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Review Article

Infant mortality rate in Tamil Nadu, Kerala, and Uttar Pradesh: a comparative analysis using national family health survey 2019-21 data

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ABSTRACT

The mortality rate is regarded as a state's health indicator, as it focuses on health policy for a limited group of the population rather than on rest. The purpose of this review is to gain a deeper understanding of child health indicators, specifically the infant mortality rate (IMR), by comparing a high-performing state like Kerala and a low-performing state like Uttar Pradesh with Tamil Nadu, using NFHS-5 data. The study uses publicly available data from NFHS-5, conducted between 2019 and 2021 by the Ministry of Health and Family Welfare, involving secondary analysis without human involvement or ethical committee approval. According to the NITI Aayog Health Index Score, among the larger states Kerala (82.20), Tamil Nadu (72.42) and Uttar Pradesh (30.57). The study found that women without schooling and those from Scheduled Castes/tribes had higher infant mortality rates (IMR) in rural areas and among Hindus in Uttar Pradesh and Kerala. Male children had higher mortality rates in Tamil Nadu and Uttar Pradesh, while birth intervals of less than 2 years and 2-3 years had higher IMR in Kerala. Tamil Nadu and Kerala outperform Uttar Pradesh in reducing infant mortality rates due to welfare schemes and services. Increased public health spending is needed to address social inequalities and health awareness.

Keywords: Infant mortality rate, Caste disparity, Schooling, Mother's age, Birth order

INTRODUCTION

The mortality rate is considered as a health indicator of a state, as it focuses on health policy for a small group of the population rather than on rest.[1] Mortality rate under 5 years including infant mortality rate, neonatal mortality rate and under-5 mortality rate an important indicator that measure overall well-being of state. Infant mortality rate (IMR) is the probability of a child born in a specific year or period dying before reaching the age of one (between birth and 11 months) per 1000 live births, if subject to age-specific rates of that period.[2] IMR has certain characteristics such as place of birth, schooling of mother, religion, caste/tribe, mother's age at birth, birth order, previous birth interval, childhood immunization, nutritional status and institutional delivery. UN millennium development goals (MDGs) are 8 goals that UN member states have agreed to achieve by the year 2015.[3] MDG-4 aims to reduce child mortality and MDG-5 aims to improve health.

The UN Millennium Development Goals (MDGs-4 A) targets reducing U5MR by two- thirds.[4] The 2030 Agenda for Sustainable Development, was adopted by United Nations Member States (2015), shares a blueprint for peace and wellness for people and planet into future.[5] SDG Target 3.2 aims to reduce preventable death of newborns and children under 5 years of age with all countries.[6] National Family Health Survey 2019-21 (NFHS-5), multi-level survey, designated to provide national, state/union territory, and district level estimates

of various surveys. NFHS-5 data has set benchmarks in examining the progress in the health sector.[7] Tamil Nadu has performed better over years than other states due to women centric policy, program and interventions. Timely intervention, proper care and sensitized workforce made access to health especially to improve maternal and newborn survival.[8] Despite the decrease in mortality rates from NFHS-4, there are increased discrepancies between urban and rural areas.

Table 1: Infant mortality rate-NFHS 5, 2019-21, Tamil Nadu, Uttar Pradesh, Kerala.

Survey data	Urban	Rural	Total
	N	N	N
Tamil Nadu	14.8	21.7	18.6
Uttar Pradesh	42	52.6	50.4
Kerala	3.5	4.2	4.4

*- no data available.

Table 2: Infant mortality rate-NFHS-5, 2019-21, Tamil Nadu, Kerala, Uttar Pradesh background characteristics.

