FACTORS AFFECTING NEONATAL MORTALITY IN A HILLY AREA OF NORTHEAST INDIA: A REGISTRY BASED STUDY

Neeraj Tiwari* and Rajkumari Sanatombi Devi**

ABSTRACT

The objectives of this study were to explore the use of local civil registration data to analyze the factors associated with neonatal mortality (0-28 days) in Sikkim between January 2000 and December 2012. Three variables age, sex and types of residence of the mother were considered in the analysis. The study was a descriptive, retrospective study based on the secondary data published by Government of Sikkim. The neonatal mortality rate was 6.9 per 1000 live births and early (0-6 days) and late (7-28 days) neonatal mortality rates constitutes 5.02 and 1.82 deaths per 1000 live births respectively and significant differences in mortality were existed between them during the study period. The results highlighted that neonatal mortality were higher among male’s neonates (7.64 per 1000 live births) as compared to female’s neonates (6.04 per 1000 live births) which was statistically significant. The maximum number of neonatal (0-28 days) mortality occurred in rural (14.25 per 1000 live births) while in urban it was 1.71 per 1000 live births. Rural-urban differences in neonatal mortality rates were found to be significant in the study.

Keywords: Neonatal mortality, Rural-urban differentials, Early neonatal deaths, Late neonatal deaths,

The term neonate refers to a live born infant from birth to before reaching 28 completed days of age whereas neonatal mortality rate (NMR) refers to the number of live born babies who die in the first 28 days after birth per 1000 live births.

*Professor and Head, Department of Statistics, Kumaun University, S.S.J. Campus, Almora-263601, Uttarakhand, India.**Lecturer, Statistics and Epidemiology Cell, Department of Community Medicine, Sikkim Manipal Institute of Medical Sciences, 5th Mile Tadong, Gangtok: 737102, Sikkim, India; E-mail: rajkumari.sd@gmail.com.
births. Neonatal deaths may be subdivided into early neonatal deaths, occurring during the first seven days of life, and late neonatal deaths, occurring after the seventh day but before the 28 completed days of life. The neonatal period commences at birth and ends 28 completed days after birth.

It is necessary to make this distinction since the causes of mortality in these two periods differ in some respects. Worldwide the risk of children dying under the age of five has fallen but the number of deaths in neonatal period has actually increased. Globally, an estimate of 10.6 million children under-five years died in 2000, declining to 8.8 million in 2008 and further to 7.7 million in 2010. However, the share of neonatal deaths increased from 37 per cent in 2000 to 41 per cent in 2008. Within the neonatal period an estimated 50 per cent of all deaths are within the first 24 hours while 75 per cent are within the first week of life. One of the 130 million babies born every year, about 4 millions die in the first 4 weeks of life each year and world-wide neonatal mortality makes up 40 per cent of the total child mortality. Ninety-nine (99%) of all children who die during the first 4 weeks of life are doing so in the poorer parts of the world, especially in sub-Saharan Africa and South Asia, where there are lacks of proper health care facilities.

Throughout the period 1990–2009, India has been the country with largest number of neonatal deaths. In India alone, around one million babies die each year before they complete their first month of life, contributing to one-fourth of the global burden. According to the various report of Sample Registration System (SRS) published by Registrar General of India, the infant mortality in India fell down from 80 in 1990 to 68 in 2000, 50 in 2009 and further decline to 44 in 2011. According to the latest 2013 SRS report, infant mortality rate in India was 42. In rural areas it was 46 (male 45, female 48), while in urban areas it was 28 (male 26 and female 29). According to NHFS - 3 (2005-06) report, neonatal mortality rate (NMR) in India was 39 per 1000 live births, with rural and urban rates being 42.5 and 28.5 per 1000 live births, respectively. There was only a decrease of 20.4 per cent in the national NMR from 1992-93 (49 per 1000 live births) to 2005-06 (39 per 1000 live births).

