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Original Article

A 10-Year Retrospective Hospital-Based Clinico-Epidemiological Study of Hansen's Disease in a Tertiary Care Centre in Coastal Karnataka

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Leprosy, caused by *Mycobacterium leprae*, is a stigmatizing disease. It predominantly affects India, Brazil, and Indonesia, with India contributing 60% of cases. Age-based classification is crucial for understanding epidemiology, clinical variations, immune responses, and tailored treatments. This study has been carried to evaluate clinico-epidemiological features of leprosy in children (<15 years), middle-aged adults (15–59 years), and the elderly (>60 years). This 10-year retrospective observational study was conducted on cases treated from January 2014 to December 2023 at a tertiary care center in South India. A total of 292 leprosy patients were included and classified according to the Ridley-Jopling classification and few according to the Indian classification of leprosy. Variables studied included nerve involvement, slit-skin smear results, treatment completion rates, reactions, relapses, and comorbidities. The study analysed the clinical characteristics of leprosy patients across different age groups—elderly (>60 years), paediatric (<15 years), and adult (15-59 years). 241/292(82.53%) of these cases were middle-aged, 32/292 (10.95%) elderly, and 19/292 (6.50%) children. Borderline tuberculoid was common across all ages. Elderly patients showed more comorbidities 14/32 (43.75%), disabilities (62.5%), and slit-skin smear positivity 9/32(28.12%). Middle-aged patients had higher nerve involvement 152/241 (63.07%) and reactions 79/241 (32.78%). Paediatric patients had better treatment completion 15/19 (78.94%) but more dapsone-related reactions 4/19(21.04%). Age-based classification highlights group-specific needs. Childhood cases suggest ongoing transmission, while elderly cases show increased dependency risks. Awareness is critical for targeted interventions for patients from different age groups.

Keywords: Geriatric Leprosy, Childhood Leprosy, Age-Specific Issues

Introduction

Leprosy derives its name from the Greek word "leper," meaning "scaly." Also referred to as "Hansen's Disease," it is one of humanity's oldest known diseases, historically recognized as "Kushtaroga" (Sharma et al 2024). Leprosy is a chronic infectious disease caused by *Mycobacterium leprae*, primarily affecting the skin and peripheral nerves, and in severe cases, other organs. The condition can result in disfigurement,

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sensory impairment, and disability, significantly reducing patients' quality of life. Beyond its physical impact, leprosy often leads to stigma and social exclusion, exacerbating psychological distress and further affecting overall well-being. Globally, 80.2% of leprosy cases are concentrated in three countries: India, Brazil, and Indonesia (Narang et al 2022). Although India achieved the elimination target of less than one case per 10,000 people in December 2005, it still reports the highest number of new cases, maintaining the largest share of the global leprosy burden despite over three decades of multidrug therapy (Sengupta 2018).

In India, 127,334 new leprosy cases were detected in 2015–2016, slightly up from 125,785 cases in 2014–2015. Despite achieving national-level elimination targets, leprosy persists, with recent studies highlighting a rise in smear-positive cases, childhood leprosy, lepromatous cases, and grade 2 disabilities across various regions (Sarode et al 2020). Thus, further efforts are needed to completely eliminate leprosy at regional levels (Mushtaq et al 2020).

Our study aimed to assess the profile and distribution of leprosy patients at our tertiary care center, with a focus on age group categorization. Analyzing age-specific patterns in Hansen's disease is crucial for understanding variations in disease presentation, immune responses, and associated comorbidities across different age groups. Such insights can guide the development of targeted interventions, enhance treatment outcomes, and inform preventive strategies tailored to specific age demographics.

Materials and Methods

This ten-year retrospective review was conducted using records of patients, diagnosed with leprosy at Father Muller Medical College, a tertiary care center. This study was an observational, analytic study with a retrospective cohort approach. All patients diagnosed with Hansen's disease, during the period extending from January 1st, 2014-December 31st, 2023 were included in the study. Patients with incomplete medical records were excluded from the study. The diagnostic criteria were followed according to the World Health Organization (WHO) guidelines followed by National Leprosy Eradication Programme (NLEP 2013). Patients were classified according to the Ridley–Jopling classification (Ridley & Jopling 1966). Some individuals were also classified as pure neuritic leprosy and indeterminate type according to The Indian classification of leprosy (IAL 1982). Diagnosis of Type 1 and Type 2 lepra reactions was based on clinical symptoms. Disabilities were assessed using the standard WHO grading system (Brandsma & van Brakel 2003). Statistical analysis utilized the Fisher extract test, chi-square test, and standard deviation. P- value was also calculated with less than 0.05 being considered as statistically significant.

