Indian J Lepr 2021, 93 : 329-340

http://www.ijl.org.in

Original Article

Clinicopathological Profile of Cases Attending Leprosy Clinic in a Tertiary Care Hospital of South Tamil Nadu and Its Correlation with Current Leprosy Trends under NLEP

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Received : 30.08.2020 Accepted : 09.08.2021

Leprosy was officially declared eliminated as a public health problem at national level from India since December, 2005; still, there are districts and blocks reporting high prevalence indicating ongoing transmission. The present study aimed at determining the current clinical profile of leprosy from a tertiary level hospital in south Tamil Nadu and its correlation with current leprosy trends under NLEP. A retrospective, proforma-based case analysis was carried out on patients diagnosed and registered in the leprosy clinic of a tertiary care teaching hospital at Tirunelveli (2012 to 2017). Data regarding demographic details, clinical features, investigations, treatment and complications were analysed and compared with other statistics under NLEP. A total of 221 patients were registered at this hospital over a 5 year period, with a male to female ratio of 2.5:1 among adults (n=207, 92.7%) and an equal sex ratio among children (n=14, 6.3%). Multibacillary leprosy was the most common clinical type (83.3%). Borderline tuberculoid leprosy was the most frequent type (34.3%) followed by lepromatous leprosy (25.7%), borderline lepromatous (21.7%), borderline-borderline and pure neuritic (6.3% each), histoid and tuberculoid (2.7% each) in descending order. Type 1 and Type 2 lepra reactions were seen in 15.4% and 10% of cases, respectively. WHO grade II deformities were diagnosed in 46.8% including PB (n=3) & MB (n=65). Very high proportion of multi-bacillary cases, increasing child rates both at district level as well as our patients and also high Grade 2 deformity rates in tandem with district NLEP statistics indicate that transmission is continuing and some patients are reporting late. Thus there is urgent need for in-depth studies at the community level and appropriate remedial public health measures are required to achieve WHO millennium goals (2016-2020).

Keywords: Leprosy Trends, Deformity, Reaction, Histopathology, NLEP, Tamil Nadu, Tertiary Care Hospital, South India

Introduction

Leprosy is a chronic granulomatous infectious disease caused by *M. leprae,* chiefly involving the skin and peripheral nerves. Elimination of leprosy as a public health problem, attained at the global level in the year 2000 and India on 31 December

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2005, has been an important achievement. On 30 January, 2006, the Government of India officially announced the elimination of leprosy as a public health problem at the national level (Dhillon 2006). Tamil Nadu was the first state to integrate leprosy services with the general health care system in July 1997 itself, and in other parts of India, it was after 2004. Its integration with the general healthcare system apparently resulted in reduced focus and funds towards leprosy for various reasons related to public health services, including medical expertise.

India, Indonesia and Brazil together account for 79.6% (1,68,949) of new caseload globally (2,10,671) and India alone accounts for 60.34% (1,26,164) of the leprosy burden of the world (Global leprosy update 2017). Even after eliminating leprosy in 2005, we detect more than one lakh new leprosy cases consistently year on year according to WHO (World Health Organisation) and NLEP (National leprosy eradication programme) data. According to NLEP, the Annual New Case Detection Rate (ANCDR) showed a gradual fall from 59 per lakh population in 2001 to 10 per lakh in 2011. After 2010-11, ANCDR remained plateaued for 5 years, around 9.7 per lakh, but in 2016-17 there was a mild surge in ANCDR, i.e. 10.2 per lakh. However, the prevalence rate (PR) showed a gradual fall from 4.2/10000 in 2001 to 0.69/10000 in 2014-15 and remained steady at 0.66/10000 during 2015-16 and 2016-17. NLEP statistics showed that Tamil Nadu (TN) state and Tirunelveli also had similar trends but of lesser magnitude during the same period. Tamil Nadu had better PR (0.41/10000vs. 0.66/10000 in India) and ANCDR (6.27 per lakh vs 10.2 per lakh in India) compared to the other parts of India (NLEP - Annual Report for the year 2016- 17). Although the average national child leprosy rate is approximately 9%, the proportion of child cases was more than 10% of new cases in 11 states / UT's of India, of which, six states Tamil Nadu, Punjab, Dadra & Nagar Haveli, Bihar, Mizoram and Arunachal Pradesh were showing very high rates ranging from 14% to 23% (Rao & Suneetha 2018).