One of the United Nation’s Millennium Development Goal is to reduce the under-five childhood mortality to 30 per 1000 live births by 2015 and since 40 per cent of all deaths in children under-five years of age is shared by neonatal deaths, main focus should be on reducing neonatal mortality. In order to achieve this goal, we need to address the variation that exists in neonatal mortality.

Sikkim, a small hilly state in the eastern Himalayas is situated in the north eastern
part of India. It is surrounded by China and Tibet in the North; Bhutan in the South East; West Bengal, India in the South and Nepal in the West. It became the 22nd state of India in 1975 and it is the second smallest state of India after Goa in terms of area with 7096 sq. km. It constitutes 0.22 per cent of the total geographical area of India. The population of the state according to 2011 census provisional data is 607,688 with 321,661 (52.9%) males and 286,027 (47.1%) females against 5, 40,493 in 2001 census, recording a net accretion of 67195 persons in a decade. This showed a change of 12.36 per cent from the last decade. it is the least populated state in India and constitutes 0.05 per cent of total population of India. During 2011 census, the administrative structure of the state constitutes 4 districts, 9-sub division, 452 villages and 9 towns and the sex ratio of the state is 889 as against 878 in 2001 and the percentage of child (0-6 years) population is 9.86 per cent. The literacy rate of the state is 84.67 per cent. According to the survey report of NFHS- 3 (2005-06), infant mortality continues to decline in Sikkim at 34 which were 44 in NFHS-2 (1998-99). According to the latest Sample Registration System (SRS) 2013 report, published by Registrar General of India, the IMR for Sikkim was 24 per 1000 live births. In rural areas it was 25 and in urban areas it was 16 per 1000 live birth.

OBJECTIVES

This study has the following objectives:

• to explore the use of local civil registration data;

• to find out the significant differences in mortality rates between early (0-6 days) and late (7-28 days) neonatal periods of life; and

• to examine the significant differences in neonatal mortality rates by sex and types of residence in Sikkim during January 2000 to December 2012.

METHODOLOGY

This is a descriptive and retrospective study. The study used the secondary data for the analysis. All the registered live births and deaths occurred in rural and urban during the neonatal periods (0-28 days) of life were filtered from January 2000 to December 2012 annual statistics reports on registration of births and deaths published by Government of Sikkim.

For the descriptive analysis, frequencies, percentages, proportion and rates were calculated, and 95% confidence intervals (CIs) were determined for mortality rates in rural neonates compared with urban neonates for each years. The mortality
rate was calculated as number of deaths divided by total live births and multiplied by 1000. The study used the t-test for finding statistical significant between the neonatal mortality rates. Chi-square test was used to compare differences in neonatal mortality among males and females neonates and types of residence of the mothers. Data were analyzed by using SPSS (Version 16.0)

Variables’ Definitions

1. The neonatal period commences at birth and ends 28 completed days after birth.

2. Neonatal Mortality Rate (NMR): This refers to the number of deaths in infant less than 28 days of age per 1,000 live births in a given year or period. It is again subdivided as
   a) Early Neonatal Mortality Rate (ENMR) (0-6 days): This refers to the number of live born infants who die during the first six days of life per 1,000 live born infants.
   b) Late Neonatal Mortality Rate (LNMR) (8- 28 days): This refers to the number of live born infants who die after the seventh day but before 28 completed days of life per 1,000 live born infants, (WHO, 2010).

3. Type of residence: It was classified into rural and urban areas according to the definition given by Registrar General of India. Rural- urban differences were reported on the basis of the residence of mother at the time of child births.

