

Transformation in Infant Mortality Rates in India: Mortality Indicators as Major Tool for Indicating Status of Nation's Health

Dr. Azhar Ali (MBA, Ph.D.)¹, Dr. Saloni Sidana IAS²

¹District Program Manager, Panna (National Health Mission M.P.)

Public Health and Medical Education, M.P., India

²Mission Director, (National Health Mission M.P.)

GoMP Public Health and Medical Education, M.P., India

Abstract

Background: Mortality is important to study population change; infant mortality is a principal component balancing child sex ratio. This study analyzed differences in mortality indicators between urban and rural areas and quantified changes over 2006–2016.

Methods: Secondary data from Sample Registration System (SRS) bulletins were analyzed using percent change and paired t-tests.

Results: Total infant mortality rate reduced from 57 (2006) to 34 (2016) — a 67.65% reduction. Paired t-tests indicate significant changes ($p < 0.05$).

Conclusions: Declining infant mortality reflects improvements in maternal and child health programs; continued emphasis on neonatal care and women's health is recommended.

Keywords: Infant mortality, Neonatal mortality, Perinatal mortality, Crude death rate, Stillbirth, Rural-Urban differences

1. Introduction

The health of nations are reflected by the health policies which indicates the child sex ratio and infant mortality rates which conveys health status of any country. So many health policies are not suitable for population control or even balancing the child sex ratio, only appropriate health policies related to child health care and especially women care can leads to better development in the bringing down the mortality rates especially in children irrespective their countries global position in the development index. It is know that world infant mortality rate is 29.4 which is equivalent to West African nation and higher than most of South Asian countries except Myanmar. However, India has witnessed an significant decline in infant mortality rate (IMR) from 129 in the year 1971 to 33 in the year 2017 which was released by SRS bulletin, it was also found that the infant mortality rate was declined by 8 per cent from 2015 to 2016 with reduced growth of 37 percent (for 1000 population) to 34 percent. In addition, the proportion of estimates with respect to infant deaths has also declined from 0.93 million to 0.84 million in the year 2015 and 2016 respectively.

The reports of SRS bulletin (2006 and 2017) reveals that gender gap especially for child survival is declined gradually and the infant mortality rate has been declined to less than 10 percent which supports the policy for having baby girl programs especially in India known as ‘Beti Bachao Beti Padhao’ scheme which was launched in the year 2015 which was a potential tool for reducing female feticide and addressing the issue of down trending child sex ratio. The study also conveys that, the rate of female feticide rates are found to be more in Madhya Pradesh at increasing rate of 932 girls per 1000 boys in the year 2001 and thereafter it was declined to 918 by the year 2011. If this situation continues for another couple of years then by the end of 2021 the proportion of female girls will be below 900 per 1000 boys which results in imbalance in child sex ratio in the country.⁵ With this backdrop, the present paper aims to quantify growth in mortality indicators with special reference to infant mortality rate changes over time in India.

Aims and objectives

- To know the status and differences among different mortality indicators among rural and urban areas in India.
- The study objective was to quantify infant mortality rates change over time and check the means among mortality indicators.

Methods

The study was conducted using secondary research method, the data obtained from various issues of sample registration system bulletins and SRS statistical report published by Registrar General and Census Commissioner, India and the study period was for about 10 years from 2006 to 2016.

Inclusion criteria

- The preferred source of data is a civil registration system which records births and deaths on a continuous basis.⁴
- If registration is complete, the resulting estimates will be accurate and timely.
- Nationally-representative estimates of under-five mortality.
- Periodic population censuses have become the primary source of data on under five and infant mortality in developing countries.

Exclusion criteria

- The study excluding demographic surveillance sites and others data sources, which are rarely representative.⁴
- To avoid potential problems with the under-reporting of neonatal deaths in some situations and ensures that the internal relationships of the three indicators are consistent with established norms.

