

Decadal Analysis of Childhood Leprosy Trends: A Study of Cases in a South Indian Tertiary Care Centre

NA Paul¹, RM Bhat², J Martis³, D Sukumar⁴, M Fernandes⁵, S Fernandes⁶

Received: 05.01.2023

Revised: 21.08.2023

Accepted: 03.09.2023

Childhood leprosy is a crucial epidemiological indicator for determining active and recent leprosy transmission in a community. It is a critical factor in gauging the success of the regional leprosy control programmes. A retrospective analysis of childhood leprosy cases from April 2010 to April 2022 in a tertiary health care center was conducted. Skin lesions, nerve involvement, the spectrum of leprosy, smear studies, reaction status, grade of deformity, treatment, and follow-up data were noted. 26/365 (7.1%) of the total leprosy cases treated at our centre during this period were children under 15 years of age. The most common age group was between the ages of 10 and 14, with a male predominance. The commonest manifestation of these patients was a solitary hypopigmented skin lesion 19/26 (73%), followed by nerve thickening 13/26 (50%). The most common nerve involved was the ulnar nerve. Borderline tuberculoid and tuberculoid leprosy were common subtypes. Even though the incidence of childhood leprosy has decreased over the years, it is still not completely eradicated. It is crucial to monitor areas with high endemicity and encourage active case tracing. Educating about the condition is essential to eliminating the disease. As it is a single-center study, only a limited number of patients were available for analysis. It would be important to investigate the problem at a community level and assess the impact of interventions being made at the public health level.

Keywords: Childhood Leprosy, South India, Clinical Presentation, Subtypes

Introduction

Leprosy is a chronic, infectious disease that has affected our society for centuries. Leprosy eradication efforts have taken various forms on a national and international level. According to the most recent World Health Organization (WHO) factsheets, 1,27,558 new cases of leprosy were reported globally in 2020, with 8,629 children under the age of 15. With 65147, 17979, and 11173 cases, respectively, India, Brazil, and

Indonesia remained the most affected countries (WHO 2019).

Despite a declining trend in cases over the years, leprosy in children persists even after achieving elimination status in 2005. The prevalence of childhood leprosy in a region is a critical indicator of active transmission. Presently, a countrywide prevalence of 7.6% is reported (Joy et al 2022) But there is a wide variance between the different regions of India. North India was noted to have a

¹ Dr. Navya Anna Paul, Junior Resident, Orchid id - <https://orcid.org/0000-0002-6763-4038>

² Dr. Ramesh Bhat M, Vice-Dean & Professor, Orchid id - <https://orcid.org/0000-0003-2566-5765>

³ Dr. Jacintha Martis, Professor and Head of Department

⁴ Dr. Sukumar D, Professor

⁵ Dr. Michelle Fernandes, Associate Professor

⁶ Dr. Sonal Fernandes, Senior Resident

Dept of Dermatology, Father Muller Medical College, Mangaluru – 575002, Karnataka, India

Corresponding Author: Dr. Navya Anna Paul, Email: navya.annapaul57@gmail.com

higher prevalence of leprosy, while South India usually reports fewer cases (Joy et al 2022). The National Leprosy Eradication Program (NLEP) of India has played a crucial role in reducing the number of cases over the years. Various central and state-level initiatives have been instrumental in the active detection and early care of cases.

Patients reporting at tertiary care institutions, though not representative of the situation in the community, yet their profiles may point to gaps and highlight important aspects for further work. We have analyzed childhood leprosy cases reported to our tertiary care hospital for that purpose.

