

# Infant Mortality Trends in India: A Review of Health System

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**Abstract:** Assuring public health services is primary duty of every government and as such, the government has taken steps to maintain public health, by opening health centers, hospitals, mobile hospitals, organizing mass awareness camps on health and so on. In this paper we will discuss Infant mortality rate is an excellent indicator of the socio-economic development of a country. India is facing severe problems related to the infant mortality. The statistics revealed that neonatal death rate is the highest in the world (43 per 1000 live births). A quarter of world's neonatal deaths (one million) each year take place in India, mostly at home (65.4% of all births and 75.3% of births in rural areas occur at home). It may be noted that despite the great importance of the subject, no information is available regarding the details of the causes of deaths. As discussed above, infant mortality is a major health problem and government is more concerned towards solving such health problem by reducing infant mortality rate. Further, the reasons for infant mortality include socio-cultural beliefs, education of mother, regular health check-up, lack of proper health care facilities, etc. Further paper will evaluate the child mortality patterns which do vary for the urban and the rural areas. The relation between the female and male mortality rates hold quite strongly in rural areas whereas in the urban areas these are weakly linked. It can be concluded that infant mortality is the result of socio-economic characteristics of mothers and households, demographic characteristics of children, and health-care behaviour of mothers, availability of health care facilities, etc. will be evaluated and concluding remarks and suggestions will be carried out in this paper.

**Keywords:** Health, Infant Mortality, Health Problems, Policies, Socio-economic Development

## Introduction

Infant mortality is a proxy indicator of population health. There is a potential association between the causes of infant mortality and factors that are likely to influence health status of the whole population (Joy Crevoiserat, Jamie Kim; 2014). Martiner (2013) Monitoring and evaluation of population health is a core public health function. The infant mortality rate (IMR) is one those core population health indicators as it reveals the quality of life of mothers and other family members, the access to and quality of health services, access to a good nutrition, education, human rights and security, inequity in deprived population groups and the environment. IMR is measured as the number of babies who die before reaching their first year of age divided by number of live births in a specific place and year. It is interpreted as the risk of a baby dying between birth and one year of age. Magnitude and geographic distribution of IMR in the World is between 1960 and 2011 infant mortality rate has been significantly reduced in 85%, from 113.7 to 17.3 per 1,000 live births, representing a reduction of 2,120 thousands infant deaths. Consistently over time, the European region shows the best situation. In 2011 the European has an IMR of 4.4 per 1,000 live births (126 000 infant deaths) and the African region has the worst situation with 58.5 per 1,000 live births, a risk 13 times higher compared with Europe. The geographic distribution of IMR consistently shows clusters of countries with high values of IMR in Africa and South-East Asia from 1960 to 2011.

### **Inequalities of IMR**

Health Intelligence (2013) the disparity of IMR among countries has also improved overtime as indicated by the boxplot chart of the data visualization. The interquartile range (difference between 75 and 25 percentiles of IMR) decreased from 120.6 in 1950 to 38.3 in 2011. This is a very important reduction of the gap among countries but still there are significant disparities, for instance, in 2011 the IMR in Sierra Leone which is the country with the highest IMR (119.2 per 1,000 live births) is 42 times higher than Andorra, the lowest IMR (2.8 per 1,000 live births). It is important to highlight the case of Republic of Korea which shows the biggest percent change of IMR from 185.1 in 1950 to 4.1 in 2011. Republic of Korea improved significantly its IMR from 1950 to 1990 with annual percent change from 30% to 39%. From 2000 to 2011 this change is around 8% keeping it below 5 per 1,000 live births. In African Region, Sierra Leone is the country with the highest IMR showing two waves of increased in 1965 and 1995, and it is the country with the highest IMR in 2011 with 119.2 per 1,000 live births followed by Democratic Republic of Congo that show a stagnant trend of high IMR from 1970 to 2011 with IMR over 110 per 1,000 live births. In the European region, which presents the lower IMR in the World, Turkey shows an interesting scenario having the higher IMR (198.1 per 1,000 live births) in 1955 that has been consistently decreased to 11.5 per 1,000 live births in 2011. Azerbaijan, Turkmenistan, Uzbekistan, Kazakhstan and Kyrgyzstan are far from the central trend of IMR in this region sharing a risk of infant mortality 10 times higher than the rest of European countries (Martiner; 2013).

