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IP Indian Journal of Clinical and Experimental Dermatology

Journal homepage: www.ijced.org/

Original Research Article

A clinicoepidemiological study of leprosy among children and adolescents in a tertiary care centre in the post elimination era

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ARTICLE INFO

Article history:
Received 26-01-2024
Accepted 14-02-2024
Available online 12-03-2024

Keywords:
Leprosy
Epidemiological profile
Clinical spectrum
Children
Adolescents
Deformity
Reaction

ABSTRACT

Background: Leprosy amongst younger age indicates active foci of transmission in the community. Our aim is to analyse the epidemiological profile, clinical spectrum, reactions and deformities of leprosy among children and adolescents.

Materials and Methods: This is a prospective observational study conducted on all newly diagnosed leprosy patients under the age of 19 years for one year.

Results: Of 113 newly diagnosed leprosy cases, 38 patients were under 19 years of age. Male-female ratio was 5.3:1. Mean age was 16.6 years. Borderline tuberculoid (BT) was the most common type followed by borderline lepromatous (BL) and Indeterminate (I) leprosy most common manifestation was hypopigmented anaesthetic skin lesion over exposed parts. 79% had multiple nerve trunk involvement of which ulnar nerve was the most common. Reaction and deformity were found to be in 21% and 18.3%. Both were seen only in multibacillary cases and predominantly in 15-19years of age. Risk factors for reactions were male sex, increasing age, labourers, borderline spectrum, skin lesion involving the nerve trunk, multiple nerve involvement and smear positivity. Risk factors for deformities were migrants in lower socio-economic status, increased duration of active disease and delayed diagnosis.

Conclusion: Leprosy, a disease of long incubation period, among adolescents may indicate missed cases of childhood leprosy. Training through integrated service in early diagnosis and its complication, introduction of an exclusive type of treatment (MB MDT) for all categories for a shortened duration and newer drugs for reactions, sustained commitment to follow-up care and health education among community is a need at this post elimination era.

1. Introduction

Leprosy, a chronic granulomatous infectious disease caused by Mycobacterium leprae predominantly affects the skin and peripheral nerves. It is transmitted via droplets from the nose and mouth and during close and frequent contacts over a longer period with untreated cases.[1,2] The social stigma attached to the disease may be attributed to the disability and deformity it leads to if left untreated in the long run. Despite India has achieved national level elimination of leprosy in December 2005, along with Brazil, Indonesia, India accounts for 79% of global new cases as in 2022.[3] Incidence of leprosy amongst young children (0-14 years) indicates active foci of transmission in the community, making it a robust epidemiological indicator to assess the success of leprosy control programs.[4] According to NLEP annual report 2021-22, child cases percentage among new cases detected has reduced to 5.76% in 2020-21.

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https://doi.org/10.18231/j.ijced.2024.001

Adolescence (10-19years), a period of transition between childhood and adulthood is a unique stage of human development and experience rapid physical, cognitive and psychosocial growth according to WHO. They depend on their parents for seeking appropriate health care. India has the largest adolescent population in the world according to UNICEF. India stands to benefit socially, politically, and economically if this large number of adolescents are safe, healthy, educated to support the country's continued development. Thus, leprosy in children and adolescent has greater impact on their physical and psychosocial health which in turn will affect the next generation and future of any country.

As there are only few epidemiological studies about leprosy among children and adolescents from our region, this study was conducted with the aim to analyse the prevalence, epidemiological profile, clinical spectrum, reactions and deformities of leprosy among children and adolescents attending our dermatology department. Also to determine possible risk factors associated with reactions and deformity.

2. Materials and Methods

This was a prospective observational study conducted in dermatology OPD of Madras medical college and RGGGH, a tertiary care centre in south India between June 2021 to May 2022. After Institutional ethics committee approval (EC Reg. No. ECR/270/Inst./TN/2013/RR-16/No 21052021), all newly diagnosed leprosy patients under the age of 19 years(children and adolescents) by the presence of at least one of the three cardinal signs of leprosy and who is yet to complete the full course of treatment: anaesthetic hypopigmented or reddish skin lesions, enlarged nerves and the presence of AFB in slit skin smear were enrolled in the study. Patients more than 19 years of age and previously treated for leprosy were excluded. Detailed history regarding occupation, residence, family history, and onset and duration of symptoms followed by general examination, systemic examination, and thorough dermatological examination was done for all patients after obtaining informed consent from participants/parents/guardian. Patients were enquired about contact history and their relationship with the contact. The number, site and morphology of skin lesion including colour, margin, surface, border, satellite lesion, central clearing, tenderness, sensation, loss of sweating or hair, feeding nerves, trophic changes such as ulcer, fissures, callus and presence of lepra reactions (type 1 and 2) were noted. Thorough sensory and motor system examination was done. Deformity was noted and graded according to WHO.[5] Peripheral nerves were palpated and graded to assess the thickness and tenderness at the time of presentation and subsequent visit. Apart from baseline investigations, slit skin smear stained by Ziehl-Neelsen method was graded for bacteriological index according to Ridley's logarithmic scale. Skin biopsy, nerve conduction study (to assess NFI-nerve function impairment) and high frequency ultrasound was done for all the patients. According to the Ridley and Jopling[5,6] classification(1966) and New IAL classification (1981), patients were grouped as: tuberculoid (TT), borderline tuberculoid (BT), mid-borderline(BB), borderline lepromatous (BL), lepromatous (LL) leprosy, indeterminate and pure neuritic leprosy. For treatment purpose, patients were categorised into paucibacillary(PB) and multibacillary(MB) according to WHO classification under NLEP.[6] Paucibacillary leprosy had 1-5 skin lesions, no or single nerve involvement and negative skin smear. Multibacillary leprosy patients had 6 or more skin lesions, more than one nerve involvement and positive skin smear at any site. Patients was started on multidrug therapy (MDT) according to the spectrum. Type 1 and type 2 lepra reactions along with neuritis were treated with limb rest, NSAIDS, steroids and physical therapy if warranted. The data was analysed statistically by SPSS software.