These trends show that although the caseload had drastically gone down in the past, the active transmission of infection still continues in several states, as shown by a steady level of annual new case detection rate, which seems to be increased in recent times. In order to understand the situation in this part of South Tamil Nadu, this study was conducted to analyse the trends in the disease over a 5 year period in a tertiary care hospital in post-elimination era and to find out if it reflects the trends in the community.

Materials and Methods

A retrospective observational study from September 2012 to August 2017 was done. This study is a hospital based study that depends on the records available. The data were retrieved from proforma based records of registered patients attending to the leprosy clinic of the outpatient department in the tertiary care teaching institution (Tirunelveli Medical College) at Tirunelveli in South Tamil Nadu. All new patients who fulfilled the case definition of leprosy (WHO 1988), that is, one of the three cardinal features of leprosy who had not been treated with ALT (Anti leprosy treatment) were included in the study. Patients under 14 years of age were classified as children. Patients with relapse, treatment failure and those partially treated were excluded from the study. Age, sex, occupation, detailed clinical history and examination, the clinical spectrum of the disease, histopathological features, slit skin smear status, treatment spectrum, presence or absence of reactions, deformities and other complications were noted in the study. The clinical spectrum of the patients was decided as per the classification proposed by Indian Association of Leprologists (IAL 1982) based on the clinical features, slit skin

smear for acid-fast bacilli (AFB) and histopathological findings. In addition to the NLEP method, reaction rates were also analysed in correlation with the spectrum susceptible for that type of reaction to assess the risk of reaction rate amongst them. Treatment was given according to the WHO recommen-dations.

The cases were divided into multibacillary (MB) (six or more skin lesions, more than one trunk nerve involvement and AFB positive) or paucibacillary (PB) (up to five skin lesions, only one trunk nerve involvement, AFB negative) for treatment purpose (WHO 1988). Type 1 Lepra reaction was diagnosed if the patient had redness, swelling or tenderness of pre-existing lesions with or without the appearance of new lesions, presence of oedema of hands, feet or face or tenderness of one or more nerves with or without nerve function impairment (NFI). Type 2 lepra reaction was diagnosed if the patient had multiple, paroxysmal crops of painful, tender, evanescent nodules or plaques suggestive of ENL, with or without constitutional symptoms such as fever and chill, malaise, lymphadenitis and myalgia with or without neuritis.

For grading the deformities of hands and feet WHO Grading scale was used (Brandsma & van Brakel 2003):

Grade 0 : No anaesthesia or no visible deformity

Grade 1: Anaesthesia present but no visible deformity

Grade 2 : Visible deformity or damage present.

Under the NLEP programme, indicators for the study period were collected and analysed for the status of progression. The trends of child rate, WHO spectrum and G2D rate were compared between our hospital data and our district NLEP (Tirunelveli) to observe if community trends were reflected in any way with tertiary care experience, but the numbers were not directly correlated as it cannot be alone due to the differences in study settings.

Statistical analysis was done using SPSS version 24. Results were expressed in percentage and proportions.

Results

In this 5-year study period, 221 new cases of leprosy were registered at our tertiary care hospital. We noticed a slight reduction in the years 2013-15; over 2015 -2017, there was an increase in the number of cases (Fig. 1). Maximum numbers of new cases (n=51) were seen in the year 2016-17.

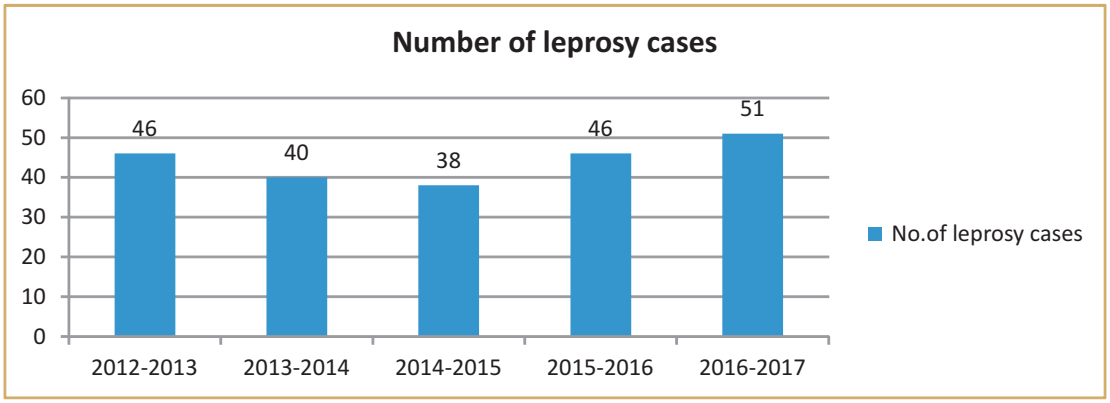

Fig. 1 : Number of leprosy cases reporting to institution over the 5year study period.