Statistical analysis

The required data was collected and tabulated using Microsoft Excel sheets. Prior to tabulation, the obtained data was subjected to simple statistical inferences such as mean, variance and t-test was used to

observe the means apart from percent change tool. The percent change tool was used for quantify infant mortality rates change over time (from 2006 to 2016). The t-test was used to analyze the difference between the means of mortality indicators over a period of one decade.

Results

Tables 1–3 summarize rural, urban and total mortality indicators for 2006 and 2016

respectively. Figures 1–6 visualize the trends and comparisons between 2006 and 2016.

Rural mortality indicators

Table 1 shows that the crude death rate (per 1000 population) during 2006 was found to be about 8.10 which was reduce to 6.90 in the year 2016, this indicates that, there was 17.39 per cent decrease in crude death rate over a period of one decade from 2006 to 2016. This clearly conveys that, about 1200 (approximately) crude deaths were found to be reduced during 2006 to 2016.

Table 1: The rural mortality indicators from 2006 to 2016.

Rural mortality indicators	2006	2016	Percent change
Crude death rate	8.10	6.90	17.39
Infant mortality rate	62.00	38.00	63.16
Neonatal mortality rate	41.00	27.00	51.85
Postnatal mortality rate	22.00	11.00	100.00
Perinatal mortality rate	41.00	26.00	57.69
Still birth rate	9.00	5.00	80.00
<u>Paired t-test results</u>			
Mean	30.52	18.98	
Variance	449.80	176.08	
Pearson Correlation	0.99		
Df	5		
t -Test	3.44		
P(T±t) two-tail	0.02		
t - Critical two-tail	2.57		

Source: Authors' calculation.

Similarly, the infant mortality was reduced by 63.16 percent, neonatal mortality rate was found to be 51.85 percent, perinatal mortality rate was found to be reduced by 57.69 percent and still birth was found to be 80.00 percent reduced during the period of one decade from 2006 to 2016. The study also focused to analyse the presence of significant difference between the mortality indicators during the study period using paired t-test. The results revealed that, p-value (0.0184) was less than level of significance (0.05) so we reject the null hypothesis and it is concluded that there is significant difference between the means of mortality indicators over a period of one decade.

Urban mortality indicators

The findings in Table 2 reveal that crude death rate (per 1000 population) during 2016 was found to be about 5.4 in urban which was more in the year 2016 accounting for about 6 per 1000 population, this indicates that, there was 10 per cent decrease in crude death rate over a period from 2006 to 2016. Similarly, the major change among urban mortality indicators was found to be high in case of infant mortality was 58.97 percent followed perinatal mortality rate was 58.33 percent the Neonatal mortality rate was found to be 60.87 percent and during the period of one decade from 2006 to 2016 were the three major indicators revealing control over mortality rates. On the other end, among urban mortality indicators such as post natal mortality rate and still birth rate indicators were found to be changed in urban mortality indicators which reveals that, about 52.94 percent and 37.50 percent was found in case of post natal mortality rate and still birth rate respectively, shows good sign of control in mortality indicators especially in urban areas.

Table 2: The urban mortality indicators from 2006 to 2016.

Urban mortality indicators	2006	2016	Percent change
Crude death rate	6	5.4	90
Infant mortality rate	39	23	58.97
Neonatal mortality rat	23	14	60.87
Postnatal mortality rate	17	9	52.94
Perinatal mortality rate	24	14	58.33
Still birth rate	8	3	37.50
<u>Paired t-test results</u>			
Mean	19.5	11.4	
Variance	146.7	52.08	
Pearson Correlation	0.99		
Df	5.00		
t - Test	3.85		
P(T±t) two-tail	0.01		
t Critical two-tail	2.57		

Source: Authors' calculation.

The study conveys that, still birth rate control was found to be high in urban when compared to rural areas. The study about significant difference between the urban mortality indicators during the study period using paired t-test indicates that, p-value (0.011) was less than level of significance (0.05) so we reject the null hypothesis and it is concluded that there is significant difference between the means of urban mortality indicators over a period of from 2006 to 2016.