FINDINGS

Table 1 depicts that between 2000 and 2012 there were 130965 live births and 897 neonatal deaths (0 -28 days), giving an average neonatal mortality rate of 6.9 per 1000 live births (range 2.7 to 11.4). The table also revealed that the maximum number of neonatal mortality 658 (5.02 per 1000 LB) occurred in the first week of life (0-6 days) while 239 (1.82 per 1000 LB) occurred in the late neonatal period (7- 28 day). The highest neonatal mortality rate was observed in 2011 (11.35 per 1000 LB) and lowest in 2001 (2.72 per 1000 LB). The mean value of the early neonatal was found to be 5.10 with a standard deviation of 2.21 while for late neonatal period it was observed to be 1.84 with a standard deviation of 0.60. The study results showed that there were significant different in mortality between early and late neonatal period of the life of the child (t= 5.16, d.f=24, P< 0.001).
TABLE 1

YEAR-WISE DISTRIBUTION OF NEONATAL (0-28 DAYS) MORTALITY RATE (PER 1000 LIVE BIRTHS) BY AGE IN SIKKIM, 2000-2012

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Live Birth</th>
<th>Early Neonatal (0 – 6 Days)</th>
<th>Late Neonatal (7 – 28 Days)</th>
<th>Neonatal (0 – 28 Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deaths</td>
<td>Rate*</td>
<td>Deaths</td>
<td>Rate*</td>
</tr>
<tr>
<td>2000</td>
<td>9610</td>
<td>22</td>
<td>9</td>
<td>0.94</td>
</tr>
<tr>
<td>2001</td>
<td>9922</td>
<td>13</td>
<td>14</td>
<td>1.41</td>
</tr>
<tr>
<td>2002</td>
<td>10322</td>
<td>21</td>
<td>11</td>
<td>1.07</td>
</tr>
<tr>
<td>2003</td>
<td>11585</td>
<td>48</td>
<td>20</td>
<td>1.73</td>
</tr>
<tr>
<td>2004</td>
<td>11809</td>
<td>66</td>
<td>25</td>
<td>2.12</td>
</tr>
<tr>
<td>2005</td>
<td>11266</td>
<td>61</td>
<td>11</td>
<td>0.98</td>
</tr>
<tr>
<td>2006</td>
<td>10886</td>
<td>60</td>
<td>28</td>
<td>2.57</td>
</tr>
<tr>
<td>2007</td>
<td>10232</td>
<td>49</td>
<td>27</td>
<td>2.64</td>
</tr>
<tr>
<td>2008</td>
<td>9755</td>
<td>61</td>
<td>19</td>
<td>1.95</td>
</tr>
<tr>
<td>2009</td>
<td>9612</td>
<td>58</td>
<td>18</td>
<td>1.87</td>
</tr>
<tr>
<td>2010</td>
<td>8610</td>
<td>54</td>
<td>19</td>
<td>2.21</td>
</tr>
<tr>
<td>2011</td>
<td>8635</td>
<td>76</td>
<td>22</td>
<td>2.55</td>
</tr>
<tr>
<td>2012</td>
<td>8721</td>
<td>69</td>
<td>16</td>
<td>1.83</td>
</tr>
<tr>
<td>Total</td>
<td>130965</td>
<td>658</td>
<td>239</td>
<td>1.82</td>
</tr>
</tbody>
</table>

*Rate: Deaths per 1000 live births

Source: Various Statistical Reports on Registration of Births and Deaths of respective years, Births and Deaths Cell, Human Care, Human Services and Family Welfare, Government of Sikkim.

Table 2 represents the year-wise distribution of neonatal mortality by sex in Sikkim during January 2000 to December 2012. It was observed that male neonatal mortality rates were higher than the female’s mortality rates during this period. Out of 66218 male live births, 506 males neonate died during this period giving an average male neonatal mortality rate of 7.64 per 1000 LB. Table 3 also shows that out of 64747 live born females, 391 died in neonatal period (0-28 days). The female neonatal mortality rate was observed to 6.04 per 1000 LB during this period. The male-to-female ratio in neonatal mortality was 1.3. The highest male neonatal mortality rate occurred in 2011 (12.89 per 1000 LB) and lowest in 2001 (2.93 per 1000 LB) while for female neonates it was highest in 2012 (9.77 per 1000 LB) and lowest in 2000 (2.32 per 1000 LB).
Table 3 showed the characteristics of neonatal mortality rate among the male and females children in the state during 2000 to 2012. The study found that there were significant differences between males and females neonatal mortality rates (Chi-square value = 12.19, d.f=1, P < 0.001).

