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Original Article

Childhood Leprosy: A 11 Year Retrospective Study at a Tertiary Care Hospital

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Childhood leprosy is considered as an important marker of the status of any ongoing leprosy control programme, as it is an indicator of active disease transmission in the community. Despite achievement of leprosy elimination status of leprosy at the National level in 2005, the reported prevalence and incidence of childhood cases continues to be high in several areas. To get an overview of child leprosy cases in this area, a retrospective analysis of 11-year records of leprosy patients aged lesser or equal to 14 years was carried out. This study is based on cases who attended the tertiary care hospital of Rajkot, Gujarat, India was carried out from January 2012 to December 2022. A total of 1034 leprosy patients attended this hospital during this period, of these 47 (4.5%) belonged to the childhood / juvenile age group whereas remaining 987 (95.5%) were adult and adolescent patients. 14 (29.7%) of these child leprosy children had a family history of leprosy disease. The most common disease sub type observed among these patients was borderline tuberculoid (34%) and tuberculoid leprosy (31.9%). Paucibacillary disease was observed in 55.3% of cases while multibacillary disease was noted in the rest of 44.7% of cases. 13 (27.6%) were BL/LL with slit skin smear positive for acid fast bacilli some even with 5+ BI which shows late diagnosis. Overall, the lag period from the appearance of symptoms to diagnosis was one year. These are not desirable indicators. In this cohort two cases (4.25 %) had type 2 reactions and 3 patients (6.4 %) reported with disabilities. This proportion of child cases is lower than national average and reported figures of NLEP from this area. 53% of these cases were migrants/immigrant (one case). To achieve the targets of zero disabilities and zero transmission more efforts are required at community level to ensure access to early diagnosis, appropriate management to locals as well migrants/ immigrants. Other transmission interruption strategies like chemoprophylaxis/ immunoprophylaxis or both need due consideration.

Keywords : Child, Leprosy, Disabilities, Tertiary Care Hospital, Rajkot, Gujarat, India

Introduction

Mycobacterium leprae causes leprosy in humans, the disease commonly affects the skin, peripheral nervous system, and certain other tissues (Jopling & McDougall 1996). In 2005, India achieved the elimination goal at public health level (less than 1/10,000 population) for leprosy at the National level. It is also known that situation has remained nearly static after that. It has been recognized that the prevalence/incidence of leprosy in children indicates the degree of recent transmission in the community (Singal & Chhabra 2017). Children are also assumed to be the group most susceptible to *Mycobacterium leprae* infection

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because of their developing immune systems and close intra-family interaction (Singal & Chhabra 2017). It possibly provides a crucial connection in the investigation of how diseases naturally progress from children to adults. Below the age of two, leprosy reporting has been uncommon (Jain et al 2014). The majority of pre-clinical or early cases go undiagnosed and self-heal. Only a small proportion of these cases progresses to clinical disease and manifest in the skin and or nerves and require treatment. However, all leprosy cases once diagnosed require treatment, as at present we cannot distinguish which case will self-heal and who will require treatment. If left untreated they may progress to more severe forms of the disease and disabilities. These characteristics and pathogenesis are important and needs to disseminate publicly so that after the disease manifestation patient should be examined properly and adequately and optimally treated to prevent the morbidity, stigma and disabilities This will also decrease the transmission dynamics in the community. Due to lack of public awareness, barriers in accessing the healthcare system, and a lack of well-recognized clinical indicators among children, childhood leprosy continues to be reported (Ghunawat et al 2019). Official statistics from 139 nations in the 6 WHO regions show that there were 127558 new leprosy patients worldwide in 2020. This figure includes 8629 children under 15 years of age. The new case detection rate in the child population was 4.4 cases per million worldwide. In India, there were 7859 (6.87%) child leprosy cases among the total cases reported, and 2761(2.41%) cases of children had grade 2 disabilities in 2020 (NLEP 2020-21). Despite major impact of MDT on disease burden, leprosy in children continues to be a challenge (Sehgal & Srivastava 1987, Kaur et al 1991, Mahajan et al 2006, Jain et al 2014, Ghunawat et al 2019). Though global and national statistics have meaning, management of any disease including leprosy requires capacity, access, and locally relevant strategies. Even though the data from tertiary care centres like ours may not represent the situation at community level, it provides information based on which further action can be planned. We have carried out this study to understand the profile of child leprosy cases reporting at our hospital, important epidemiological indices like time taken for reporting, likely sources of infection and other issues like reactions, disabilities which influence the outcomes.