Results

The study analyzed the clinical characteristics of leprosy patients across different age groups—elderly (>60 years), paediatric (<15 years), and adult (15-59 years) (Table 1). Out of 292 patients, the majority were adults 241 (82.53%), followed by elderly 32(10.95%) and 19 paediatric (6.50%) groups. The male-to-female ratio was similar in elderly and paediatric groups (2.2:1 and 2.1:1, respectively), while adults had a higher male distribution (1.97:1).

The line graph (Fig. 1) shows a general declining trend in the number of leprosy patients from 2014 to 2023, with a notable drop from 44 cases in 2014 to 25 in 2023. While there are intermittent rises in 2017, 2019, and 2021, the overall pattern suggests a gradual decrease in hospital-reported

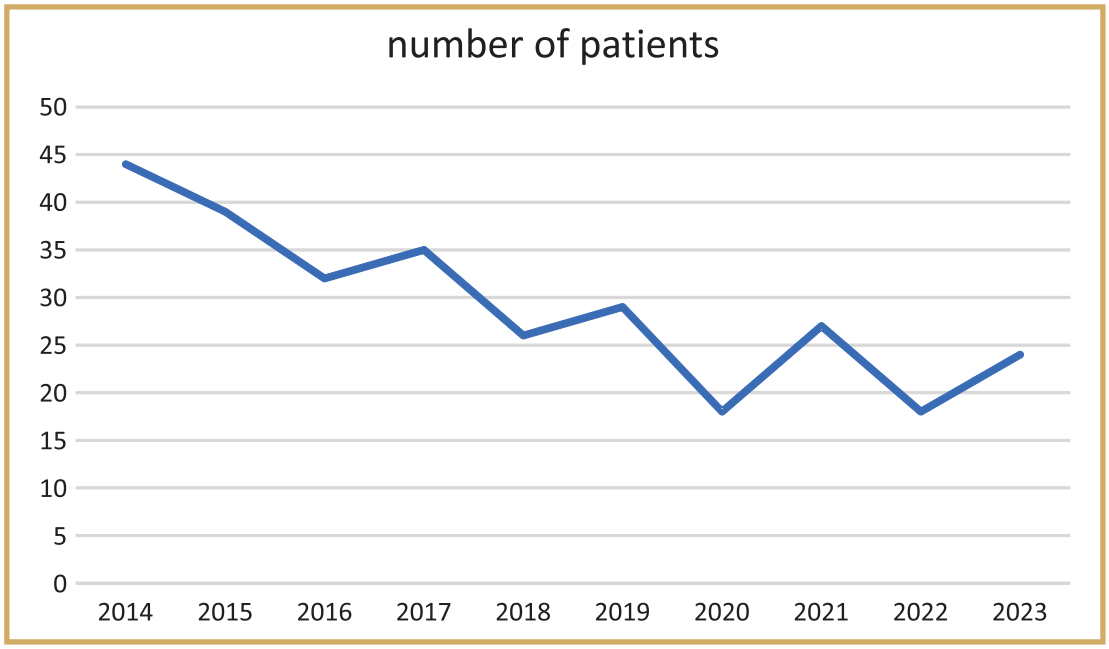

Fig. 1: Number of patients of Hansen's disease diagnosed at Father Mueller Hospital between 2014 to 2023.

cases over the decade.

The disease spectrum varied by age (Table 1), with borderline tuberculoid (BT) being the most prevalent across all groups. Figs 2 and 3 illustrate borderline tuberculoid leprosy, characterized by a well-defined erythematous plaque with central clearing on the lateral abdomen and an erythematous plaque on the infraorbital region). In the pediatric age group, the tuberculoid spectrum is the second most common, accounting for 6/19 cases. Fig. 4 shows a well defined hypopigmented macule noted over right cheek noted in a paediatric age group-(tuberculoid leprosy).

In the middle-aged group (241/292), lepromatous leprosy, pure neuritic leprosy, and histoid leprosy were observed in 37/241 (15.35%), 15/241 (6.22%), and 10/241 (4.19%) of cases, respectively, compared to 12.5%, 6.25%, and 0% in the elderly group (Table 1). Histoid leprosy was observed in patients aged >60 years, presenting as multiple erythematous nodules on the cheeks, forehead, and back.) in the elderly. None of these three forms were observed in childhood cases.