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Male live Births</th>
<th>No. of Male Neonatal Mortality</th>
<th>Male Neonatal Mortality Rate per 1000 live births</th>
<th>No. of Female live Births</th>
<th>No. of Female Neonatal mortality</th>
<th>Female Neonatal mortality rate per 1000 live births</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>4865</td>
<td>20</td>
<td>4.11</td>
<td>4745</td>
<td>11</td>
<td>2.32</td>
</tr>
<tr>
<td>2001</td>
<td>5116</td>
<td>15</td>
<td>2.93</td>
<td>4806</td>
<td>12</td>
<td>2.50</td>
</tr>
<tr>
<td>2002</td>
<td>4582</td>
<td>15</td>
<td>3.27</td>
<td>5740</td>
<td>17</td>
<td>2.96</td>
</tr>
<tr>
<td>2003</td>
<td>5965</td>
<td>44</td>
<td>7.38</td>
<td>5620</td>
<td>24</td>
<td>4.27</td>
</tr>
<tr>
<td>2004</td>
<td>6025</td>
<td>48</td>
<td>7.97</td>
<td>5784</td>
<td>43</td>
<td>7.43</td>
</tr>
<tr>
<td>2005</td>
<td>5764</td>
<td>39</td>
<td>6.77</td>
<td>5502</td>
<td>33</td>
<td>6.00</td>
</tr>
<tr>
<td>2006</td>
<td>5595</td>
<td>45</td>
<td>8.04</td>
<td>5291</td>
<td>43</td>
<td>8.13</td>
</tr>
<tr>
<td>2007</td>
<td>5161</td>
<td>49</td>
<td>9.49</td>
<td>5071</td>
<td>27</td>
<td>5.32</td>
</tr>
<tr>
<td>2008</td>
<td>4999</td>
<td>43</td>
<td>8.60</td>
<td>4756</td>
<td>37</td>
<td>7.78</td>
</tr>
<tr>
<td>2009</td>
<td>4921</td>
<td>43</td>
<td>8.74</td>
<td>4691</td>
<td>33</td>
<td>7.03</td>
</tr>
<tr>
<td>2010</td>
<td>4383</td>
<td>45</td>
<td>10.27</td>
<td>4227</td>
<td>28</td>
<td>6.62</td>
</tr>
<tr>
<td>2011</td>
<td>4422</td>
<td>57</td>
<td>12.89</td>
<td>4213</td>
<td>41</td>
<td>9.73</td>
</tr>
<tr>
<td>2012</td>
<td>4420</td>
<td>43</td>
<td>9.73</td>
<td>4301</td>
<td>42</td>
<td>9.77</td>
</tr>
<tr>
<td>Total</td>
<td>66218</td>
<td>506</td>
<td>7.64</td>
<td>64747</td>
<td>391</td>
<td>6.04</td>
</tr>
</tbody>
</table>

Source: Various Statistical Reports on Registration of Births and Deaths of respective years, Births and Deaths Cell, Human Care, Human Services and Family Welfare, Government of Sikkim.
TABLE 3
THE CHARACTERISTICS OF NEONATAL DEATHS BY SEX IN SIKKIM, 2000-2012

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Male (%)</th>
<th>Female (%)</th>
<th>Total</th>
<th>Chi-square Value</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Live births</td>
<td>66218 (50.56)</td>
<td>64747(49.44)</td>
<td>130965</td>
<td>12.19</td>
<td>0.001</td>
</tr>
<tr>
<td>Total Neonatal deaths</td>
<td>506 (56.41)</td>
<td>391(43.59)</td>
<td>897</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 1 shows the trends of the distribution of neonatal mortality rate by sex in Sikkim during January 2000 to December 2012. The figure illustrated that male neonatal mortality rate showed a steep increased while among the female neonates there was a slow fluctuation in increased mortality during this period. Male neonatal rate decreased in 2001, 2005, 2008 and 2012 while female neonatal rate decreased in 2005, 2007 and 2010. Male neonatal mortality rate increased from 4.11 in 2000 to 7.73 in 2012 while female neonatal mortality rate increased from 2.32 in 2000 to 9.77 in 2012. It indicates an average annual percentage change of 11.48 for males’ neonates and 26.76 for female neonates during the study period.