3. Results

During the one year study period, there were 113 newly diagnosed leprosy patients in our department. Among them 38 patients were under the age of 19 years(children and adolescents). Prevalence of childhood leprosy was found to be 6% (7 out of 113) in our department. As per Table 1 and Figure 1, patients aged between 15-19 years were found to be majority (82%) and less than 14 years of age was found to be 18%. Majority of childhood leprosy were found in older age group of 11–14 years(13%). The youngest patient in our study was 9 years old. The mean age in our study was found to be 16.6 years. The male to female ratio was 5.3:1. In our study duration of symptoms ranged from 3 months to 2 years. Socio-demographic characteristics of our study subjects is as per Table 2. Among the study population 63% were working, 21% patients were students and 16% were unemployed. Natives of Tamil Nadu was 61% and 39% were migrants from other states like Bihar(15%), Uttar Pradesh (8%), Andra Pradesh, Rajasthan, Orissa, Jharkhand, West Bengal, Madhya Pradesh each contributing 2.6%. In our study 58% belonged to middle socioeconomic class and 39% belonged to lower socioeconomic class. We found 60% to be illiterate.

In 71%, the duration of disease was less than one year. Mean duration was 8 months. In our study, contact history was present in 7 paucibacillary (3 indeterminate and 4 BT Hansen) and 2 multibacillary patients (2 BT Hansen) patients. As in Table 3, more number of PB cases seen among patients with contact history (P value is 0.00001-statistically significant at p<.05). Two patients (childhood indeterminate leprosy) had contact with their father who were treated lepromatous leprosy patients, four BT patients

had contact with their treated BL/LL grandparents, two BT patients with their treated BL siblings and one indeterminate Hansen patient worked in a leprosy centre (Figure 4A). All the contacts were multibacillary cases and smear positive.

As in Table 4 and Figure 2, most common clinical spectrum was BT borderline tuberculoid (71%) followed by BL borderline lepromatous leprosy (13.1%). Other types seen were I-indeterminate (7.9%), BB mid borderline (5.2%) and PNL pure neuritic leprosy(2.6%). We didn't find any LL, TT leprosy and relapse in our study. As in Table 4, eight paucibacillary (20.9%) and thirty multibacillary (79%) patients were seen in our study. As in Table 5, more number of multibacillary cases seen with duration of disease less than one year (p value<0.001, statistically significant). All the female patients(6) had BT borderline tuberculoid leprosy.

As in Table 4, majority (97.4%) presented with hypopigmented patches and only 2.6% had no skin involvement(pure neuritic Hansen). The distribution of patches was predominantly over the exposed body parts such as upper extremities (68%), lower extremities (42%) and face (26%). Involvement of covered body parts were seen in 18%. Bilaterally symmetrical skin lesions and infiltrated plaque were noted in 13%. Nodules was a presenting complaint in 2.6%. Peripheral nerve trunk enlargement were encountered commonly(92%) in our study population. Multiple nerve trunk enlargement (79%) was common followed by single nerve trunk(13% cases). Among them 54% had grade 1 thickening, 37% had grade 2 and 8% had grade 3 thickening.

Among children (0-14 years), BT Hansen (71.4%) was the commonest clinical type followed by indeterminate type (28.5%). Hypopigmented anaesthetic patches(100%) was the most common presentation followed by one or more enlarged nerve was seen in 57% of children contributing to MB clinical spectrum. The ulnar nerve was the most common thickened nerve followed by radial cutaneous nerve.