Total mortality indicators

The findings on total mortality indicators which includes both rural and urban, reveals that still birth rate and post natal mortality rate indicators were found to be reduced in total mortality indicators which reveals that, about 125 per cent and 81.82 percent was found in case of still birth rate and post natal mortality rate respectively. However, the Infant mortality rate which was reduced by 32 points indicating reduction of about 67.65 percent control over a period from 2006 to 2016. Similarly, percent change in case of mortality indicators such as the crude death, Neonatal mortality rate, and perinatal mortality rate were found to be 17.19 per cent, 54.17 per cent and 60.87 percent during study period. The study analysed the significant difference between the total mortality indicators during the study period using paired t-test indicates that, It was found that, p-value (0.018) was less than level of significance (0.05) so we reject the null hypothesis and it is concluded that there is significant difference between the means of mortality indicators over a period from 2006 to 2016.

Table 3: Total mortality indicators from 2006 to 2016.

Total mortality indicators	2006	2016	Percent change
Crude death rate	7.5	6.4	17.19
Infant mortality rate	57	34	67.65
Neonatal mortality rat	37	24	54.17
Postnatal mortality rate	20	11	81.82
Perinatal mortality rate	37	23	60.87
Still birth rate	9	4	125.00
<u>Paired t-test results</u>			
Mean	27.92	17.07	
Variance	369.64	138.27	
Pearson Correlation	0.99		
Df	5.00		
t – Test	3.46		
P(T±t) two-tail	0.02		
t Critical two-tail	2.57		

Source: Authors' calculation.

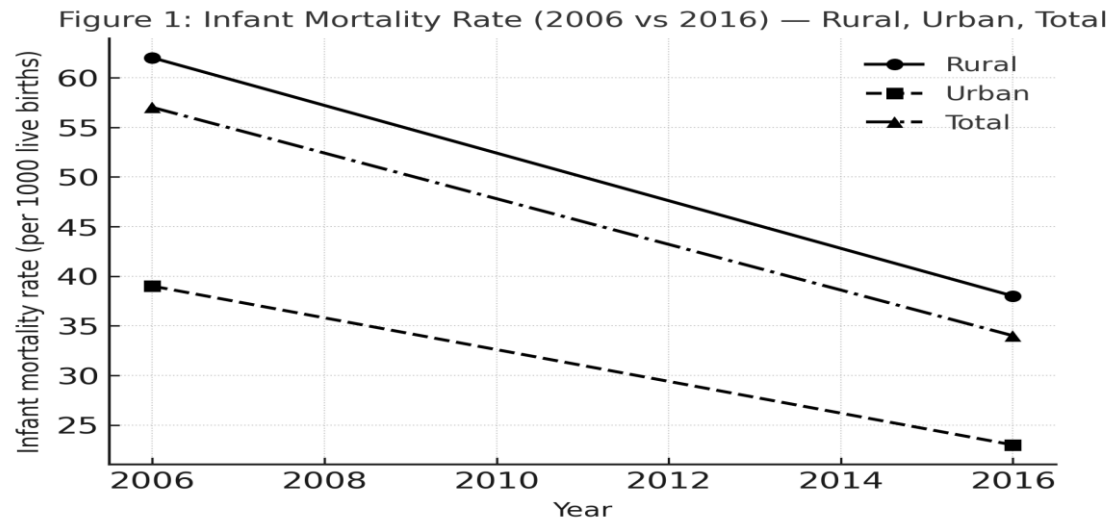


Figure 2: Rural mortality indicators (2006 vs 2016)