Materials and Methods

A retrospective study on childhood leprosy was carried out in the Outpatient Department of Dermatology at Father Muller Medical College Mangaluru, Karnataka, India. This tertiary care center is involved in leprosy-related activities and serves the coastal regions of Karnataka and North Kerala. The hospital records of leprosy cases treated at our centre from April 2010 to March 2022 were retrieved and analyzed after the ethical committee's approval. The records of diagnosed cases of childhood leprosy were reviewed and analyzed based on clinical presentation, cutaneous examination, leprosy spectrum, presence of reaction, deformities, smear and histopathological studies, therapy, and follow-up. The patients were categorized into indeterminate, tuberculoid, borderline tuberculoid, mid-borderline, borderline lepromatous, and lepromatous leprosy. The diagnosis of childhood leprosy was established following a thorough assessment, which included a comprehensive medical history, cutaneous examination, a detailed nerve examination, voluntary muscle testing, and relevant investigations. These diagnostic procedures were conducted with the explicit consent of

the patient or their legal guardian at the time of presentation.

“New case” refers to an individual who has been newly diagnosed with leprosy and has not received treatment for the same before while ‘Old case’ refers to individuals who have been previously diagnosed with leprosy and have received treatment for the disease in the past.

Following was the practice followed/ is being followed to diagnose, classify, and manage leprosy cases at our centre:

In our leprosy clinic, we commence the patient categorization process using the Ridley-Jopling classification system. We conduct skin biopsies and slit skin smears whenever deemed necessary. Furthermore, we differentiate patients into two categories: Multi-bacillary (MB) or Paucibacillary (PB), based on the extent of skin lesions and peripheral nerve involvement as per criteria defined by WHO and followed by NLEP (NLEP 2013). This categorization is instrumental in tailoring our therapeutic interventions. These patients continue to receive multi-drug therapy (MDT) through our clinic until they successfully complete their treatment. Subsequently, we maintain regular follow-up with them for a specified duration.

For individuals presenting with motor deformities and trophic ulcers, we extend specialized care within our institution. This care is delivered in close collaboration with the departments of orthopedics and physiotherapy, all at a minimal cost.

Results

From April 2010 to April 2022, a total of 365 new cases of Hansen's disease were reported, with 26 patients being children (Table 1). When the trend of newly detected cases over the decade is compared to that of children, both show a steady decline (Fig.1). In 2017 and 2020, there

Table 1 : New cases diagnosed during the study period of 12 years.

Time Period	Total No. of New Cases Detected	Total No. of Newly Detected Childhood Leprosy (< 15Y)
April 2010 - March 2011	26	4
April 2011 - March 2012	56	7
April 2012 - March 2013	33	4
April 2013 - March 2014	50	2
April 2014 - March 2015	35	5
April 2016 - March 2017	25	0
April 2017 - March 2018	33	1
April 2018 - March 2019	38	1
April 2019 - March 2020	23	1
April 2020 - March 2021	23	0
April 2021 - March 2022	23	1

