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Profiles of Pediatric Leprosy: A Report from a University Hospital of Nepal in the Post-Elimination Era

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Abstract. Because pediatric leprosy strongly indicates continuous disease transmission in the community, knowing the profiles of pediatric leprosy is of great value for a leprosy-free world. We conducted this study to assess the clinical profiles of pediatric leprosy in Nepal. This retrospective study analyzed the 7-year record from 2011 to 2017. There were a total of 68 pediatric leprosy cases. Male (63.2%) cases outnumbered female cases. The minimum age of the leprosy-affected children was 6 years, with the mean age 12.17 (±1.95) years. Contact history was present in 26 (38.2%) children. Most of them (83.8%) had positive slit-skin smear. Lepra reaction was present in 14.7%. Nine had disability, with 4/9 (44.4%) of them having grade 2 disability. More than two-thirds (70.6%) were multi-bacillary cases. Some (2.9%) even had lepromatous leprosy. Leprosy continues to be a disease of concern in the post-elimination era even in the pediatric population.

Children are prone to be infected with *Mycobacterium leprae* because of their immature or nascent immunity and intrafamilial contacts.[1] Diagnosing leprosy can be a herculean task not only for dermatologists but also for general physicians, neurologists, and pediatricians because its presentation may vary from an asymptomatic patch to diffuse infiltration of the entire skin and neuromuscular symptoms. The early diagnosis of leprosy is essential in the prevention of deformities, the repercussions of which are still more catastrophic when treating children younger than 15 years.[2]

It is one of the neglected tropical diseases of developing countries. Indonesia, Brazil, and India contributed to 8%, 13%, and 60% of the global new case burden in 2015, whereas Nepal contributed to 1.3%.[3,4] According to the WHO, 7.5% of new pediatric leprosy cases are diagnosed annually.[5]

Nepal declared leprosy elimination in 2010.[6] However, there remain major challenges of sustaining this achievement and reducing the disease burden. The prevalence of the disease is increasing in recent years from 0.77 in the year 2010 to 0.99 in the year 2017.[7] Because pediatric leprosy signifies the continuous transmission of the disease in the society, we aimed to identify the clinico-epidemiological profiles of pediatric leprosy cases in a tertiary hospital of eastern Nepal in the post-elimination era.

The subjects of this study were all the diagnosed cases of leprosy younger than 15 years in the Department of Dermatology, BPKIHS, from January 2010 to December 2017. Required details like age, gender, address, history of contact, lesion type, diagnosis (according to Ridley–Jopling,[8] Indian,[9] and WHO classification systems,[10] slit-skin smear [SSS] status, bacillary index [BI], lepra reaction, disability, etc.) were extracted from all completely filled records maintained in the department. Ethical approval was obtained from the departmental research unit with the title "Clinico-demographic profiles of leprosy: an experience from tertiary care hospital of eastern Nepal." The data were analyzed using SPSS version 11.5 (Chicago, IL). Frequencies and percentages were used for qualitative data. Quantitative variables were presented as the mean and SD. For the inferential statistics, chi-square tests were used at a 95% CI, where a P-value < 0.05 was considered significant.

A total of 68 pediatric leprosy cases were diagnosed during the study period. Male (63.2%) cases outnumbered the female (36.8%) cases, with a gender ratio of 1.72. The mean age was 12.17 (±1.95) years, with the youngest participant being 6 years. Most patients were in the age-group of 12–14 years. History of contact was present in more than a third of them. Both skin and neurological involvement were present in 26 (38.2%) patients. Most of them 57 (83.8%) had positive SSS. Around half of them had 3+ and more BI. Lepra reaction was present in 10 (14.7%) patients, with predominance of Type 1 reaction (T1R) over Type 2 reaction. Disability was present in nine (13.2%) patients. Among them, five children had grade 1 disability and the rest had grade 2 disability. In total, 59 (86.8%) were diagnosed as borderline tuberculoid (BT) leprosy, with five total cases of borderline lepromatous (BL) and lepromatous leprosy. However, none were in the mid-borderline (BB) spectrum. Because BB is the most unstable one, they might change the spectrum quickly.[11] Majority (83.8%) had multi-bacillary leprosy (Table 1).

