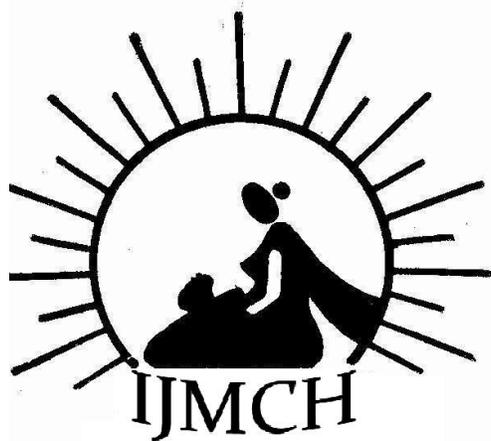**Rural - Urban and Sex Differentials in Infant**

Mortality in Sikkim

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To find out the rural urban and sex differentials in infant mortality in Sikkim during 2000 to 2010.

Rural - Urban and Sex Differentials in Infant Mortality in Sikkim

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ABSTRACT

Background: The level of infant mortality varies with the types of the residence of the mothers and the sex of the newly born child also influence on the probability of the survival of the child are poorly understood in many societies and these differences still can't be completely abolished in the societies by the societies in many developing countries.

Objectives of the study: To find out the rural urban and sex differentials in infant mortality in Sikkim during 2000 to 2010.

Methods and Findings: Registered birth and deaths records obtained from various Annual Vital Statistics Reports of Civil Registration system published by Government of Sikkim were used to investigate the differences in infant mortality in rural and urban areas and sex differentials in infant mortality between January 2000 to December 2010. A total of 100943 live births were recorded in Sikkim during this period. Out of 1441 infant deaths, 615(43%) occurred in rural areas and 826 (57%) occurred in urban areas. Average infant mortality in rural was 14.4 per 1000 live births while for urban areas it was 14.1 per 1000 live births and there were no significant difference between rural and urban infant mortality during this period (chi-square test =1.37, P > 0.05). Out of 1441 infant deaths, 814 (56.5%) were males and 627 (43.5%) were female deaths. The risk of the male infant deaths was 1.3 times of the females. The infant mortality rates were 14 and 13 per 1000 live births for males and females infant deaths respectively and statistical significant difference in mortality between males and females infants were observed in this study. (Chi-square test = 21.05, P<0.01).

Conclusions: There were no significant difference between the infant deaths in rural and urban areas and significant differences in mortality were observed between the males and female infants.

Keywords: rural urban differences*, sex differential, infant* mortality rate, live birth, Sikkim

INTRODUCTION

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.[1]

One of the aims of UN Millennium Development Goal 4 (MDG 4) is to reduce mortality of children younger than 5 years by two-thirds by 2015, but many countries, especially in south Asia and sub-Saharan Africa, are not on track to meet this target.[2] In case of India this would imply a reduction of the infant mortality rate to 27 and of the under- five mortality to 32 by 2015.[3]

Biological, social and behavioral factors have resulted in differences in the most common causes of death for males and females' infant deaths. [4] An infant mortality rate is an outcome rather a cause and hence directly measures results of the distribution and use of resources.[5]

There are significant variations in child mortality among the various regions of the World. About half of under-five deaths occur in only five countries: India, Nigeria, Democratic Republic of the Congo, Pakistan and China. India (22 percent) and Nigeria (11 percent) together account for a third of all under-five deaths.[6]

There is substantial variation in infant mortality even within India and within states. According to the latest report of Sample Registration System (SRS) published by Registrar General of India, IMR in the state of Madhya Pradesh (59) was about five times than that in Kerala (12) and the infant mortality in India has reduced from 80 in 1990 to 68 in 2000, 50 in 2009 and further decline to 44 in 2011.[7] Place of residence has, for centuries, been implicated as a health determinant.[8] According to SRS 2011 bulleting , published by Registrar General of India, infant mortality rates are substantially higher in rural areas in India. In rural areas it was 48 (male 27, female 31), while in urban areas it was 29 (male 27 and female 31) per thousand live births.[7] Another Survey report, the National Health Family Survey (NHFS) - 3(2006-2007) showed that the number of infant deaths per 1,000 live births for India continues to decline, dropping from 68 in NFHS-2(1998-1999) to 57 per thousand births. . Still, more than one in 18 children died within the first year of life, and more than one in 13 die before reaching age five. Infant and child mortality rates are higher in rural areas. The same report stated that Infant and child mortality rates are higher in rural areas as compared to urban areas in India. Infant mortality rate was 62 deaths per 1,000 live births in rural areas while in urban areas it was 42 deaths per 1,000 live births).[9]