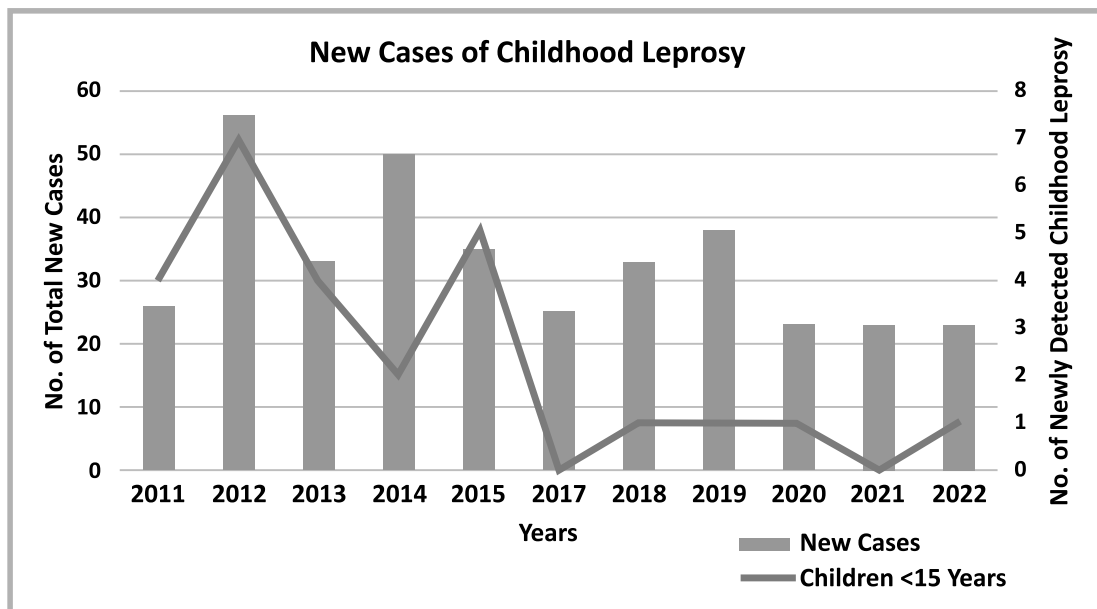


Fig. 1 : Graph highlighting the trend of cases over the past 12 years.

were no cases of childhood leprosy reported at our centre.

Age and Sex wise distribution

The most common age group affected in our

study was between 10 to 14 years. The age distribution is shown in Table 2. Male children have a mildly higher preponderance than female children (1.1:1) in our study.

History of contact

Around 46 percent of patients have a family history or a history of known contact with leprosy. This emphasizes the significance of close contact with leprosy cases.

Signs and symptoms

1. Skin lesions

A solitary hypopigmented lesion was the most frequently encountered cutaneous symptom (73%). The majority of patients (85%) had fewer than five lesions. The sensory loss was associated with 73% of the lesions. One of the patients was mentally retarded, which made evaluation difficult.

2. Nerve involvement

Nerve thickening is the second most common finding. It was found in 53.8% of patients. The ulnar nerve (35%), followed by the radial and lateral popliteal nerves (15%), was the most frequently involved. Only two patients developed a type 1 reaction and neuritis.

Disability/Deformity

During these twelve years only one patient presented with a partial claw hand (Grade 2 deformity). Given the patient's late presentation to the clinic and the presence of deformity, the

recommended treatment modalities were limited to corrective surgeries and physiotherapy. Unfortunately, the patient expressed unwillingness to pursue these treatment options.

Type of leprosy as per Ridley-Jopling Classification

Following the Ridley-Jopling Classification, borderline tuberculoid and tuberculoid leprosy (each accounting for 46% of cases) and indeterminate type (8%) respectively represent the leprosy spectrum with the highest prevalence.

Slit Skin smears for AFB

Smear tests were positive for acid fast bacilli (AFB) in only 12% of cases. The results of 77% of the smear tests were negative.

Treatment

73% of the patients were treated with the paucibacillary multi-drug regimen. After completing the paucibacillary regimen, one child relapsed, necessitating the implementation of a multibacillary regimen. Notably, two patients who exhibited type 1 reactions characterized by neuritis received treatment with oral steroids to mitigate the reactive state.

Follow-up

65% of patients completed their therapy with a favourable response, while 27% dropped out or were lost to follow-up. Among the patients who were lost to follow-up, 4 cases were PB and 3 cases were MB.

Table 2 : Age distribution of cases studied.

Age Group	No. of Children	Percentage of Children in the Age Group
0-5	3	12%
6-10	9	35%
11-14	14	54%
Grand Total	26	100%

These above-mentioned findings have been summarized in Table 3.

The data pertaining to childhood leprosy, as documented in the records of the leprosy

Table 3 : Summary of the findings of present study.

