ACHIEVING SUSTAINABLE DEVELOPMENT GOALS (SDGs) IN INDIA WITH A FOCUS ON REDUCING INFANT MORTALITY IN THE SOUTHERN STATES.

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Abstract

The infant mortality rate (IMR) is a key component of India's sustainable development goals and it serves as an important development indicator for the country. This paper explores the current state of IMR in the southern regions of India. This paper examines the status of IMR in the southern state of India. To accomplish this, the study utilizes a log-linear growth model, ANOVA, and Duncan's multiple comparison techniques to compare IMR among South Indian states with the national average. The findings indicate that Kerala has a very low average IMR, Tamil Nadu and Karnataka have moderate levels, and Andhra Pradesh has a high IMR. Specifically, Tamil Nadu should focus on improving child healthcare to achieve further reductions in IMR, while Karnataka and Andhra Pradesh need to intensify their efforts to decrease IMR significantly. The study concludes that state governments must implement effective child healthcare programs at the ground level to lower the national average IMR and meet the sustainable development goals in India as soon as possible.

Keywords: MDGs, Infant Mortality Rate, South Indian, child healthcare.

1. Introduction

In 2015, every United Nations member state endorsed the 2030 Agenda for Sustainable Development, outlining a comprehensive strategy to ensure global peace and prosperity now and in the future. Through a worldwide partnership, all developed and developing countries have committed to taking serious action towards the 17 Sustainable Development Goals central to the 2023 agenda. This agenda emphasizes improving health, education, and economic growth while reducing inequality by eradicating poverty and other deprivations associated with a country's development. Although the SDGs do not set a specific target for the infant mortality rate (IMR), SDG 3.2 aims to eliminate preventable deaths of children under five by 2030. The

targets are set at no more than 12 neonatal deaths per 1,000 live births and no more than 25 under-five deaths per 1,000 live births. Therefore, infant mortality is a pivotal issue in global development, with governments worldwide prioritizing its reduction. The significant variations in IMR across different regions have driven efforts in all countries to address this concern. In developed countries like Australia and Canada, the IMR is below 10 per 1,000 live births. However, in many African and Asian countries, the IMR exceeds 50, and in some cases, it is over 100 per 1,000 live births in the current context. The United Nations estimates that annually, 10 million infants die worldwide, with India contributing to one-quarter of these deaths. Hence, examining infant mortality in India is crucial on a global scale. At both the national and state levels, India strives to minimize IMR to the greatest extent possible. This paper aims to assess the status of different states in southern India by analysing trends, patterns, and variations in IMR across these regions.

1.1 Literature Review Regarding Infant Mortality Rate (IMR)

Marian Claeson and Eduard R. Bos (2000) analyzed India's IMR trends since 1981. Their study indicates a recent slowdown in the IMR decline, deviating from historical trends. They also examine childhood mortality effects and propose targeted strategies for various states, based on current mortality rates and advancement stages. Satish B. Agnihotri (2001) has analyzed West Bengal's infant and child mortality using district and state-level estimates, comparing them with national data. Using mapping techniques for 1981 and 1991 estimates, the study identifies high-mortality regions and reveals significant gender gaps, especially in urban areas. It finds higher IMR among SC and ST nationally, however, these differences are less evident in rural West Bengal. Furthermore, mortality rates are elevated among Muslims and Christians associated with Hindus. Umakant Dash and V. R. Muraleedharan (2008) analyzed technical efficiency in achieving overall health outcomes, such as reduced IMR and increased life expectancy, utilizing district-level health data from Tamil Nadu. Their study reveals that a significant portion of districts—52% for life expectancy and 72% for infant mortality rates—are incompetent in achieving these health goals. Ellen Van De Poel and Eddy Van Doorslaer (2009) have inspected the disparity of rural and urban area disparity in IMR across six African countries. Using a novel decomposition method the study has analyzed Demographic and Health Survey data. The study results indicate that variations in the distribution of factors impacting mortality, rather than disparities in their effects, predominantly explain the disparity between rural and urban areas. Specifically, disadvantages in both noticed and unnoticed

household characteristics explain approximately two-thirds of the higher infant mortality rates observed in rural areas.