Nerve involvement was highest among adults 152/241(63.07%), followed by the elderly 18/32 ((56.25%) and pediatric patients 5/19(26.31%), with ulnar nerve thickening as the most commonly affected site. Comorbidities were significantly more frequent in the elderly (43.75%) compared to adults (16.59%), and slit skin smear positivity was also higher in the elderly (28.12%) compared to adults (24.89%) (Table 1).

Reaction rates were highest in the adults 79/241 (32.78%), followed by elderly 8/32 (25%) and 1/19 (5.26%) in the pediatric group.

Disability grading revealed higher rates of

Table 1: The clinical characteristics of leprosy patients across different age groups-elderly (>60 years), paediatric (<15 years), and adult (15-59 years).

Clinical parameters	Elderly (> 60 years)	Pediatric (< 15 years)	Adult age group (15-59)	P value
Total leprosy patient	32/292(10.95%)	19/292(6.50%)	241/292(82.53%)	0.029 hs
Male: female ratio	2.2:1	2.1:1	1.97:1	
SPECTRUM				
Tuberculoid spectrum	1(3.12%)	6 (31.57%)	31(12.86%)	
Borderline Tuberculoid	20(62.50%)	12(63.15%)	91(37.75%)	
Mid boderline			19(07.88%)	
Borderline Lepromatous	4(12.5%)	1(5.26%)	24(09.95%)	
Lepromatous Leprosy	4(12.5%)	-	37(15.35%)	
Pure neuritic Leprosy	2(6.25%)		15(06.22%)	
Histoid leprosy	-		10(04.19%)	
Indeterminate leprosy	-		15 (06.22%)	
Nerve Involvement	18(56.25%)	5(26.31%)	152(63.07%)	0.006 hs
Smear positivity rate	9(28.12%)	3(15.78%)	60 (24.89%)	0.601 ns
Treatment				
MB-MDT	24(75%)	16(84.21%)	169(81.32%)	
PB-MDT	8(25%)	3(15.78%)	72(29.87%)	
Completed treatment	21(65.62%)	15(78.94%)	170(63.07%)	0.601 ns
Reactions	8(25%)	1(05.26%)	79(32.78%)	0.034 s
Type 1 reaction	6(18.75%)	-	62(25.72%)	
Type 2 reaction	2(6.25%)	1(5.26%)	17(07.05%)	
RELAPSE			5(02.07%)	
DISABILITY	20 (62.5%)	2(10.52%)	128(53.11%)	0.000 hs
Grade 1	12(37.50%)	1(5.26%)	70(29.04%)	
Grade 2	8(25%)	1(5.26%)	58(24.06%)	
comorbidities	14(43.75%)	-	40(16.59%)	0.000hs
DIH	2 (06.25%)	4(21.05%)	29(12.03%)	0.290 ns

hs: highly significant, s: significant, ns: nonsignificant, DIH: dapsone induced haemolysis

grade 1 and grade 2 disabilities in the elderly 20/32(62.5%), followed by the adult group 128/241(53.11%), with only a smaller percentage 2/19 (10.52%) affected in the pediatric group.

In the pediatric age group, 15/19 (78.94%) completed treatment, representing the highest

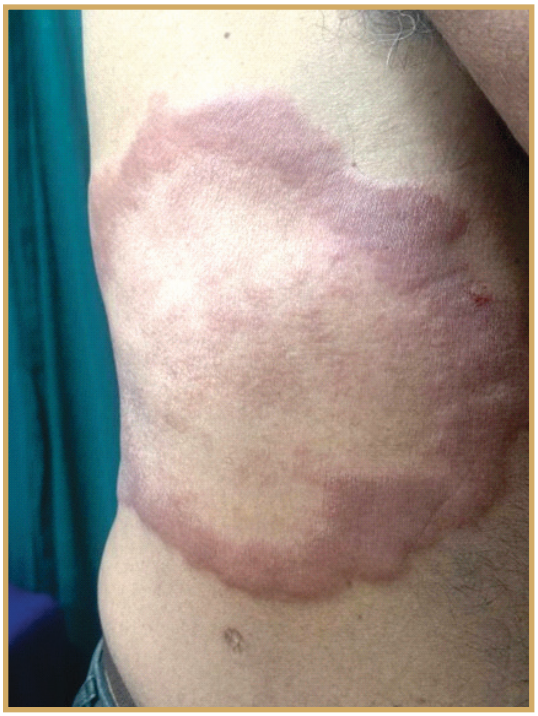

Fig. 2 : A well-defined erythematous plaque with central clearing on the lateral abdomen – BT leprosy.

