Typhoid in Tamil Nadu: Trends, Challenges, and Public Health Implications (2015-2025)

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Abstract- Typhoid fever remains a significant public health concern in India, with recent estimates indicating approximately 10 million cases in 2021, the highest national burden globally. However, a critical lack of recent, state-specific surveillance data for Tamil Nadu hinders accurate burden assessment and targeted intervention. This review synthesizes available national and regional evidence to extrapolate trends, challenges, and implications for Tamil Nadu. Major challenges include evolving antimicrobial resistance, with ciprofloxacin non-susceptibility in 99.3% of S. Typhi isolates nationally, and limitations in diagnostic capacity. Public health implications underscore the urgent need for enhanced lab-based surveillance, the integration of Typhoid Conjugate Vaccines (TCV) into the state immunization program, and the strengthening of Water, Sanitation, and Hygiene (WASH) infrastructure. An integrative approach is essential for the effective prevention and control of typhoid fever in Tamil Nadu.

I. INTRODUCTION

Typhoid or enteric fever, primarily caused by Salmonella enterica serovar Typhi, is a major waterborne and foodborne illness. It remains a serious public health problem in economically developing nations, where a large proportion of the population lacks access to safe water and adequate sanitation. The World Health Organization (WHO) estimates a global incidence of millions of cases annually, with a significant portion of this burden falling on South Asia.

While national data for India indicates a severe burden, with one study reporting about 10 million cases in 2021, the precise epidemiological trends in Tamil Nadu from 2015 to 2025 are not well-documented in the readily available scientific literature. This gap itself represents a primary challenge for public health policy. This article aims to compile existing evidence, identify data gaps, and discuss the persistent challenges and evolving public health strategies, including vaccination and antimicrobial stewardship, relevant to typhoid control in Tamil Nadu.

II. METHODOLOGY

This research article is based on a narrative review of scientific literature. A search was conducted for peer-reviewed articles, surveillance reports, and public health documents pertaining to typhoid fever in India and Tamil Nadu specifically, published between 2015 and 2025. Sources included PubMed (PMC), ScienceDirect, and other academic databases.

Inclusion Criteria: Studies and reports focusing on typhoid incidence, antimicrobial resistance (AMR), diagnostics, vaccine efficacy, and public health interventions in India. Given the paucity of Tamil Nadu-specific data, national data was used to provide context and highlight regional evidence gaps.

Exclusion Criteria: Non-English publications, articles without accessible abstracts or full texts, and studies conducted prior to 2015 unless for historical trend analysis.

Limitation: The most significant limitation is the lack of recent, comprehensive, and publicly available state-specific surveillance data for Tamil Nadu, which constrains the ability to draw precise conclusions.

III. EPIDEMIOLOGICAL TRENDS: A DATA GAP FOR TAMIL NADU

National data suggests a complex picture of typhoid trends. Some large tertiary care centers in India have reported a decline in the isolation of S. Typhi from blood cultures over a 15-year period ending in 2015. This decline was temporally related to economic

improvement, increased female literacy, and the use of more effective antibiotics.

However, this trend is not necessarily indicative of a reduced burden. A 2024 report emphasized that India continues to experience an "alarming rise in typhoid cases," with an incidence rate substantially higher than in neighboring countries like Pakistan, China, and Indonesia. Furthermore, typhoid risk is highly focal, with significant urban-rural disparities. Prospective research in India (2017-2020) found the risk of typhoid fever was markedly higher in urban locations (576–1,173 cases per 100,000 child-years) compared to a rural site (35 cases per 100,000). The disease disproportionately affects children, with most cases occurring in individuals under 15 years of age.

Table: National Trends of Antimicrobial Resistance in S. Typhi Isolates (Illustrative)

Antibiotic	Resistance Trends (Historical context)	Recent Data (2021 -2024)
Ciprofloxacin	Resistance rose to 98% using reversed criteria	99.3% non susceptibility
Ampicillin, chloramphenicol, co-trimoxazole	Declining resistance (Multidrug-resistant-MDR)	Only 1.8% MDR Isolates
Ceftriaxone	Low resistance (1.5-4%)	Emergence of 18 ceftriaxone- resistant isolates in Ahmedabad
Azithromycin	An effective alternative	Yearly increase in MIC values , indicating creeping resistance

IV. MAJOR CHALLENGES IN CONTROL AND MANAGEMENT

4.1. The Critical Data Gap and Diagnostic Hurdles

The most fundamental challenge for Tamil Nadu is the lack of a robust, state-specific surveillance system. Uncertainty regarding the true disease burden is a major impediment to effective policy. This is compounded by significant diagnostic challenges. The gold standard of blood culture has a sensitivity of only 40-60%. The widely used Widal test suffers from poor sensitivity and specificity, often leading to misdiagnosis. While novel diagnostics like loop-mediated isothermal amplification (LAMP) and the TPTest are promising, they are not yet widely implemented in routine healthcare settings, leading to continued reliance on clinical diagnosis, which is often inaccurate in areas with co-endemic febrile illnesses.

4.2. Evolving Antimicrobial Resistance (AMR)

Antimicrobial resistance is a severe and growing threat to typhoid control. National data reveals a dramatic shift in resistance patterns:

Near-Universal Fluoroquinolone Resistance: Ciprofloxacin is no longer a reliable treatment option, with 99.3% of recent S. Typhi isolates showing non-susceptibility.