FIGURE 1

DISTRIBUTION OF NEONATAL MORTALITY RATE BY SEX IN SIKKIM, 2000 TO 2012
As shown in Table 4 it was observed that neonatal mortality in rural areas was much higher than in urban areas. Out 897 neonatal deaths, the maximum number 765 (14.25 per 1000 LB) of neonatal deaths occurred in rural areas while in the urban areas it was 132 (1.71 per 1000 LB). The highest neonatal mortality rate in rural areas was observed in 2012 (37.33 per 1000 LB) and lowest in 2001 (3.54 per 1000 LB). Neonates in rural areas were 8.3 times more likely to die than neonate in urban areas. The highest neonatal mortality in urban areas occurred in 2003 (3.75 per 1000 LB) followed by 2004 (3.05 per 1000 LB). It was also observed that there were no cases of neonatal mortality in urban in 2002 and 2012.

**TABLE 4**

YEARWISE DISTRIBUTION OF NEONATAL MORTALITY RATE (PER 1000 LIVE BIRTHS) IN RURAL AND URBAN AREAS IN SIKKIM, 2000-2012

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Live Birth in Rural</th>
<th>No. of Neonatal Deaths in Rural</th>
<th>Mortality Rate in Rural</th>
<th>95% C.I in rural</th>
<th>No. of Neonatal Infant Deaths in Urban</th>
<th>Mortality Rate in Urban</th>
<th>95% C.I in Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>4745</td>
<td>21</td>
<td>4.43</td>
<td>2.53</td>
<td>3.33</td>
<td>10</td>
<td>2.06</td>
</tr>
<tr>
<td>2001</td>
<td>4769</td>
<td>17</td>
<td>3.56</td>
<td>1.87</td>
<td>3.14</td>
<td>10</td>
<td>1.94</td>
</tr>
<tr>
<td>2002</td>
<td>5069</td>
<td>32</td>
<td>6.31</td>
<td>4.13</td>
<td>0.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>2003</td>
<td>5711</td>
<td>46</td>
<td>8.05</td>
<td>5.73</td>
<td>5.31</td>
<td>22</td>
<td>3.75</td>
</tr>
<tr>
<td>2004</td>
<td>5257</td>
<td>71</td>
<td>13.51</td>
<td>10.36</td>
<td>4.39</td>
<td>20</td>
<td>3.05</td>
</tr>
<tr>
<td>2005</td>
<td>4821</td>
<td>55</td>
<td>11.41</td>
<td>8.39</td>
<td>3.89</td>
<td>17</td>
<td>2.64</td>
</tr>
<tr>
<td>2006</td>
<td>4443</td>
<td>81</td>
<td>18.23</td>
<td>14.26</td>
<td>1.89</td>
<td>7</td>
<td>1.09</td>
</tr>
<tr>
<td>2007</td>
<td>4158</td>
<td>68</td>
<td>16.35</td>
<td>12.47</td>
<td>2.23</td>
<td>8</td>
<td>1.32</td>
</tr>
<tr>
<td>2008</td>
<td>3862</td>
<td>71</td>
<td>18.38</td>
<td>14.11</td>
<td>2.53</td>
<td>9</td>
<td>1.53</td>
</tr>
<tr>
<td>2009</td>
<td>3375</td>
<td>69</td>
<td>20.44</td>
<td>15.62</td>
<td>1.95</td>
<td>7</td>
<td>1.12</td>
</tr>
<tr>
<td>2010</td>
<td>2745</td>
<td>62</td>
<td>22.59</td>
<td>16.96</td>
<td>2.98</td>
<td>11</td>
<td>1.88</td>
</tr>
<tr>
<td>2011</td>
<td>2442</td>
<td>87</td>
<td>35.63</td>
<td>28.14</td>
<td>2.83</td>
<td>11</td>
<td>1.78</td>
</tr>
<tr>
<td>2012</td>
<td>2277</td>
<td>85</td>
<td>37.33</td>
<td>29.39</td>
<td>0.00</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td>53674</td>
<td>765</td>
<td>14.25</td>
<td>13.24</td>
<td>2.00</td>
<td>132</td>
<td>1.71</td>
</tr>
</tbody>
</table>