Materials and Methods

This is a retrospective study of leprosy cases among all cases attending the Dermatology Department of Pandit Deendayal Upadhyay Medical College and Hospital, Rajkot, from January 2012- December 2022. Ethics approval was taken from Institutional Ethics committee. The data of child leprosy cases who were less than or equal to 14 years of age, was analysed. The case detection was passive, and based on whatever children attended the hospital and were diagnosed as suffering from leprosy. No active search was carried out. The detailed history as noted in the records, and the examination findings were recorded and analysed. All data regarding age, sex, native of which area, history of any other person in family who was diagnosed with leprosy, or had treatment of leprosy earlier, other household contacts, number of skin lesions, nerve involvement, clinical classification, presence of lepra reaction and disabilities, were taken from the Leprosy Register of this hospital. Detailed note of the examination findings included number of skin lesions, peripheral nerve thickening, sensory examination, motor examination, signs suggestive of type 1 and type 2 reactions, presence of neuritis and disabilities. Standard criteria for diagnosis and classification (IAL 1982, Ridley & Jopling 1966) and grading of disabilities as per WHO criteria (Brandsma & van Brakel 2003) was followed. Slit Skin Smear

examination was done, histopathology findings were noted and analysed for these leprosy cases. The leprosy patients were essentially classified according to the IAL classification (Mishra & Kataria 2017) - The clinical types diagnosed included lepromatous leprosy (LL),), borderline lepromatous (BL), mid borderline (BB), borderline tuberculoid (BT), tuberculoid TT), pure neuritic (N) and Indeterminate leprosy. These cases were classified into paucibacillary (PB) and multibacillary (MB) types as per WHO criteria (WHO 2012a) for treatment purposes and were treated as per accepted NLEP guidelines (NLEP).

Monthly out-patient follow up was done during treatment. Follow up laboratory studies during treatment include the following complete blood count, liver function test and renal function test and slit -skin smear performed every 6 months during treatment and after completion of treatment.

Out of these 47 children included in the study, 36 children have completed the treatment and 11 are on treatment. There was no drop-out.

Results

In the data analyzed from 2012 to 2022, 47 (4.5%) cases of childhood leprosy were recorded from the total of 1034 leprosy cases who visited this hospital during this period. The year wise distribution of cases is shown in Table 1. The age profile of the childhood cases detected during this study ranged from 5 to 14 years.

Demographic profile

Twenty-nine cases (61.7%) belonged to 11 to 14 years age group; this was followed by 17 (36.3%) children who were aged between 6 to 10 years; and only 1 (2%) child cases were aged 5 years. No child leprosy case was reported below this age (Fig. 1). Males accounted up to 63.8% of the participants in this study, while females comprised 36.2%. The male to female ratio was 1.76:1.

Most of the cases were observed in the migrant /immigrant population from neighbouring districts and States. Majority of cases were from Bihar 15 (31.9%) followed by Madhya Pradesh 09 (19.1%)- these are migrants. Patients belonging to Gujarat State were 22 (46.8%), while one case (2.2%) was from Nepal- this is the only immigrant in our series (Table 2).

Contact History

A total of 14 (29.7%) of the children had a family history of a leprosy case in the family. All these 14 children had close interaction with family members who had leprosy. Most of the index

Table 1 : Year-wise distribution of the cases of childhood leprosy.