Background characteristics	Tamil Nadu	Kerala	Uttar Pradesh
Schooling			
No schooling	*	*	57.7
<10 Years complete	25.4	-9.5	55.8
10 or more years complete	15.8	3.8	39.4
Religion			
Hindu	18.7	6.8	51.6
Muslim	19.4	2.7	45.1
Christian	16.9	-1.4	*
Caste/Tribe			
Scheduled caste	25.3	-1.1	57.8
Scheduled tribes	*	4.9	57.6
Other Backward class	15.2	3	48
Others	*	*	5.8
Child's sex			
Boy	20.6	3.2	51.5
Girl	16.3	5.7	49.1
Mother's age at birth			
<20	17.3	*	79
20-29	18.2	5.2	47.3
30-39	20.4	2.4	51.5
40-49	*	*	-60.7
Birth order			
1	17	5.8	56.2
02-Mar	18.9	3.3	43
4 or more	*	*	58.8
Previous birth interval			
<2 years	28.3	*	69.1
2-3 years	10.9	6.5	37.6
4 years or more	27.5	2	38.8
Total	18.6	4.4	50.4

*- no data available.

The aim of this review is to gain a deeper understanding of child health indicators, specifically the IMR, by comparing a high-performing state like Kerala and a low-performing state like Uttar Pradesh with Tamil Nadu, using NFHS-5 data. The study is done with the publicly available data from NFHS-5 conducted between 2019 and 2021. NFHS-5 was conducted by the Ministry of Health and Family Welfare. The fact sheet provides information on key indicators and trends in India. The study uses secondary analysis of existing data, requiring no ethical committee approval. Four survey schedules- household, women's, men's, and biomarkers—were taken in local languages using computer assisted persona interviewing (CAPI). The women's schedule includes fertility,

contraception, reproductive health, sexual behavior, in addition, the biomarker schedule includes hemoglobin levels for women aged 15-54 years.

The analysis has been limited to only 3 states- Tamil Nadu, Kerala and Uttar Pradesh. The NITI Aayog Health Index (2019-2020) is a useful instrument to measuring and comparing the overall performance and incremental performance across states and union territories across time and nudging states and union territories to shift the focus from inputs and outputs to outcomes. According to the NITI Aayog Health Index Score, among the larger states Kerala (82.20) has the highest overall performance score among major states followed by Tamil Nadu (72.42) and lowest among larger state is Uttar Pradesh (30.57).[9]

According to the human development index (2022), Kerala (0.758) has high human development whereas Tamil Nadu (0.692) and Uttar Pradesh (0.609) have medium human development.

Tamil Nadu and Kerala are regarded among well-performing states in public health services with low mortality rate, competent health care infrastructure and sufficient health resources. Among the aspirational districts, districts in Uttar Pradesh have shown remarkable improvement.

The IMR was high in rural areas compared to urban areas. Uttar Pradesh accounted for the highest share of infant deaths in both rural and urban areas (Table 1).

In Central and Southern Asia, there are 21 infant deaths for every 1000 live births. In Uttar Pradesh, the IMR was higher than in other Indian states. Prematurity, low birth weight, neonatal infections, pneumonia, diarrheal illness, birth asphyxia, and birth trauma are the causes of IMR.10 IMR was lower for women who had schooling more than 10 years had less IMR. Religion and IMR have a complicated and multifaceted interaction. In Kerala and Uttar Pradesh, the Hindu community had a higher IMR than the Muslim community.

However, in Tamil Nadu, Muslims had a higher IMR than Christians and Hindus. There is a lack of evidence about cultural practices, economic conditions, livelihood and dietary preferences in religious practices. Discrimination and deprivation are experienced by marginalized communities, including Scheduled Castes and Tribes. Scheduled caste/tribes had higher IMR in all 3 states under comparison. Male children have a higher risk of mortality compared to female children in Tamil Nadu and Uttar Pradesh and vice versa in Kerala. The risk of IMR was higher among boys than girls.[11] IMR among mothers age at birth was high among age <20 years in Uttar Pradesh, age between 30-39 in Tamil Nadu and age between 20-29 in Kerala. Birth order 1 had increased IMR in Kerala, while 2-3 had high IMR in Tamil Nadu. Uttar Pradesh has a high IMR among birth orders of 4 or more (Table 2).