### **Trends in Infant mortality Rate**

Assuring public health services is primary duty of every government and as such, the government has taken steps to maintain public health, by opening health centres, hospitals, mobile hospitals, organizing mass awareness camps on health and so on. Many of the weaker groups such as women and children are prone to many types of illness, due to which even there is death of these women and children. Deaths of mothers during the pregnancy or after delivery are identified as maternal mortality. Similarly, due to different problems, if new born child is dead or death after delivery, it is called as infant mortality. Many of the reasons are causing for maternal mortality and infant mortality in India. Infant mortality rate is an excellent indicator of the socio-economic development of a country. India is facing severe problems related to the infant mortality. The statistics revealed that neonatal death rate is the highest in the world (43 per 1000 live births) (UNICEF, 2008). A quarter of world's neonatal deaths (one million) each year take place in India, mostly at home (65.4% of all births and 75.3% of births in rural areas occur at home) (NFHS-3, 2007). It may be noted that despite the great importance of the subject, no information is available regarding the details of the causes of deaths (Rohini Ghosh, 2012). It is believed that infectious diseases such as sepsis, pneumonia, tetanus, diarrhea, preterm birth and complications of asphyxia may be responsible for most of these deaths in the neonatal period. It is well established that better post partum health care practices reduce neonatal mortality and morbidity to a large extent, and safe delivery practices like clean cord care (cutting the umbilical cord with sterilized instrument and tying it with a thread), thermal care (drying and wrapping the newborn immediately after delivery and delaying the newborn bath for at least 6 hours or for several days to reduce the hypothermia risk) and initiating breastfeeding within the very first hour after birth are the main factors for reduction of neonatal mortality. There are also other reasons for infant mortality such as, the cultural beliefs operate through diverse socio-economic and income related factors, and have strong influence on child mortality, starting from the mother's womb and continues through the neonatal, post neonatal period and persists throughout the life cycle. In this context, maternal health is an important factor in determining neonatal mortality. The incidence of maternal anemia is also as high as more than 50% in most of the Indian states. Apart from the above biological factors, young age at marriage, frequent child-bearing, unplanned motherhood and abortions result in poor nutritional status of Indian women and poor survival rates of their children.

Discussing the role of female literacy in lowering infant mortality, Jain and Visaria (1988) emphasize that female literacy as a proxy for female autonomy has been shown to affect infant mortality primarily through its association with indicators of better medical care during prenatal, natal and post-natal periods. Literacy improves access to knowledge and information, changes behavioural pattern, increases utilization of health services and thus contributes to lowering of infant mortality. Besides, the states where female literacy is high also have better availability of medical services. However, literacy does contribute to improving women's self-image; empowers and facilitates decision-making triggering off a change in the authority pattern all ultimately contributing to better health care.

The infant and child mortality patterns do vary for the urban and the rural areas. The relation between the female and male mortality rates hold quite strongly in rural areas whereas in the urban areas these are weakly linked (Agnihotri, 2001). It can be concluded that infant mortality is the result of socio-economic characteristics of mothers and

households, demographic characteristics of children, and health-care behaviour of mothers, availability of health care facilities, etc. Hence, to assess the extent of infant mortality in Gulbarga district, the present study is planned.

### Review of Literature

As stated by Agnihotri (2001), declining infant and child mortality levels are sure indicators of development. But these may not evenly benefit male and female children especially if the girl children are unable to access the improved health infrastructure and nutritional support. The consequent gender gap in mortality is a good index of discrimination against the girl children. Analysis of time series data on infant and child mortality of major Indian states indicates a more rapid decline in male mortality rates as mortality levels decline. However, many states known for their gender bias do show evidence of the 'substitution effect', i.e., more rapid decline in female infant and child mortality rates in the wake of increasing incidence of pre-natal selection. It is argued here, however, that a mere improvement in mortality rates among 'surviving' girl children does not mean an improvement in the quality of their survival.

Sakthi Padhi (2001) stated that infant/child mortality is not a simple function of the level of economic development, pace of economic growth or material prosperity. Proximate conditions having a direct bearing on infant and child mortality are such that they cannot be influenced through increases in income and purchasing power alone and are outside the market domain. The National Family Health Survey provides rich and variegated data which are useful for studying the early mortality in Orissa and provide a solid empirical foundation for further probing of certain questions such as accessibility and quality of a whole range of public goods and services which have a direct bearing on premature mortality.