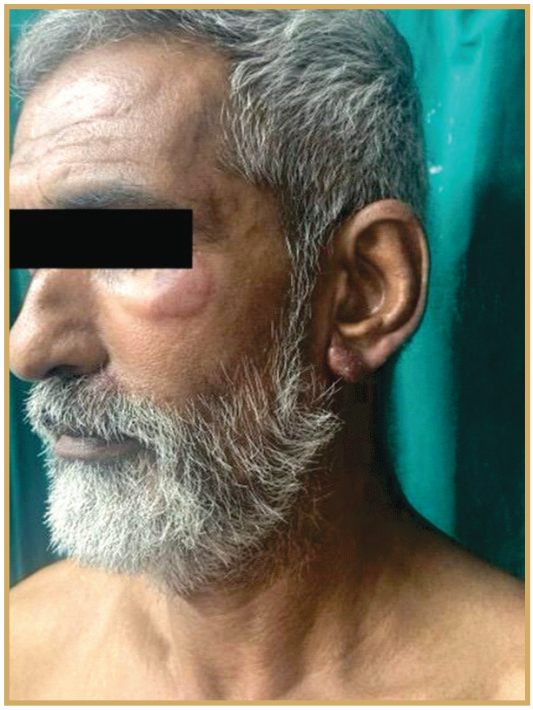

Fig. 3 : An erythematous plaque on the infraorbital region diagnosed as BT leprosy.

Table 2: Age-wise and year-wise distribution of newly diagnosed leprosy patients.

Years	Elderly (> 60 years)	Paediatric (< 15 years)	Adult age group(15-59)
2014	2	6	30
2015	4	4	26
2016	2	0	29
2017	5	1	29
2018	3	1	23
2019	5	1	26
2020	3	0	17
2021	3	0	28
2022	2	4	14
2023	3	2	19

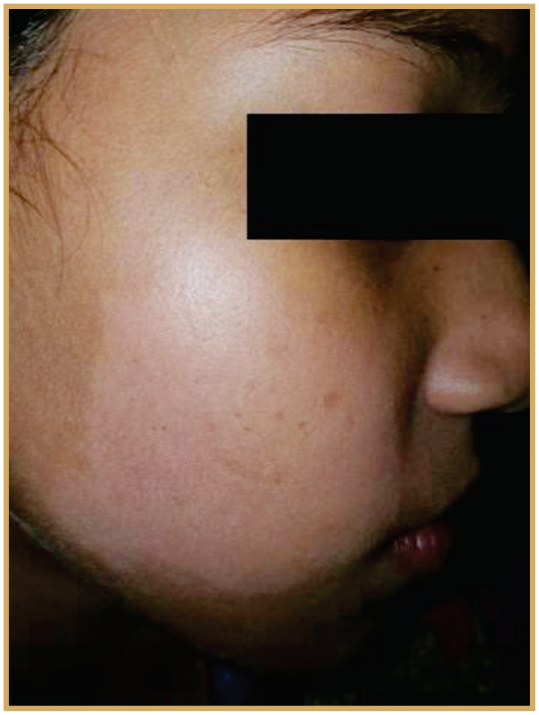

Fig. 4 : Macular lesion on the face of a child.

completion rate among all groups whereas these figures were lower in elderly (21/32, 65.62%) and adult group (170/241, 63.07%).

Five patients experienced dapsone hypersensitivity syndrome (DHS) in the adult age group. One pediatric patient developed lupus vulgaris and one elderly patient developed pulmonary tuberculosis upon completing treatment. Additionally, 21.05% of patients experienced dapsone-induced hemolysis, which is higher in the elderly than the rates observed in the adult (12.03%) and pediatric (6.25%) groups.

The data across the decade (2014–2023) reveals distinct trends in the three age groups. The elderly population (>60 years) shows a fluctuating pattern, with cases rising from 2 in 2014 to peaks of 5 in 2017 and 2019, followed by a decline to 3 in 2020–2021, dropping to 2 in 2022, and slightly increasing to 3 in 2023. Paediatric cases (<15 years) exhibit variability, starting at 6 in 2014, dropping to 0 in 2016, and fluctuating between 1–4 cases afterward, ending at 2 in 2023, suggesting an overall decline with intermittent increases. The adult group (15–59 years) showed a consistent downward trend, from 30 cases in 2014 to 14 in 2022, with a minor rise to 19 in 2023 (Table 2). These trends highlight the need for targeted interventions for each age group.