Serial No	Feature	No of cases	Percentage
1.	Total number of newly detected childhood cases	26 cases	7.1% of all cases
2.	Age Distribution		
	1. 0-5	3	11.5%
	2. 6-10	9	34.6%
	3. 11-14	14	53.8%
3.	Sex Distribution		
	1. Female	12	46%
	2. Male	14	54%
4.	Solitary Skin lesion	19	73%
5.	2 to 5 skin lesions	3	12%
6.	>5 skin lesions	4	15%
7.	Nerve thickening	13	50%
8.	Family history	12	46.1%
9.	Type 1 Reaction	2	8%
10.	Type 2 Reaction	-	-
11.	Deformities	1	4%
12.	Skin Smear		
	Positive	3	12%
	Negative	20	77%
	Not done	3	12%
13.	PB	19	73 %
14.	MB	7	27%
15.	Indeterminate	2	7.69%
16.	Tuberculoid	12	46.1%
17.	Borderline tuberculoid	12	46.1%
18.	Borderline	-	-
19.	Borderline lepromatous	-	-
20.	Lepromatous leprosy	-	-
21.	Released from treatment	17	65.3%
22.	Relapse	1	3.8%
23.	On treatment	1	3.8%
24.	Lost to follow up	7	26.9%

Table 4 : Comparison of data from our study with the data collected from the District Leprosy Office for the year 2021-22.

Parameter	DK District (No. of Cases) 2021- 2022	Our Study (No. of Cases) 2021 - 2022
NEW CASES DETECTED TOTAL (Adult +Child)	39 cases	23 cases
NEW CASES (CHILD)		
- PB	3	1
- MB	1	-
- TOTAL	4	1
DEFORMITIES (Child)		
- GRADE I	1(MB)	-
- GRADE II	-	-
- REACTIONS	NIL	NIL

Table 5 : Comparison of present study with similar studies on childhood leprosy.

Study	% of cases	M/C Age Group (Years)	H/O Contact	Sex	Type	Nerve Thickening	TR1	TR2	Deformity
Jammu (Sakral et al 2022)	3.55%	11- 15	23.6%	M	BT, BL	76.4%	18.2%	3.6%	7.3%
South Rajasthan (Balai et al 2017)	2.3%	10 – 14	28.1%	M	BT, BL	68.7%	-	9.4%	12.5%
Central India – Chhattisgarh (Gitte et al 2016)	16%	13-18	44.1%	M	NM	NM	17.8%	NM	19.4%
Delhi (Ghunawat et al 2018)	7.6%	11-15	3.5%	M	BT, L	59.3%	15%	NM	24.7%
Odisha (Joy et al 2022)	10.4%	11-13	NM	M	BT	NM	22.2%	5.6%	32.1%
Our Study	10.4%	11-14	46.1%	M	BT	50%	8%	NM	4%

Abbreviations: M – Male, BT- Borderline Tuberculoid, BL- Borderline Lepromatous, L- Lepromatous, T- Tuberculoid, TR1 – Type 1 Reaction, T2R- Type 2 Reaction, NM- Not Mentioned, MB- Multi-bacillary, PB – Paucibacillary.

clinic at Father Muller Medical College, has been compared with the information gathered through a community survey and subsequently reported to the District Leprosy Office, Dakshina Karnataka. This comparison is summarized in Table 4. During 2021-22 in Dakshina Karnataka, a total of 39 cases were detected, with four of them being children (10.25%) under the age of 15. Among these cases, three were classified as paucibacillary, and one as multibacillary. Furthermore, one case of Grade 1 deformity was reported.

Discussion

Childhood leprosy is an important tool for understanding the epidemiology of leprosy and the effectiveness of leprosy control programmes in a particular area. A 2015 study assessing the prevalence of childhood leprosy in the same region (catering to Coastal Karnataka and North Kerala) reported a prevalence of 11.2% (Babu et al 2018). The current study found 7.1% of all cases were children in the same area, this proportion has varied from 0% to 4.3% between 2016 to 2022 at our centre. NLEP data for 2021-22 also observed 10% (4/39) child rates in Dakshina Karnataka district. Consequently, we can conclude that the leprosy scenario in the area has apparently improved. However, firm conclusions can be made after carrying out well designed studies in the community in this area.

When the data from the previous 12 years was examined, no cases were reported in 2017 and 2020. A prevalence of 8.9% was noted until 2019. Zero cases in 2020 can be attributed to underreporting because of the global pandemic, however, no childhood case was reported earlier also during 2016-17.

