

# A Retrospective Study of Comprehensive Assessment of Leprosy in Bangalore District.

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## Abstract

Leprosy, caused by *Mycobacterium leprae*, remains a public health concern in Bangalore district, India. A retrospective study analysed data from 637 leprosy patients (2020-2023) in government hospitals. The majority were males (76%), and most cases were in the  $\geq 14$  years age group. 3% of patients were children. Multibacillary (MB) leprosy accounted for 77% of cases, while paucibacillary (PB) leprosy accounted for 23%. Moderate (G2) deformities increased over time. 69% of patients completed treatment and were cured, with higher cure rates for MB type (88%). The study provides valuable insights into leprosy prevalence and treatment outcomes, emphasizing the ongoing need for prevention and treatment efforts.

**Keywords:** Hansen's disease, multibacillary leprosy, paucibacillary leprosy, epidemiology.

## Introduction

Morbus Hansen, also known as leprosy, is a persistent condition caused by a mycobacteria called *Mycobacterium leprae* (*M. leprae*). This bacterium, which is resistant to acid, was initially detected by Gerhard Armauer Hansen in 1874 as the primary disease-causing bacteria in humans. *M. leprae* was identified from ancient skeletal remains found in India, dating back to 2000 BC. [1] Leprosy, an enduring condition triggered by *Mycobacterium leprae*, predominantly impacts the skin and nerves, leading to distinct clinical features such as insensate skin sores and thickening of peripheral nerves. [2] To diminish the worldwide impact of leprosy, the World Health Organization implemented the use of Multiple Drug Therapy (WHO-MDT) in 1982. WHO-MDT is an accessible and cost-effective treatment approach that involves the monthly administration of rifampicin and clofazimine, along with daily dapsone and clofazimine, for a duration of two years (recently reduced to one year) in cases of multibacillary leprosy. [3] Leprosy is among the thirteen significant debilitating illnesses categorized under neglected tropical diseases, which comprise the prevalent chronic infections found in the most impoverished individuals worldwide. [4] The prevalence of this illness remains a significant concern in numerous regions of Asia, with India being particularly affected, emphasizing its continued importance as a public health issue. [5] By the conclusion of 2015, the total count of individuals afflicted by leprosy across 38 countries under the World Health Organization (WHO) regional jurisdiction reached 176,176, equivalent to a prevalence rate of 0.18 cases per 10,000 inhabitants. [6] Throughout the ages, individuals affected by leprosy have had to confront prejudice, mistreatment, and social exclusion. The sole recognized remedy in India involved utilizing chaulmoogra oil. [7] In December 2005, India successfully attained the worldwide objective of eliminating leprosy, with an average prevalence rate of 0.68/10,000 at the national level in 2015. Nonetheless, subsequent to achieving this milestone, new cases have continued to be identified through the National Leprosy Eradication Programme (NLEP) at a similar frequency, ranging from approximately 1.2/100,000 in 2008 to 0.97/100,000 in 2015. [8] The typical theories regarding the aetiology of hypopigmentation, anhidrosis, keratosis, depilation, loss of sensation, paralysis, and trophic ulceration in leprosy propose that these manifestations arise from the degeneration of diverse nerve types. [9] In 2009, the World Health Organization (WHO) reported that 17 nations (including India and Brazil) documented over 1000 fresh instances, constituting 94% of the newly identified cases worldwide. Certain isolated occurrences may be observed in countries that receive migrants from less developed nations. [10] Patients with lepromatous leprosy (LL) exhibit prevailing Th2 immune responses and a greater tolerance for the growth of *M. leprae*, leading to the manifestation of multibacillary (MB) leprosy. On the other hand, tuberculoid/borderline tuberculoid (TT/BT) patients typically display robust cellular immune responses and low levels of antibodies against *M. leprae* antigens. They develop localized granulomas in their lesions, often without detectable bacilli. [11] *Mycobacterium lepromatosis*, a recently identified bacterium, has been found to be responsible for causing leprosy. Initial phylogenetic examination of its 16S rRNA gene and a few other gene segments indicated substantial divergence from *Mycobacterium leprae*, a widely recognized leprosy-causing agent. This significant variation supports the classification of *M. lepromatosis* as a distinct species. [12]