Among 15-19 years of age, BT Hansen (71%) was the commonest type followed by BL(16%), BB(6.4%) and PNL(2.6%). Pure neuritic leprosy was diagnosed in a 19 year male construction worker who presented with weakness, clawing of right ring and middle finger (Figure 7C) for 3 months. Diagnosis of pure neuritic Hansen in type 1 reaction with grade 2 deformity was confirmed with nerve biopsy. He was advised limb rest and started on MB MDT with steroids.

As in Figure 5 IA to IC, a BB Hansen male of 18 years old migrant from Rajasthan presented with multiple erythematous infiltrated, annular and punched out plaques over trunk with asymmetrical multiple nerve involvement and loss of sensation(Grade 1 deformity-G1D) over both foot with type 1 reaction. Another BB Hansen patient was found to have type 1 reaction with neuritis and G1D. As in Figure 5 IIA to IIC a case of 18 year old BL Hansen from Bihar working as labourer, presented with >25 small hypopigmented infiltrated patches and plaque with coppery hue bilaterally symmetrical all the over body. Another BL Hansen with type 2(ENL erythema nodosum leprosum) reaction was seen. He was started on MB MDT with steroids. A 18 year old from Bihar and another 19 year old patients from Madhya Pradesh with trophic ulcer(G2D) were diagnosed to have BL Hansen. A BT Hansen patient with painful swelling over right lower arm was found to have right ulnar nerve abscess by high resolution USG at an earlier stage (Figure 6). Decompression by surgical drainage along with MB MDT and steroid was given.

As in Table 6 and Table 7, the overall prevalence of reaction was found to be 21%. Comparing age group, reaction was found to be in predominantly in 15-19 years age (18.4%) than in less than 14 years of age (2.6%) as only one child had type 1 reaction. Only one BL patient had ENL type 2 reaction (2.6%). Neuritis was seen in 10.5% in our study. Reactions were more seen in BT patients(50%) followed by PNL, BB, BL 12.5% each. But highest reaction rate was found in PNL(100% - 1 out of 1) followed by BB(50%- 1 out of 2), BL(20%- 1 out of 5) and BT(18.5%-5 out of 27) as in Table 7.

Overall prevalence of deformity in our study was found to be 18.3% of which G2D was found to be 10.5%. As in Figure 7 A and B, 19 year old male with weakness of right side of the face was diagnosed BT Hansen with G2D after skin biopsy and MB MDT was started. Thus as in Table 6, deformity was found only seen among 15-19 years of age and multibacillary cases. Grade 2 deformity (G2D-visible deformity) encountered in our study were facial palsy, claw hand (Figure 7C) trophic ulcer and earlobe infiltration (Figure 5 IIC). G1D found in our study was loss of sensation of either one or both limbs. Deformity seen in the clinical spectrum in descending order – BL(42%), BB(28%), BT(14%) and pure neuritic(14%). As in Table 5, one to two years of disease duration was found to be a risk factor for deformity (p value is 0.0002- statistically significant at p<.05).

Slit-skin smear (SSS) was positive in 7 patients(18.4%) who were BB and BL leprosy. Clinicopathological concordance of skin and nerve biopsy was observed in 34 patients(89.4%). Histopathological examination of skin and nerve was useful especially in diagnosis of indeterminate and pure neuritic leprosy. As per Table 8, in high resolution ultrasound, 86% patients had nerve enlargement,66% patients had hypoechogenicity,66% had increased epineural thickness, 55% showed enlargement of fascicles and 18% had hypervascularity. Early ulnar abscess was identified by HF USG. 92% of our patients had abnormal nerve conduction study(NCS). Most common pattern seen was sensory motor axonal neuropathy (72%). Sensory nerves(58%) were more involved than motor

Table 1: Age and gender distribution of study participants

Gender	Age distribution of the study population (n=38)				Total N%
	0-5 years N%	6-10 years N%	11-14 years N%	15-19 years N%	
Male	0	2 (5)	4 (11)	26 (68)	32 (84)
Female	0	0	1 (3)	5 (13)	6 (16)
Total	0	2 (5)	5 (13)	31 (82)	38 (100)

Table 2: Sociodemographic characteristics of the study population (n=38)

Sociodemographic characteristics		Frequency	%
Place of residence	Urban	24	63
	Rural	6	16
	Periurban	8	21
Nativity	Tamilnadu	23	61
	States other than TN	15	39
Education	Illiterate	23	60
	Primary school	6	16
	Middle school	4	11
	High school	3	8
	Higher sec school/college	2	5
Occupation	Student	8	21
	Labourer	24	63
	Unemployed	6	16
Marital status	Single	34	89
	Married	4	11
	Separated/divorced/widowed	0	0
Socioeconomic status	Upper class	1	3
	Middle upper	4	11
	Middle lower	18	47
	Upper lower	2	5
	Lower	13	34

Table 3: Relationship between contact history and WHO clinical types

Contact history	WHO clinical types		Total
	PB	MB	
Present	7 (87.5)	2 (6.7)	9 (100)
Absent	1 (13.5)	28 (93.3)	29 (100)
Total	8 (100)	30 (100)	38 (100)