The cases with disabilities vary from region to region. Joy et al (2022) reported 32.10% (18/32) disabilities (grade 1 and 2) in child leprosy cases studied by them. Ghunawat et al (2018) reported

7.6% (113/1487) child rate in their leprosy cases between 2005 to 2015, disability rates in their child cases was 28/113 (24.8%) majority (21/28) being grade 2 disability. India continues to contribute the most cases of leprosy in the world (56.6%), reporting a staggering (114, 451 out of a total 202,185) of new cases (NLEP 2018-19, WHO 2020). Child rates/proportion thus needs to be carefully monitored as it would reflect comparatively a recent transmission.

The age group most affected is 10 to 14 years old. The older age group may have predominated due to a delay in diagnosis. A few reasons could be the bacilli's longer incubation period, misdiagnosis of hypopigmented lesions, and difficulty assessing the sensation of lesions in younger age groups. There is a male predominance noted in multiple studies, but its clinical significance is unclear (Joy et al 2022, Ghunawat et al 2018, Chaitra et al 2013). In our study, a ratio of 1.1:1 was seen. In a study by Joy et al, males were five times more affected than females but Babu et al reported a ratio of 1.04:1 (Joy et al 2022, Babu et al 2018). This discrepancy could be due to less access to health care for female children or different population groups covered.

The mode of transmission of leprosy is uncertain although droplets from nose and mouth have been considered. A history of prolonged and close contact with leprosy cases have been implicated in its transmission (WHO 2019, Smith et al 2015). Identifying a child case can help in tracing an index case. In our study, 46% of our child cases had a history of contact. Children are said to be nine times more likely to contract the infection if a family member has leprosy and four times more likely if a neighbor has leprosy (van Beers et al 1999).

In our study, approximately 73% of the cases were paucibacillary. The predominance of paucibacillary cases could indicate that the cases

were diagnosed early in our settings which are mostly self-reporting cases.

A single solitary lesion was the most common skin manifestation, and the ulnar nerve was the most common peripheral nerve that was involved in our study. Ulnar nerve thickening is like other studies (Balai et al 2017, Babu et al 2018, Ghunawat et al 2018, Joy et al 2022). The incidence of lepra reactions (type 1) was 8% and 12% showed skin smear positivity which is higher compared to a few studies by Chaitra & Bhatt (2013) and Ghunawat et al (2018).

Deformities in leprosy are an indication of a missed diagnosis or detection. In our study, only one child was presented with a partial claw hand (4% deformity rate in 12 years). In comparison to 10.4% child proportion reported by Joy et al (2022) and 9.4% by Balai et al (2017), it is lower in our series. If confirmed at community level, this is a good sign of timely diagnosis and proper management.

Sixty-five percent of the cases completed the required multidrug therapy and were discharged. Only one case demonstrated relapse after treatment completion. However, 19% of cases continued their treatment at another center, so no follow-up data were available for those cases, and 8% of cases discontinued treatment.

Comparison of our study with some other studies has been highlighted in Table 5. It is apparent that there is wide variation in the rates and profile of childhood leprosy in different settings (Gitte et al 2016, Balai et al 2017, Ghunawat et al 2018, Joy et al 2022, Sakral et al 2022). These differences could be due to different periods, different geographical and endemicity situations prevalent in various parts of the country. It would not be appropriate to extrapolate findings to state or national levels.

Our study shows that there has been a positive

shift toward eradication in recent years in Dakshina Karnataka. Although this is a single-center, hospital-based study with a small sample size, it helps us understand that the epidemiological pattern of childhood leprosy in the area is improving, and it is critical to continue eradication efforts. WHO strategy 2016 onwards has focused on zero transmission, zero-disability and zero stigma (WHO 2016), same is being targeted by NLEP in India (National Strategic Plan 2023). Consistent low proportion of childhood leprosy cases and low disability/ deformity rates during the 2016 -2022 in our patients confirms a positive trend.

