

Original Research Article

A clinico-epidemiological profile of Hansen's disease in a tertiary care center – insights from the post-elimination era

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ABSTRACT

Background: Although leprosy was officially eliminated as a public health problem in India in 2005, several districts and blocks continue to report new cases, indicating ongoing transmission. This study aimed to assess the current clinical and epidemiological profile of leprosy patients attending a tertiary care hospital.

Methods: A prospective observational study was conducted among patients diagnosed with Hansen's disease at a tertiary care hospital, between August 2020 to August 2025. Diagnosis was based on WHO criteria and classified according to the Ridley-Jopling system. Data on demographic characteristics, clinical presentation, treatment, complications, deformities, and yearly trends were analysed.

Results: A total of 117 patients were registered during the study period, with a male-to-female ratio of approximately 2:1. Children (≤ 14 years) constituted less than 2% of cases. Multibacillary (MB) leprosy was the predominant clinical type (58.94%). Borderline-borderline leprosy was the most common morphological subtype (43.58%), followed by borderline tuberculoid (BT) (25.33%), tuberculoid (TT) (10.25%), lepromatous (LL) (5.98%), borderline lepromatous (BL) (3.41%), pure neurotic (1.70%), and histoid and indeterminate leprosy (0.85% each). Lepa reactions were observed in 11.11% of patients. World health organization (WHO) Grade II deformity was present in 0.66%, with claw hand being the most common deformity.

Conclusions: The study highlights the persistence of leprosy transmission despite low overall prevalence. The predominance of MB and borderline forms suggests ongoing community transmission. Strengthening early case detection, health education, treatment adherence, and disability prevention measures remain essential for effective disease control.

Keywords: Hansen's disease, Leprosy, Epidemiology, Slit skin smear, COVID-19

INTRODUCTION

Leprosy, also known as Hansen's disease, is a chronic infectious disease caused by the slow-growing bacterium *Mycobacterium leprae*, which primarily affects the skin, peripheral nerves and nasal mucosa.¹ Despite India

achieving the national elimination target (defined as a prevalence rate of less than 1 per 10,000 people) in December 2005, the nation still reports nearly 80% of the world's new leprosy cases.^{2,3} This suggests that while the overall prevalence has decreased, the rate at which new cases are identified remains a challenge, highlighting the

need to understand the disease's current epidemiological profile for effective public health strategies and program management.^{2,4}

Leprosy diagnosis employs multiple classification methods, with the Ridley-Jopling system being the most recognized due to its strong clinical, histological, and objective correlation.⁵ This spectrum-based model groups patients into five categories: TT, BT, BB, BL, and LL. For treatment purposes, however, the WHO simplifies the classification into two groups: PB and MB, based on the number of skin lesions or nerve involvement, which reflects the wide array of clinical presentations.⁶ This research aims to analyze the current clinico-epidemiological profile of leprosy in a tertiary care hospital population. A key objective is to quantify the disease burden in the post-elimination period and identify the underlying factors driving new case detection. These findings are essential for developing effective, evidence-based research and intervention studies tailored for both community-based and institutional leprosy control programs.

This prospective observational study was conducted from August 2020 to August 2025 at a tertiary care center. The study population consists of all individuals presenting to the dermatology outpatient department who are clinically suspected of having Hansen's disease (leprosy).

METHODS

A prospective observational study was conducted in the Dermatology/Leprosy Outpatient Department and the Department of Microbiology, Government General Hospital a tertiary care center and Government Medical College, Siddipet, from August 2020 to August 2025. Patients diagnosed with Hansen's disease who attended the study centre during the specified study period and fulfilled the predefined clinical, bacteriological, and/or histopathological diagnostic criteria were eligible for inclusion. Patients of all age groups and both genders were considered for participation. Patients with incomplete clinical or laboratory records, those who had received treatment elsewhere with inadequate documentation, and those who did not provide consent to participate were excluded from the study.