Year	Number of cases
2012	02
2013	03
2014	06
2015	06
2016	04
2017	02
2018	05
2019	05
2020	03
2021	02
2022	09
Total - January 2012 to December 2022	47

Table 2 : Distribution of cases according to native place.

Name of state	Number of cases
Gujarat	22(46.8%)
Madhya Pradesh	09(19.1%)
Bihar	15(31.9%)
Nepal	01(2.2%)

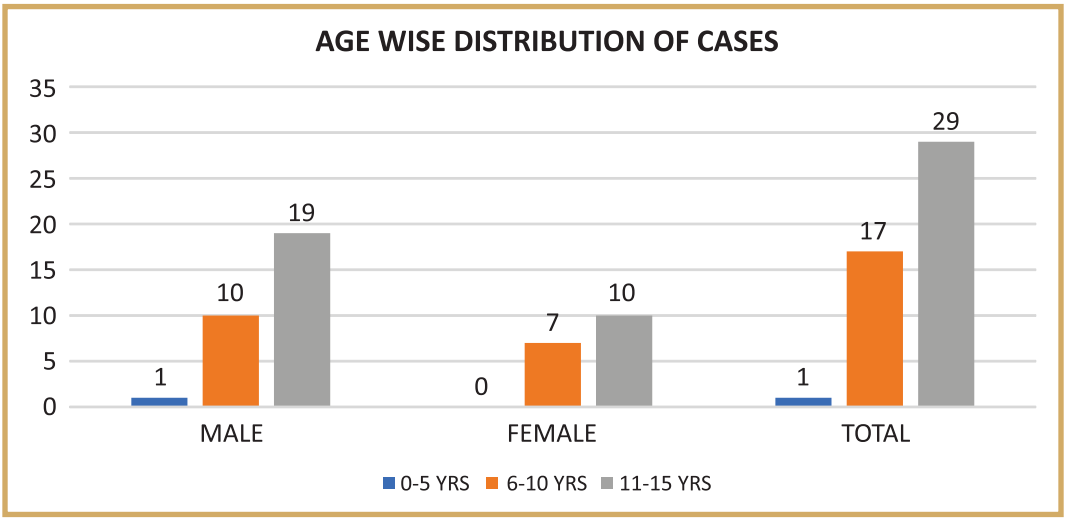

Fig. 1 : Age wise distribution of cases.

cases are parents of the child patients. Duration of contact between the patient and index case ranged between 5 to 10 years.

Clinical disease spectrum

According to the IAL classification, majority of the cases 21 (44.7%) belonged to the borderline tuberculoid spectrum, followed by 10 cases of tuberculoid leprosy (21.2%) and 3 cases were of indeterminate leprosy (6.3%) (Table 3). Majority of these childhood leprosy patients were of PB type according to the WHO classification (Fig. 2).

More than five skin lesions were present in 22 (46.8%) cases, whereas 15(31.9%) had two to five skin lesions. In 10 (21.3%) children, a single lesion was observed (Table 4). A total of 26(55.3%) cases presented with multiple nerve involvement, ulnar nerve being the most common followed by common peroneal nerve.

Forty (85.1%) children gave a history of such symptoms for less than a year and seven (14.9%) children consulted a doctor earlier, and history of signs and symptoms for more than 1 year.

Smear positivity and histopathology

Slit-Skin Smear (SSS) positivity for AFB after Ziehl Neelson staining of smears was observed in 13 (27.6%) cases, whereas the rest 34 (72.4%) did not reveal acid-fast bacilli on slit-skin smear examination. Among the slit-skin smear positive cases, 5 belonged to borderline lepromatous, while 8 belonged to the lepromatous leprosy group (Table 5).

Table 3 : Spectrum of disease.