Chi square value: 22.83. P value is 0.00001 (Statistically significant at p<.05)

Table 4: Clinical spectrum, types and age distribution of the study population

Skin/Nerve involvement			Age in years		Total
			0-14 (n=7)%	15-19 (n=31)%	N=38(%)
Paucibacillary (PB) N=8	Indeterminate	Single skin, No nerve SSS(-)	2 (28.5)	1 (3.2)	3 (7.9)
	BT	<10 skin, One nerve, SSS (-)	1 (14.3)	4 (13)	5 (13)
Multibacillary (MB) N=30	BT	<10 skin, >1 nerve, SSS(+/_)	4 (57)	18 (58)	22 (58)
	BB	10-30 skin, >1 nerve, SSS(+/_)	0 (0)	2 (6.4)	2 (5.2)
	BL	>30 skin, >1 nerve, SSS(+/_)	0 (0)	5 (16)	5 (13)
	Pure neuritic	No skin, >1 nerve, SSS(+/_)	0 (0)	1 (3.2)	1 (2.6)
Total			7 (100)	31 (100)	38 (100)

Table 5: Relationship between duration of leprosy and occurrence of MB and deformity

WHO clinical types & deformity		Duration of disease <1 year	Duration of disease 1-2 years	Chi square test/ P value	Statistical significance
WHO clinical types	MB	25	5	10.44/ 0.001	Statistically significant at p<.05
	PB	2	6		
Deformity	Yes	1	6	13.44/ 0.0002	Statistically significant at p<.05
	No	26	5		

Table 6: Complication and age distribution among children and adolescents

Complications			Age in years 0-14 (n=7)	Age in years 15-19(n=31)	Total (N=38)%
Deformity		Grade 2	0 (0)	4 (12.9%)	4 (10.5%)
		Grade 1	0 (0)	3 (9.7%)	3 (7.8%)
		Grade 0	6(86%)	25 (80%)	31 (81.7%)
Reaction	Type 1	With neuritis	0 (0)	3 (10%)	3 (7.8%)
		Without neuritis	1 (14%)	3 (10%)	4 (10.5%)
	Type 2	With neuritis	0 (0)	1 (3%)	1 (2.6%)
		Without neuritis	0 (0)	0 (0)	0 (0)

Table 7: Distribution of complication among clinical spectrum among study population

Clinical characteristics		Deformity (N=7) n%	Reaction (N=8) n%
Spectrum	Indeterminate	0 (0)	0 (0)
	Pure neuritic	1 (14)	1 (12.5)
	TT	0 (0)	0 (0)
	BT	1 (14)	5 (50)
	BB	2 (28)	1 (12.5)
	BL	3 (42)	1 (12.5)
	LL	0	0
Total		7 (18.3%)	8(21%)

Table 8: High frequency ultrasound findings among study population

HF USG findings	Frequency	Percentage
Enlargement	33	86
Hypoechogenicity	25	66
Enlarged fascicles	21	55
Epineurium thickness	25	66
Hypervascularity	7	18

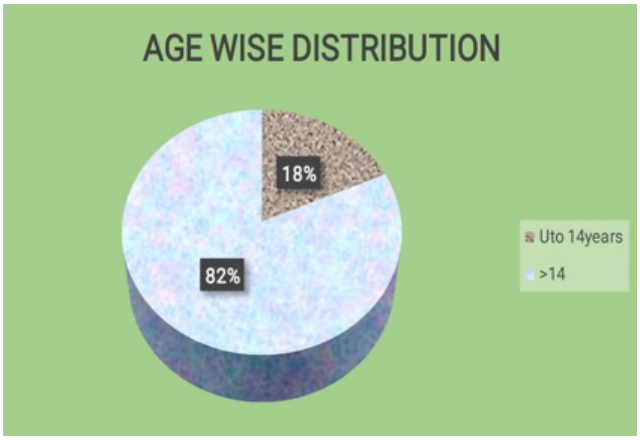

Figure 1: Age distribution of study population (n=38)

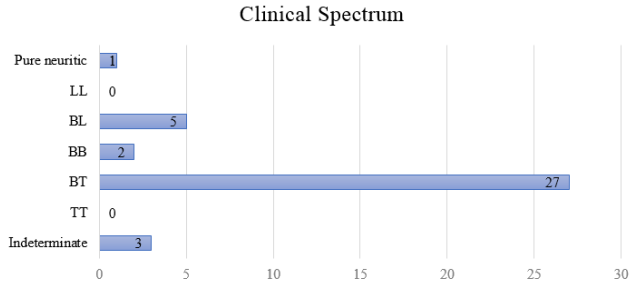

Figure 2: Distribution of clinical spectrum among study population (n=38)

nerves(42%). Amplitude was the most affected parameter among both sensory and motor nerves. In sensory nerves

