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ORIGINAL ARTICLE

URBAN HOTSPOTS OF LEPROSY: CHILD AND MIGRANT-LINKED TRANSMISSION IN CHENNAI, 2021–2025

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ABSTRACT

INTRODUCTION : Annual New Case Detection Rate (ANCDR) per 100,000 population remains a critical indicator for monitoring progress under India's National Leprosy Eradication Programme (NLEP). While Tamil Nadu as a state has maintained relatively low ANCDR, Chennai district, a metropolitan and purely urban setting, presents unique challenges due to large-scale migrant settlements, high mobility, and floating population. Notably, child ANCDR in the district has been consistently higher compared to the state average, suggesting active transmission. This study describes the epidemiological profile and spatial distribution of new leprosy cases across the 15 administrative zones of Chennai during 2021–2025, with reference to time, place, and person distribution.

METHODS : Secondary data were extracted from official programme registers for the fiscal years 2021–2025. Variables included age, gender, type of leprosy, presence of deformity, and mode of case detection. Population denominators were derived from 2011 Census projections, disaggregated by age and gender. ANCDR was calculated annually and stratified by zone, age group, gender, and type of leprosy. Special attention was given to industrial and border zones to understand spatial clustering.

RESULTS: A total of 515 new leprosy cases were reported during the five-year period. The overall ANCDR ranged from 1.0 per 100,000 in 2020–21 to 1.3 in 2024–25, with a transient peak above 2.0 during 2022–23. Spatial analysis showed six zones reporting ANCDR >2.0, three of which were industrial hubs and three located at district borders (range: 2.0–4.9). Child ANCDR was notably high, ranging from 3.5 to 11.5, especially in industrial, their adjoining residential zone and border zones. Multibacillary (MB) cases constituted more than 50% of all detections, with MB ANCDR remaining stable across zones (approximately 1.2). Paucibacillary (PB) cases were more common in the <15-year age group (1.5 per 100,000). No cases were reported among listed household or neighborhood contacts despite systematic screening.

CONCLUSION: Surveillance in Chennai shows static overall ANCDR but persistent hotspots in industrial and border zones with elevated child ANCDR, indicating ongoing transmission likely linked to migrants. Stable MB rates and absence of contact cases suggest transmission beyond households. Conventional case-finding may miss such foci, underscoring the need for innovative surveillance strategies targeting migrant populations to sustain elimination goals.

KEYWORDS : Leprosy, Annual New Case Detection Rate, Urban Health, Migrants, Child Leprosy, Industrial Zones, NLEP, Chennai

INTRODUCTION

Leprosy, caused by Mycobacterium leprae, remains a public health challenge in India despite achieving elimination status at the national level in 2005. India continues to contribute more than half of the world's annual new leprosy cases.[1] The Annual New Case Detection Rate (ANCDR) is a critical indicator used to monitor progress under the National Leprosy Eradication Programme (NLEP).[2]

Tamil Nadu state has sustained relatively low ANCDR in recent years; however, Chennai district, a purely urban metropolitan setting, presents unique epidemiological challenges. Migrant labour, floating population and high-density settlements increase risk of sustained transmission. Notably, child ANCDR in Chennai has remained higher than the state average, suggesting active transmission.[3]

While rural leprosy transmission dynamics have been well studied, there is limited evidence on urban hotspots, particularly in industrial and border zones where migrants congregate. This study examines five-year surveillance trends (2021–2025) in Chennai, focusing on spatial patterns and vulnerable sub-populations.

METHODS

STUDY DESIGN AND SETTINGS: A descriptive cross-sectional study was conducted using secondary programme data from 15 administrative zones of Chennai district, Tamil Nadu, India.

DATA SOURCES: Case data were extracted from official NLEP

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registers for 2021–2025. Variables included:Age, gender, type of leprosy and mode of detection (active vs. passive). Population denominators were derived from 2011 Census projections, disaggregated by age and gender.

DATA ANALYSIS: ANCDR was calculated as number of new cases per 100,000 population annually. Rates were stratified by zone, gender, and age group (<15 years vs. ≥15 years). Data were analyzed using descriptive statistics and presented as trends over time.

RESULTS

From 2021–2025, 515 new cases were detected in Chennai. The overall ANCDR ranged from 1.0 per 100,000 in 2021 to 1.3 in 2025, with a transient spike to >2.0 in 2022–23(Figure 1). Six zones reported ANCDR >2.0 (range: 2.0–4.9), of which three were major industrial hubs and three were located at district borders(Figure 2). Child ANCDR was disproportionately high (3.5–11.5 per 100,000)(Figure 4), concentrated in industrial and border zones. Paucibacillary leprosy were more common among children (Table 2). Multibacillary leprosy accounted for more than 50% of all detections, with stable MB ANCDR (~1.2). Paucibacillary leprosy was more frequent among children (Table 2). No household or neighbourhood contact cases were identified despite systematic screening. Self- reporting and case detection by active search were almost equal across years (Table 3).