A total of 117 enrolled participants underwent a detailed clinical examination, including assessment of skin lesions, peripheral nerve involvement, sensory and motor deficits, lepra reactions, and deformities. Slit-skin smear (SSS) examination was performed to detect acid-fast bacilli and determine the bacteriological status. Relevant information was systematically recorded using a structured, predesigned questionnaire that included sociodemographic characteristics such as age, gender, and place of residence, as well as clinical manifestations, contact history, disease classification, lepra reactions, and deformities.

Hansen's disease was classified according to the five-group Ridley-Jopling classification (indeterminate, TT, BT, BL, and LL) as well as the WHO operational classification into PB and MB disease. In accordance with the National Leprosy Eradication Programme (NLEP) operational criteria, patients presenting with six or more skin lesions and/or involvement of multiple peripheral nerves were categorized as having MB disease and managed accordingly.

The collected data were systematically analyzed to determine the distribution and trends of Hansen's disease with respect to age, sex, residence, contact history, clinical spectrum, operational classification, bacteriological status, lepra reactions, and deformities. The findings from the study population were subsequently compared with available national-level epidemiological data to identify similarities, differences, and relevant epidemiological trends.

RESULTS

A total of 117 patients were clinically diagnosed with Hansen's disease during the study period, and all patients were managed in accordance with the WHO multidrug therapy (MDT) guidelines. Among the 117 cases, 76 (64.95%) were males, and 41 (35.04%) were females, demonstrating a clear male predominance (Figure 1 A). The mean age of the affected individuals was 45 years, with the average age of morbidity being 50.47 years. The highest proportion of cases was observed in the 41-50-year age group (26.4%), followed by the 31-40-year age group (21.36%) and the 51-60-year age group (19.65%). In contrast, leprosy was relatively uncommon among children under 10 years of age (1.7%) and individuals over 80 years of age (0.85%) (Figure 1 B).

Spectrum and classification of Hansen's disease

Among the 117 patients diagnosed with Hansen's disease, 48 (41.02%) were classified as PB, whereas 69 (58.94%) had MB disease, indicating a predominance of MB cases (Table 1; Figure 2A). Based on the Ridley-Jopling classification, BB was the most frequently observed clinical form, accounting for 43.59% of cases, followed by BT at 33.33%, and TT with 10.26% of cases, LL leprosy and BL disease accounted for 5.98% and 3.41% of cases, respectively. Histoid and indeterminate forms were observed in 0.85% of patients each (Table 2 and Figure 2 B).

Morbidity and bacteriological status

Of the 117 patients, 19 (16.2%) had documented morbidity, while SSS examination was positive for acid-fast bacilli in 21 (17.94%) patients. Among patients with morbidity, 15 (78.94%) had MB disease and 4 (21.05%) had PB disease, demonstrating a higher proportion of morbidity among patients with the MB form (Table 1 and Figure 2 A).

Reactional states and deformities

Leprosy reactions were documented in 7 patients (5.98%), with erythema nodosum leprosum (ENL) as the predominant reactional presentation. Deformities were identified in 5 (4.27%) patients and were predominantly observed among those with MB disease (Table 3 and Figure 3).

Age-wise distribution of PB and MB disease

Age-wise analysis showed that both PB and MB disease were predominantly observed among older patients, with the highest number of cases occurring between 41 and 60

years of age. Distribution of PB and MB cases across different age groups is shown in Table 4 and Figure 4 A.

Trend of Hansen's disease cases, 2020-2025

The annual trend analysis demonstrated considerable variation in the number of Hansen's disease cases detected at the tertiary care hospital during the five-year period. The number of cases increased from 62 in 2020-2021 to 120 in 2021-2022, and then declined progressively to 104 in 2022-2023, 89 in 2023-2024, and 60 in 2024-2025 (Figure 4 B). The observed temporal variation indicates a marked increase in case detection during 2021-2022, followed by a declining trend over the subsequent three years.

Table 1: Distribution of PB and MB leprosy cases according to gender, morbidity status and SSS positivity.