Bhalotra (2008) investigated the impact of aggregate income shocks on infant mortality in India and investigates likely mechanisms. A recent OECD-dominated literature reports the provocative finding that mortality at most ages is pro-cyclical. Similar analyses for poorer countries are scarce, and both income risk and mortality risk are greater in poor countries. This paper uses data and methods designed to avoid some of the specification problems in previous studies and it explores mechanisms and extensions that have not been previously considered. It uses individual data on infant mortality for about 150000 children born in 1970-1997, merged by cohort and state of birth with a state panel containing information on aggregate income. Identification rests upon comparing the effects of annual deviations in income from trend on the mortality risks of children born at different times to the same mother, conditional upon a number of state-time varying covariates including rain shocks and state social expenditure. Rural infant mortality is countercyclical, the elasticity being about -0.33. This is despite the finding that relatively high risk women avert birth or suffer fetal loss in recessions. It seems in part related to recessions stimulating distress labor amongst mothers, in contrast to the case in richer countries, where they discourage labor market participation. Health-care seeking declines in recessions and this appear related to the opportunity cost of maternal time. Disaggregation reveals that the average results are driven by rural households in which the mother is uneducated or had her first birth in teenage, and that it is only girls that are at risk; boys are protected from income shocks. Exposure to poor conditions in the fetal and neonatal period appears to have a larger effect on infant mortality than similar exposure in the post-neonatal period.

According to Rohini Ghosh (2012), the countdown database to track the maternal and child survival rate, as set by the Millennium Development Goal, reported recently that India's progress is not satisfactory in reducing newborn and child deaths. Articles on neonatal and child mortality in India were accessed from PubMed/MEDLINE. Risk factors associated with neonatal and child mortality were reviewed in three crucial phases of pregnancy, childbirth and postnatal period. The review revealed economic disparity acts through various avenues of cultural belief and restrictions and is indirectly associated with care seeking behavior and utilization of health care, resulting in slow decline of child mortality rate in India. Secondly, cultural norms, practices, and beliefs are strongly associated with high neonatal mortality, contributing to the sluggish decline of overall child survival rate. Proximate determinants of child mortality, i.e., income, cultural behavior and beliefs, in multiplicity of Indian cultures, are closely associated with health seeking behavior, antenatal care, delivery practices and postnatal care of infants. It is concluded that apart from raising awareness among community leaders, family members responsible for care giving should be specially targeted for removal of hostile perceptions and barriers for improvement of child survival. Also there is need for developing new strategies for health education based on indigenous concerns, addressing socio-cultural barriers.

### Historical and Predicted Trends

There has been a consistent decline in Infant Mortality Rate (IMR) and Under-Five Mortality Rate (U5MR) in India. The rate of decline in current decade is higher than in the previous. However, based on robust projections, at the current rate of decline, India is unlikely to meet the targets for Millennium Development Goal (MDG)-4, which aims to reduce by two thirds, between 1990 and 2015, the under-five mortality rate. Six states of India though are likely to achieve the IMR and U5 MR target of MDG-4: Tamil Nadu and Kerala in the South, Maharashtra in the West, West Bengal in the East, and Punjab and Himachal Pradesh in the North. There is a small or no decline in early neonatal mortality rate (ENMR), which hovers at around 30/1000 live births. ENMR is an indicator of quality of perinatal care. In the last decade, IMR decline in urban areas is much less sharper than in rural areas, narrowing the gap between the rural and urban (Census of India (2013)).

### Maternal and Demographic factors

*Education:* Children born to mothers with at least 8 years of schooling have more chances to survive. IMR and U-5 MR among children born to illiterate mothers have been consistently higher than those born to mothers with any education. However, the association between maternal education and child mortality becomes significant only when maternal education exceeds 8 years of schooling. For example, children born to mothers with at-least 8 years of schooling have 32% lesser chances of dying in neonatal period and 52% lesser chances in the post-neonatal period, as compared to the illiterate mothers.

*Age:* Children born to adolescent mothers are at higher risk. Infant and under-five mortality rates are highest among mothers under 20 years of age. The rates are lowest among the children born to mothers between the ages of 20-24, remain low up to 25-34 years of age, and increase again after that age. Thus, a U-shaped relationship is observed between mother's age at childbirth and U-5 mortality. The effect of the low age of the mother on mortality is highest during the neonatal period (79% higher), and progressively diminishes during the post-neonatal (27% higher) and 2-4 year age-group.

*Spacing between childbirths:* Children born less than two years after the first delivery are less likely to survive. There is a consistent and significant impact of birth intervals less than 24 months on child survival. For example, a child born within 24 months of the previous child has 68% higher risk of dying within the neonatal period and 99% higher risk of dying in the post-neonatal period. The risk further increases sharply if the previous child has died. A short birth interval not only increases mortality risk of the subsequently born children, but also of those born earlier.

*Maternal Nutrition Status:* Mortality among children born to obese mothers is higher.