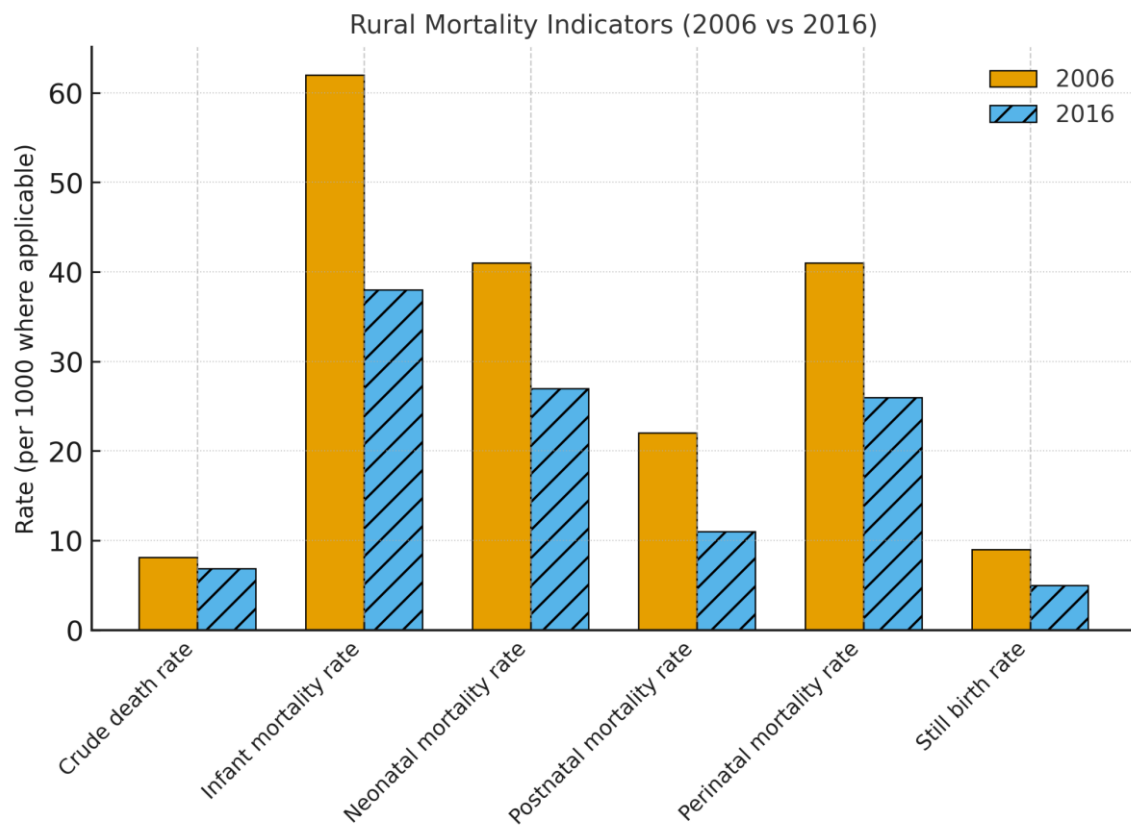


Figure 3: Urban mortality indicators (2006 vs 2016)