The main indicators for diagnosis consist of a depigmented area of skin accompanied by sensory dysfunction, enlargement of the nerves in the peripheral regions, and the detection of *M. leprae* in slit-skin smears. These smears are evaluated using the Ridley and Jopling bacteriological index, which assigns a grading ranging from 1+ to 6+.[13] The treatment regimens endorsed by the World Health Organization, involving either a six-month or 24-month multidrug therapy (consisting of rifampicin, dapsone, and clofazimine), yield favourable clinical outcomes and minimal relapse rates.[14]

## Materials and methods

The investigation was conducted on individuals diagnosed with Hansen's disease who sought medical care at the outpatient department in a government hospital located in Bangalore. The study was conducted over a period of three years, ranging from 2020 to 2023. The data was gathered from the government hospitals which are under National leprosy eradication (NLEP) program in, Bangalore district.

### Inclusion criteria:

1. All patients who sought medical attention and received a diagnosis of leprosy, regardless of their treatment history.
2. Patients who were newly diagnosed, actively undergoing treatment, and those who had completed their recommended treatment but were still under surveillance, were all included in the study.

### Exclusion criteria:

Patients with disabilities resulting from identifiable causes other than the specified condition were excluded. All patients who met the criteria for the study were included.

## Results

In this study a total of 637 individuals diagnosed with Hansen's disease, seeking treatment at the outpatient department of a government hospital in Bangalore district, under the National Leprosy eradication Program (NLEP), were included in the study conducted over a three-year period from 2020 to 2023.

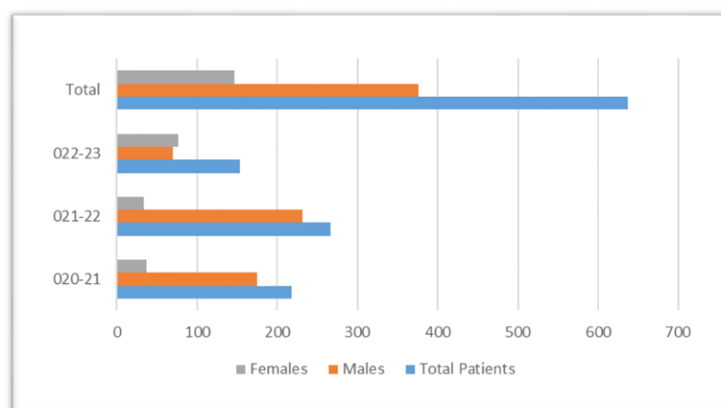
**Age distribution:** The age of the patients ranged from  $\leq 13$  years to  $\geq 14$  years. The majority were in the  $\geq 14$  years.

**Gender distribution:** Across the period of 2020-2023, a total of 637 patients were recorded. Out of these, 376 were males, making up approximately (76%) of the total, while 147 were females, constituting around (24%) of the total. The ratio of males to females was approximately 2.56:1. breaking down the gender distribution for each individual year. In the year 2020-21, out of 218 patients, there were 175 (80%) males and 37 (20%) females. For the year 2021-22 among 266 patients 231(86%) were males and 33(14%) were females. Lastly, in the year 2022-23, out of 153 patients 70 were males (45%) and 77(55%) were females gender distribution is shown in (Table 1) and (Graph 1).

TABLE 1 Gender distribution among male and female patients in leprosy and male to female ratio.

Year	Total Patients	Males (Percentage)	Females (Percentage)	Male-to-Female Ratio
2020-21	218	175 (80%)	37 (20%)	4.73:1
2021-22	266	231 (86%)	33 (14%)	7:1
2022-23	153	70 (45%)	77 (55%)	0.91:1
<b>Total</b>	<b>637</b>	<b>376 (76%)</b>	<b>147 (24%)</b>	<b>2.56:1</b>

GRAPH 1 Gender distribution among male and female patients in leprosy



**Child cases:** During the period from 2020 to 2023, there were a total of 637 patients, out of which 14 were children, representing approximately 3% of the total. Specifically, there were 6 child cases out of 218 patients in the year 2020-21, 2 child cases out of 266 patients in the year 2021-22, and 6 child cases out of 153 patients in the year 2022-23.

**Types of leprosy:** In this study out of the total of 637 patients observed during the years 2020-2023, there were 492 (77%) cases classified as multibacillary (MB) type and 145 (23%) cases classified as paucibacillary (PB) type. a breakdown of these classifications for each individual year.