Analysis of the National Family Health Survey (NFHS)-3 data showed that neonatal mortality among children born to mothers with low Body Mass Index (BMI) (<18.5) was slightly higher than those with normal BMI (18.5-24.9). Similarly, children born to obese mothers (high BMI, >18.5) showed 2.7 times higher mortality during neonatal period than those of mothers with normal BMI. This effect was much less marked beyond the neonatal period. While mild maternal anemia (hemoglobin levels 10-11.9 gm/dL) did not confer additional risk of death in infancy, moderate or severe anemia (Hb levels <10 gm/dL) was associated with 26% higher neonatal and 16% higher post-neonatal mortality rates.

*Attendance at childbirth:* Deliveries attended by health professionals have a lower risk. NFHS-3 revealed that neonatal mortality is lowest for children delivered at home by health professionals (19.8/1000 live births) and was highest for children delivered at home by traditional birth attendants (27.2/1000 live births). Mortality among those delivered in a hospital was in between the two (25.2/1000 live births).

### Social and Economic Factors

*Social Group:* Children born in SC and ST families have higher risk of dying than others. The risk is higher for children born in scheduled tribe (ST) families as compared to scheduled caste (SC). For example, a child born to an SC family has 13% higher risk of dying in the neonatal period and 18% higher risk of dying in the post-neonatal period, as compared to others. Similarly, a child born to an ST family has 19% higher risk of dying in the neonatal period and 45% risk of dying in the post-neonatal period. Belonging to a social group, however, is not an independent risk factor for mortality. Its effect on mortality appears to be mediated through other social, economic and environmental factors.

*Economic status (as measured by Standard of Living Index or SLI):* Mortality among low SLI has declined the most. Between 1981 and 2005, under-five mortality levels and its components have declined across all economic groups, as defined by the Standard of Living Index. The decline among Low SLI households has been the highest (37.7%),

while High SLI households have shown the least decline. This is a very positive trend which indicates that the gap between rich and poor is narrowing throughout the years. Neonatal mortality among children born to households with high SLI has not declined at all. Economic status has an independent effect on U-5 mortality and its components.

*Sex of the child:* IMR among girls has become equal to that among boys, indicating that gender inequality has increased. Girls have lower mortality in the neonatal period, but then have higher mortality than boys thereafter throughout the childhood. Due to lower Neonatal Mortality Rate (NNMR), IMR in girls had been lower than among boys during all five year periods since 1981. However, in recent years, due to slower decline in NNMR among girls, IMR among girls has become equal to that among boys.

Nikita Mehta (2013) according to Registrar General of India, India's maternal mortality rate declined 16% in 2011-12 from 2007-09. Infant mortality in India declined marginally to 42 deaths per 1,000 live births in 2012 from 44 deaths in 2011. Pregnancy-related and infant deaths in the country have declined significantly from a few years earlier, according to the latest data released by the Registrar General of India, but experts say there's not much to cheer in the numbers given that India still lags behind developed nations and even its poorer neighbours. India's maternal mortality rate (MMR), or the rate of deaths among women during or after pregnancy, declined by 16% in 2011-12 from 2007-09, according to the data released on Friday. Although the MMR dropped from 212 deaths per 100,000 live births in 2007-09 to 178 in 2010-12, India is behind the target of 103 deaths per live births to be achieved by 2015 under the United Nations-mandated Millennium Development Goals (MDGs).

The MMR in southern states fell 17% from 127 to 105, closer to the MDGs. Assam and Uttar Pradesh/Uttarakhand were the worst performing states, with an MMR of 328 and 292, respectively. Kerala and Tamil Nadu have surpassed the MDG with an MMR of 66 and 90, respectively. Infant mortality declined marginally to 42 deaths per 1,000 live births in 2012 from 44 deaths in 2011. Madhya Pradesh registered the highest infant mortality at 56, and Kerala the least at 12. Among metropolitan cities, Delhi, the national capital, was the worst performer with 30 deaths per 1,000 live births in 2012. One in every 24 infants at the national level, one in every 22 infants in rural areas, and one in every 36 infants in urban areas still die within one year of life, the report said. "There is not much to celebrate with the decline in maternal mortality as we are still far behind developed countries and even developing countries like Nepal and Bangladesh, which have surpassed us," said Amit Sengupta, of Jana Swasthya Abhiyan (People's Health Movement), a civil society organization. The "government mandate to institutionalize (child) deliveries will have marginal results till problems like early marriage of girls, nutrition of women and gender equity are not looked at."