Leprosy classifications	Male, N (%)	Female, N (%)	Total, N (%)	Morbidity, N (%)	SSS positive, N (%)
PB	12 (10.26)	36 (30.77)	48 (41.03)	4 (21.05)	7 (33.33)
MB	64 (54.70)	5 (4.27)	69 (58.97)	15 (78.95)	14 (66.67)
Total	76 (64.96)	41 (35.04)	117 (100.00)	19 (100.00)	21 (100.00)

Table 2: Distribution of leprosy cases according to Ridley-Jopling classification and gender.

Ridley-Jopling classification	Male, N (%)	Female, N (%)	Total, N (%)
TT	6 (5.13)	6 (5.13)	12 (10.26)
BT	29 (24.79)	10 (8.55)	39 (33.33)
BB	38 (32.48)	13 (11.11)	51 (43.59)
BL	3 (2.56)	1 (0.85)	4 (3.42)
LL	6 (5.13)	1 (0.85)	7 (5.98)
PN	0 (0.00)	2 (1.71)	2 (1.71)
Histoid	1 (0.85)	0 (0.00)	1 (0.85)
Indeterminate	0 (0.00)	1 (0.85)	1 (0.85)
Total	83 (70.94)	34 (29.06)	117 (100.00)

Table 3: Distribution of ENL and deformities among patients with leprosy.

Clinical manifestation	N	Percentage (%)
ENL	7	5.98
Deformities	5	4.27
Total	12	100.00

Table 4: Distribution of leprosy cases according to age group and PB/MB status.

Age group (in years)	PB	MB	Total
<10	1	1	2
11-20	1	2	3
21-30	2	11	13
31-40	12	13	25
41-50	13	18	31
51-60	13	10	23
61-70	4	11	15
71-80	2	2	4
>80	0	1	1
Total	48	69	117

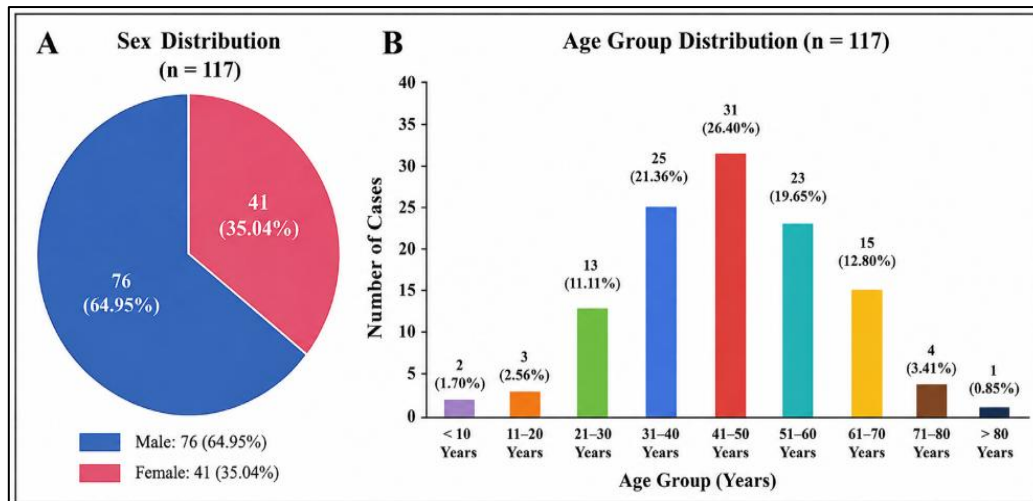


Figure 1: Demographic characteristics of patients with Hansen's disease, (n=117). (A) Sex distribution of predominant male patients compared with female patients and (B) age-group distribution of study population.