Elsie R. Pamuk, Regina Fuchs, and Wolfgang Lutz (2011) analyzed the varying properties of resources like human and material on IMR in emerging countries. The research underscores that elements beyond economic and educational resources exert notable influence on IMR, with significant disparities persisting across communities and countries even after accounting for these factors. S. James (2014) analyzes the historical trends of IMR over decades, focusing on the recent acceleration in the deterioration of IMR in India. The study delves into the socio-economic and demographic shifts that have contributed to this decline, particularly highlighting the impact of initiatives like the NRHM. Dr. Nityananda Barman and Dipul Talukdar (2014) investigated in Assam the factors influencing the IMR in India. Their findings highlight that economically disadvantaged regions experience higher rates of both infant and maternal mortality compared to more developed areas. The study underscores the multifaceted that socio and economic factors have made an impact on IMR. In Assam, a socio-economically disadvantaged state, the IMR is significantly higher compared to more prosperous states in India.

Damodar Sahu (2015) explored IMR and related factors among ST in rural areas. The study observed a notable decline in IMR from 1992 to 2006 among these communities. Still, the study noted an elevated risk of IMR among births to mothers aged 30 years or older in comparison to those aged 20-29 years. Suriyakala, V., Deepika, M. G., Amalendu, J., & Deepa, G. (2016) examine factors that influence IMR and the study has applied Regression analysis to assess their impact on infant mortality and evaluates states' performance in reducing IMR through technical efficiency analysis. The study shows that substantial progress is observed in major states, smaller states, and Union Territories. Puranik et al. (2018) led a study focusing on the Infant Mortality Rate (IMR), a critical global health indicator. Their research aimed to identify IMR hotspots across Indian states from 2000 to 2012, and identify predictors of IMR while considering spatial autocorrelation. The study has observed negative associations between IMR and indicators such as female literacy, antenatal check-up coverage, and urban population percentage. Also, the study underscores the persistent challenge of high IMR in generally underachieving states, requiring targeted interventions. Mukherjee et al. (2019) explored the causes of IMR in rural India, focusing on distal factors influencing IM rates. The results showed a significant negative correlation between female literacy rates and IMR, with

moderate negative correlations also observed for female unemployment rates and GSDP. Still, only female literacy rates continued ominously connected with IMR after adjustments. The study concluded that improving rural female literacy is crucial in reducing infant mortality in rural India. Chaurasia (2020) examined IMR trends in India from 1971 to 2018 with the help of regression analysis. The findings revealed three distinct periods of trend changes during this timeframe, each with varying rates of decline. Particularly noteworthy was a substantial slowdown in IMR reduction from 1992 to 2006. Still, following the introduction of the NRHM in 2005, there was a notable speeding up in IMR decline to more than 4% annually. Given the study's context, IMR serves as a crucial indicator for assessing community health. Socioeconomic factors play a critical role in influencing the decline of IMR. Additionally, IMR is a key component of HDI, essential for evaluating public health strategies. The Sustainable Development Agenda aims to reduce IMR by two-thirds from 1990 to 2020. Therefore, this study is important for evaluating the status of IMR in India.

2. Aim of the study

- To study the current situation, trends, and inequalities in IMR across India and four southern states.