Children with skin and neurological symptoms, more than five skin lesions, and positive SSS had a significantly higher frequency of lepra reaction. Although children with the diagnosis of BT leprosy had a significantly higher frequency of lepra reaction ($P < 0.001$), it was not significant clinically. Although the frequency of disability was more in patients with a history of contact, only neurological involvement, or pure neuritic (PN) leprosy, its clinical significance could not be correlated (Table 2).

Of 499 leprosy cases presented in out center during the study period, 13.6% were children younger than 15 years. One-fourth of them had familial contact with leprosy patients. Most of the children (83.8%) had positive SSS, with almost half of them (47.1%) having BI 3+ and more. Nine (13.2%) kids even had disabilities at the time of the first presentation to the hospital (Table 1). Lepromatous leprosy and BL leprosy were present in three and two kids, respectively. The type of lesions, number of skin lesions, SSS status, and final diagnosis significantly determined the lepra reaction in children (Table 2).

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TABLE 1
Clinico-demographic profiles

Characteristic	Categories	No. of patients (n = 68)	Percentage
Age-group (years)	6–8	4	5.8
	9–11	17	25.0
	12–14	47	69.2
Gender	Female	25	36.8
	Male	43	63.2
History of contact	No	42	61.7
	Familial	17	25.0
	Extrafamilial	9	13.2
Lesion type	Nerve	4	5.9
	Skin	38	55.9
	Both	26	38.2
Number of skin lesion	≤ 5	52	76.5
	> 5	12	17.6
	Absent	4	5.9
Slit-skin smear	AFB positive	57	83.8
	AFB negative	11	16.2
Bacteriological index	1	14	20.6
	2	11	16.2
	3	14	20.6
	4	8	11.8
	5	10	14.7
	Absent	11	16.2
Lepra reaction	Present	10	14.7
	Type 1	7	10.3
	Type 2	3	4.4
	Absent	58	85.3
Disability	Present	9	13.2
	Absent	59	86.8
Final diagnosis	Tuberculoid leprosy	0	0
	Borderline tuberculoid	59	86.8
	Mid-borderline	0	0
	Borderline lepromatous	2	2.9
	Lepromatous	3	4.4
	Pure neuritic	4	5.9
WHO classification	Multi-bacillary	57	83.8
	Paucibacillary	11	16.2

AFB = acid fast bacilli.

We had 13.6% pediatric leprosy cases. In other reports, it ranged from 4.5% to 9.6%.[12–15] It is almost three times more than the previous finding from the same center (4.5%) two decades back.[12] Because pediatric leprosy signifies continuous community transmission of the disease, its increasing prevalence is alarming to sustain the leprosy elimination.

We found male gender predilection in childhood leprosy. It was comparable with other studies.[13,14] This could be because of the negligence of the female child in our part of the world. However, male:female was 4:1 in a previous report from the same center.[12] This could be a good sign of decreasing gender discrimination and parent's awareness.

Maximum children had the age between 12 and 14 years, with the youngest age being 6 years. This was consistent with many previous studies. This could be because of the long incubation period of leprosy.[2] Likewise, we might misdiagnose indeterminate leprosy as pityriasis versicolor, pityriasis alba, post-inflammatory hyperpigmentation, early vitiligo,

TABLE 2
Clinical profiles, lepra reaction, and disability

		Lepra reaction			Disability		
Characteristic	Category	Present (n = 10)	Absent (n = 58)	P-value	Present (n = 9)	Absent (n = 59)	P-value
Lesion type	Nerve	0 (0.0%)	4 (6.9%)	0.013	2 (22.2%)	2 (3.4%)	0.022
	Skin	2 (20.0%)	36 (62.1%)		2 (22.2%)	36 (61.0%)	
	Both	8 (80.0%)	18 (31.0%)		5 (55.6%)	21 (35.6%)	
Number of skin lesions	≤ 5	4 (40.0%)	48 (82.8%)	< 0.001	2 (22.2%)	50 (84.7%)	< 0.001
	> 5	6 (60.0%)	6 (10.3%)		5 (55.6%)	7 (11.8%)	
	Absent	0 (0.0%)	4 (6.9%)		2 (22.2%)	2 (3.3%)	
History of contact	Present	4 (40.0%)	22 (37.9%)	0.901	4 (44.4%)	22 (37.3%)	0.030
	Absent	6 (60.0%)	36 (62.1%)		5 (55.6%)	37 (62.7%)	
Slit-skin smear	Positive	10 (100.0%)	47 (81.0%)	0.03	7 (77.8%)	50 (84.7%)	0.597
	Negative	0 (0.0%)	11 (19.0%)		2 (22.2%)	9 (15.3%)	
Diagnosis	Borderline tuberculoid	6 (60.0%)	53 (91.4%)	< 0.001	1 (11.1%)	1 (1.7%)	0.022
	Borderline lepromatous	2 (20.0%)	0 (0.0%)		5 (55.6%)	54 (91.5%)	
	Lepromatous	2 (20.0%)	1 (1.7%)		1 (11.1%)	2 (3.4%)	
	Pure neuritic	0 (0.0%)	4 (6.9%)		2 (22.2%)	2 (3.4%)	