Creeping Resistance to Key Drugs: While resistance to older first-line drugs (defining MDR typhoid) has declined, there are alarming signs of resistance to the current first-line drugs. Surveillance from 2021-2023 shows a consistent yearly increase in azithromycin MIC values for both S. Typhi and S. Paratyphi across India. Furthermore, the emergence of ceftriaxone-resistant S. Typhi in Gujarat state is a grave development, mirroring the extensively drug-resistant (XDR) outbreaks seen in Pakistan.

The following chart illustrates the proportion of resistant S. Typhi isolates for key antibiotics based on recent national surveillance data, highlighting the severity of the AMR problem

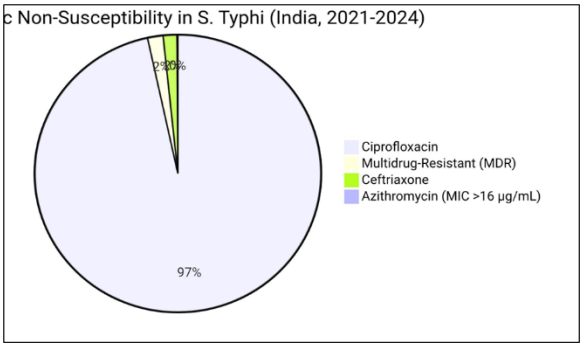
Antibiotic Non-Susceptibility in S. Typhi (India, 2021-2024)

-Ciprofloxacin: 99.3

-Azithromycin (MIC >16 µg/mL): 0.1

-Ceftriaxone: 1.6

-Multidrug-Resistant (MDR): 1.8



4.3. Environmental and Socioeconomic Drivers

Typhoid is a disease of poor sanitation and contaminated water. The persistence of the disease is fundamentally linked to inadequate WASH infrastructure. Risk factors include larger households with fewer assets and unhygienic toilet facilities. Control efforts must therefore extend beyond the healthcare sector to include significant investment in public utilities and health education.

V. PUBLIC HEALTH IMPLICATIONS AND THE WAY FORWARD

5.1. Vaccination as a Critical Tool

The high burden of typhoid, particularly among children, makes vaccination a cornerstone of any control strategy. The World Health Organization has prequalified a Typhoid Conjugate Vaccine (TCV), and India's National Technical Advisory Group on Immunisation (NTAGI) has recommended its inclusion in the Universal Immunisation Programme. TCVs offer significant advantages, including longer-lasting immunity and suitability for younger children. Studies have shown that vaccination is effective and can be cost-saving in urban India from a societal perspective. A comprehensive vaccination campaign in Tamil Nadu's endemic areas, particularly urban centers, is an urgent public health priority.

5.2. Strengthening Surveillance and Laboratory Capacity

There is an urgent need to establish a lab-based sentinel surveillance system for Tamil Nadu, similar to the Surveillance for Enteric Fever in India (SEFI) network. This would provide real-time data on incidence, circulating strains, and AMR patterns, enabling evidence-based policy and targeted interventions. Strengthening laboratory capacity for blood culture and antimicrobial susceptibility testing is essential for both surveillance and improved clinical care.

5.3. Implementing an Integrative Approach: The WASH Strategy

No single intervention will eliminate typhoid. A multi-pronged approach is essential. Alongside vaccination, the Water, Sanitation, and Hygiene (WASH) strategy is fundamental for sustainable control. This includes ensuring access to clean drinking water, promoting proper handwashing practices, and safe disposal of human excreta. Public awareness campaigns about food and water safety are a critical component of this strategy.

VI. DISCUSSION AND CONCLUSION

The available evidence, while not specific to Tamil Nadu, paints a concerning picture of the typhoid situation in India, characterized by a high disease burden and a rapidly evolving antimicrobial resistance crisis. The key challenges for Tamil Nadu include a critical gap in surveillance data, diagnostic limitations, and the looming threat of drug-resistant typhoid.

The public health implications are clear. A business-as-usual approach is insufficient. Tamil Nadu must take decisive action on three fronts:

1. Prevention: Accelerate the introduction of TCV into the state's routine immunization schedule, with initial focus on high-burden urban areas.
2. Surveillance: Invest in and establish a comprehensive, lab-based surveillance system to generate Tamil Nadu-specific data on incidence and AMR.
3. Integration: Combine vaccination with robust WASH interventions and professional education on antimicrobial stewardship to preserve the efficacy of remaining treatment options.

In conclusion, while typhoid fever remains a formidable public health challenge, the tools for its control are available. The path forward for Tamil Nadu requires political will, strategic investment, and an integrated public health approach to reduce the burden of this preventable disease.

REFERENCES

[1] Gopalakrishnan R, et al. Typhoid fever: Control & challenges in India. Indian J Med Res. 2019.
[2] Mehta K, Joshi M, Omar MA. Typhoid fever in India: A growing concern requiring urgent vaccination in endemic areas. Health Sci Rep. 2024.
[3] Babu M, et al. Typhoid conjugate vaccine implementation in India: A review of supportive evidence. Vaccine: X. 2024.
[4] John J, et al. Longitudinal Typhoid Fever Trends in India from 2000 to 2015. Am J Trop Med Hyg. 2018.
[5] Andrews JR, et al. Antimicrobial susceptibility trends of S. Typhi and S. Paratyphi in a post-COVID-19 pandemic India, from a multicenter surveillance network. Sci Rep. 2025.