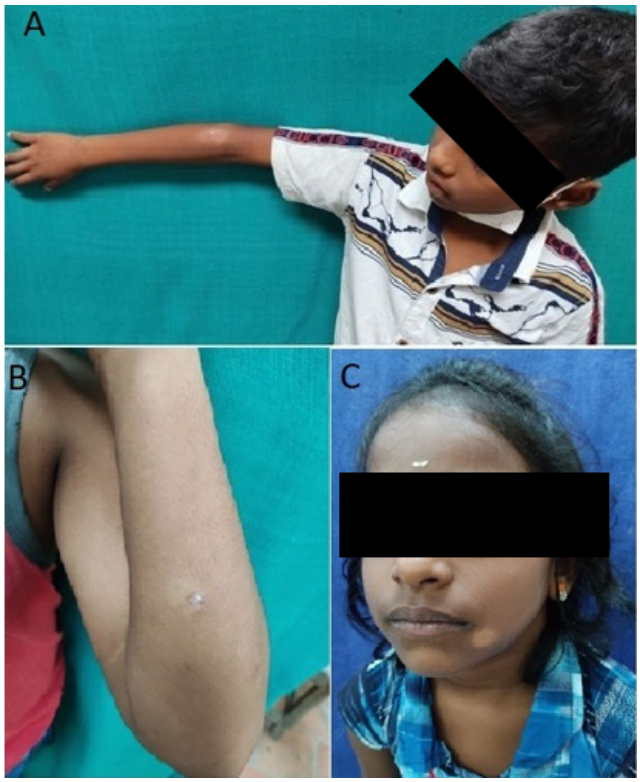

Figure 3: (**A and C**) shows well to ill defined hypopigmented patch of BT hansen in children. **B:** Shows vague hypopigmented patch of Indeterminate Hansen in a child

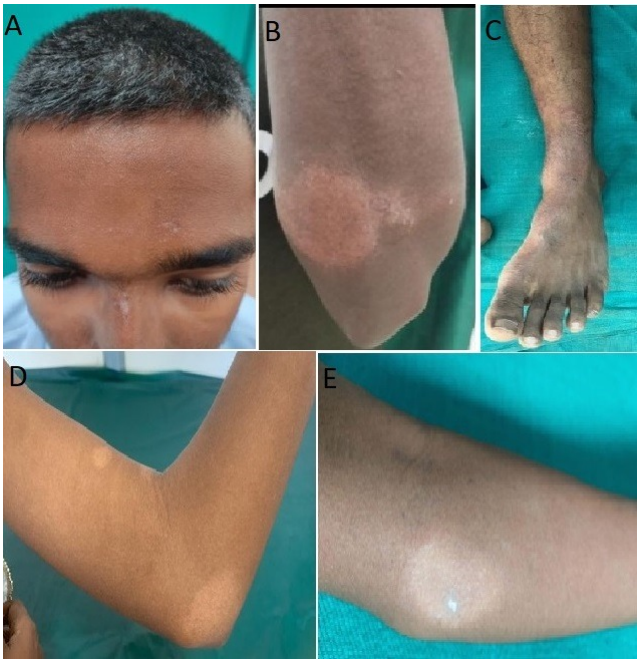

Figure 4: **(A)** shows vague hypopigmented patch of Indeterminate hansen over face in a 19-year-old male working in a leprosy centre. **(B)** shows well to ill-defined hypopigmented patch of BT hansen with satellite lesion. (**C** to **E**) shows hypopigmented ichthyotic patch of BT hansen in adolescents

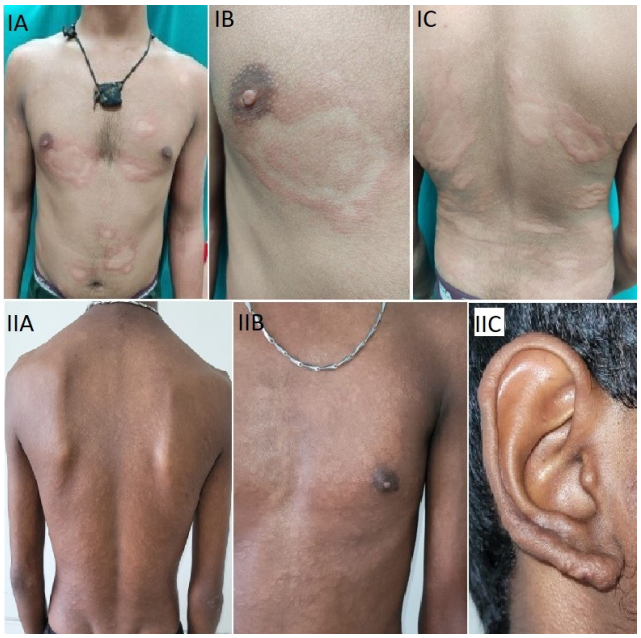

Figure 5: **(IA to IC)** Shows hypopigmented to erythematous infiltrated annular and punched out lesions of BB Hansen with Type 1 reaction.(**IIA** to **IIC)** Shows numerous bilateral symmetrical hypopigmented patches and infiltrated plaques with coppery hue and earlobe infiltration in a BL Hansen patient.