Source: Various Statistical Reports on Registration of Births and Deaths of respective years, Births and Deaths Cell, Human Care, Human Services and Family Welfare, Government of Sikkim.
Table 5 showed the characteristics of neonatal mortality in rural and urban areas in Sikkim during January 2000 to December 2012. The difference in neonatal mortality rates in rural and urban areas were found to be significant during the study period (Chi-square value= 7.21 d.f=1, P< 0.001).

**TABLE 5**

THE CHARACTERISTICS OF RURAL AND URBAN NEONATAL DEATHS IN SIKKIM, 2000-2012

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Rural (%)</th>
<th>Urban (%)</th>
<th>Total</th>
<th>Chi-square Value</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Live Births</td>
<td>53674(4.10)</td>
<td>77291(95.90)</td>
<td>130965</td>
<td>7.21</td>
<td>0.001</td>
</tr>
<tr>
<td>Total Neonatal Deaths</td>
<td>765 (85.28)</td>
<td>132 (14.72)</td>
<td>897</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 2 depicted the year-wise distribution of neonatal mortality rate in rural and urban areas. It showed that there has been an increasing trend in neonatal mortality in rural areas except in the years 2001, 2005 and 2007. The neonatal mortality rate increased from 4.43 in 2000 to 37.33 in 2012 per 1000 LB. The average annual percentage change was 61.89 in rural areas. However, the trend of neonatal deaths for urban areas revealed a pattern of consistency during 2000 to 2012. In urban areas the neonatal mortality rate showed a declination during this 13 years study period. The neonatal mortality rate in urban areas decreased from 2.06 in 2000 to 0.00 per 1000 LB in 2012. The average annual percentage change in urban areas was 8.33 per 1000 live births.

**FIGURE 2**
DISCUSSION

The neonatal period carries the highest risk of death in human life. In present study, the overall calculated neonatal mortality (0-28 days) rates was 6.85, early neonate mortality (0-6 days) rate 5.02 and late neonatal mortality (7-28 days) rate 1.82 per 1000 live births. According to NFHS-3 (2005-06) neonatal mortality rate in Sikkim was 19.4 which was 26.3 in NFHS-2 (1998-99)\textsuperscript{16}. Study of Sharifzadeh et al. (2008) conducted in Iran showed that 57.7 per cent of the total deaths were neonatal and 42.3 per cent were postneontal. Out of 90 cases of death under one month (neonatal), 28.9% were during the first 24 hours after birth, 42.2 per cent between 1-7 days, and 28.9 per cent at the age 8-28 days\textsuperscript{17}.

In the present study, it was observed that the number of death for male infants is more than the number of female infant deaths during the neonatal period. Out of total 897 neonatal deaths, 506 were males and 391 were female. The study showed that neonatal mortality rate for males were 7.64 and 6.04 per 1000 live births were females. The sex difference in mortality in was 1.6 per 1000 live births. This is in support to the medical belief that neonatal mortality is higher in boys than in girls because newborn boys are biologically more fragile than girls\textsuperscript{18}. In the current research, study male neonates were 1.3 times more likely to die than females which were similar to the finding of other study\textsuperscript{19}. Girls in Sikkim have a lower mortality risk than boys during the neonatal period, but a slightly higher mortality risk than boys during the post-neonatal period\textsuperscript{16}.