Out of 221 patients, 207 were adults (Male=151 & Female=56) with a male to female ratio of 2.5:1 and 14 (6.3%) were children with equal sex ratio. The age of patients ranged from 7 to 72 years. Most of the cases belonged to the age group 21 to 40 years (44.8%), while the other age groups were in descending order of frequency. There were 41 to 60 years (33.9%), above 60 years (10.8%), 0 to 14 years (6.3%) and 15 to 20 years (4.1%) (Fig. 2).

There were about 12 (5.42%) patients who had a history of contact with Hansen's patients. There were 81 (36.5%) patients with1 to 5 lesions, 126 (57.1%) with more than 5 skin lesions, and 14 (6.3%) had no skin lesions but presented with only nerve thickening. Clinically thickened peripheral nerve enlargement was recorded in 76.5% of patients (*n* = 169), including the pure neuritic. All pure neuritic cases had polyneuritic involvement. The ulnar nerve was the most commonly thickened nerve seen in 143(64.7%) followed by the common peroneal nerve in 107(48.4%), the posterior tibial nerve in 101(45.7%) and radial cutaneous nerve in 91(41.1%) patients. The most commonly encountered type of leprosy in our

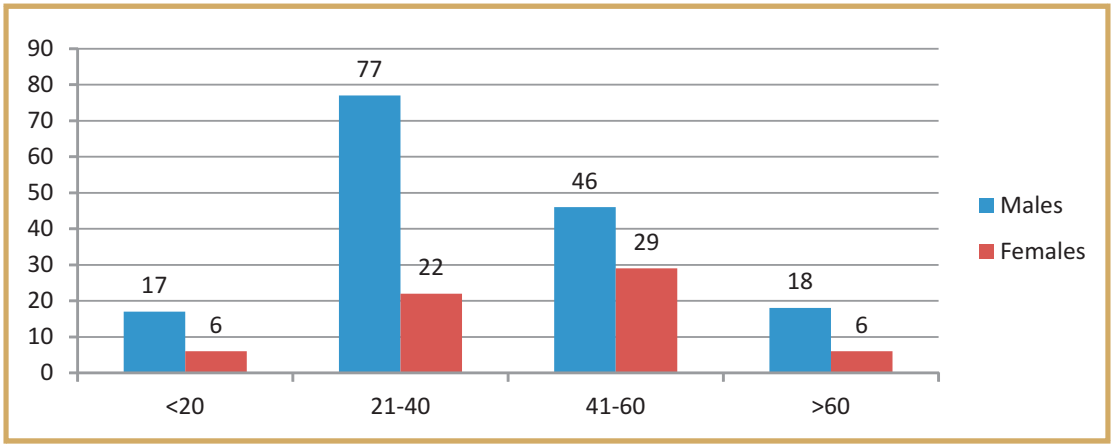

Fig. 2 : Age and gender wise distribution

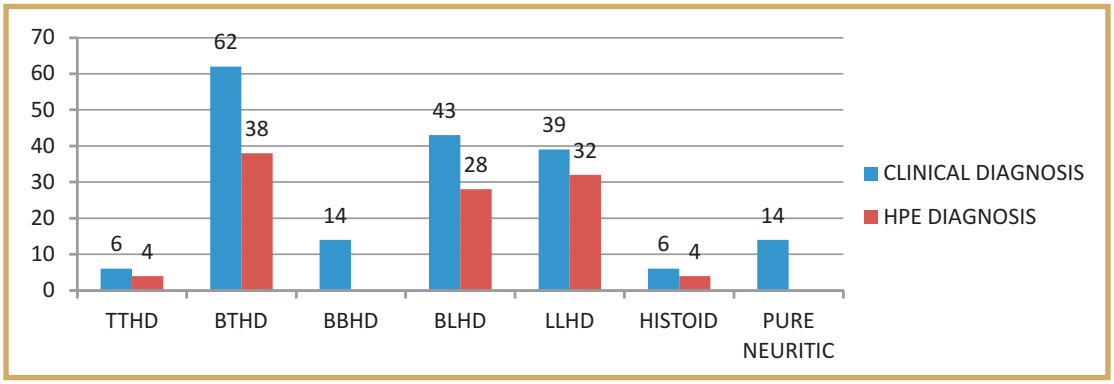

Fig. 3 : Clinical spectrum of leprosy studied

study was borderline tuberculoid Hansen's disease -BTHD in 76 (34.3%) patients, followed by lepromatous Hansen's Disease -LLHD in 57 (25.7%), borderline lepromatous Hansen's disease - BLHD in 48(21.7%), borderline Hansen's disease - BBHD in 14(6.3%), pure neuritic in 14(6.3%), tuberculoid Hansen's disease - TTHD in 6(2.7%) and histoid leprosy in 6(2.7%) patients. Biopsy records were available for 83.25% (184/221) cases. Histopathological features suggestive of Hansen disease were seen in about 170(92.4%) patients and 14 patients did not show biopsy features suggestive of leprosy Hansen's disease, all belonging to pure neuriticleprosy disease. Concordance with clinical spectrum was maximum with LLHD (32/39, 82.5%) patients, followed by TTHD and histoid leprosy – Hansen's Disease (4/6, 66.6% each), BLHD (28/43, 65.1%), BTHD (38/62, 61.2%) and none of the patients showed concordance in BBHD (0/14, 0%) (Fig. 3).