Registrar General of India (2013) according to the Annual Health Survey (AHS), which covers nine states, India has made headway in institutionalizing child deliveries, i.e. taking place in hospitals. More than 40% of child deliveries in Chhattisgarh and 79% in Madhya Pradesh were institutional in 2012, compared with 34.9% in Chhattisgarh and 76.1% in Madhya Pradesh in 2011. The states covered by the AHS are Rajasthan, Uttarakhand, Uttar Pradesh, Madhya Pradesh, Bihar, Jharkhand, Chhattisgarh, Odisha and Assam. More than 85% of the total births took place in government institutions in Madhya Pradesh and Odisha in 2011, and this was more than 60% in the other states surveyed, except Jharkhand, according to the latest AHS data. But total fertility ratio (TFR), or the average number of children given birth by a woman, reach a preferred level of 2.1 in only 29 out of 284 AHS districts, whereas in 2011 it was 20 districts, according to the AHS data. The Registrar General also released data showing that the sex ratio at birth improved by 2 points to 908 females per 1,000 males in 2010-2012 from 906 in 2009-2011. Chhattisgarh reported the highest sex ratio at birth (979) and Haryana the lowest (857).

### **Estimates of Mortality Indicators according to Census of India**

Mortality is one of the basic components of population change and related data is essential for demographic studies and public health administration. It is the principal ingredient for population projections and life tables. Information on death events recorded in Sample Registration System (SRS) is used to estimate mortality indicators. The various measures of mortality published under SRS are Crude Death Rate (CDR), Under-five Mortality Rate (U5MR), Infant Mortality Rate (IMR) and its components, Age Specific Mortality Rates (ASMR), Still Birth Rate (SBR) and Peri-Natal Mortality Rate (PMR). According Census of India report presents that Infant Mortality Rate (IMR) by sex and residence for the year 2010 for India and bigger States. Infant Mortality Rate is defined as the infant deaths (less than one year) per thousand live births. At the National level, IMR is reported to be 47 and varies from 51 in rural areas to 31 in urban areas. Among the bigger States, it varies from 13 in Kerala to 62 in Madhya Pradesh. Female infants experienced a higher mortality than male infants in all States.

The infant mortality rate, which plays an important role in health planning, has shown a considerable decline from 129 per 1000 live births in 1971 to 110 in 1981 and from 80 in 1991 to 47 in 2010. The child mortality rate has depicted a perceptible decline from 51.9 in 1971 to 41.2 in 1981 and from 26.5 in 1991 to 13.3 in 2010. In 2010, about 34 percent of the deaths were institutional and 66 percent received medical attention other than institution. Sample Registration System (SRS) of Census of India states that early neo-natal mortality rate i.e. number of infant deaths less than seven days of life per thousand live births forms an important component of infant mortality rate and more specifically of the neo-natal mortality rate (SRS Statistical Report-2012; 2013). The early neo-natal mortality rate along with the percentage of early neo-natal deaths to the total infant deaths is at the National level, the early neo-natal mortality rate for the year 2010 has been estimated at 25 and ranges from 28 in rural areas to 15 in urban areas. Among the bigger States, Kerala (5) and Madhya Pradesh (34) are the two extremes. The percentage of early neo-natal deaths to the total infant deaths during the year 2010, at the National level, has been 53.9 and it varies from 54.6 in rural area to 49.6 in urban areas. In most of the States, rural proportion is relatively higher than the urban proportion except Delhi, Chhattisgarh, Madhya Pradesh and West Bengal. Among the bigger States the percentage for total, varies from 38.7 in Kerala to 69.4 in Jammu & Kashmir.

### Conclusions

There are large inequities in U5 mortality across states and between social and economic groups inhibit the acceleration in progress. The good news is that there is some evidence of reduction of social and economic inequalities over the past two-three decades. Continued presence of several risk factors, which are significantly associated with infant and U5 mortality retard the progress: foremost among them are low levels of maternal education (less than class 8), early childbearing (earlier than 20 yrs), and inadequate birth spacing (less than 24 months). Stagnation of early neonatal mortality in India and most of the states highlight the importance of improving quality of perinatal care for improving child survival. The analysis also points to some disturbing trends: slower decline of under-five mortality in urban areas, strong and apparently independent association of neonatal mortality with maternal obesity and progressive diminishing of biological advantage that girls have in infancy. When seen in context of increasing urbanization, these trends are likely to become increasingly important in determining child survival in times to come. Infant health continues being a priority for countries and the world. National and local governments, NGOs, Civil Society and the general public should continue paying attention to the health of infant and children population. Many efforts should continuously be putting to improve the quality of life, access to high quality health service, education, human security and rights, improve environments, and remove risk factors and determinants of infant health.

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