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EARLY NEONATAL MORTALITY IN INDIA: A STUDY OF TRENDS, DETERMINANTS AND INEQUALITIES

Binod Bihari Jena, Research Scholar

Jawaharlal Nehru University, New Delhi, India

Abstract: *This paper examines the trends, determinants and inequalities in early neonatal mortality in India by using SRS and NFHS data sources. To study the determinants of early neonatal mortality, the odds ratio and the predicted probabilities of dying is calculated. The concentration index and Wagstaff's decomposition technique is used to study the inequalities in early neonatal mortality and its determinants. The results show that the present level of early neonatal mortality rate in India is very high and its share in neonatal mortality rate has already reached to more than 70%. During the last three and half decades (1972-2008) the percentage reduction in early neonatal mortality rate was very slow compared with the reduction in post neonatal mortality rate and in late neonatal mortality rate. The age patterns of mortality during early neonatal period are unevenly distributed and this pattern has remained the same over the three rounds of NFHS with the highest risk of dying in day zero. The probability of dying was higher among newborns of very small birth size and born to old age mothers, born in other religion and living in unhygienic environment and the probability of dying was lower among newborns born to mothers who were taking full antenatal care and having at least secondary education. The inequality analysis shows that early neonatal deaths are concentrated among the poor population and the main determinants of these inequalities are women's illiteracy, not utilization of antenatal care, poor economic status and residency in rural areas.*

Introduction:

High child mortality in many parts of the world has identified the reduction of under-five and infant mortality rate by two-thirds between 1990 and 2015 as two important targets of the Millennium Development Goal-4 of child survival (MDG, 2000). Therefore, the two indicators of child mortality become common while measuring progress in child well being in any country. In 2009, 8.1 million children across the world died before their fifth birthday and most of these children lived in developing countries and died from a disease or a combination of diseases that could easily have been prevented or treated (UNICEF, 2010). However, the rate of decline in under-five mortality is still insufficient to reach the MDG goal by 2015, particularly in Sub-Saharan Africa and South Asia. It is alarming that among the 64 countries with high mortality rates only 9 are on track to meet MDG-4 (UNICEF, 2010). Therefore, the reduction in infant and under-five mortality remains a primary concern for most developing countries. While strategies such as immunization, oral rehydration and control of acute respiratory infections have contributed to the decline of deaths among children above one month of age, but, the reduction in neonatal deaths (deaths under four weeks of age) has not been significant. As a result, there is a shifting of mortality to neonatal period which is a serious concern in developing countries and the MDG-4 requires major reductions in neonatal mortality (Lawn, 2005).

In India IMR continued to remain high as compared to all developed countries and many of the developing countries. It has declined from 139 in 1972 to 53 in 2008 indicating a reduction of 62 percent. This decline in IMR was mainly because of the substantial reduction of deaths during the post neo-natal and late neonatal period. During this period post-neonatal mortality and late neonatal mortality has declined to 74 percent and 78 percent respectively whereas the early neonatal mortality has been declined only 23 percent. Currently more than two-thirds (66%) of infant deaths comprised of neonates most of who die within the first week of life i.e., during early neonatal period. The share of early neonatal deaths has been increasing over the years and in the year 2008 it has reached to 77 percent of all neonatal deaths and 51 percent of infant deaths and 39 percent of under-five mortality (SRS, 2009). In the year 2000, 27 percent of the global neonatal deaths were from India (WHO, 2005). Hence, it is important to focus the crucial first seven days of life in order to reduce infant mortality rate to the targeted level that will meet India's Millennium Development Goal-4 for child survival.

Statement of the Problem

In order to achieve the Millennium Development Goal-4 of child survival, India needs to reduce its under-five mortality rate by two-thirds, between 1990 and 2015. But according to 2010 MDG evaluation report it is not possible for India to achieve the goal because both under-five and infant mortality rate continued to remain high as the rate of reduction is very slow. The report particularly emphasizes the need for the reduction in early neonatal deaths since it constitutes more than 51 percent of total number of infant deaths in 2008 (WNTA, 2010). Currently a large portion (66%) of infant deaths occurred in neonatal period and again majority of neonatal deaths (77%) comes from early neonatal period (SRS, 2009). Therefore, a faster rate of reduction in infant mortality rate can only be possible through a higher rate of reduction in early neonatal mortality rate.

Earlier studies show that the reduction of early neonatal deaths remains challenging "because it is predominantly caused by biological and genetic factors and it can be little influenced by public health measures" (Achyut et al, 1997). Other studies show that along with biological factors, socio-economic, cultural, environmental, demographic factors and factors related to pregnancy and delivery significantly impact on newborns survival during early neonatal period. However, recent studies show that providing necessary information on birth preparedness, recognitions of danger sign, educating pregnant women and caretakers about antenatal care, safe delivery practices and home based neonatal care can reduce early neonatal mortality to a large extent (Kumar, 2008). Hence, there is a need to examine how these factors along with socio-economic and environmental, demographic and biological and programmatic factors affect the survival of newborns during early neonatal period. Studies on socioeconomic inequalities in infant mortality show that the deaths are not proportionally distributed among poor and non-poor (Hosseinpoor, et al. 2005). So, in this context, there is also a need to examine the socio-economic inequalities in early neonatal mortality i.e., how deaths during early neonatal period are distributed among the poor and non-poor and which factors contribute largely to these inequalities, so that effective health policies can be formulated to reduce the socio-economic inequalities in early neonatal mortality.