While analysing the slit skin smear results, 65.1% of cases (n=144) of leprosy were found to be AFB negative, and 34.8% (n=77) were AFB positive and all AFB positive cases belonging to the lepromatous spectrum, including both BLHD and LLHD. Fifty-six lepra reaction cases were diagnosed during the study period. Type 1 and type 2 reaction seen in 15.4% (n=34) and 10% (n=22) respectively. Most of the type 1 reactions occurred in the borderline spectrum (BTHD, BBHD and BLHD), whereas the type 2 reaction occurred in BLHD and LLHD. Based on the above statement, if calculated, 24.6% & 20.9% of patients developed type1 and type 2 reactions, respectively, in the corresponding clinical spectra. Deformities were noticed in 145 (65.6%) cases, of which 68(46.8%) cases had grade 2 deformity, 77(53.2%) cases had grade 1 deformity. LLHD spectrum presented with more number of G2D cases (n=39). No child cases had a deformity. Out of 221 patients, 37(16.7%) were treated with PB and 184(83.3%) were treated with MB regimen. (Table 1).

Comparison of trends of leprosy indicators over 2012-2017 under Tirunelveli NLEP statistics and our hospital-based data are presented in Table 2. While the MB percentage has decreased from 72% (2012-13) to 48% (2016-17) at district level, it has marginally increased from 78% (2012-13) to 86% (2016-17) at our hospital. Percentage of new leprosy cases with G2 disability has stayed nearly same (30.4% in 2012-13 versus 29.3% in 2016-17)

Table 1 : Year wise statistics of number of cases on clinical spectrum, treatment regimen and G2D

Years	Clinical spectrum (IAL classification)								Treatment regimen (WHO)		Deformity G2D	
	TTHD	BTHD	BBHD	BLHD	LLHD	HISTOID	PURE NEURITIC	Total	PB	MB	PB	MB
2012-13	2	16	4	10	12	0	2	46	10	36	0	14
2013- 14	1	13	3	9	9	2	3	40	8	32	1	12
2014-15	1	11	3	8	11	1	3	38	6	32	1	10
2015-16	1	17	2	10	11	1	4	46	6	40	0	15
2016-17	1	19	2	11	14	2	2	51	7	44	1	14
Total	6	76	14	48	57	6	14	221	37	184	3	65

Table 2 : Trends of leprosy indicators over 2012-2017 under NLEP in regard to child rate WHO spectrum and G2D rate

Sl. no	Year	NLEP (Tirunelveli District)				Our study			
		Child rate	PB	MB	G2D	Child rate	PB	MB	G2D
1	2012-13	3.2%	28%	72%	3.2%	4.3%	21.7%	78.3%	30.4%
2	2013-14	4.1%	31.4%	68.6%	4.1%	7.5%	20%	80%	32.5%
3	2014-15	5.9%	24%	76%	5.9%	5.2%	15.7%	84.3%	28.9%
4	2015-16	5.3%	49.5%	50.5%	5.3%	6.5%	13.1%	86.9%	32.6%
5	2016-17	8.4%	51.3%	48.3%	8.4%	7.8%	13.7%	86.3%	29.3%

Table 3 : Comparative analysis of various tertiary care hospital based studies done on across India