Spectrum of disease	No. of cases
Indeterminate leprosy	03(6.3%)
Tuberculoid leprosy	10(21.2%)
Borderline tuberculoid leprosy	21(44.7%)
Mid borderline leprosy	Nil
Borderline lepromatous leprosy	05(10.6%)
Lepromatous leprosy	06(12.8%)
Erythema nodosum leprosum (in case of lepromatous leprosy)	02(4.4%)
Total	47

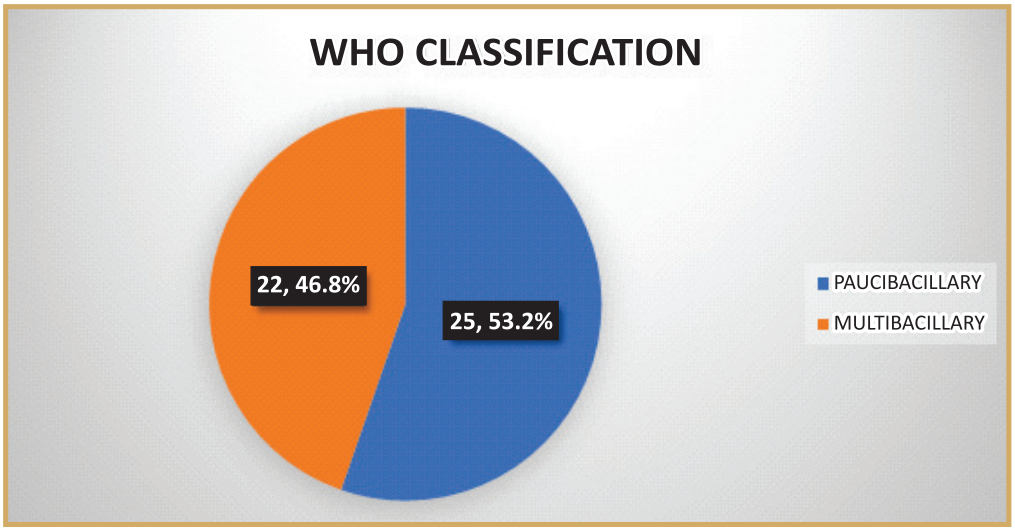

Fig. 2 : Case distribution according to operational treatment classification of WHO (Paucibacillary/ Multibacillary).

Table 4 : Clinical presentation according to number of skin lesions in childhood leprosy cases.

Number of skin lesion	Number of patient
Single	10(21.3%)
2-5	15(31.9%)
>5	22(46.8%)
Pure neuritic	0(00.0%)

Table 5 : Bacteriological index in child cases with various types of leprosy.

Type of Leprosy	Bacteriological Index							Total no of cases
	0 (%)	1+ (%)	2+ (%)	3+ (%)	4+ (%)	5+ (%)	6+ (%)	
Indeterminate leprosy	03(6.3)	-	-	-	-	-	-	03
Tuberculoid leprosy	10(21.2)	-	-	-	-	-	-	10
Borderline tuberculoid leprosy	21(44.7)	-	-	-	-	-	-	21
Mid borderline leprosy	-	-	-	-	-	-	-	-
Borderline lepromatous leprosy	-	01(2.1)	03(6.3)	01(2.1)	-	-	-	05
Lepromatous leprosy	-	-	02(4.2)	01(2.1)	01(2.1)	02(4.2)	-	06
Erythema nodosum leprosum (in case of lepromatous leprosy)	-	-	-	02(4.2)	-	-	-	02

Table 6 : Table showing correlation between histopathological and clinical diagnosis in various types of leprosy in present study.

Histopathological diagnosis	Clinically diagnosed cases					
	TT (%)	BT (%)	BB (%)	BL (%)	LL (%)	IL (%)
Indeterminate leprosy	-	-	-	-	-	03(6.3)
Tuberculoid leprosy	06(12.7)	04(8.5)	-	-	-	-
Borderline tuberculoid leprosy	-	21(44.6)	-	-	-	-
Mid borderline leprosy	-	-	-	-	-	-
Borderline lepromatous leprosy	-	-	-	05(10.6)	-	-
Lepromatous leprosy	-	-	-	-	06(12.7)	-
Erythema nodosum leprosum (in case of lepromatous leprosy)	-	-	-	-	02(4.2)	-

On histopathological examination, 25 numbers (53.2%) of cases were classified as BT cases; 06(12.8%) as LL, 06(12.8%) as TT cases; 04(10.6%) as BL cases and 3(6.4 %) of cases as Indeterminate cases. 2 (4.3%) LL cases also had ENL reaction (Erythema nodosum leprosum) (Table 6). Minor differences in type of leprosy were mainly in TT/BT types, these did not appear to be therapeutically relevant.