Table 1: Distribution of ANCDR/100,000 populationby age group and gender, Chennai district, Tamil Nadu, India, 2021-2025

Age group	2020-21	2021-22	2022-23	2023-24	2024-25
<15	0.1	0.8	2	0.5	0.5
>15	1.2	1.3	1.9	1.6	1.5

Gender	2020-21	2021-22	2022-23	2023-24	2024-25
Male	1.4	1.7	3.3	1.8	1.7
Female	0.5	0.7	0.5	0.9	0.9

Table 2 : Distribution of ANCDR/100,000 population by type of leprosy, Chennai district, Tamil Nadu, India, 2021-2025

Type of leprosy	2020-21	2021-22	2022-23	2023-24	2024-25
PB	0.6	0.6	0.9	0.5	0.5
MB	0.5	0.7	1.2	1	0.8

Table 3: Distribution of ANCDR/100,000 population by mode of detection, Chennai district, Tamil Nadu, India 2022- 2025

Mode of detection	2022-23	2023-24	2024-25
Contact tracing	0	0	0
Active search	0.8	0.3	0.8
Self-reporting	1	1	0.4

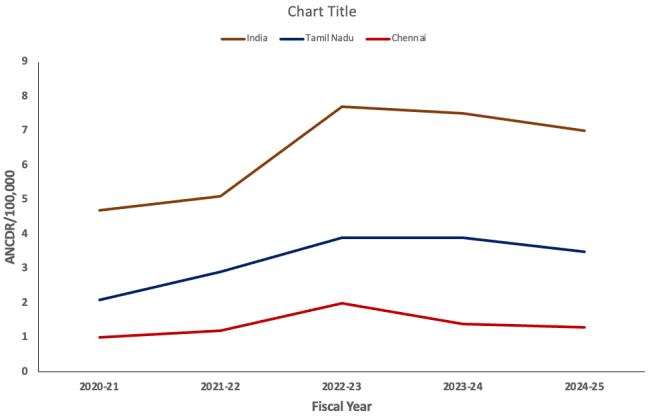
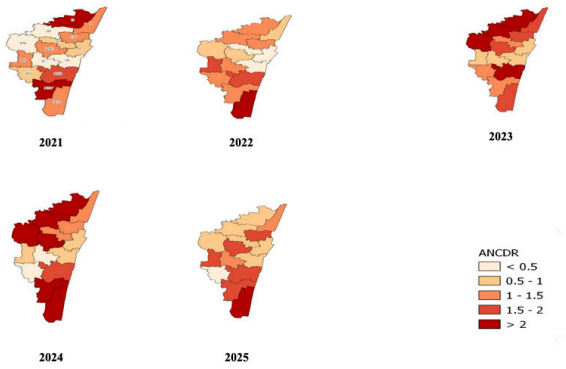
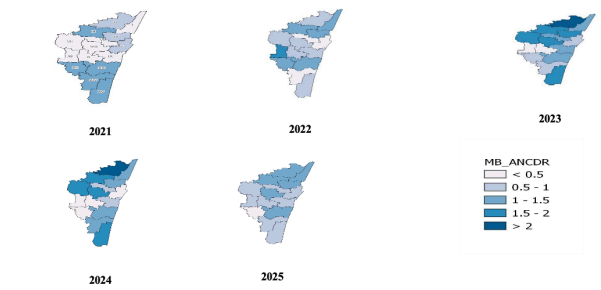


Figure 1: Distribution of Annual New Case Detection Rate by year, Chennai district, Tamil Nadu, India, 2021-2025



(Zone I – Tiruvotriyur, Zone II – Manali, Zone III – Madhavaram, Zone IV – Tondiarpet, Zone V – Royapuram, Zone VI – T.V.K.Nagar, Zone VII – Ambattur, Zone VIII – Anna Nagar, Zone IX – Teynampet, Zone X – Kodambakkam, Zone XI – Valsaravakkam, Zone XII – Alandur, Zone XIII – Adyar, Zone XIV – Perungudi, Zone V – Sholinganallur)

Figure 2: Distribution of Annual New Case Detection Rate (ANCDR) per 1,00,000 by Zones, Chennai District, Tamil Nadu, India, 2021- 2025



(Zone I – Tiruvotriyur, Zone II – Manali, Zone III – Madhavaram, Zone IV – Tondiarpet, Zone V – Royapuram, Zone VI – T.V.K.Nagar, Zone VII – Ambattur, Zone VIII – Anna Nagar, Zone IX – Teynampet, Zone X – Kodambakkam, Zone XI – Valsaravakkam, Zone XII – Alandur, Zone XIII – Adyar, Zone XIV – Perungudi, Zone V – Sholinganallur)

Figure 3: Distribution of Multibacillary leprosy Annual New Case Detection Rate (MB ANCDR) per 1,00.000 population by Zones, Chennai district, Tamil Nadu, India 2021-2025