S. no	Study parameters		Thyvalappil et al (2019), Kerala.	Rama et al (2015), Andhra Pradesh.	Chhabra et al (2015), Delhi.	Rawat et al (2017), Uttarakhand	Present study, Tamil Nadu, Tirunelveli.
1.	Nature of study		Retrospective observational study	Retrospective observational study	Retrospective observational study	Retrospective observational study	Retrospective observational study
2.	Duration of study & total cases		• 10 year (2010 - 2016) • n=133	• 6 year (2007-2012) • n=675	• 5 year (2007-2012) • n=849	• 5 year (2011-2015) • n=238	• 5 year (2012-2017) • n=221
3.	Common age group (in years)		21-40	21-40	21-40	17-40	21-40
4.	Gender ratio (M:F)		2.4:1	1.56:1	2.3:1	3.7:1	2.5:1
5.	Clinical spectrum (IAL classification)		• BTHD 60.1% (n=80) • LLHD 15.1% (n=21) • BLHD 7.5% (n=10)	• BTHD 56.8% (n=384) • BLHD 16.8% (n=114) LLHD 8.4% (n=57)	BTHD 56.3% (n=478) BLHD 24.9% (n=212) LLHD 8.1% (n=69)	BTHD 39.5% (n=94) BLHD 26.5% (n=63) LLHD 21.4% (n=51)	BTHD 34.3% (n=76) LLHD 25.7% (n=57) BLHD 21.7% (n=48)
6.	Peripheral nerve involvement		NA	NA	88.9% UN>CPN>PTN	NA	76.5% UN>CPN>PTN
7a.	Percentage of reactions among total no. of cases*	Type 1	29.3% (n=39)	6.9% (n=47)	30.4% (n=258)	18% (n=43)	15.4% (n=34)
		Type 2	7.9% (n=11)	7.2% (n=49)	7.1% (n=60)	16.4% (n=39)	10% (n=22)

7b.	Reactions out of susceptible spectrum**	Type 1	41.4%	8.9%	36.6%	26.2%	24.6%
		Type 2	35.4%	28.6%	21.3%	34.2%	20.9%
8.	G2D rate		9.7% (n=13)	13.4% (n=91)	37.9% (n=332)	8.8% (n=21)	30.7% (n=68)
9.	SSS positivity		25.5% (n=34)	NA	NA	NA	34.8% (n=77)
10.	HPE correlation		89.1% (n=115)	NA	78.8% (n=784)	NA	92.3% (n=170)
11.	Treatment spectrum (WHO)	PB	42.1% (n=56)	61.6% (n=416)	13.1% (n=416)	18.1% (n=43)	16.7% (n=37)
		MB	57.9% (n=77)	38.4% (n=259)	86.9% (n=737)	81.9% (n=195)	83.3% (n=184)
12.	High infectivity spectrum among MB cases (BLHD & LLHD).		40.2% (n=31)	66.1% (n=171)	38.1% (n=281)	58.4% (n=114)	57.1% (n=105)

*Indicates total number of reactions out of all new cases (NLEP/WHO method).
**Indicates % of reactions that occur among expected clinical spectrum at risk, denominator for type 1 reactions were total of BTHD, BBHD & BLHD and for type 2 reactions were total of BLHD and LLHD.
*** NA=not available.

at our hospital, however it has worsened from 3.2% in 2012-13 to 8.4% in 2016-17 at Tirunelveli district level. Child rates have increased at both at hospital (4.3% in 2012-13 versus 7.8% in 2016-17) and district level (3.2% in 2012-13 versus 8.4% in 2016-17).

Discussion

Leprosy is still a major public health problem in many parts of India. Over the study period of 2012-17, the total number of new cases, which was around 1.3 lakhs in 2012-13, declined to 1.25 to 1.27 lakhs between 2013 and 2016, but later increased to 1.35 lakhs in the year 2016-17 in the India. During our study period, according to NLEP Annual Report for the year (2016-17), PR had remained plateaued (0.7/10000 in 2012-13 vs0.66/10000 in 2016-17), but ANCDR showed a slightly increasing trend from 10 per lakh in 2012-13 to 10.2 per lakh in 2016-17. As at the national level, a similar trend was observed in our state of Tamil Nadu also. Over this period, in Tirunelveli district, a total number of cases increased from 101 to 178, PR increased from 0.31 to 0.36 per 10000, while ANCDR from 3.1 to 5.3 per 1 lakh. The statistics of Tirunelveli showed a similar trend in tandem with the state and of the country.