In the year 2020-21, there were 197 (90%) patients classified as MB type and 21(10%) patients classified as PB type.

During the year 2021-22, there were 152 (57%) patients identified as MB type and 114 (43%) patients identified as PB type.

Lastly, in the year 2022-23, there were 143 (93%) patients classified as MB type and 10 patients classified as PB (7%) type. all types are summarised in (Table 2)

**TABLE 2** Types of leprosy in patients during the respective year

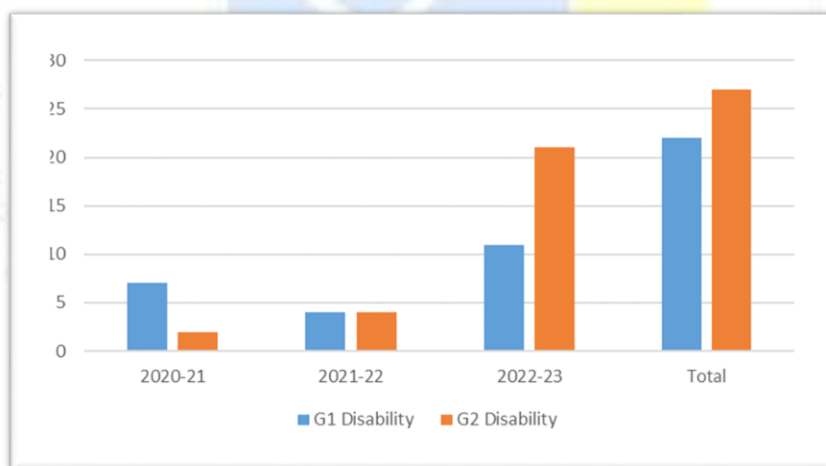
	Total Patients	MB Type (Percentage)	PB Type (Percentage)
2020-21	218	197 (90%)	21 (10%)
2021-22	266	152 (57%)	114 (43%)
2022-23	153	143 (93%)	10 (7%)
<b>Total</b>	<b>637</b>	<b>492 (77%)</b>	<b>145 (23%)</b>

**Type of disability:** In this research, cases of mild deformity (G1) and moderate deformity (G2) were included in the analysis, considering the combined data from three years. Out of a total of 637 cases, there were 22(45%) instances of G1 deformity and 27 (55%) instances of G2 deformity. During the time frame encompassing 2020 to 2021, the study identified 7 (78%) instances of G1 disability and 2 (22%) instances of G2 disability. In the subsequent period of 2021 to 2022, the data revealed 4 (50%) cases of G1 disability and 4 (50%) cases of G2 disability. Lastly, in the year 2022 to 2023, the prevalence of G1 disability cases reached 11 (34%), while G2 disability cases surged to 21(66%). types of deformity is shown in (Graph 2).

**Released from treatment (RFT) or cured cases:**

The cumulative number of patients receiving treatment over the course of three years amounted to 637, out of which 440 (69%) successfully completed their treatment and were deemed cured. Among the 440 cured cases, 385 (88%) were categorized as multibacillary (MB) type and 55 (12%) as paucibacillary (PB) type. The study also provided specific data for each individual year, highlighting that in the year 2020-21, 131 (86%) MB cases and 21 (14%) PB cases were successfully cured. Similarly, in the year 2021-22, 130 (88%) MB cases and 18 (12%) PB cases achieved a state of cure. Lastly, in the year 2022-23, 124 (89%) MB cases and 16 (11%) PB cases were recorded as successfully treated so in third respective year 2022-23 the treatment success rate is more compared to other two years. summary of treatment and cured cases are shown in (Table 3) and (Graph 3).