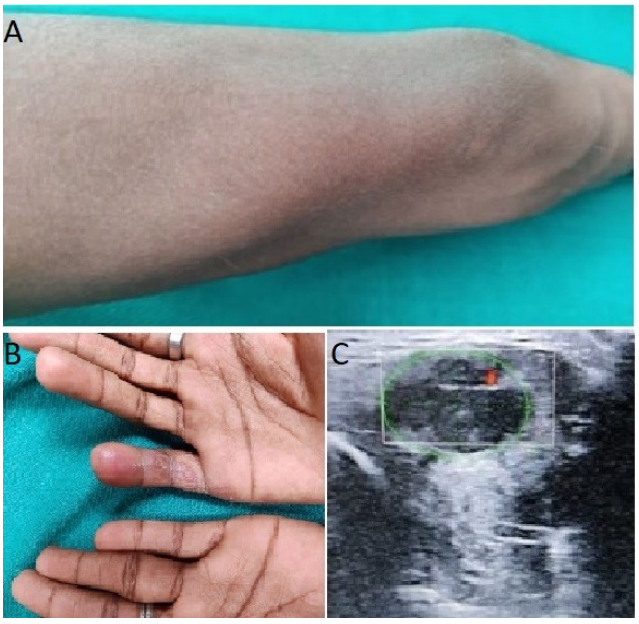

Figure 6: **(A)** shows clinical picture of doubtful nerve abscess with painful swelling in right lower arm with not markedly thickened ulnar nerve in a BT hansen with erythematous infiltrated plaque on right hand of the same patient as in **(B);** **(C)**High resolution ultrasonography showing right ulnar nerve nodular thickening, nerve hypo echogenicity suggestive of nerve abscess.

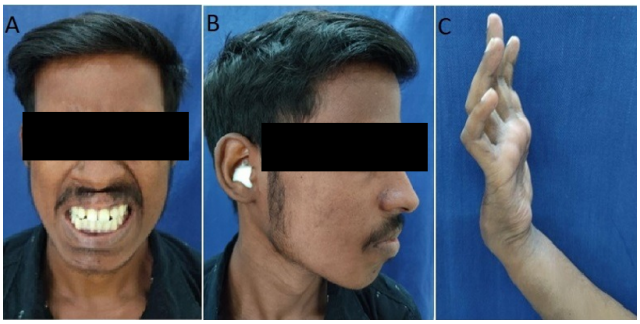

Figure 7: (A and B)shows a BT Hansen patient with mid facial palsy, variation in nasolabial fold and deviation of angel of mouth to opposite side with hypopigmented ichthyotic patch on right side of his face. **(C)** shows fixed ulnar claw hand, thenar and hypothenar wasting and guttering in a pure neuritic hansen patient.

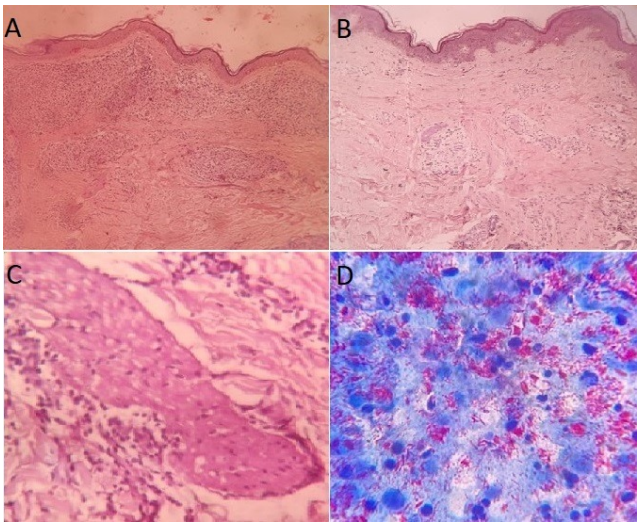

Figure 8: (A): HPE from skin, 10X shows grenz zone, diffuse foamy macrophage granuloma more along neurovascular bundle with numerous lymphocytes suggestive of BL Hansen; (**B**): HPE from skin, 10X shows epitheloid cell granuloma along neurovascular bundle and eccrine glands with moderate number of lymphocytes suggestive of BT Hansen; (**C**): HPE from skin, 40X shows infiltration of arrectores pili muscle with lymphocytes and epitheloid cells in a BT Hansen; (**D**): SSS from earlobe of a BL hansen downgrading showing numerous AFB bacilli.

amplitudes (52.8%) was most affected followed by their velocities (12%) and then latencies (8.1%). In motor nerves amplitudes (43.2%) are more affected followed by their velocities (15%) and latencies (9.2%). Among clinically insignificant thickened nerves, NCS was helpful in detecting subclinical neuropathy in 37%.