etc.[15] Similarly, both parents and the dermatologist may not opt for the diagnostic biopsy in kids, thus further increasing the underdiagnosis.

More than one-third of children (38.2%) had positive contact history. It was two to three times more than the previous reports.[12,15] However, in a retrospective study, it could be difficult to exactly define and identify true contacts. Familial contact was found in 25% of the cases, which was comparable with a report from India.[13] The risk of transmission of leprosy is four times higher in case of neighborhood contact, and the risk increases to nine times in case of familial contact.[16] Close familial contact is an important source of infection, especially in children with weaker immunity status.[17] Hence, our finding reinforces the importance of screening both familial and extrafamilial contacts. Probably, it is a high time to invest maximum on active contact tracing.

The majority (76.5%) of the children had less than five skin lesions, which is similar to the previous observations. Hence, a high degree of suspicion should arise in any child presenting with skin patches, even if the sensation is intact, and such cases must be followed to avoid misdiagnosis.[15] In a previous report from the same center, the majority (50%) had more than five lesions.[12] Patients with a lesser number of lesions these days could be because of higher suspicion of leprosy in children, increasing number of biopsy in case of doubt, increasing emphasis on contact tracing, and increasing disease awareness among parents.

We had 83.8% of children with positive SSS. Around half of them (47.1%) had 3+ and more BI. Although the WHO had targeted for global elimination of leprosy by 2020,[3] we are still getting a significant number of pediatric leprosy with high BI. Because of the relatively greater number of positive SSS status and highly bacilliferous leprosy in children, the authorities must plan molecular studies to identify any hidden genetic or other predisposing factors in our part of the world.

Multi-bacillary (83.8%) cases distinctly outnumbered the paucibacillary (16.2%) cases. It is similar to other studies.[15,18,19] However, in some studies, paucibacillary (71%) cases were predominant.[13] This can be directly correlated to the higher SSS positive status in our study.

We had 14.7% cases of lepra reactions with the predominance of T1R (10.3%). This was comparable with other reports.[14,19,20] Children with both skin and nerve involvement, more than five skin lesions, positive SSS, and BT leprosy had a significantly higher frequency of lepra reaction (Table 2).

Similar to previous reports, we also had predominance (86.8%) of BT leprosy.[13–15,19] Pure neuritic leprosy was found among 5.9% of children. This was comparable with the past studies,[12,19] but lesser than one Indian report.[14] We must be very vigilant with this type of presentation because it might be missed easily and the patient may land up with permanent disabilities.

Disability in children is an unfortunate tragedy. It was found in nine (13.2%) children. Although the frequency of disability was more in patients with a history of contact, PN leprosy, and more than five skin lesions, its clinical significance could not be correlated. But, some of these factors had also been stated as important risk factors in a previous study.[21] However, retrospective data from a single hospital with a smaller sample might reflect only the tip of the iceberg of the disease burden in the communities.

Leprosy remains a disease of high concern even in the post-elimination era. A significant number of pediatric leprosy cases (13.6%) signifies ongoing active disease transmission in the community. This focuses on the need for active surveillance for the contact tracing, advanced clinical training, and intensive awareness programs. A significant number of highly bacilliferous cases in our study also warrant stakeholders to search deeply into this matter for any hidden genetic or environmental factors in our area. If not intervened on time, a leprosy-free world will become an unfulfilled dream.

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