There are striking disparities in Infant mortality rate (IMR) across gender too. The infant mortality is higher for males than females in most available data for different countries and different historical periods.[10-12] In most populations, male mortality is higher than female mortality at almost all ages.[13] The sex of the newly borne child is also one of the variables that determine the survival chance of infant and biologically male children experienced higher mortality than the female children.[14] Such sex differentials in child mortality are considered as one of the contributing factors to the secular decline in child sex ratio (0-6 years old, female per 1000 male) and it is a matter of serious concern for such a long period and poses tricky issues to Indian societies in general and women in particular.[15]

PROFILE OF THE STUDY AREA:

Sikkim, a small Himalayan State became the 22nd state of India in the year 1975. Situated in-between latitudes 270-280 N and longitudes 880- 890 S, in the North Eastern part of India, the State shares its borders with China in the north, Bhutan in the East, Nepal in the west and Darjeeling District of West Bengal, India, in the south. It is the second smallest state with an area of 7096 sq. km.and the least populated state in India with a population of 607,688 in which 321,661(52.9%) are males and 286,027 (47.1%) are females according to 2011 Provisional population census. The state is divided into four districts- North, South, West and East district. Gangtok, the capital of Sikkim is located in the East District and there are 9-sub division, 452 villages and 9 towns in the state. According to 2011 provisional population census, only 24.97 per cent of the state's population lives in urban areas and 75.03 per cent lives in rural areas.

The density of Sikkim increased from 45 persons per sq. Km in 1981 to 86 which is nearly double in 2011.The Literacy rate of the state is 82.2, as per 2011 census; with the male literacy being 87.30 percent and female literacy is 76.43 percent.[16] According to SRS 2011 report, published by Registrar General of India, the IMR for Sikkim was 26 per 1000 live births. In rural areas it was 28 while in urban areas it was 17 per 1000 live birth.[7] Another Survey Report, NHFS-3(2006-2007) showed that the Infant mortality continues to decline in Sikkim at 34(30-urban, 34-rural) which were 44 in NHFS-2(1998-1999).[17] Between 1991and 2001, the sex ratio dropped in Sikkim from 878 to 875, the lowest in relation to the other north eastern states of India. According to the 2011 provisional population census report, the sex ratio (number of females per 1000 males) show an improvement from 875 in 2001 to 889 in 2011. However the general trend of age group 0-6 is declining which was 14.46 in 1991, coming down to 10.05 in 2011. The percentage of child (0-6 years) population to total population is 9.86 in the state. The population of male in the age group 0-6 has declined from 13.81 in 2001 to 9.77 in 2011 whereas the corresponding females have declined from 15.20 in 2001 to 10.37 in 2011. The maximum percentage of 0 - 6 populations has been reported in the West district (16.35%) which is the least urbanized district (3.84 percent urban population) and minimum in the East district (12.82%)which is the most urbanized district in the state (4.92 percent urban population).[16]

MATERIALS AND METHODS:

Source of data

Registered birth and deaths data obtained from the various "Annual statistical Reports on Registration of Births and Deaths ''of Civil Registration system Published by Government of Sikkim were used to investigate the changes in infant mortality in rural and urban areas and sex differences in infant mortality occurring in Sikkim from 2000 to 2010.

Registration of births and deaths act 1969 was implemented in Sikkim on 20th August, 1979.The Act aims at compulsory accounting of vital events which results in the issuance of certificates as well as generation of valuable data for plan and policy formulation on health sector. The Sikkim registration of births and deaths rule was fully amended in revamp system in December 1999 and came into force with effect from 01/01/2000. Every month statistical reports of births, deaths and still births are submitted to the head quarter by the registration centres where these monthly returns are compiled and computed with the help of software provided by the Registrar General of India (RGI), Government of India, New Delhi.

Study Sample

A total of 100943 registered live births and 1441 registered infant deaths occurred in the state during January 2000 to December 2010 were used in the study.