In our study, from 2012 to 2015, there was a gradual reduction in the number of new cases, but in 2016 and 2017, there was a slight surge which could be ascribed to the influence of leprosy case detection campaigns (LCDC) that were held in many states. Maximum numbers of new cases were seen in 2017 in this study, which was comparable to a study done in the

neighbouring state of Kerala (*Thyvalappil et al* 2019) also. Due to the variable study periods, other similar studies could not be correlated in the report to this aspect (Table 3). Male preponderance noted in this study (M: F=2.5:1) has also been noted in many studies done across the country. Of the total 221 cases, 6.3% of patients were children, and 28.5% were females, similar to studies done in Andhra Pradesh (Rama et al 2015) and Delhi (Chhabra et al 2015) which also showed higher incidence in children and females. Studies were done in high burden leprosy states like Maharashtra (Jain et al 2014) (9.1%), and Odisha (Pradhan et al 2020) (16.4%) also showed a higher number of childhood cases. The majority of cases belonged to the young adult age group (21-40 years) (44.7%) in the present study, and a similar trend was noted in most of the studies across the whole country (Thyvalappil et al 2019, Rama et al 2015, Chhabra et al 2015, Rawat et al 2017). Hence it is evident that the burden of the disease affects mainly the young productive male population of the society and also more children and women since recently.

In this study, only 5.4% of patients gave the history of leprosy in family or close contact in adult patients and none in childhood cases. Similarly, a lower percentage (9.2%) of household contact history was reported in Himachal Pradesh (Jindal et al 2009). This indicates that the chance of contracting the infection among children and adults outside the family is high & implies that there is a persistent transmission of the disease in the community in our settings. This fact is supported by the discussions held in the symposium by the Leprosy Mission Trust of India in 2015 (Singh et al 2015). In contrary to this, the study was done in Karnataka (Chitra & Bhat 2013) has reported that the child proportion among the newly diagnosed cases did not show any significant decline following elimination, and there was a history of household contacts in more than half of child cases (Chaitra & Bhat 2013).

Most of the cases belonged to the borderline spectrum (53%) in this study. The most commonly encountered spectra were BTHD, followed by LLHD, BLHD, and TTHD, with a similar trend in a neighbouring state (Kerala) (Thyvalappil et al 2019) also. The studies done in other parts of India (Rama et al 2015, Chhabra et al 2015, Rawat et al 2017) have shown different trends, where the most common spectrum was BTHD followed by BLHD and LLHD (Table 3). Cases belonging to infectious spectrum (BLHD and LLHD including histoid) constituted about half of the patients in this study, whereas in the neighbouring states like Kerala (Thyvalappil et al 2019), Andhra Pradesh (Rama et al 2015) and also in Delhi (Chhabra et al 2015) it was about one quarter to one-third of the cases but the states with higher caseload like Uttar Pradesh (Adil et al 2018) showed that nearly 2/3rd (66.2%) cases belonged to infectious spectrum. At the same period, there is more number of new cases detected in the community, dynamics of the disease transmission and also explains the current trend of ANCDR. In the year 2016-17, the total new caseload in Kerala (n=496) and Andhra Pradesh (n=4228) were lower than in Tamil Nadu (n=4937) whereas in Uttar Pradesh (n=22,301) it was very high. These statistics go in tandem with the caseload in that States/UT, which could be observed by comparing the new cases reported in the NLEP annual progress report.

Pure neuritic Hansen disease has been reported in 3% to 10% in Southern states (Thyvalappil et al 2019, Rama et al 2015) including this study (6.3%) whereas it was very low in Delhi (0.5%) (Chhabra et al 2015). Peripheral nerve involvement in the form of thickening was seen in 76.5% of patients in our study, whereas it was as high as 88.9% in a study conducted in Delhi (Chhabra et al 2015).

The most common nerve involved was the ulnar nerve (64.7%), followed by the common peroneal nerve (48.4%) and posterior tibial nerve (45.7%) in the present study.