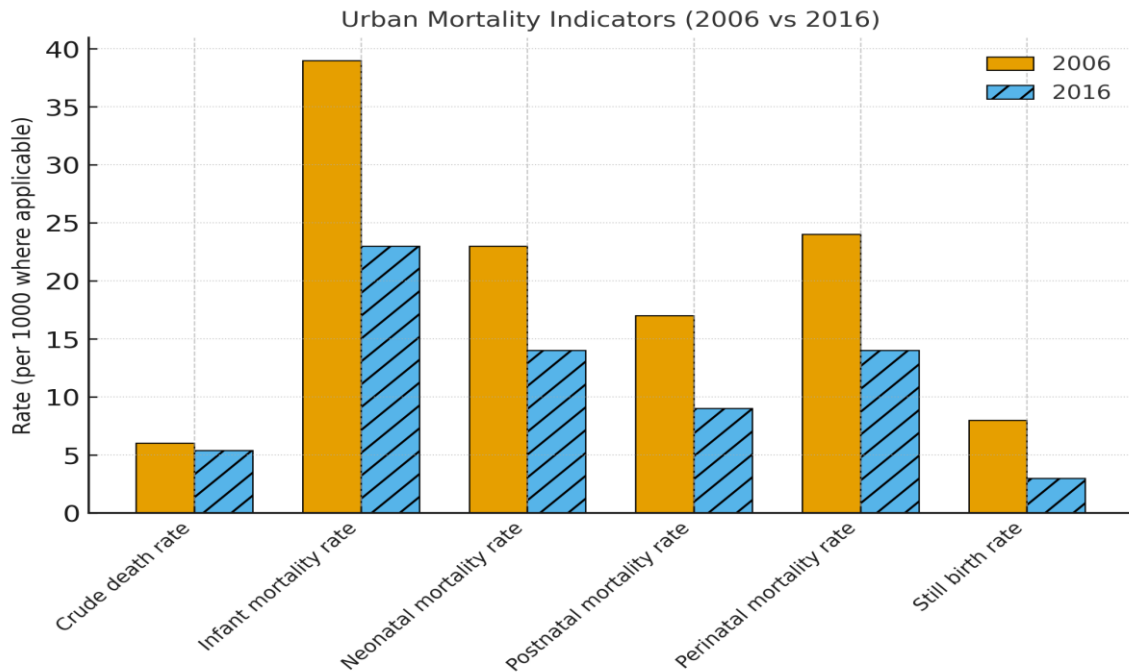


Figure 4: Total mortality indicators (2006 vs 2016)