4. Discussion

To the best of our knowledge we could find only two studies that included under 19 years of age as study population– Rao[7] et al(0-18years) and John[8] et al(10-20years). Studies that included 0-14 years (childhood) as study population were Selvakumar et al,[9] Archana et al[10] and Chodavadia et al.[11]

The mean age of 16.6 years found in our study may be due to long incubation period of leprosy, difficulty in assessing the sensory loss in younger children and delay in diagnosis of early lesions/indeterminate Hansen which was in accordance to findings by singhal[10] et al(14years). In our study males outnumbered females with the male to female ratio 5.3:1. This is similar compared to John[8] et al(1.93:1). This may be because of increased male immigrants from other parts of country in search of better employment and thus increased chance of acquiring leprosy. Detection in females may be lower because of socioeconomic and cultural difficulties such as neglect, social stigma and seeking more indigenous treatment. This imbalance needs further research.

Varied manifestation of leprosy seen in our study may be due to large number of migrants and their genetic susceptibility and ethnic variation. Illiteracy(60%) has implication on awareness, fear and myth about leprosy and thus more indigenous treatment. Subjects who are labourers like construction workers (63%) are prone to disability and reaction. Stigma and discrimination causes not only in delay in diagnosis and treatment, it further worsens the socioeconomic status of the patients. Psychological stress of both the family and the patient on diagnosing leprosy in a student should also be taken into account. Malnutrition, overcrowding and increased contact seen in lower socioeconomic category paves the way for spread of leprosy and in turn its complication. This will cause a significant increase in DALY(disability adjusted life year) subsequently affecting the gross per capita income earned by the working population. Recognition of these factors and early socioeconomic rehabilitation will decrease the risk of deformities.

In our study duration of symptoms ranged from 3 months to 2 years. This is less compared to singhal[10] et al(3months to 5 years). Mean duration was 8 months. This is less compared to Gitte[12] et al(13-14months). Delay in diagnosis may be because of less awareness about subtle symptoms of the disease and dependency of children/adolescents on their parents/guardians.

23.6% had contacts of leprosy in our study. This is more compared to Rao[7] et al(18%) and less compared to Jain[13] et al(38.8%). 8 patients had intra familial contact and one patient had non familial contact. All the contacts were multibacillary cases. Presence of both familial and non-familial contact in our study indicates continuing

transmission of disease in the community. This warrants the effective screening of all family members of leprosy patients and less complexity diagnostic tests for measuring innate immunity to identify the target people for chemoprophylaxis which may prevent further transmission of disease in the community. More number of familial contact could be possibly attributed to genetic predisposition, ethnic susceptibility and prolonged and close contact within the family. Risk of developing leprosy is 9 times higher if contact is intrafamilial and 4 times higher if there is neighbourhood contact.[14] This indicates the need of the more contact surveys in the future.

BT borderline tuberculoid (71%) was the commonest followed by BL borderline lepromatous (13.1%) is similar to Rao[7] et al where he found BT (68.75%); BL (15.62%); LL (9.38%) BB (3.12%); and PNL (3.12%). We could not find LL Hansen. This has epidemiological importance as lepromatous leprosy is an adult disease of longer incubation period. More number of multibacillary cases seen with duration less than one year may be attributed to migrant population, genetic susceptibility, ethnic susceptibility and better health seeking behaviour.

The distribution of hypopigmented patches predominantly over the exposed body parts such as upper extremities (68%). This is similar to Rao[7] et al(59.3%). 79% had more than one nerve enlargement. This is more compared to Rao[7] et al(59.38%) This indicates neurological involvement more common among Indians and may be attributed to genetic susceptibility, labourers and thus more risk of paralytic, anaesthetic and specific deformity if left untreated. Thus it is important to unravel the pathophysiology of leprosy neuropathy and also prompts research in newer diagnostic and therapeutic field in neuropathy. Treatment with prednisolone in early course of disease may improve the nerve function impairment. But this also emphasises concerns about side effects of prednisolone in younger age and need for a research on alternative drugs. Thus treatment of NFI should be patient-centred rather than a standard protocol to assess the response eventually and change accordingly whenever needed. In India, it is not always practical under field conditions with integrated health services and declining leprosy expertise.