Conclusion

Our data indicates that transmission of leprosy in Mangalore, Dakshina Kannada Karnataka appears to be low. Nearly half of these cases had family contacts. Preventive strategies to raise societal awareness are critical in the early detection of cases. Active surveillance, particularly among family members, school-age children, is required to detect and track down index cases as early as possible. To ensure the success of leprosy elimination, it is critical to educate the community about the condition and reduce the social stigma associated with it. Other supportive measures like chemoprophylaxis and immunoprophylaxis are expected to strengthen these efforts to stop transmission on a sustained basis.

References

1. Babu A, Bhat MR, Jayaraman J (2018). Childhood leprosy in the post elimination era: A vision achieved or a concern growing at large. *Indian J Paediatr Dermatol*. **19(1)**: 26-30. DOI: 10.4103/ijpd.IJPD_132_16.
2. Balai M, Agarwal C, Gupta LK et al (2017). Current scenario of childhood leprosy at a tertiary care hospital in southern Rajasthan. *Indian Dermatol Online J*. **8(6)**: 494-495. https://doi.org/10.4103/idoj.IDOJ_8_17.

3. Chaitra P, Bhat RM (2013). Post elimination status of childhood leprosy: Report from a tertiary-care hospital in south India. *BioMed Res Int.* **2013**: 1–4. <https://doi.org/10.1155/2013/328673>.
4. Ghunawat S, Relhan V, Mittal S et al (2018). Childhood leprosy: A retrospective descriptive study from Delhi. *Indian J Dermatol.* **63(6)**: 455–458. https://doi.org/10.4103/ijd.IJD_99_17.
5. Gitte SV, Ramanath NS, Kamble KM (2016). Childhood leprosy in an endemic area of central India. *Indian Pediatr.* **53**: 221-224. doi: 10.1007/s13312-016-0824-1.
6. Joy N, Patnaik S, Nayak S et al (2022). A hospital-based cross-sectional study of clinico-epidemiological aspects of childhood leprosy with disability in the post-elimination era. *Lepr Rev.* **93(3)**: 224–234. <https://doi.org/10.47276/lr.93.3.224>.
7. National Leprosy Eradication Programme (2013). Training manual for medical officer. Central Leprosy Division, DGHS, MoHFW, Nirman Bhawan, New Delhi.
8. NLEP-Annual Report for the year 2018–2019. Central Leprosy Division, Directorate General of Health Services, Ministry of Health and Family Welfare, New Delhi.
9. National Strategic Plan and roadmap for leprosy 2023-2027. Accelerating towards leprosy free India. Central Leprosy Division, MoHFW, Govt of India.
10. Sakral A, Dogra N, Dogra D et al (2022). Clinical and epidemiological trends in childhood leprosy: A 20-year retrospective analysis from a tertiary care hospital in Jammu, North India. *Indian J Dermatol Venereol Leprol.* **88(6)**: 755-760. doi: 10.25259/IJDVL_1326_20.
11. Smith CS, Noordeen SK, Richardus JH et al (2015). A strategy to halt leprosy transmission. *Lancet Infect Dis.* **15(1)**: 96-97. doi:10.1016/s1473-3099(14)71024-7.
12. van Beers SM, Hatta M, Klatser PR (1999). Patient contact is the major determinant in incident leprosy: Implications for future control. *Int J Lepr Other Mycobact Dis.* **67(2)**: 119–128.
13. World Health Organization (2016). Global leprosy strategy 2016-2020. Accelerating towards leprosy free world. WHO, Regional Office South -East Asia.
14. World Health Organization. Global leprosy update, 2019: time for action, accountability, and inclusion. World Health Organization. 2020. Available from: <https://www.who.int/wer/2020/wer9540.pdf>.
15. World Health Organization (2020); Available from: <https://www.who.int/news-room/fact-sheets/detail/leprosy>.

How to cite this article : Paul NA, Bhat RM, Martis J et al (2023). Decadal Analysis of Childhood Leprosy Trends: A Study of Cases in a South Indian Tertiary Care Centre. *Indian J Lepr.* **95**: 261-269.