**GRAPH 2** Leprosy induced disability in patients yearly distribution.

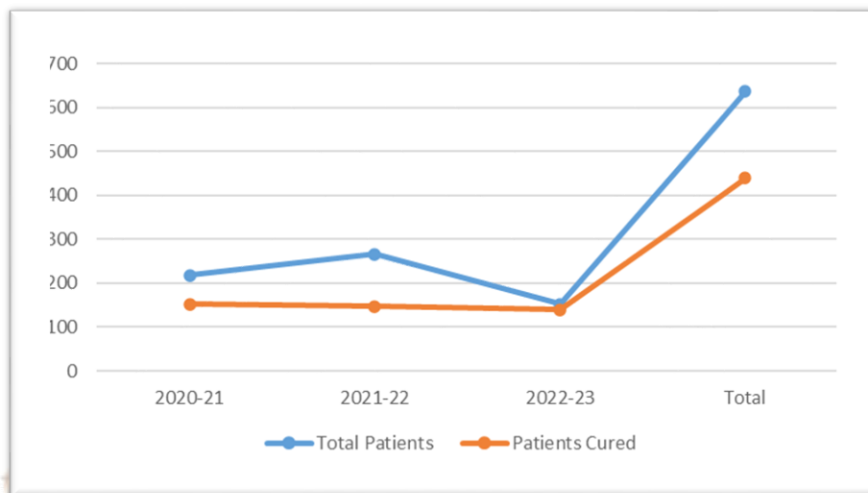


**TABLE 3** Treatment and cured patients outcome of the leprosy

Year	Total Patients	Patients Cured
2020-21	218 (34%)	152 (24%)
2021-22	266 (42%)	148 (23%)
2022-23	153 (24%)	140 (22%)
<b>Total</b>	<b>637 (100.0%)</b>	<b>440 (69%)</b>



GRAPH 3 Treatment and cured patient's outcomes in all 3 years



## Discussion

In this comprehensive three-year study conducted in the Bangalore district, an examination was conducted on a cohort of 637 individuals diagnosed with Hansen's disease. The results unveiled that the predominant gender was male, constituting 76% of the total sample, with a male-to-female ratio of approximately 2.56:1. The age distribution indicated a higher representation of individuals aged 14 years and above, while children comprised a mere 3% of the cases. Multibacillary (MB) type cases were more prevalent, accounting for 77% of the total, while paucibacillary (PB) type cases made up the remaining 23%. The analysis also scrutinized deformity and treatment outcomes, with G1 deformity present in 45% of cases and G2 deformity in 55%. Remarkably, treatment success was achieved in 69% of patients, with most cured cases falling under the MB type (88%). These notable findings contribute valuable insights that can enhance our understanding and guide the management of Hansen's disease in the study area, underscoring the importance of targeted interventions and improved treatment strategies. There are some limitations to consider: the study focused solely on patients seeking treatment at a government hospital, which may not fully represent the entire population of individuals affected by the disease in the district. Additionally, the study spanned only a three-year period, which may not capture long-term trends or variations in disease patterns. Despite these limitations, the study provides valuable insights that can guide further research and inform targeted interventions for Hansen's disease in the study area. The study revealed a prevalent occurrence of deformities in patients diagnosed with G1D and G2D, particularly affecting the feet. Approximately 15.3% of patients exhibited G1D-related deformities, while a larger proportion of 38.5% had deformities associated with G2D.[15] In recent decades, the utilization of molecular techniques for detecting and identifying *M. leprae* DNA in different tissues has emerged as a valuable method for diagnosing leprosy. This approach has shown promise in effectively identifying the presence of the bacterium. However, it should be noted that the direct detection of acid-fast bacilli (AFB) in slit-skin smears exhibits a notable specificity but relatively limited sensitivity, with an approximate sensitivity rate of 50%.[16] The current research demonstrates the socio-demographic characteristics of individuals diagnosed with leprosy, indicating that fewer than 50% of the participants belonged to the age category of 40 to 50 years old.[17] The prevalence of moderate disability (grade 2) among patients was greater compared to mild disability (grade 1). While the national-level program focuses on monitoring grade 2 disability for evaluating program effectiveness, the assessment of grade 1 disability holds greater significance in preventing disability. [18]

## Conclusion

In conclusion, this ground-breaking study provides comprehensive insights into the epidemiology and treatment outcomes of Hansen's disease in the Bangalore government hospitals. The findings highlight the predominance of the disease in individuals aged 14 years and older, with a higher proportion of male patients. Additionally, the study reveals a significant burden of multibacillary leprosy cases and emphasizes the importance of early detection and prevention of disability. Furthermore, the remarkable success in curing most patients, particularly those classified as multibacillary type, underscores the effectiveness of the National Leprosy Eradication Program. These findings contribute immensely to the understanding and management of Hansen's disease, paving the way for targeted interventions and improved treatment strategies in the future.

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