TBA	5.8	6.0	6.0	6.3	6.2
Un-trained dai	39.5	48.6	46.5	53.2	50.5
Relative/friends	43.9	35.0	37.0	31.9	34.0
None	1.4	0.8	0.9	1.4	1.2
Safe delivery	28.2	32.2	31.3	26.8	28.7
Number of women	2,826	9,975	12,801	18,335	31,137
Table based on women who had their last live/still birth since 1-1-1999/1-1-2001					

Table 3: Natal Care Services

The percentage of home deliveries attended by health professionals do not differ much by women age. About 8-10 percent of birth were attended by health professionals for women age below 20 and 20-24 years. The un-trained dai 40 percent age group 15-19 and 49 percent of age group 20-24. The percentage of births attended by health professionals decreased steadily with increase in parity of women. The extent of safe deliveries varied substantially by background characteristics of women. Only 28.7 percent were safe deliveries with 31.5 percent safe in less than 25 year compared to 26.8 above 25 years.

### 7.7. Place of Delivery

Table 3 present the percentage of women age group by place of delivery and the selected background characteristics of women.. One of the thrust areas of the maternal and child health services is the encouragement of the safe delivery under proper hygienic condition and under the supervision of trained health personnel, to ensure better health of the mother and child. Most of the deliveries in the state were normal deliveries (93 percent) 77.2 percent were home deliveries. The proportion of caesarian deliveries is higher in age group 15-24 (4.4 percent) than the age group 25+ (3.8 percent). Most of the institutional deliveries (22.8%) had taken place in the private institutions (14 percent).

### 7.8. Assistance during Home Delivery

Further table 3 shows distribution of assistance during home delivery by selected background characteristics. Generally, assistance during delivery can be provide by medical staff (doctors, ANM/ Nurse/LHV, TBA un-trained dai ) and relative/friends etc. If more than one type of attendant assisted during the delivery, then only the more qualified person is considered. Only 2 percent of home deliveries were attended by doctors six percent by ANM/Nurse/LHV/TBH and 51 percent by untrained dais. 34 percent were attended by relatives and friends and 1 percent of home deliveries were not attended by anyone. Overall, health professionals attended 8 percent of deliveries that took place at home.

## 8. Postnatal Care

- Post Natal Care

Characteristics	15-19	20-24	15-24	25 +	All women
Percentage or women who were advised to have deliver at health facility	12.0	15.2	14.5	13.8	14.1
Percentage of women who were visited within 2 weeks of delivery	7.6	7.1	7.2	6.4	6.7
Percentage of women who were visited at least once within 6 weeks of delivery	10.0	9.4	9.5	8.6	9.0
Table based on women who had their last live/still birth since 1-1-1999/1-1-2001					

Table 4: Advised to have delivery at health facility and follow-up services for postpartum check-up

The health of a mother and her new born child depends not only on the health care the mother receives during her pregnancy and delivery but also on the care she and the infant receive during the first few weeks after delivery. Postnatal check ups soon after the delivery are particularly important for births that take place in non institutional settings. Recognizing the importance of postnatal check-ups, the Reproductive and Child Health Programme recommends three postnatal visits (Ministry of Health and Family Welfare, 1997). Table 4 presents the proportion of women by advised to have delivery at health facility and follow-up services for postpartum check-up, post – delivery complication and type of treatment of these complications by background characteristics. About 6.7 percentage of women who were visited within 2 weeks of delivery. 14.1 percent of women were advised to have deliver at health facility and only 9 percentage of women were visited at least once within 6 week of delivery. Infant and child mortality rates reflect country's level of socioeconomic development and quality of life and are used for monitoring and evaluating population and health programmes and policies. Table 5 shows neonatal, post-neonatal, infant mortality, child mortality rate, under five mortality (5q0) and percentage share of neonatal mortality in IMR for DLHS 2002-04 of fifty percentage sample population per district in Uttar Pradesh. The mortality condition in Uttar Pradesh varies to district to district. The neonatal mortality in Uttar Pradesh varies from varies from low Firozabad (29.4) and highest Lalitpur (82.6). The Postneonatal mortality rate in varies the highest in Sitapur ((47.1) and low kanpur Nagar (15.1) per 1000 live births. The infant mortality rate is low in Muzaffar Nagar (52) and highest Etah (123.1) per live births. The child mortality rate (at age 1-4 year) in low Etah (18.2) and highest Kaushambi (71.5) per 1000 children. The under five mortality (5q0) low Muzaffar Nagar (82.3) and highest Lalitpur (175.7) die before reaching age five. Further the percentage of neonatal mortality in IMR in different district in Uttar Pradesh varies. The international experience, however, suggests that the proportion of neonatal mortality in IMR increased with the reduction in IMR. The decline in infant mortality in India will primarily depend upon reducing neonatal mortality. As was noted earlier, the factors that determine neonatal mortality and its causes have yet to be explicitly examined. Hence, what follows is mainly an attempt to put together the main factors that are associated with the neonatal mortality.