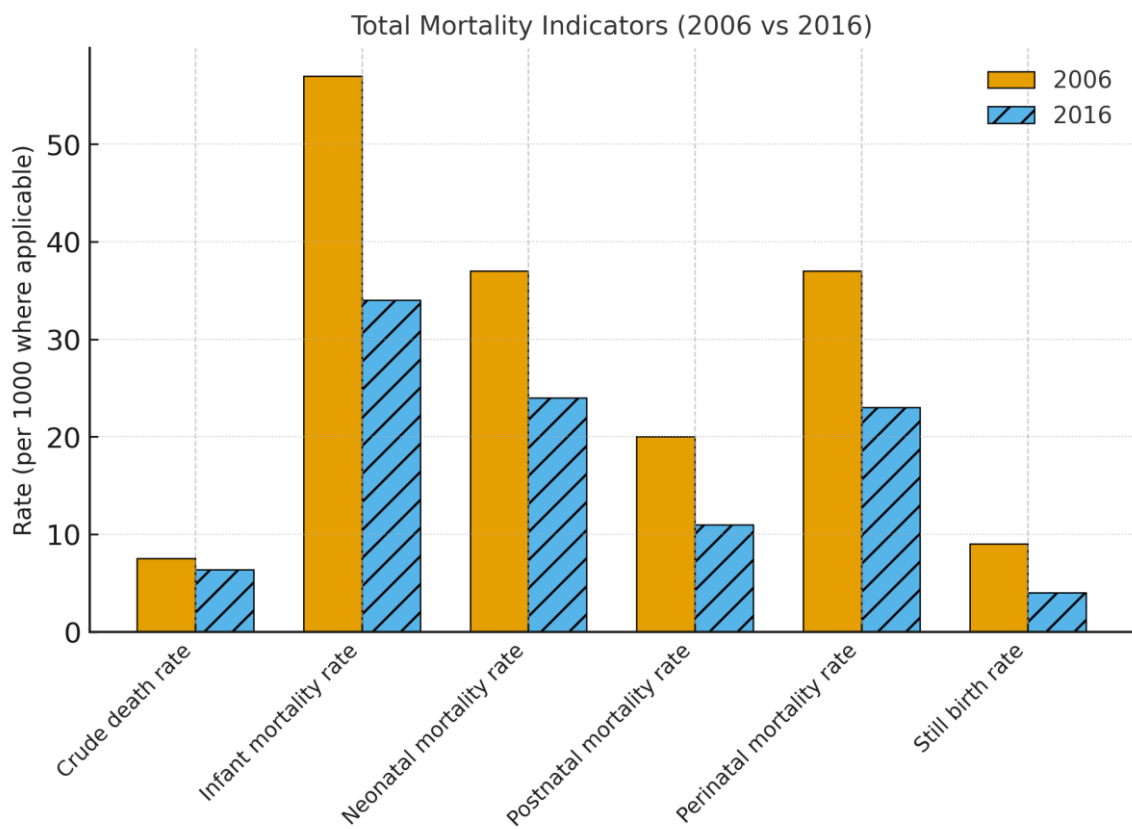


Figure 5: Percent Change in Mortality Indicators (2006 → 2016)