Among children (0-14 years), BT(86%) was the commonest clinical type followed by indeterminate type (14%). This is similar to Archana[10] et al commonest was BT(70%) and followed by BL(9.9%). Childhood leprosy was found to be 6%. This is similar compared to Nageswaramma[15] et al(8%) and less compared to Nirma[4] Joy et al(10.4%). Less incidence of childhood cases indicates less transmission of disease and efficient ongoing control programme. In our study we found multiple nerve involvement in 57% among children and ulnar nerve being the most commonly thickened nerve. This is more compared to Archana[10] et al(48.3%). Thus it is not uncommon for children to get complications related to leprosy. This also emphasises an easy, simple and alternate method in field to assess nerve involvement in children. Children with thickened nerve trunks has 6.1 times higher risk of developing disabilities compared to the those who did not have nerve enlargement.[16] Presence of more MB cases among children (4 out of 7) though can be attributed to early nerve involvement(>1 nerve) and effective screening, still this needs further research. Among 15-19 years of age, BT Hansen was the commonest type followed by BL and BB. BL seen only in 15-19 years of age can be due to longer incubation period of leprosy.

Prevalence of reaction was found to be in 21% patients. This is more compared to Rao[7] et al(6.24%) and John[8] et al(14.5%). This may be due to male predominance, increasing age, labourers, borderline spectrum, skin lesions>5, skin lesion involving the nerve trunk, multiple nerve involvement and SSS positivity. In our study only one child was found to have type 1 reaction (14%). This is less compared to Archana[10] et al(18.6%). This may be due to lesser susceptibility of reactions in children. Highest reaction rate was found in PNL(100%) followed by BB(50%), BL(20%) and BT(18.5%). This is different compared to Archana[10] where they found BB(100%), BL (35·3%), and BT patients (15·7%). This may be due to more nerve involvement and unstable borderline spectrum.

Prevalence of deformity in our study was found to be 18.3%. This is more compared to Rao[7] et al(3.12%). G2D was found to be 10.5% in our study. This is similar to Kar and Job et al(G2D-10.5%).[16]

Both deformities and reactions were seen only in multibacillary cases and predominantly in older age(14-19years of age) This is similar to Archana[10] et al. Grade 2 deformity is an epidemiological marker for the need of community survey for early detection of symptoms and early referral for expertise treatment. As this is a hospital based tertiary care centre study this may not reflect the actual prevalence of our community and it is judicious to consider other parameters like immigrant, occupation, lower socio economic status, genetic susceptibility, increased duration of active disease and delay in accessing healthcare for diagnosis and treatment. Risk of developing deformity in childhood is 6.1 times higher when thickened nerve trunk are present.[16] Presence of deformity in patients with less duration of disease (1 year) needs further research.

Slit-skin smear positive in 18.4% is less compared to Rao[7](25%) et al. This may be attributed to more BT Hansen cases, less sensitivity of SSS, site of smear selection and lack of expertise. This emphasis the need for strengthening of lab in using this simple diagnostic test as severity and therapeutic monitoring tool for preventing relapse and reaction.[17] Clinicopathological concordance was observed

in 30 patients(86.8%). This is similar to Archana[10] (86.1%) et al and more compared to Kumar[18] (60.6) et al. This may be due to optimal selection of biopsy site. As in study by Ramadan[19] et al, our study showed more changes in NCS. NCS was useful in detecting subclinical neuropathy and high resolution ultrasound in detecting early ulnar abscess.

5. Conclusion

Diagnosing leprosy at a younger age has a serious socioeconomic, cultural, psychological and physical impact on patients and their family. Since adolescents move closely with children, undetected multibacillary cases leads to transmission of disease in the community.[14] Deformity is worser than the disease itself. Deformities and reactions at a younger age not only restricted the physical activities, some were stigmatised and lost opportunity to socialise in getting education and earn money compared to their peer group. This warrants the need for more intense community, contact and school survey for early detection and referral for expertise treatment.

More than one nerve involvement indicates neurological involvement more common among Indians. Grade 1 disability assessment and its early diagnosis, a more neglected issue is more important in terms of prevention of grade 2 deformity. Thus we emphasise for the need of an easy, simple and alternate method in field to assess nerve involvement among children. Treatment of NFI should be patient-centred rather than a standard protocol to assess the response eventually and change accordingly. In India, it is not always practical under field conditions with present integrated health services and declining leprosy expertise. An holistic approach should also include prevention of new disability and socio economic rehabilitation of leprosy disabled patients, thus combat stigma and ensure human rights are respected.

6. Limitations

Since this is a hospital based observational study, findings cannot be extrapolated to the general population. There was difficulty in identification of the neighbourhood contacts due to nondisclosure of the diagnosis in the fear of stigmatisation. Large number of cases from migrant populations of the high prevalence states hinders to know the actual prevalence. Thus an increased duration of study or larger study population would have substantiated the above findings.

7. Ethical Approval

The study was approved by the institutional ethics committee.

8. Source of Funding

No funding sources.

9. Conflict of Interest

None declared.

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Cite this article: Hariharasudhan S, Durgavathi C, Priyavathani Annie Malathy R, Daniel SJ, Sampath V. A clinicoepidemiological study of leprosy among children and adolescents in a tertiary care centre in the post elimination era. *IP Indian J Clin Exp Dermatol* 2024;10(1):1-10.