Slit skin smear for AFB showed 34.8% positivity, out of which 72% belonged to LLHD and 28% belonged to BLHD and in concordance to a study done in Kerala (Thyvalappil et al 2019) where the overall positivity rate was 25.5%. None of the other spectra showed AFB positivity. Among the MB patients, the AFB positivity rate was 41.8% in the present study. Except for the study done in Kerala, studies done in other parts of India (Rama et al 2015, Chhabra et al 2015, Rawat et al 2017), have not mentioned SSS positivity rate. A clinico-histopathological correlation consistent with leprosy was observed in 92.3% of cases, and non-specific histological features were noted in 7.6% (mainly in pure neuritic cases). Concordance with clinical spectrum was maximum in LLHD patients, followed by TTHD, histoid leprosy, BLHD, and BTHD, which was similar to the study done by Moorthy et al *(*2001) Karnataka. None of the clinically diagnosed BBHD (n=14) patients were concordant with the histopathological diagnosis, of which 78.6% had histopathological features of BTHD with type 1 reaction and the rest (21.4%) with features of BLHD. It is said that the correlation is usually better at polar spectra (lepromatous and tuberculoid) due to the clinical and immunological stability of the disease, while borderline spectrum, which is characterized by unstable immunity and proneness for reactions, and their evolution towards the upgrading or downgrading decides their histopathological features which depend upon patient's specific immunity towards Lepra bacillus.

About 15.4% of patients developed type 1 reactions during the study period. Similar high trend of lepra reactions were seen in studies done in various parts of India ranging from 18% - 30.4% (Thyvalappil et al 2019, Chhabra et al 2015, Rawat et al 2017). Among the patients with Type 1 reactions, 47% developed the reaction before initiation of MDT. 32.3% within 6 months of starting MDT, and 11.7% developed after 6 months. Late Type 1 reaction was noted in 8.8%. Type 2 reaction was seen in 10%, which was concordant to the many studies done in various parts of India (Thyvalappil et al 2019, Rama et al 2015, Chhabra et al 2015) but was found high in Uttarakhand (Rawat et al 2017) (around 16.4%). Among the patients with Type 2 reactions, 31.8% developed the reaction before initiation of MDT, 18.1% developed within 6 months of starting MDT and 40.9% developed after 6 months, and 9.1% of patients developed Type 2 reactions between 1-3 years after initiation of therapy. Reactions were more prevalent in the patients treated with the MB regimen. If not detected and treated early, the high frequency of nerve damage that occurs during the immunological process of lepra reactions will lead to significant morbidity and deformities.

Usually, the incidence of lepra reaction is calculated by dividing the number of patients with lepra reaction by the total number of new leprosy cases under NLEP. But, type 1 lepra reaction usually occurs in the borderline spectrum (BTHD, BBHD and BLHD) and type 2 lepra reaction in the lepromatous spectrum (BLHD and LLHD). Hence if we use the expected spectra alone instead of total leprosy cases in the denominator, the incidence of the leprosy reactions adjusted to the spectrum can be calculated. In our study, if the incidence of type 1 and type 2 lepra reactions were calculated using total leprosy cases in the denominator, there would be 15.4% n=34) and 10%(n=22), respectively. Among the type 1 reaction, half of the cases were BTHD, one third were BBHD and the remaining were BLHD. In type 2 reaction, two-

third of the cases were LLHD; one third were BLHD. While if only the expected spectra are considered in the denominator, the incidence of type 1 and type 2 lepra reactions would be 24.6% and 20.9%, respectively, which is higher compared to the routine method of calculation. The incidence of type 2 reaction nearly doubles if calculated by the method as mentioned above, which could be used as a predictor of the risk of reaction concerned to the spectrum. If this calculation is applied to other studies (Thyvalappil et al 2019, Rama et al 2015, Chhabra et al 2015, Rawat et al 2017)' the incidence of type 2 reaction will increase by three to five folds which is higher than the incidence in our study (2 fold increase). Thus, the population seems to be at higher risk of type 2 reactions, especially in southern states of India (Thyvalappil et al 2019, Rama et al 2015). But for type 1 reactions, the change was minimal, as the borderline cases constituted more than 2/3rd of total cases (Thyvalappil et al 2019, Rama et al 2015, Chhabra et al 2015, Rawat et al 2017). This needs to be explored further.

Around 30.7% of patients had G2D rate during the study period, which is similar to study done in Delhi (Chhabra et al 2015) and lower (17.8%) in studies done in other parts of India (Thyvalappil et al 2019, Rama et al 2015, Rawat et al 2017). There were no childhood leprosy cases with G2D in the present study. Grade II deformity was seen in 8% of paucibacillary patients and 35.3% of multibacillary adult patients. The percentage of patients with deformities is direct indicator of lapse in early detection and prompt treatment initiation as well as community awareness level. In the current study, 83.3% of cases were multibacillary as per WHO definition, which is similar to studies done in north India (Chhabra et al 2015, Rawat et al 2017) and lower in other south Indian studies (Thyvalappil et al 2019, Rama et al 2015).