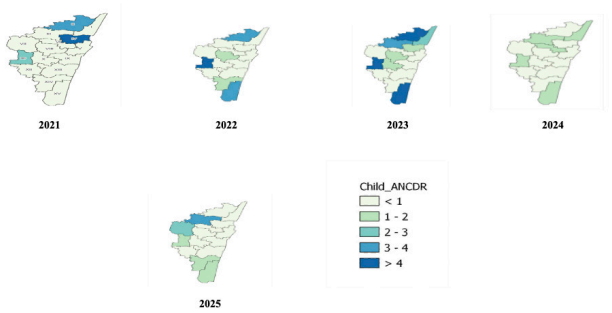


Figure 4: Distribution of Child Annual New Case Detection Rate (Child ANCDR) per 1,00,000 population by Zones, Chennai district, Tamil Nadu, 2021-2025

DISCUSSION

Our findings reveal that while the overall ANCDR in Chennai remained relatively static and lower than the National and State ANCDR (Figure 1) hotspots persist in industrial and border zones (Figure 2). The elevated child ANCDR in these zones signals ongoing community transmission (Figure 4). Similar findings have been reported in urban areas of India and Brazil, where migrant populations play a key role in sustaining transmission.[4,5]

The predominance of Multibacillary leprosy (>50%) (Table 2) and the absence of cases among household contacts suggest that new infections are more likely linked to transmission in community or workplace settings rather than traditional household foci. This aligns with evidence that migrants, who have the infection and residing among the local residents spread the disease.[6]

This study has certain limitations that should be considered when interpreting the findings. As it relied on secondary programme data, the accuracy and completeness of case records could not be independently verified. Population denominators were derived from 2011 Census projections, which may not fully reflect the dynamic urban population, particularly in the context of rapid growth and unrecorded migrant influx. The retrospective and descriptive design limited the ability to establish causal inferences regarding transmission pathways. Despite systematic screening, no new cases were identified among household contacts, which may indicate limitations in current surveillance approaches rather than a true absence of risk. Additionally, molecular or laboratory confirmation of Mycobacterium leprae transmission was not performed, which would have strengthened the epidemiological interpretation. Finally, advanced geospatial modelling was not employed, restricting the precision of hotspot identification. Nevertheless, the analysis provides valuable insights into leprosy epidemiology in a metropolitan context and highlights important gaps in surveillance.

CONCLUSION

Five-year surveillance of leprosy in Chennai revealed that, although the overall Annual New Case Detection Rate (ANCDR) remained relatively static from 2021 to 2025, persistent hotspots continue to exist in industrial and border zones. Elevated child ANCDR in these same areas is a significant concern, as it points to ongoing community-level transmission and recent infections. The findings strongly suggest that migrant populations, particularly those concentrated in industrial hubs and border settlements, play a central role in sustaining urban transmission. The predominance of multibacillary cases alongside the absence of new household contact cases indicates that transmission is occurring outside traditional household or neighborhood clusters. These observations highlight that conventional surveillance and case-finding strategies, which focus on household contacts, may be insufficient in metropolitan environments with high mobility and dense populations.

RECOMMENDATIONS

In light of these findings, several measures are recommended to strengthen leprosy control efforts in urban and migrant-dense settings:

1. Targeted surveillance should be prioritized in industrial hubs and border zones through regular, community-based screening to detect early cases and prevent ongoing

transmission.

2. Workplace-centered interventions for migrant workers, including health education campaigns, dermatological screening, and integration of leprosy awareness into occupational health services, are urgently needed.

3. Integration with urban health and welfare systems can enhance coverage, by embedding leprosy services within broader urban health missions, labor welfare schemes, and social protection programs.

4. Geospatial mapping and digital tools should be adopted to identify and monitor hidden transmission pockets in real time, enabling more precise targeting of resources.

5. Adaptation of NLEP strategies is necessary to address the unique challenges of metropolitan contexts, including migration, floating populations, and community-level transmission outside household networks.

6. Child leprosy detection should be maintained as a key sentinel indicator for monitoring ongoing transmission and guiding focused interventions.

7. Together, these recommendations call for a shift from conventional household-based surveillance toward more innovative, migrant-focused, and community-driven approaches to sustain leprosy elimination goals in urban settings.

CONFLICT OF INTEREST

None

REFERENCES

1. World Health Organization. Global leprosy update, 2022: moving towards interruption of transmission. Wkly Epidemiol Rec. 2023;98(35):413–28.

2. Directorate General of Health Services. National Leprosy Eradication Programme – Progress Report 2023. Ministry of Health and Family Welfare, Government of India.

3. National Institute of Epidemiology. Leprosy surveillance data analysis, Tamil Nadu 2015–2020. Indian J Lepr. 2021;93(3):189–97.

4. Lockwood DNJ, Saunderson P. Nerve damage in leprosy: a continuing challenge for scientists, clinicians, and service providers. Int Health. 2012;4(2):77–85.

5. Penna MLF, Grossi MAF, Penna GO. Country profile: leprosy in Brazil. Lepr Rev. 2013;84(4):308–15.

6. Kumar A, Girdhar A, Chakma JK. Hidden transmission of leprosy among migrants in urban India. Indian J Dermatol Venereol Leprol. 2019;85(5):449–55.