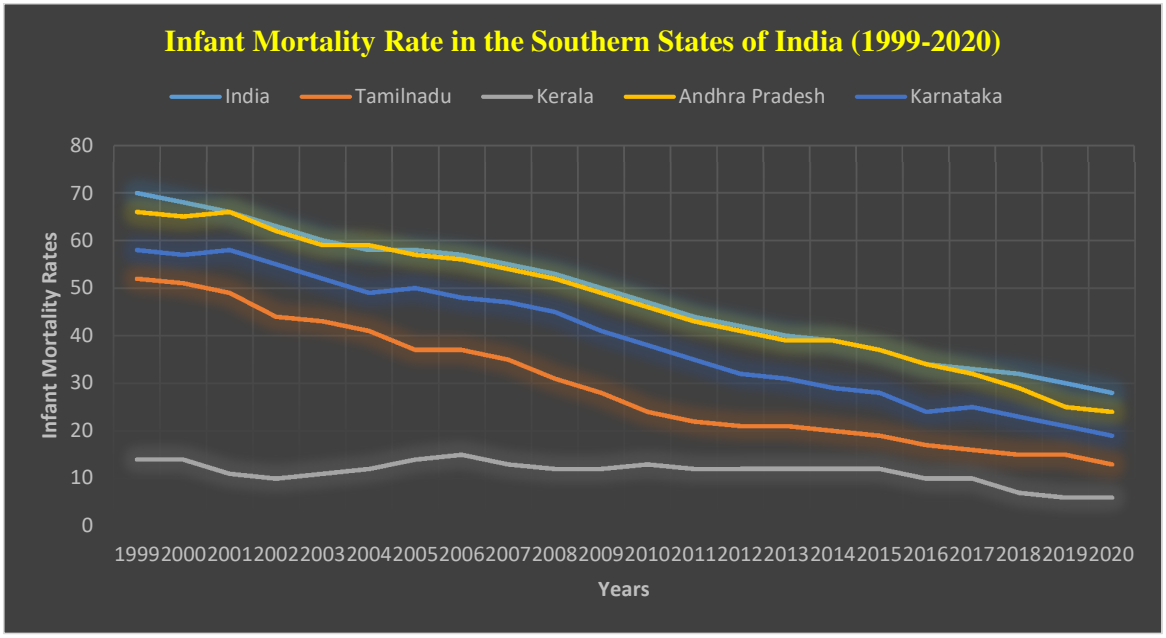
3. Methodology of the study

This analytical and descriptive research utilizes available data and information. The data has been taken through secondary sources like Sample Registration System Statistical Reports, SRS Bulletins, and RBI reports from 1999 to 2020. Descriptive statistics and econometric tools are employed to present the status of infant mortality through graphs. Log-linear growth models analyze IMR trends, whereas ANOVA and Duncan’s multiple comparison techniques are used to compare IMR across southern Indian states and at the national level. The analysis encompasses four southern states: Tamil Nadu (TN), Andhra Pradesh (AP), Karnataka (KA), and Kerala (KL).

4. Analysis and interpretation

A comprehensive assessment has been conducted for India and its southern states about IMR from 1999 to 2020 statistical report of this study is detailed below in the form of a chart.

Chart-1 Infant Mortality Rates in the Southern States of India



Source: computed by the researcher

The chart presents the Infant Mortality Rates (IMR) for India and four southern states spanning the years from 1999 to 2020. The IMR is reported as the number of deaths of infants under one-year-old per 1,000 live births. The national IMR shows a consistent decline from 70 in 1999 to 28 in 2020. Tamil Nadu IMR has decreased significantly from 52 in 1999 to 13 in 2020, reflecting a continuous improvement in infant health outcomes. Kerala maintained the lowest IMR among the states listed, starting at 14 in 1999 and declining to 6 by 2020, showcasing sustained low infant mortality. The IMR in Andhra Pradesh dropped from 66 in 1999 to 24 in 2020, indicating substantial progress over the period. Karnataka state's IMR decreased from 58 in 1999 to 19 in 2020, following a similar downward trend as the other states. The Key Observations at National Trend The overall IMR for India showed a significant reduction, indicating improved healthcare and socioeconomic conditions across the country. In terms of State Comparisons**,** Kerala consistently had the lowest IMR throughout the period, reflecting its advanced healthcare infrastructure and social indicators. Tamil Nadu showed a steady decline, positioning itself as the second-best in terms of low IMR among the states listed. Andhra Pradesh and Karnataka also displayed significant improvements, though they started with higher IMRs compared to Kerala and Tamil Nadu. Overall, the data indicates a positive trend in reducing infant mortality rates across India and the southern states. Continued efforts

in healthcare improvements, socio-economic development, and policy interventions are crucial to sustaining and furthering this progress.

4.1 Patterns in Infant Mortality Rates in Southern Indian States

This table presents the Compound Annual Growth Rate (CAGR) of Infant Mortality Rates (IMR) for India and four southern states. Additionally, the table includes the t-ratio and p-value for each region, indicating the statistical significance of the observed trends over the study period.