Reactions and disabilities

Two (4.25%) cases had episodes of Type 2 reactions (ENL) in the present series. No cases of previous treatment and relapse was observed in the children. Disabilities were seen in 5 children (10.6%); among them 2(4.25%) had Grade 1 disability (loss of sensation over hands and feet). Three cases (6.38%) had grade 2 disability (partial claw hand in the beginning of treatment itself and none deteriorated during treatment with or without reaction.

Discussion

According to the NLEP 2015 Annual Progress Report, a total of 125,785 new leprosy cases were detected in 2014-2015, making the yearly new case detection rate of 9.73/100,000. Of these, 9.04% of the newly detected cases were children (NLEP 2014-15). However, according to the NLEP 2020-2021 report, a total of 2386 new leprosy cases were detected during the period, resulting in an annual new case detection rate of 3.82/100,000. Of these 5.28 % of the cases were children (NLEP 2020-21). This may have been due to the Covid 19 pandemic and lock downs, and therefore lesser number of cases were reporting to the State Health Systems.

The percentage of paediatric cases is a crucial indicator of ascertaining the transmission dynamics of the disease in the population. Detection of large number of MB cases specially smear positive BL/LL types also raises serious concern of late diagnosis and reporting besides, as the issue of the active transmission of leprosy in children. Leprosy in children is a sign of high levels of community transmission. In the present series the proportion of child leprosy cases was 4.5%. As this study was done in a Hospital at Rajkot (Gujarat) it may not reflect the exact

tatus of childhood leprosy in the community, but still raises concern. Child leprosy cases globally were 8.8% of total cases in 2020, and in India, its proportion was 5.28% in 2020. The average symptom duration was more than a year, which might be linked to a lack of understanding about leprosy or obstacles to receiving or using healthcare facilities.

The male to female ratio amongst child leprosy cases observed in this study is similar to the findings of many studies conducted over the past few decades (Selvasekar et al 1999). The gender ratio was 1.76:1 in present study. Literature reports indicate a child leprosy M: F ratio, varies from 3.3:1 to 1:1 as referred by John et al (2005) including adolescent patients. Sex ratio does not depict the true picture as several socio-cultural factors in the local population play a major role in reporting of cases to a health facility. WHO reported (WHO 2012b) that there is "no significant difference" in the leprosy prevalence between the sexes.

It has been reported that there is a four-fold increased risk of contracting leprosy by contacts, due to community transmission, and this risk increases to nine-fold in house hold contacts, when index leprosy patient exists inside the family (van Beers et al 1999). The present study observed that history of contact with leprosy cases was present in 29.7% of children detected which is itself important. Also, among familial contacts, the risk of infection increases from 35% to 65% if the index case is suffering from MB leprosy as compared to PB leprosy (Uikey et al 2019). Gitte et al (2016) reported contact history in 44.1% children in their study. All such findings, therefore, re-emphasise, that all contacts of newly detected cases should be examined so that hidden cases are treated early, and also transmission of disease can be arrested. A strong focus on contact examination, health surveys in schools is required to detect cases early, prevent disabilities and thereby limit the transmission of the disease. Chemoprophylaxis / immunoprophylaxis by using vaccines like indigenous MIP (Mycobacterium *indicus pranii*) vaccine can be cost effective intervention to block the transmission effectively (Muniyandi et al 2021).