Place of residence has, for centuries, been implicated as a health determinant.\textsuperscript{20} Neonatal mortality in rural and urban areas was 14.25 and 1.71 per 1000 live births in the present study. In a study conducted in Gujarat, it has been found that neonatal mortality was 1.70 times higher in rural area than urban area.\textsuperscript{21} Authors Kabir and Chowdhury have explained that urban-rural differentials may be attributed to different health care services including higher coverage with immunization, safe delivery of births and access to health care services\textsuperscript{22}. However, the improvement of health facilities in rural areas may have helped to eliminate this differences\textsuperscript{23}. Evidence has suggested that these deaths could be prevented by simple, inexpensive practices and interventions during the pregnancy, delivery and postnatal period\textsuperscript{24}.

CONCLUSION

The study found that there were significant differences in mortality according to the age of the child. Higher incidence of deaths was observed among the early neonates than the late neonates. The study also highlighted that neonatal mortality was higher among the male neonates as compared to female neonates which was statistically significant. The statistical finding of the study can be interpreted in another way that no sex bias in mortality was observed in this
present study which indicates a good social status of women in the society. The study also reveals significant differential in mortality according to the place of residence of the mothers. Rural mothers faced more cases of neonatal mortality than their urban counterparts which may be because of disparities that exist in socio-economic conditions, health infrastructures and poor road transportation problems within the state. It indicates that the type of place of residence is also an important determinant of child survival in the state.

Limitation of the Study

Since the study is based on the registered live birth and deaths occurred mostly in hospital setting, so the results are difficult to interpret for the entire state.

Acknowledgements: The authors thank the Chief Registrar and his staff, Births and Deaths Cell, Department of Health Care, Human Services and Family Welfare, Government of Sikkim for providing the data for analysis of this study.

REFERENCES


This journal is indexed / abstracted by the following:

- Index Medicus for WHO, South-East Asia Region, WHO, New Delhi;
- Indian National Scientific Documentation Centre, New Delhi;
- Cambridge Scientific Abstracts, Bethesda, MD, U. S. A.;
- IndMED: A Bibliographic Database of Indian Bio-Medical Research, New Delhi;
- EMBASE, The Excerpta Medica Database, Netherlands;
- All India Index to Periodical Literature in English Database, Hyderabad;
- Global Health Database, CAB International Publishing, Wallingford, The United Kingdom; and
- Guide to Indian Periodical Literature, Indian Documentation Services, Gurgaon, Haryana.

Papers published in the Journal-“Health and Population: Perspectives and Issues’ are also available on www.nihfw.org
STATEMENT ABOUT OWNERSHIP AND OTHER PARTICULARS ABOUT ‘HEALTH AND POPULATION-PERSPECTIVES AND ISSUES’, REQUIRED UNDER THE REGISTRATION OF NEWSPAPERS (CENTRAL RULES 8)

FORM IV
(Rule 8)

1. Place of Publication
   National Institute of Health and Family Welfare,
   Baba Gang Nath Marg, Munirka,
   New Delhi-110067

2. Periodicity of the Publication
   Quarterly

3. Printer’s Name
   Prof. Jayanta K. Das
   Nationality: Indian
   Address: Director
   National Institute of Health and Family Welfare
   Baba Gang Nath Marg, Munirka
   New Delhi-110067

4. Publisher’s Name
   Prof. Jayanta K. Das
   Nationality: Indian
   Address: Director
   National Institute of Health and Family Welfare
   Baba Gang Nath Marg, Munirka
   New Delhi-110067

5. Editor-in-Chief’s Name
   Prof. Jayanta K. Das
   Nationality: Indian
   Address: Director
   National Institute of Health and Family Welfare
   Baba Gang Nath Marg, Munirka
   New Delhi-110067

6. Editor’s Name
   Prof. Neera Dhar
   Nationality: Indian
   Address: National Institute of Health and Family Welfare
   Baba Gang Nath Marg, Munirka
   New Delhi-110067

7. Name and addresses of individuals who own the newspaper and partners or shareholders holding more than one per cent of the total capital
   National Institute of Health and Family Welfare
   Baba Gang Nath Marg, Munirka
   New Delhi-110067

I, Prof. Jayanta K. Das, hereby declare that the particulars given above are true to the best of my knowledge and belief.

Sd/
(Prof. Jayanta K. Das)