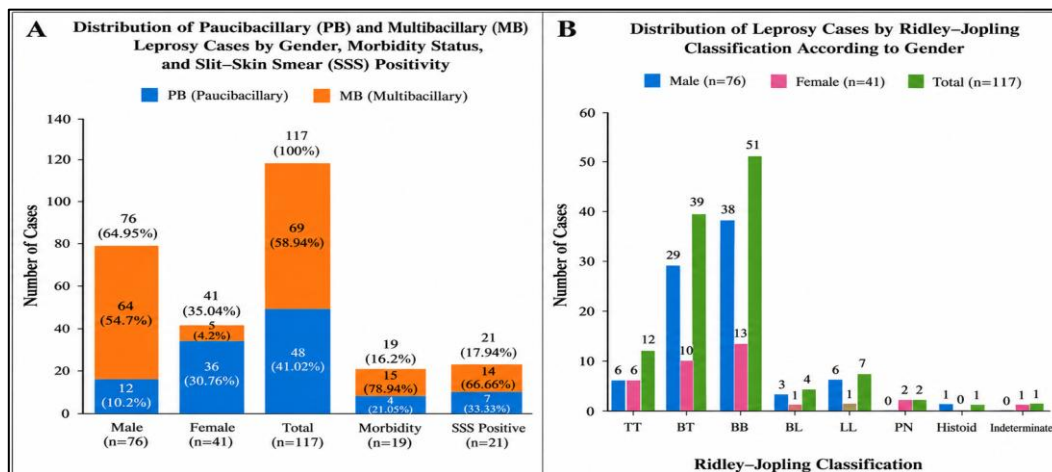


Figure 2: Distribution of leprosy cases according to clinical classification, gender, morbidity status, and SSS positivity, (n=117). (A) Distribution of PB and MB cases according to gender, morbidity status, and SSS positivity and (B) distribution of patients according to the Ridley-Jopling classification and gender.

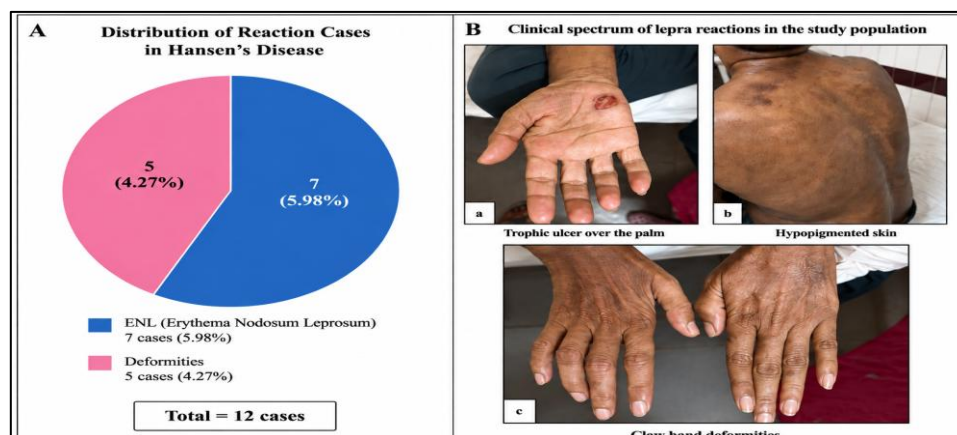


Figure 3: Distribution and clinical characteristics of patients with Hansen's disease. (A) Distribution of reaction cases, showing ENL and deformities cases, (B) clinical spectrum of lepra reactions and associated manifestations observed in the study population, (a) Trophic ulcer over the palm, (b) Hypopigmented skin lesions and (c) Claw-hand deformity.