DISCUSSION

IMR has reduced in years due to economic transition, government initiatives to improve utilization of public and private health care, and upliftment of women. Infant mortality rate is higher in rural regions due to prevailing illiteracy and lack of access to adequate and timely medical care.[13] Mothers having a greater number of children experience higher infant deaths except in Kerala, where there is a reduction in birth order greater than 2.[12] It might be challenging for the mother to care for her children after many pregnancies, which increases the risk of infections and malnutrition. The likelihood of low birth weight also rises with several pregnancies, which affects the child's chances of surviving.[14] Girl babies have less infant mortality compared to boys, due to genetic and biological makeup. Boys are weaker biologically and more susceptible to diseases and premature death.[15]

A major factor influencing both population stabilization and newborn health is female literacy.[16] Mothers who had greater than 10 years of schooling had a higher rate of drop-in infant mortality. But in Uttar Pradesh there is higher rate of infant death among mothers who had no education. Education of mothers can influence the attitudes of mothers towards beliefs, traditional norms, and hygiene practices.[17] A shorter birth interval is associated with a lower survival rate for babies born to mothers who have not fully recovered from their pregnancy or from maternal depletion syndrome (MDS) which is seen in all 3 states.[18] Since low fertility women may have superior nutritional status and access to therapy, shorter birth intervals may not deplete the mother’s nutritional resources to the extent that the child’s risk of death increases.[19] Longer birth intervals (>4 years) have a slightly higher infant mortality rate compared to moderate birth intervals (2-3 years) in Uttar Pradesh and Tamil Nadu.

Infants whose mothers did not visit prenatal care (ANC) programs were more likely to die than newborns whose mothers did. Compared to fewer ANC visits, four or more ANC visits indicate a decreased risk of IMR.[20]

42.4% of Uttar Pradesh residents had at least four ANC visits, compared to 78.6% in Kerala and 89.9% in Tamil Nadu. In the first trimester, 77.4% of Tamil Nadu women, 93.6% of Kerala women, and 62.5% of Uttar Pradesh women got an antenatal checkup.

Infant mortality rate is higher among Hindus in Kerala and Tamil Nadu as majority population follows Hinduism. But in Tamil Nadu, IMR is higher in Muslims. Infant mortality rate was lower in other backward class compared to scheduled caste. Tamil Nadu, being one of the most developed states in India, has many social welfare schemes, but still there needs improvement in the

IMR among SC's, as caste remains a significant line of social division in India.[21] In Uttar Pradesh, there is a higher IMR seen in Scheduled caste and Scheduled tribes.

According to Statista (2019), the number of doctors per 10,000 population is 42 per 10,000 population in Kerala, compared to 12 per 10,000 and 8 per 10,000 in Tamil Nadu and Uttar Pradesh, respectively.[22] Kerala has the highest literacy rate of 94.0%, while 80.1% in Tamil Nadu and 67.7% in Uttar Pradesh.[23] Kerala has the highest literacy rate, excellent healthcare and human development index. These factors contributed to higher life expectancy, improved overall health, and a lower infant mortality rate, which enhanced gender equality, empowered marginalized communities and enhanced socio-economic growth.

CONCLUSION

To conclude, there is a difference in IMR in caste, schooling and birth interval <2 years. Kerala performs better in combating infant mortality compared with Tamil Nadu and Uttar Pradesh, due to welfare schemes and services provided by the State and Federal Government. Nevertheless, despite increased focus on the issue of caste disparities and birth interval in the mortality patterns over the past few decades in health policies and programs, actual public health spending must be increased to the extent that is necessary to address social inequalities and awareness in health. The health information system is the cornerstone of development in health, and periodically performed NFHS surveys represent an indicator for India. To obtain an accurate assessment when comparing national statistics. A few parameters must be clarified, such as birth order, birth size, preceding birth interval, schooling, religion, caste, and wealth quintile.