Statistical Analyses

The study examined the number of live born infants and infant deaths for each years and infant mortality rate were calculated per 1000 live births by using the formula of the number of infant deaths divided by the number of live birth of the same year. Crude comparison of the sex differences in infant mortality and rural urban differences in mortality based on the place of occurrence were performed by using the chi-square test for determining the statistical significance. Rate ratios of deaths for rural and urban infant deaths were calculated with 95% Confidence interval (95%CIs) for each year.

RESULTS

Table 1: Distribution of live births and infant deaths by place of occurrence

years	Rural			Urban			Rural Urban rate ratio(95% C.I)
	No. of live birth	No. of infant deaths	Mortality rate(95%C.I)	No. of live birth	No. of infant deaths	Mortality rate(95%C.I)	
2000	4449	41	9.2(6.4,12.0)	4631	19	4.1(2.3,5.9)	2.2(1.2,3.2)
2001	4769	30	6.3(4.1,8.5)	5153	26	5.0(3.1,6.9)	1.3(0.6,2.0)
2002	5069	74	14.6(11.3,17.9)	5253	20	3.8(2.1,5.5)	3.8(3.1,4.5)
2004	4992	92	18.4(14.6,22.2)	6552	86	13.1(9.2,17.0)	1.4(0.7,2.1)
2005	4821	73	15.1(11.6,18.6)	6445	123	19.1(15.7,22.5)	0.8(0.3,1.3)
2006	4443	83	18.7(10.5,27.5)	6443	129	20.0(16.6,23.5)	0.9(0.4,1.5)
2007	4167	92	22.1(11.7,32.5)	6074	129	21.2(17.5,24.9)	1.0(0.4,1.7)
2008	3774	47	12.5(6.0,19.0)	5876	91	15.5(12.3,18.7)	0.8(0.2,1.4)
2009	3375	43	12.7(9.0,16.5)	6237	100	16.0(12.9,19.1)	0.8(0.2,1.4)
2010	2745	40	14.6(10.1,19.1)	5865	103	17.6(14.2,21.0)	0.8(0.2,1.4)
Total	42604	615		58529	826		

Table no.1 shows the Infant Deaths by place of occurrence of the incidence. Out of 1441 infant deaths, 615(43%) occurred in rural areas and 826 (57%) occurred in urban areas. Births to rural areas accounted 42.2% of all birth and 42.3% of all deaths during these periods while in urban areas it was 57.8% and 57.3% respectively. The overall infant mortality rate in rural was 14.4 per 1000 live births while for urban areas it was 14.1 per 1000 live births and there were no significant difference between rural infant mortality and urban infant mortality during this period (chi-square test =1.37, P > 0.05).

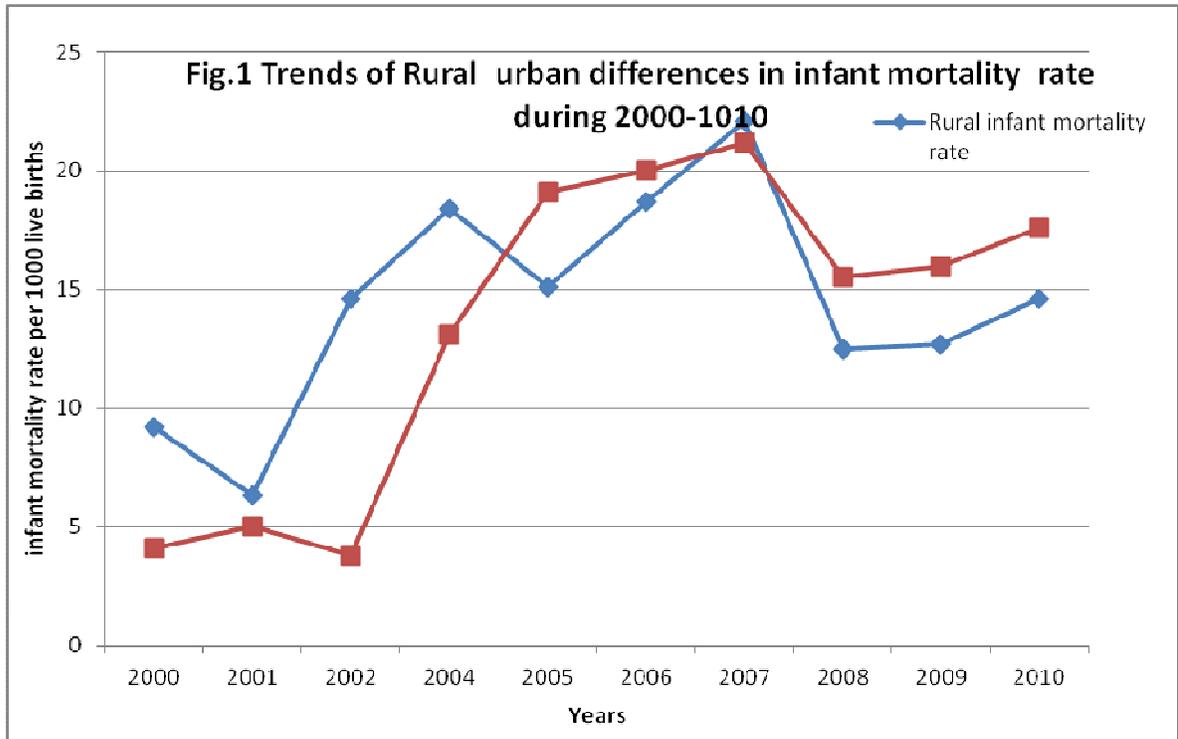Fig.1 Trends of Rural urban differences in infant mortality rate during 2000-1010