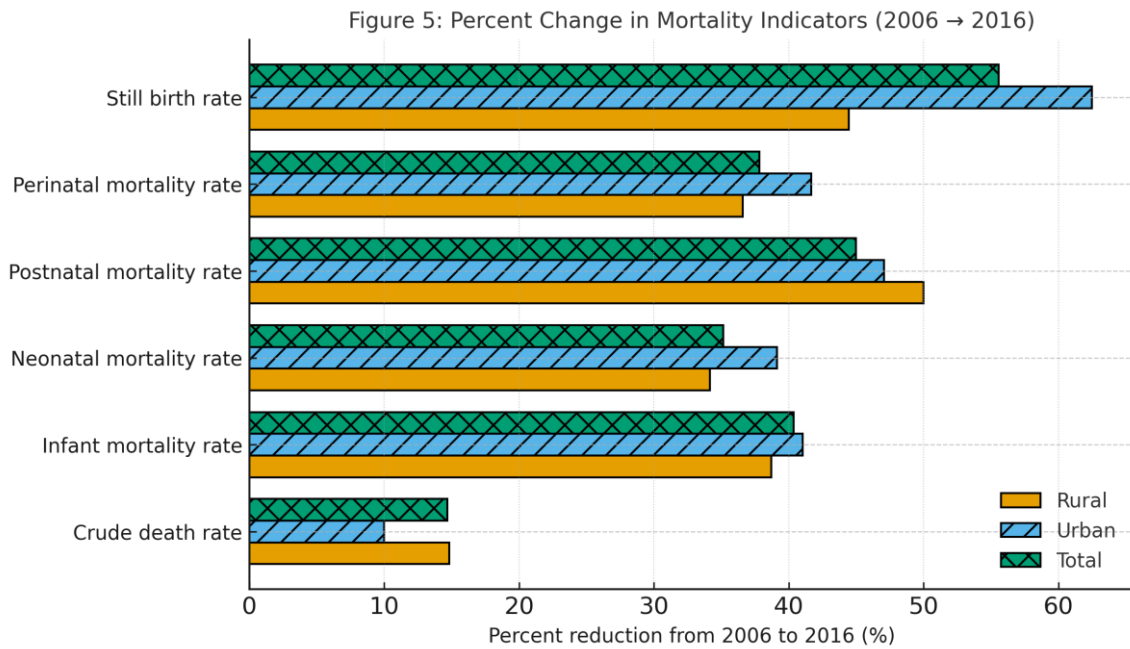
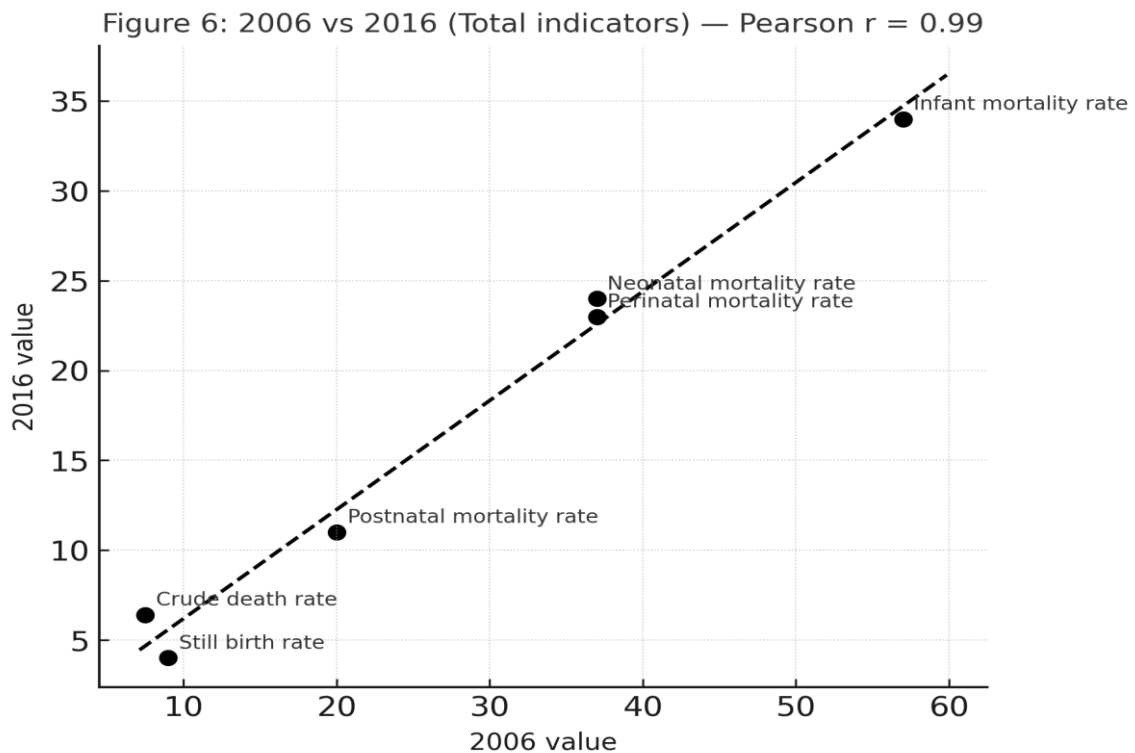