Table 2: Patterns in IMR in Southern Indian States

Country &states	CAGR	t-ratio	P-value
INDIA	-2.74	-21.23	0.000
TN	-6.25	-19.71	0.000
AP	-2.71	-20.15	0.000
KA	-3.46	-9.85	0.000
KL	-0.21	-0. 1648	0.752

Source: derived from the researcher's calculations

Table 2 reveals the IMR for India has a CAGR of -2.74%, with an extremely significant t-ratio of -19.32 and a p-value of 0.000, indicating a robust declining trend in infant mortality rates nationwide. The Tamil Nadu state exhibits the most substantial reduction in IMR with a CAGR of -6.25%, supported by a t-ratio of -19.73 and a p-value of 0.000, demonstrating a highly significant downward trend. Andhra Pradesh demonstrates a Compound Annual Growth Rate (CAGR) of -2.71%, supported by a t-ratio of -20.15 and a highly significant p-value of 0.000, indicating a substantial decline in IMR. Karnataka exhibits a CAGR of -3.46%, with a t-ratio of -9.85 and a p-value of 0.000, indicating a notable decrease in IMR throughout the study period. Kerala exhibits negligible change in IMR with a CAGR of -0.21%, a t-ratio of -0.1648, and an insignificant p-value of 0.752, suggesting no substantial trend in infant mortality rates during the analyzed timeframe. Further, the data reveals a significant decline in IMR for India and most southern states, particularly Tamil Nadu, Andhra Pradesh, and Karnataka. Kerala, however, shows no significant change, likely due to its already low IMR at the start of the period. The statistical significance of these trends underscores the effectiveness of health policies and interventions aimed at reducing infant mortality in these regions.

4.2 Evaluation of IMR among the Southern Indian States

This table compares the IMR among the southern states of India as well as the national average for India. The comparison is made using ANOVA with a significance level (alpha) of 0.05. The table presents the mean IMR for each group, divided into homogeneous subsets based on the Tukey HSD test.

Table 3: Assessment of IMR among the Southern Indian States

States	N	Subset for alpha = 0.04			
		1	2	3	4
KL	21	12.467			
TN	21		35.644		
KN	21			46.311	
AP	21				54.355
INDIA	21				55.311
Sig.		1.000	1.000	1.000	.632
62.658:ANOVA F-Value			0.000:P-value		
The means for groups in homogeneous subsets are presented.					
a. Utilizes a Harmonic Mean Sample Size of 15.000.					

Source: derived from the researcher's calculations

Table **-3** indicates that Kerala has the lowest mean IMR at 12.467, which falls into its subset, indicating it is significantly different from the other states and the national average. Tamil Nadu's mean IMR is 35.644, placing it in the second subset, showing a significant difference from Kerala but not from Karnataka, Andhra Pradesh, and the national average. Karnataka has a mean IMR of 46.311, positioned in the third subset, indicating significant differences from Kerala and Tamil Nadu. Andhra Pradesh's mean IMR is 54.355, which falls into the fourth subset along with the national average, suggesting no significant difference between these two. At, the national average IMR is 55.311, grouped with Andhra Pradesh in the fourth subset. The ANOVA results reveal significant differences in IMR among the southern states and the national average. Kerala stands out with the lowest IMR, while Tamil Nadu, Karnataka, and Andhra Pradesh show progressively higher IMR, with Andhra Pradesh closely aligning with the national average. The significant F-value and p-value indicate that these differences are

statistically significant, reinforcing the necessity for targeted health interventions in states with higher IMR.

4.3 Result and Discussion

The current study examines IMR trends using historical data from 1999 to 2020 in the southern states of India. The findings reveal a decline in IMR for Tamil Nadu (TN), Andhra Pradesh (AP), and Karnataka (KA) during this period. Similar results were identified in previous studies by Marian Claeson and Eduard R. Bos (2000) on IMR trends in India, S. James (2014) on historical IMR trends over decades in India, and Damodar Sahu (2015) on IMR and related factors among Scheduled Tribes in rural areas from 1992 to 2006 in India.

Conclusion

India holds a crucial role in global efforts to eradicate preventable infant mortality. The study reveals a significant reduction in the IMR at the national level. Specifically, the analysis of the southern states of India shows that Tamil Nadu has achieved a substantial decline in IMR. Furthermore, Kerala exhibits the lowest IMR among the states studied, although Tamil Nadu has shown a remarkable reduction over recent years. The findings also indicate that Karnataka and Andhra Pradesh have comparatively higher IMRs than Tamil Nadu and Kerala. These states require focused interventions, as some districts suffer from inadequate awareness and insufficient quality in healthcare programs. By addressing these disparities, the average IMR in these states can be further reduced, aiding India in promptly meeting the Sustainable Development Goals (MDG).

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