In the present study the percentage of PB and MB cases was 53.2%, 46.8%, respectively. NLEP data from Surat district reports that 6.3% PB and 11.1% MB leprosy patients are children (NLEP 2020-21). Thus, our hospital data is slightly different from Surat district as Surat is high endemic area of Gujarat. Gitte et al (2016) had also observed PB cases were more than MB (59.9% PB and 40.1% MB) among child leprosy cases in their study. It may be noted that, as there are other more common causes of hypopigmented patches in children, there is a considerable chance of misdiagnosis when there is only one/few patch/es on the face (Mahajan et al 2006). In the present study, 44.7% cases were of borderline tuberculoid (BT), 21.3% of tuberculoid and 6.1% of Indeterminate cases (proved histologically). Except for some help in indeterminate cases, histopathology is mainly of academic interest and good clinical skills along with SSS may be adequate. Similarly, Mahajan et al (2006) reported BT leprosy in 73% childhood patients, while Kumaravel et al (2017) reported 58.7% BT cases in their series. While data of one place or hospital cannot be extrapolated to other place/ institution, it is apparent that profile of disease has not changed over the years. Further, disseminated bacteriologically positive BL/LL could be diagnosed clinically, of course bacteriological examination appears to be relevant.

The average duration of disease in children before reporting was up to one year in the present study. Even one year of delay in diagnosis and attending a tertiary care hospital shows a lack of

awareness and proper sense of urgency on the part of the parents and the guardians. Setting up of regular health check-up and surveys in schools may reduce the duration. Mahajan et al (2006) reported an even higher duration between the development of symptoms and reporting to the health facility as 1.5 years. Gitte et al (2016) reported a mean duration of 13–14 months between appearance of first symptom/ report and report for check-up at a hospital. This factor shows the limited awareness of the disease in the population and the subtle signs and symptoms of the disease which prevent earlier reporting and diagnosis. Intense efforts are required to reduce this delay for effective management of leprosy.

Reactions are uncommon in children, with only 4.25% in our study. This was also observed by Sehgal & Srivastava (1987) more than 30 years ago. However, Gitte et al (2016) reported that 17.6% of children had developed Lepra reaction in their series. Grade 2 disability was seen in 6.38% children, of these 4.25% had Grade 1 disability. No eye involvement was seen in present study. Mahajan et al (2006) observed that 13% of childhood leprosy patients in their series reported with disability at the time of presentation in their study. While the situation is not that bad in child cases reporting to our hospital, we must strive to reach the target of leprosy without any disabilities especially in children (WHO 2016).

Our study has limitations of data from one hospital only which may not be representative of situation in the urban and rural communities of this area. Properly designed epidemiological studies and interventions should be undertaken at community levels.

Conclusion

Leprosy has been eliminated at the national level, however, there are still endemic areas and focal points where the disease are still present and the disease continued to be transmitted. Our study shows that nearly one third of child leprosy cases had known contact of leprosy as possible source and still there was a delay of one year in diagnosis, some child cases still ended up with disability. There is clear need to augment the strategy at public health level for early detection, use other measures like chemoprophylaxis or immunoprophylaxis or both to effectively block the transmission from such sources.

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References

1. Brandsma JW, van Brakel WH (2003). WHO disability grading: operational definitions. *Lepr Rev*. **74:** 366-373.
2. Ghunawat S, Relhan V, Mittal S et al (2019). Childhood leprosy: A retrospective descriptive study from Delhi. *Indian J Paediatr Dermatol*. **20**: 325-328.
3. Gitte SV, Sabat RN, Kamble KM et al (2016). Childhood leprosy in an endemic area of central India. *Indian J Paediatr Dermatol*. **53**: 221-224.
4. Indian Association of Leprologists (1982). The consensus classification of leprosy approved by the Indian Association of Leprologists. *Lepr India*. **54(1)**: 17-26.
5. Jain M, Nayak CS, Chokkar R et al (2014). Clinical, bacteriological, and histopathological characteristics of children with leprosy: A retrospective, analytical study in dermatology outpatient department of tertiary care centre. *Indian J Paediatr Dermatol*. **15**: 16-19.
6. John AS, Rao PS, Kundu R et al (2005). Leprosy among adolescents in Kolkata, India. *Indian J Lepr*. **77**: 247-253.
7. Jopling WH, McDougall AC (1996). Definition, epidemiology and world distribution. In:

Handbook of Leprosy, 5th edition, CBS Publishers and Distributors, New Delhi, pp1-9.