Figure 6: 2006 vs 2016 (Total indicators) — Scatter with regression



Discussion

The results indicate substantial reductions across all mortality indicators from 2006 to 2016, with both rural and urban areas showing statistically significant improvements. The findings support the effectiveness of maternal and child health programs.

The study focused on revealing the status different mortality indicators in case of rural and urban areas. Further, the study also made to quantify infant mortality rates change over time and check the means among mortality indicators. In nutshell, due to change in mortality indicators how the child sex ratio will be changing for future growing population.^{2,4}

A study supports the findings that, the reduction proportion was found to be more post-neonatal rate than in neonatal mortality and neonatal mortality rates are basically found high in case of under age group of five among infant mortality rates.⁵ However, it was interesting to note that, among rural mortality indicators such as post natal mortality rate and still birth rate indicators were found to be reduced in rural mortality indicators which reveals that, about 80 per cent was found in case of still birth rate and post natal mortality rate was found to 100 per cent which shows good sign of control in mortality indicators especially in rural areas.⁶

The government is making steady efforts in order stabilize the health care services for both women and childcare which are very essential for every individual family either it may be urban or rural areas.

The study supports that, in spite of constant situations prevails in Indian scenario although many efforts are made by government to reduce the percent among maternal health and child birth outcomes programs such as “Home-based New Born Scheme and Janani Surakhsha Yojana (JSY) are operational for channelizing institutional delivery among pregnant women to bring down the number of maternal and infant mortality rates.⁷ The study identifies to know the possible reasons for difference among the infant mortality rates especially with sex and residence. The study quotes supported by WHO reveals that, the probable reasons attributed for high infant mortality rates are accounted for lack of skill attendance availability in both rural and urban areas which is vital intervention for ensuring safe deliveries in case of both non-institutional and institutional delivery cases.^{8,9} The reasons behind these efforts are focusing on safe delivery of pregnant women’s and it has been recognised as one among indicators for evaluating the successful strategy to achieve long terms goals such as Millennium Development Goal 5.¹⁰ Hence the study suggests that, in order to improve neonatal rates there is need of skilled attendants as major timely intervention as one of pre-requisite infrastructure for safe motherhood.

Conclusion

Infant mortality is a sensitive indicator of overall health development. Continued investment in neonatal care, skilled birth attendance, and maternal health programs is essential to maintain progress and ensure balanced child sex ratios.

The infant mortality rate frequently provided as a key indicator of all the development, either it may be economic, technological, health interventions, and the socio-cultural environment. Apart from this, the Government have been giving wide publicity to the programmes especially for child care and women in

order to bring balance in child sex ratio through take initiatives in the form of immunization for both children and pregnant women, spreading awareness about the sufficient intake of iodized salt, knowledge and awareness to pre-natal care and safe delivery, etc. all these basic facilities has increased access to a minimum package of essential services that would significantly reduce high infant mortality rates, especially reproductive health services coupled with perinatal care, camping's on improved breastfeeding practices in rural areas, practice of home-based treatment for diarrhoea; and timely introduction of nutritional health supplementary foods. In addition, these significant changes are due to increase in the health services which are implemented by government in the form of interventions such as National Rural Health Mission (2005) which was renamed into National Health Mission' NHM (2013) in which one of the goal is to reduce Infant Mortality Rate (IMR) to 25 per 1000 population, National Urban Health Mission (2013), RMNCH+A, strengthening of primary health center services, health quality assurance, human resources, community development processes, information and knowledge about health of children and women, availability of various drugs and diagnostics and supply chain in health care etc. all these are channelized properly in order to achieve the decline trends in mortality rates in long run.¹¹ Finally the study concludes that, all these programs are laid down to decline in infant mortality rates especially in India which is essential and also needed to cope up with problems arising from population pressures which can be tackled by means of appropriate health services packages for safe guarding the health of children and women for better growth and reaching stable child sex ratio for the growing population of different countries especially in South Asian Countries like India.

References

1. Fabella C. Population growth and infant mortality. UPSE Discussion Paper; 2008.
2. Sandell J, Upadhya AK, Mehrotra SK. A study of infant mortality rate in selected groups of population in district Gorakhpur. Indian J Pub Health. 1985;29(1):37-42.
3. Yadavar S. The spending and policy research foundation. Retrieved from IndiaSpend, Mumbai; 2019.06.02. Registrar General of India.
4. Sample registration system: maternal mortality in India 1997-2003; trends, causes and risk factors, sample registration system. Government of India, New Delhi; 2006:1 29.
5. Gupta and Suchandna, Beti Bachao Abhiyan, Skewed sex ratio in Madhya Pradesh. Times of India, 2012.
6. Rammohan A, Iqbal K, Awofeso N. Reducing neonatal mortality in India: critical role of access to emergency obstetric care. PloS One. 2013;8(3).
7. Lim SS, Dandona L, Hoisington JA, James SL, Hogan MC, Gakidou E. India's Janani Suraksha Yojana, a conditional cash transfer programme to increase births in health facilities: an impact evaluation.
8. Lancet. 2010;375(9730):2009-23. Making pregnancy safer: the critical role of the skilled attendant A joint statement by WHO, ICM and FIGO, 2004;1-218.
9. Graham W, Bell J, Bullough C. Can skilled attendance at delivery reduces maternal mortality in developing countries? Paper presented at: European Commission Expert Meeting on Safer Motherhood, Brussels, Belgium, 2000;(10) 27-8.