## 9. Discussion and Conclusion

The analysis mortality brought out major determinants of neonatal mortality in Uttar Pradesh to examine the importance of the factors influencing the neonatal mortality. However, it is difficult to get information on all the determinants in a single survey. From the above discussion it is clear that all the 7 proximate determinants are not of equal importance in India. The impact of demographic factors, and effects of antenatal and delivery care on neonatal mortality, specifically, the effects of number of antenatal care visits, immunization of pregnant women against tetanus, taken IFA tablets and management and referral of high risk pregnancies, natal care, that is encouragement of safe delivery, post-natal care and management of unwanted pregnancies. Another probable determinant of neonatal mortality is mothers under nutrition given the high level of nutritional deficiency observed in the Uttar Pradesh. The women whose last pregnancy terminated in to live/still births were asked about the details of antenatal, natal and postnatal care they received pregnancy, delivery and post-delivery complications they suffered from and the

treatment seeking behaviour in case of complications. The presents information on antenatal, natal and postnatal care received by women whose last pregnancy had terminated during the three years preceding the survey as live or as still birth. Tetanus is one of the major cause of neonatal mortality in developing countries (stanfield and Galazka, 1984). It is highly recommended that pregnant women receive at least two doses of tetanus toxoid vaccine (Datur et al 1999; Jones 1983). Some of the independent variables contain different dimensions so as to assess the extent of mortality experienced by each group compared to a reference category. For instance, the age of the mother at the time of births is grouped in the three categories (15-19 years, 20-24 and 25 and above) with reference group being 20-24 years. The differentials in neonatal, post neonatal, infant, child and under five mortality will be as levels and differentials in perinatal mortality. These mortality rates are relevant to a demographic assessment of the population and are an important measure of country's level of socioeconomic development and quality of life and monitoring and evaluating health programmes.

The current study suggests that an effective reduction in infant mortality depends primarily on controlling neonatal deaths as it constitutes over 65 percent of all infant deaths in India. The strategies adapted to ensure child survival thus far helped children beyond one month of age. As a result there has been a shifting of infant mortality towards early days. Neonatal mortality shows both changing trends and variations amongst the Uttar Pradesh, apart from the fact that it is higher than the national average. One important step towards achieving a reduction of neonatal mortality is to carefully understand its major determinants in the state. The attempt in the analysis was carried out using the DLHS-RCH 2002-04 data to assess the importance of utilization of the reproductive health services. The various factors that could influence neonatal outcome were identified. It brought out the importance of factors like antenatal care services particularly number of antenatal care visits at least on tetanus toxoid injection and supplementary iron in the form of IFA tablets. Natal care services reducing neonatal mortality to encourage deliveries under proper hygienic conditions under the supervision of trained health professionals and provision of safe delivery services. The health of mother and her newborn child depends not only on the health care she receives during her pregnancy and delivery but also care of the infant receiving during the first few weeks after delivery. Among health care interventions, immunization of pregnant women against tetanus, IFA tablets etc., natal care services and postnatal care service has a substantial effect in reducing neonatal mortality.

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