Discussion

Despite advancements in the diagnosis and treatment of leprosy, the disease remains a public health challenge, especially in developing nations. India holds the distinction of having the highest number of leprosy cases globally, accounting for more than half of the world's total cases annually.

In our study, we analysed an epidemiological data at our single tertiary care centre in Southern India with a total of 292 cases, of which 66.4% were male and 32.5% were female, highlighting a clear male predominance. This gender disparity aligns with the findings of Sharma et al (2024), Vashisht et al (2021), Tegta et al (2019), who also reported similar trends in their respective studies.

The proportion of childhood leprosy cases, defined as those affecting individuals under the age of 18, were observed to be 7.5% in the study by Ghunawat et al (2018) and 4.81% in the study by Dogra et al (2024). In our study, the prevalence was noted to be 6.50%, which aligns with these findings indicating some commonality in the transmission dynamics of leprosy in these populations.

The prevalence of leprosy among elderly individuals aged over 60 years was 10.95% in our study. This figure falls between the 15.6%

reported by Diniz & Maciel (2018) and the 9.9% observed by Bisherwal et al (2023).

According to the Ridley-Jopling classification (1966), the majority of cases in our study were in the borderline tuberculoid (BT) spectrum. This observation is consistent with findings by Vashisht et al (2021) who reported that 71.5% of cases were classified as BT.

In elderly patients, signs or symptoms of nerve involvement were observed in 56.25% of cases in our study, a proportion significantly higher than the 37.9% reported by Diniz & Maciel (2018). Among children under the age of 15, nerve thickening was observed in 26.31% of cases, which is notably lower than 56.3% reported by Dogra et al (2014) and 59.2% reported by Ghunawat et al (2018).

Lepra reactions were identified in 20 paediatric cases (33.9%) by Dogra et al (2014), while our study reported a much lower prevalence of 5.26%. Smear positivity was observed in 7% of cases in the study by Ghunawat et al (2018), whereas our study recorded a significantly higher positivity of 15.78%. These wide variations in the profile of patients show that results of one study can not be compared with others in such situations.

In the paediatric age group, the treatment completion rate was recorded at 78.94% in our study. However, these rates were lower (63-65%) in adult and elderly groups. While we should aim for much higher completion rates, the reasons for low completion rates in adults and elderly need proper research and remediation.

The disability rate among elderly individuals was notably higher in our study, at 62.5%, compared to the 39.9% reported by Diniz & Maciel (2018). In contrast, the disability rate among children was observed at 10.52% in our study, which is considerably lower than the 24.7% reported by Ghunawat et al (2018).

With the increasing population and the immense diversity within it, coupled with the persistent prevalence of leprosy, there is a pressing need for comprehensive epidemiological studies. These studies are not only critical for understanding the disease's distribution and determinants but also for identifying specific demographic and geographical areas most affected by the condition. Such targeted insights are essential for the development of effective, evidence-based strategies aimed at reducing the overall disease burden.

Epidemiological age-related research can help pinpoint regions of high endemicity, understand transmission dynamics, and assess the effectiveness of existing control measures. Furthermore, these studies enable the identification of vulnerable groups, such as children, the elderly, and marginalized populations, who may require specialized interventions. By uncovering the underlying factors contributing to the disease's persistence, such as delayed diagnosis, healthcare access disparities, and socio-economic challenges, policymakers and healthcare providers can implement more precise and impactful interventions.

The present study is a single-center hospital-based study with a limited number of patients analyzed. Prevalence rates were calculated based on dermatology OPD data and not population-based estimates. Further large-scale, community-based studies are necessary for more comprehensive insights.

Conclusions

This retrospective hospital-based clinico-epidemiological study identifies distinct age-related patterns in Hansen's disease. While borderline tuberculoid remains most common,

histoid and lepromatous leprosy were seen only in adults. Elderly patients had the highest disability, comorbidity, reaction rates, and drug-related complications. Paediatric prevalence showed a declining trend, possibly suggesting reduced transmission in this population. However, stable or fluctuating adult and elderly trends highlight ongoing endemicity. New insights—such as age-specific absence of histoid leprosy and higher dapsone-induced hemolysis in elderly—underscore the need for age-tailored monitoring and public health strategies. Continued surveillance and targeted interventions remain essential for regional elimination of Hansen's disease.

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