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REFERENCES

1. Finkelstein JZ, Duhau M, Speranza A. Trend in infant mortality rate in Argentina within the framework of the millennium development goals. Arch Argent Pediatr. 2016;114(3):216-22.
2. Indicator metadata registry details. https://www.who.int. Accessed on 15th May 2024.
3. Black RE, Laxminarayan R, Temmerman M, Walker N, editors. Reproductive, Maternal, Newborn, and Child Health: Disease Control Priorities, Third Edition (Volume 2). Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2016.
4. Millennium development goals (MDGs). https://www.who.int/news-room. Accessed on 11 July 2024.
5. The 17 Goals. Sustainable Development. Avaialable at: https://sdgs.un.org/goals. Accessed on 11 July 2024.
6. Under-five deaths. Available at: https://www.who.int/data/gho. Accessed on 11 July 2024.
7. NFHS-5_Phase-II. Available at: https://main.mohfw.gov. Accessed on 15 May 2024.
8. Safer pregnancy in Tamil Nadu: from vision to reality. Available at: www.who.int/publications. Accessed on 11 July 2024.
9. NITI Aayog-World Bank. Health Index Round IV 2019-20. Healthy states progressive India, Report on the Ranks of States and Union Territories. Available at https://www.niti.gov.in/sites/default/files/2021-12/NITI-WB_Health_Index_Report_24-12-21.pdf. Accessed on 14 October 2024.
10. Bassani DG, Kumar R. Million Death Study Collaborators, Causes of neonatal and child mortality in India: a nationally representative mortality survey. Lancet Lond Engl. 2010;376(9755):1853-60.
11. Bango M, Ghosh S. Social and Regional Disparities in Utilization of Maternal and Child Healthcare Services in India: A Study of the Post-National Health Mission Period. Front Pediatr. 2022;10:895033.
12. Gokhale MK, Rao SS, Garole VR. Infant mortality in India: use of maternal and child health services in relation to literacy status. J Health Popul Nutr. 2002;20(2):138-47.
13. Karthik Nagesh N, Razak A. Current status of neonatal intensive care in India. Arch Dis Child Fetal Neonatal Ed. 2016;101(3):260-5.
14. Ali DA, Mohamed NA, Ismail AI, Hassan GD. The risk factors of infant mortality in Somalia: evidence from the 2018/2019 Somali health & demographic survey. BMC Pediatr. 2024;24:486.
15. Pongou R. Why is infant mortality higher in boys than in girls? A new hypothesis based on preconception environment and evidence from a large sample of twins. Demo. 2013;50(2):421-44.
16. Saurabh S, Sarkar S, Pandey DK. Female Literacy Rate is a Better Predictor of Birth Rate and Infant Mortality Rate in India. J Fam Med Prim Care. 2013;2(4):349.
17. Kiross GT, Chojenta C, Barker D, Tiruye TY, Loxton D. The effect of maternal education on infant mortality in Ethiopia: A systematic review and meta-analysis. PLoS ONE. 2019;14(7):220076.
18. Kiross GT, Chojenta C, Barker D, Loxton D. Individual-, household- and community-level determinants of infant mortality in Ethiopia. PLoS ONE. 2021;16(3):248501.
19. Kozuki N, Walker N. Exploring the association between short/long preceding birth intervals and child mortality: using reference birth interval children of the same mother as comparison. BMC Public Health. 2013;13(3):6.

20. Puranik A, Binu VS, Biju S, Subba SH. Spatio-Temporal Assessment of Infant Mortality Rate in India. Indian J Public Health. 2018;62(1):32.
21. Bango M, Ghosh S. Reducing infant and child mortality: assessing the social inclusiveness of child health care policies and programmes in three states of India. BMC Public Health. 2023;23:1149.
22. India: number of doctors per 10,000 population by state. Statista. Available at: https://www.statista.com. Accessed on 18th October 2024.
23. Ministry of Statistics and Program Implementation. Women & Men in India-2016: Chapter-3 Literacy and Education. Available at: https://www.mospi.gov.in/sites/default/files/reports_and_publication/statistical_publication/social_statistics/WM16Chapter3.pdf. Accessed on 18 October 2024.

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