8. Kaur I, Kaur S, Sharma VK et al (1991). Childhood leprosy in Northern India. *Indian J Paediatr Dermatol*. **8**: 21-24.
9. Kumaravel S, Murugan S, Fathima S et al (2017). Clinical presentation and histopathology of childhood leprosy. *Int J Sci Stud*. **4**: 167-169.
10. Mahajan S, Sardana K, Bhushan P et al (2006). A study of leprosy in children, from a tertiary pediatric hospital in India. *Lepr Rev*. **77**: 160-162.
11. Mishra R, Kataria J (2017). Classification. In: *IAL Textbook of Leprosy* (Bhushan Kumar and HK Kar, Eds.), 2nd edition, Jaypee Brothers Medical Publishers (P) Ltd. New Delhi, pp256-257.
12. Uikey D, Joshi R,Verma N.(2019). A case series of paediatric leprosy. *Indian J Paediatr Dermatol.* **21**: 66-69.
13. Muniyandi M, Singh M, Singh M et al (2021). Cost-effectiveness of incorporating *Mycobacterium indicus pranii* vaccine to multidrug therapy in newly diagnosed leprosy cases for better treatment outcomes & immunoprophylaxis in contacts as leprosy control measures for National Leprosy Eradication Programme in India. *Indian J Med Res*. **154**: 121-131.
14. NLEP. Classification of leprosy. National Programmes. https://dgehs.delhi.gov.in https://cltri.gov.in.
15. NLEP Annual Report 2014-15. National Leprosy Eradication Programme, Ministry of Health and Family Welfare (India). *National Leprosy Eradication Programme Annual Report for 2014-2015.* Available from: http://nlep.nic.in/pdf/Progress%20report%2030th%20November%2014-2015%20.pdf.
16. NLEP Annual Report 2020-21. National Leprosy Eradication Programme, Ministry of Health and Family Welfare (India). *National Leprosy Eradication Programme Annual Report for 2020-2021.* Available from: http://nlep.nic.in/pdf/Progress%20report%2030th%20November%2020-2021%20.pdf.
17. Ridley DS, Jopling WH (1966). Classification of leprosy according to immunity. A five-group system. *Int J Lepr Other Mycobact Dis*. **34(3):** 255-273.
18. Sehgal VN, Srivastava G (1987). Leprosy in children. *Int J Dermatol*. **26**: 557-566.
19. Selvasekar A, Geetha J, Nisha K et al (1999). Childhood leprosy in an endemic area. *Lepr Rev*. **70**: 21-27.
20. Singal A, Chhabra N (2017). Childhood Leprosy. In: *IAL Textbook of Leprosy* (Bhushan Kumar and HK Kar, Eds.), 2nd edition, Jaypee Publishers (P) Ltd. New Delhi, pp 360-361.
21. van Beers SM, Hatta M, Klatser PR et al (1999). Patient contact is the major determinant in incident leprosy: Implications for future control. *Int J Lepr Other Mycobact Dis*. **67**: 119-128.
22. World Health Organization (2012a) WHO Expert Committee on Leprosy. 8th Report, Geneva, *Techn Report Series*. 968.
23. World Health Organization (2012b). Weekly epidemiological record. Releve epidemiologiue hebdomadaire. *Wkly Epidemiol Rec*. **34**: 317-328.
24. WHO (2016). Global leprosy strategy 2016–2020: Accelerating towards a leprosy free world. World Health Organization, Regional Office for SouthEast Asia, New Delhi.

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