Fig. 1 depicts the trends of IMR in rural and urban areas in Sikkim based on civil registration data during 2000 to 2010. It was observed that the paces of decline in IMR were fluctuating in both rural and urban areas during this period. The IMR in rural areas declined from 9.2 in 2000 to 6.3 per thousand live births in 2010 whereas in urban areas it increased from 4.1 in 2000 per thousand live births to 5.0 in 2010.Afterward there was a sharp increased in IMR in rural areas except in the year 2005 and 2008 The overall increased in rural areas was 58.7 percent where IMR increased from 9.2 to 14.6 deaths per thousand live births.

However a sharp increased in urban areas can be observed from 2000 till 2007. In urban areas IMR was 4.1 in 1990, which increased to 17.6 per thousand live births in 2010, which mean an increase of 329 percent in infant deaths. It showed that the overall increased was more in urban areas as compared to rural areas during the study period.

Table 2: Distribution of live births and infant deaths by sex

YEARS	TOTAL MALE BIRTH	NO.OF MALE DEATHS	INFANT MORTALITY RATE FOR MALE	TOTAL FEMALE BIRTH	NO.OF FEMALE DEATHS	INFANT MORTALITY RATE FOR FEMALE
2000	4601	38	8.3	4479	22	4.9
2001	5112	29	5.7	4810	27	5.6
2002	4582	56	12.2	5740	38	6.6
2004	5804	103	17.7	5550	75	13.5
2005	5764	107	18.6	5502	89	16.2
2006	5596	113	20.2	5290	99	18.7
2007	5169	137	26.5	5072	84	16.6
2008	4945	70	14.2	4705	68	14.5
2009	4921	73	14.8	4691	70	14.9
2010	4383	88	20.1	4227	55	13.0
Total	50877	814		50066	627	

Table no 2 shows the number of live births and infant deaths by sex. During this period, there were 100943 live births, out of this, 50877(50.4%) were males and 5066(49.6%) were female. The sex ratio at birth was 984 females each to 1000 males. Out of 1441 infant deaths, 814 (56.5%) were males and 627 (43.5%) were female deaths. The sex ratio at mortality was 770 females per 1000 boys. The mean mortality of the males was 1.3 times of the females. The average infant mortality rates were 14 and 13 per 1000 live births for males and females infant deaths respectively during this period. The overall increased in infant deaths during this period was 1.5 per 1000 live births. While infant mortality increased for both male and female infants during the study period (Table 2, Figure 2), the rate of increased was greater for males as compared to female infants. During this periods, the male infant mortality increased by 11.8 per 1000 live births, but female infant mortality increased by 8.1 per 1000 live births.

There were significant difference in mortality between males and females during this period. (Chi-square test = 21.05, P<0.001).