Objectives of the Study

I. To examine the levels and trends in early neonatal mortality rate.

II. To study the age patterns of mortality in early neonatal period.

III. To examine the factors affecting early neonatal mortality.

IV. To study the socio-economic inequalities in early neonatal mortality.

Methodology:

i. Procedure for Estimation of Early Neonatal Mortality rate (ENMR)

$$ENMR = \frac{Deaths\ of\ infants\ in\ 0-6\ days\ after\ birth}{live\ Births} \times 1000$$

$$ENMR = \frac{PMR - SBR}{1000 - SBR} \times 1000\ (\text{if deaths during 7 days are not available})$$

where, PMR is Perinatal Mortality Rate and SBR is Still Birth Rate. Before estimating ENMR three points moving average of PNMR and SBR is taken to remove any random fluctuation.

ii. Bivariate Analysis (cross tabulation)

iii. Multivariate Analysis (Binary logistic regression and predicted probability of dying)

iv. Inequalities and Decomposition Analysis in Early Neonatal Mortality

The degree of socio-economic inequalities in early neonatal mortality is measured by using the concentration index. Wagstaff's decomposition technique is used to find out the determinants of inequalities in early neonatal mortality.

Results and discussions:

The present level of early neonatal mortality in India is very high. During the last three and half decades the percentage reduction in early neonatal mortality rate was very low compared with the reduction in post neonatal mortality rate and in late neonatal mortality rate. Marked differences in early neonatal mortality rate are also observed between south and north Indian states and between rural and urban areas. Among some bigger states the percentage share of early neonatal mortality rate to neonatal mortality rate has already reached to more than 90% showing the increasing dominance of early neonatal mortality in neonatal mortality. The disparity in early neonatal mortality rate between EAG and non-EAG states is increasing over the years because of the differences in the rate of reduction. Among the six NFHS regions the highest percentage reduction in early neonatal mortality rate during NFHS-1 to NFHS-3 was in south region. The deaths during early neonatal period are unevenly distributed and this pattern has remained the same over the three rounds of NFHS. The highest risk of dying was in day zero (within first 24 hours of life) where nearly forty percent of total deaths have occurred. Therefore

the first twenty four hours in newborn's life needs maximum care in order to save a substantial number of deaths during early neonatal period.

From this study it is found that newborns of very small birth size and born to old age mothers are facing higher chance of dying. On the other hand lower probability of dying was seen among newborns born to mothers who were taking full antenatal care and having secondary and above education. Mothers living environment where there is lack of quality drinking water and sanitation facilities and households where solid cooking fuels are used contribute to higher probability of dying among newborns. Newborns born in hospital deliveries having higher likelihood of dying compared with home deliveries which seem to be unexpected, but it was supported by some previous studies (Achyut, 1997 and James, 2004).This result may be due to the fact that in many cases some serious delivery complicated women at the last moment approaches to hospitals where doctors cannot save the lives of the newborns. The other explanation from this study is that when the duration of stay in hospital after delivery was not enough resulted higher early neonatal mortality. Hence in this case it can be said that though hospital delivery is a necessary condition for newborns survival but it may not be always a sufficient condition if the duration of stay is not enough.

In India there exists socio-economic inequality in early neonatal mortality where higher proportion of early neonatal deaths occurs in poor population. Among the three broad regions the highest regional inequality in early neonatal mortality was in EAG region which is the most backward region in terms socio-economic and health indicators. The lowest inequality in early neonatal mortality was observed in south region. In EAG region though early neonatal mortality rate was higher than other region but the inequality in early neonatal mortality in EAG region was less than other region. Of the total explained inequalities, the contribution of women with no education was the highest (35%) followed by no antenatal care utilization (24.7%), poor economic status (12%), and living in rural areas (11.6%).

References:

Achyut, P., S. Lahiri, and R. Acharya. 1997. "Non-biological correlates of early neonatal deaths: evidence   from five selected states of India," *Demography India* 26(2):241-260.

Aggarwal, A. K., R. Kumar, and P. Kumar. 2003. "Early neonatal mortality in a hilly north Indian state: socio-demographic factors and treatment seeking behaviors," *Indian Journal of Preventive Social Medicine* 34(1 & 2).

Araujo, B. F., M. C. Bozzetti, and A. C. A. Tanaka. 2000. "Early Neonatal Mortality in Caxias   do Sul: a cohort study," *Jornal de pediatria* 76(3): 200-206.

Bang, A. T., R. A. Bang and H.M. Reddy, 2005. "Home based neonatal care: summary and application of the field trial in rural Gadchiroli, Maharashtra, India: 1993-2003," *Journal of Perinatalogy* 25:S108–S122 (9).

Hill, K., Y. Choi. 2006. "Neonatal mortality in the developing world," *Demographic Research* 14(18): 429-452.

Kumar, V. et al. 2008. "Effect of community based behavior change management on neonatal mortality in Shivgarh, Up, India: a cluster-randomized controlled trial," *The Lancet* 372(9644): 1151 – 1162.

Lawn, J. et al. 2005. "4 million neonatal deaths: when? Where? Why?" *The Lancet.*1-10

Lawn, J., K. W. Ketende, and S. N. Cousen. 2006. "Estimating the causes of 4 million neonatal deaths in the year 2000," *International Journal of Epidemiology 35(706-718).*

Hosseinpoor, A.R. et al. 2006. "Decomposing socioeconomic inequality in infant mortality in Iran," *International Journal of Epidemiology* 35: 1211-1219.

Speybroeck, N. et al. 2010. "Decomposing socioeconomic health inequality," *International Journal of Public Health* 55: 347-351.