Similarly, BLHD and LLHD patients number were more than half of the MB cases in these studies. The incidence of MB cases is generally higher in tertiary care centres which could be due to reporting and referral of high morbid and complicated cases to such centres like ours, while the PB cases are mainly dealt periphery by field workers and PHCs. The main important strategies to prevent deformity are early diagnosis and treatment of leprosy and lepra reactions, education, and regular follow-up of the patients.

The incidence of MB cases in our study is much higher when compared to district NLEP statistics. The proportion of multi-bacillary cases is an indicator of delayed diagnosis which could be due to difficulty to access to the services or inadequate public awareness programmes. This is further supported by the South Indian study (Daniel et al 2009).In the current study, out of 184 MB cases, 57.1% (n=105) cases were BLHD and LLHD, who are the potential source of infection to the community. This shows that these cases are still present in the community, which is responsible for continued disease transmission. As of now, NLEP does not have a provision for recognisingthe highly infectious spectrum in their MB data. If we follow the slit skin smear and spectrum wise classification in the field level too, then only we can get data about highly infectious spectrum. Only then we can map those high-risk areas and take steps for early detection of cases, prevention of disease transmission and education of the community too. The incidence of G2D rate also showed much higher than district level. The higher number of G2D cases in our study was against the WHO millennium goal for 2016-2020 (<1 per million) regarding deformity rate. We need to take stringent measures to achieve the goal.

The trends of leprosy indicators over the years (2012-2017) show increasing child rates both in our hospital-based study & our district NLEP, whereas there is decrease in child rate over National level. At the same time, MB cases are gradually decreasing in our district as per NLEP data, however, there was increase in MB cases in our hospital-based study. Percentage of cases with grade 2 disabilities remained high around 30% in these five years at our hospital, both high MB proportion and G2 disabilities indicate that cases report to our institution late (Table 2). There is increase in cases with G2 disabilities indicating delayed diagnosis and treatment at community level. Both increase in child rates and disabilities show the need for intensified action at public health level.

The multipurpose workers and Accredited Social Health Activists (ASHA) now carry out leprosy work, and they may lack the desired clinical skills to detect cases of leprosy unless trained well. Horizontal integration of leprosy services with general health programs dampens the sustainability of these programs and the quality of service provided (Nair & Vidyadharan 2016). After the elimination of leprosy as a public health problem, other epidemic diseases like dengue, chikungunya and newly emerging viral diseases have become relatively more important for national health missions, which has resulted in less focus on leprosy control, including manpower and funds. It is important now that the NLEP takes a relook into its existing policy apart from LCDC and device appropriate remedial policy measures to detect cases early with resumption of lab testing even in the periphery and arrest community transmission.

Conclusion

The prevalence of leprosy is gradually decreasing in many countries; however, new case detection rates remain at almost the same level globally and in different regions. Despite leprosy being eliminated as public health problem at national level from our country, the community scenario still lacks many things, and lots of aspects still need attention. The high rate of MB cases in our study as well as a high proportion of patients presenting with Grade II deformity in the district, is a matter of great concern as these findings are far above the national and global level as discussed above. This shows the need to increase the awareness in the community as well as among the health care workers so that the cases report early, are diagnosed early and managed appropriately and thus disease transmission and deformities gradually reduce and finally become zero. As the last mile is always hardest to go, the intensified focus should be made on early case detection and treatment, strengthened referral mechanism and implement the action of frequent training programmes for all the stakeholders from administrators to doctors and down to field level health staff to bring leprosy under control as well as to attain WHO millennium goals.

Limitations

Our data has some limitations : first, as it is the referral tertiary care centre in South Tamil Nadu, most of the cases reported to the department are of the severe spectrum who might have reported to us late due to various reasons, which have contributed to the high proportion of MB cases as well as cases with Grade 2 deformities. Secondly, we were not able to follow all patients on their completion of treatment since we referred patients to their nearby primary health centre for MDT. Clearly, there is a need to carry out population-based studies to understand the situation better at community level and take necessary remedial measures.

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How to cite this article : Nirmaladevi P, Arunkumar B, Judith Joy S et al (2021). Clinicopathological Profile of Cases Attending Leprosy Clinic in a Tertiary Care Hospital of South Tamil Nadu and Its Correlation with Current Leprosy Trends under NLEP. *Indian J Lepr.* **93**: 329-340.