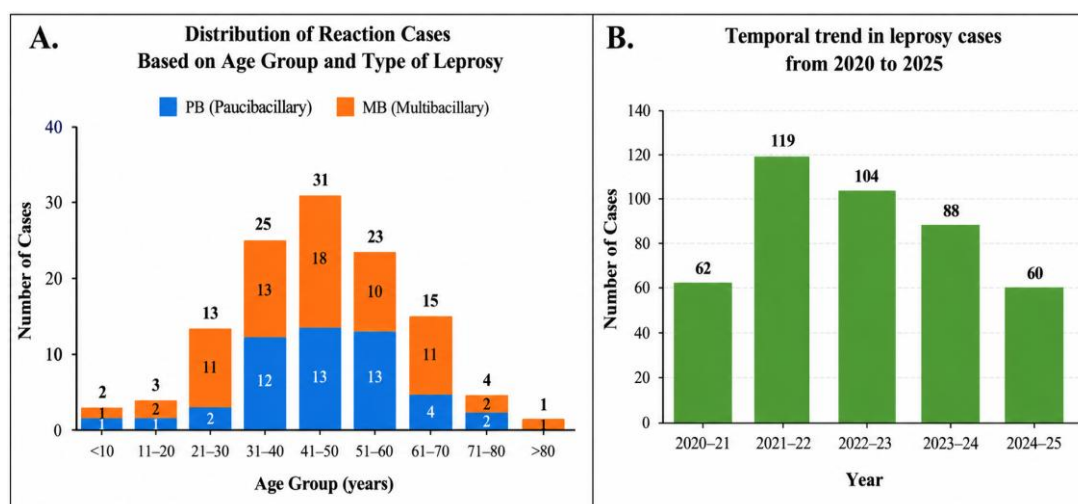


Figure 4: Distribution of reaction cases based on age, temporal trend, in the study population. (A) Age-wise distribution of leprosy cases according to PB and MB status, demonstrating the distribution of PB and MB cases across different age groups and (B) temporal trend in leprosy cases from 2020 to 2025. The annual number of cases increased from 2020-21 to 2024-25.

DISCUSSION

There is limited data on clinico-epidemiological patterns in the post-elimination era. There is an increase in the number of cases post-pandemic. Despite elimination, new cases continue to emerge, especially in endemic pockets. Early detection is crucial to prevent disabilities and stigma. MB cases predominated in the post-elimination era.^{7,11} post-elimination monitoring is essential to sustain gains. A significant proportion of MB cases and lepra reactions are seen.^{8,9,11} Leprosy predominantly affected individuals in the 41-50 age group, which may be due to comorbidities that compromise immune function, thereby increasing susceptibility to the disease.^{7,10} This highlights the need to continue active surveillance, active case detection, awareness programs, and targeted leprosy-control activities to prevent under-reporting and sustain elimination goals.^{3,16} The predominance of MB/BB cases calls for further research on immune mechanisms, transmission dynamics, drug-resistance patterns, and targeted interventions.¹⁸ This gender bias may reflect greater occupational exposure, hormonal or immunological differences, and health-seeking behaviors among males, consistent with previous epidemiological studies.^{10,12} The age pattern suggests that leprosy primarily affects adults in their most productive age, potentially due to prolonged exposure and delayed incubation.^{7,10} The reduced frequency in children indicates the impact of ongoing control measures, though continued transmission is evident in younger cohorts.¹³ The dominance of borderline forms suggests that the region is in an active transmission phase, in which immunological instability drives disease heterogeneity.^{7,8} These findings emphasize the importance of early detection and timely intervention to prevent irreversible disabilities.⁹ The detection of reactions and deformities underscores the persistence of delayed case detection.⁹ These findings call for strengthened community-based screening, early treatment

initiation, and continuous monitoring under national control programs to minimize transmission and disability.^{3,16} The study highlights the continued presence of Hansen's disease in the post-elimination era, which emphasizes the need for early diagnosis, surveillance, contact tracing, prompt MDT, and rehabilitation to prevent disability and stigma.^{7,11,16} The COVID-19 pandemic had significant economic, social, and health impacts on the lives of persons affected by leprosy. The pandemic led to under-reporting and reduced surveillance in endemic regions.^{11,14,15} Immunological and drug-resistance mechanisms need to be evaluated and addressed.¹⁸

CONCLUSION

Current evidence indicates that, despite achieving elimination status, leprosy continues to persist in endemic regions, with a noticeable rise in cases during the post-pandemic period. The predominance of MB and borderline forms, along with the continued occurrence of lepra reactions and deformities, suggests ongoing transmission, delayed case presentation and detection. The higher burden among middle-aged individuals may reflect waning immunity and prolonged exposure, while the lower prevalence in children points to the partial success of existing control measures. Gender differences in disease burden may be attributed to variations in exposure patterns and health-seeking behaviour. Overall, these findings underscore the urgent need for strengthened post-elimination surveillance, active case detection, community awareness, and timely interventions to prevent disability and reduce stigma.

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