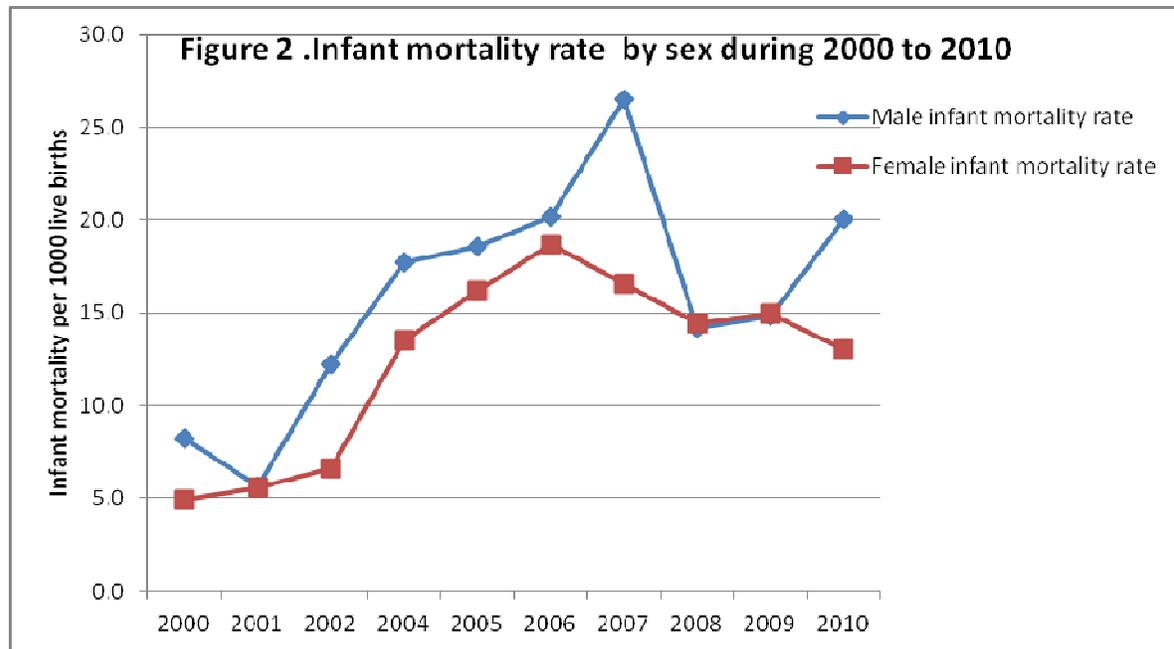Figure 2 .Infant mortality rate by sex during 2000 to 2010

Fig.2 depicts that the IMR between male and female children was nearly the same in 2000, 2008 and 2009. The difference in mortality for both the sexes was narrowed from 2001 to 2006 and a gap in between them can be observed only in 2007 and 2010. There was a steady decline in female infant death during 2006 to 2010 and a sharp decreased in male infant deaths can be observed in 2008 and again increased in 2010.

DISCUSSION

The study observed that out of 1441 infant deaths, 615(43%) occurred in rural areas and 826 (57%) occurred in urban areas. The overall infant mortality rate was 14.4 per 1000 live birth in rural areas while in urban areas it was to be 14.1 per 1000 live births and no statistical significant difference between rural and urban infant mortality were found during this period which may be because of the reasons that majority of the people in the state live in rural areas. According to 2011 provisional population report 75.03 per cent of the state's population lives in rural areas. A study conducted by Office of the Registrar General of India (1981) has also observed the rural urban differences in Infant mortality.[18] Among families living in rural areas have higher incidence of infant mortality as compared with their urban counterparts. [19-27]

Biologically female infant is stronger than male infant.[28-,29]In those communities where biological factors play more role than social factors; the male infant deaths rate is higher than the female infant deaths rate. The study found that the risks of male infant mortality were 1.3 times higher than the females deaths and there were significant differences in mortality between male and female child which may support the biological believe that male infant have the higher risk of dying during the first year of live than girls which also indicates that that there is no sex discrimination in the state. It was observed in many studies that male infant have the higher risk of dying during the first year of live than girls. [30 – 33]

CONCLUSION

The study observed that there exist no statistical differences in rural and urban infant deaths in the state and significant differences in mortality between male and female infants were observed in this study. Finding the differences in infant mortality between rural and urban areas and sex bias in infant mortality will help to set priorities, shape policies, design programmes and monitor progress towards various maternal and child health programmes and policies of the nation at the state level.

Limitations:

Since the study is based on the registered birth and deaths occurred mostly in hospital setting, so the results are difficult to interpret for the entire state and the rural urban differences in infant mortality may depends on the number of registration of births and deaths that occurred during this periods.

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