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Clinico-Epidemiological Study of Leprosy Cases at a Tertiary Care Hospital in Maharashtra: 10 Years Retrospective Study

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ABSTRACT
After the introduction of multi drug therapy against leprosy, prevalence of leprosy has drastically reduced globally but the current statistics show that leprosy continues to be a public health problem in India. The purpose of the study is to determine the sociodemographic and clinical characteristics of leprosy and their trends at a tertiary care center in Maharashtra. Case records of leprosy patients treated at a tertiary care hospital were studied retrospectively for demographic data, clinical features, deformities, reaction, treatment, slit skin smears and histopathology. Out of 910 patients, most of the patients were in the age group of 16-30 years and childhood leprosy constituted 6.04%. Contact tracing was elicited in 21.09%. Majority of cases were multi bacillary (75.16%) leprosy. Most common clinical spectrum seen was borderline tuberculoid (32.96%). Most common lepra reaction was Type 1 lepra reaction (20.43%). Grade 2 deformity was diagnosed in (29.45%) patients. Ulnar nerve was the most frequently nerve involved (55.49%). Slit skin smear was positive in (74.62%) patients. In the post elimination era, a huge number of cases were detected with increasing trend of borderline lepromatous leprosy, multi bacillary and deformity is a matter of concern which signify the delay in the diagnosis and management. Our findings highlight the need for implementation of effective measures and provide high-quality leprosy services and improving awareness to ensure appropriate health seeking behaviour and reducing social stigma. This is a retrospective study and patients are included who reported voluntary or referred.

INTRODUCTION

Leprosy, also known as Hansen's disease, is a chronic granulomatous infection caused by My cobacterium leprae[1]. M. leprae is a tardy multiplier and has an incubation period ranges from 2-12 years. The exact mechanism of transmission of leprosy is not known, most widely belief is person-to-person spread via nasal droplets[2]. The disease mainly affects the skin, the peripheral nerves, mucosa of the upper respiratory tract and the eyes[3]. After the introduction of MDT, the prevalence rate of India rapidly came down from 57.66 per 10,000 population in 1982-0.95 per 10,000 population at the national level by 2005. On 30th January 2006 India officially announced that leprosy has been eliminated at the national level, yet there are pockets of high prevalence in a few states[4,5]. Sadly that is not in reality as Brazil, India and Indonesia reported more than 10000 new cases each, together accounting for 78.1% of global new cases[6]. 174 087 new cases were reported globally in 2022 according to official figure from 182 countries from 6 WHO region corresponding to a rate of detection of 21.8 per million population. This represented an increase of 23.8% over that in 2021 (140 594). South east Asia region accounted for 71.4% of the new cases[7]. Prevalence rate of leprosy in India has come down from 0.69/10,000 in 2014-15-0.45 per 10,000 population in 2021-22.Annual new case detection rate per 100,000 population has come down from 9.73 (2014-15) to 5.52 (2021-22).Worst affected regions in India include were Bihar, Orissa, Chhattisgarh, Gujarat, Jharkhand, MP, Maharashtra etc. where prevalence is was found to be <2 in many districts[8,9]. Efforts to eliminate leprosy have been intensified with the Global leprosy strategy 2021-2030 was developed as constituent of the neglected tropical diseases (NTD) road map 2021–2030 calls for accelerating action to reach the goal of zero leprosy-zero disease, zero disability and zero stigma and discrimination[5]. Despite national elimination of leprosy new cases are increasing, this may be attributed to pockets of high endemicity in the country, many hidden cases in the community as revealed by the sample survey conducted by Indian Council for Medical Research (ICMR), new case detection rate has remained almost the same since 2005 and the disability rates in new cases has been rising due to a delay in diagnosis[10]. The present study aims to give an insight into the clinical and epidemiological profile of leprosy patients at a tertiary care center in Maharashtra.

MATERIALS AND METHODS

A descriptive retrospective record base study was conducted in the leprosy clinic of the dermatology outpatient department at a tertiary care center institute in Maharashtra. Case records of leprosy patients treated at a tertiary care centre over 10 years from 2010-2019 were studied retrospectively for age, sex, occupation, marital status, history (duration and contact history), examination finding such as lesion count, lesion morphology, site , peripheral and cranial nerve involvement, neuritis, deformities, reaction, treatment received -MB- MDT, PB- MDT, side effects of drug, relapse and laboratory investigations (slit skin smears and histopathology). Some patients who did not have any cutaneous findings with significant nerve conduction abnormalities were classified as pure neuritic leprosy. Patients were classified as per Ridley Jopling classification and treated accordingly. WHO classification was used to classify the patients as multi bacillary (MB) or paucibacillary(PB) leprosy. Ethical clearance was obtained from the institutional ethics committee to conduct the study.

Statistical Analysis: The data was managed and entered in Excel 2022 and latest SPSS version was used for statistical analysis. The qualitative and nominal variables were measured in percentages and proportions, chi square values and P values were obtained for relevant associations. Quantitative variables were expressed in means and standard deviations. The confidence interval was taken 95% and hence p value >0.05 was considered as significant when studying associations.

RESULTS AND DISCUSSIONS

A total of 910 leprosy patients were registered at the leprosy clinic during the study period with age ranging from 4yrs-90 yrs age (mean age 37.13±16.27 standard deviation). The disease burden was maximum among the age interval 16-30 yrs with about 330 cases (36.26%). (Table 1). The cases consisted of males 557(61.21%) and females 353(38.79%), with a male to female ratio of 1.57: 1. History of contact was elicited among 192 cases (21.09%). Among the pediatric age group there were 55 cases (6.04%) with mean age of 11.54 yrs±2.98. Significant proportion of patients belongs to student 304(33.40%) and farmer 242(26.59%) followed by housewife 212(23.29%), labourer 144(15.82%) and driver 8(0.88%).

Table 1: Age Wise Distribution of Leprosy Patients(n=910)

Age	No. of cases
1-15	55(6.04%)
16-30	330(36.26%)
31-45	281(30.88%)
46-60	152(16.70%)
61-75	90(9.89%)
76-90	2(0.22%)
Total	910

Multi bacillary (MB) leprosy was the most common form of leprosy, encountered in 684 (75.16%) cases. Association between gender and clinical type of leprosy showed no significant association($\chi 2$=1.12 and p value >0.05) (Table 2).

Table 2-Association Between Gender and Clinical Type of Leprosy (n=910)

Gender	Multi bacillary	Paucibacillary	Total
Male	412	145	557(61.21%)
Female	272	81	353(38.79%)
Total	684(75.16%)	226(23.73%)	910

649 subjects had >5 lesions, while 214 patients presented with <5 lesions. The most common clinical features among the study subjects were found to be erythematous plaque 492(54.06%) followed by hypo pigmented anesthetic macule 348 (38.24%), nodules 283(31%), papules 260(28.6%) and hypopigmented aneasthic plaque 214(23.5%). Most common clinical spectrum was Borderline tuberculoid (BT) 300(32.96%), followed by borderline lepromatous (BL) 256(28.13%), lepromatous (LL) 191(20.98%), mid borderline (BB) 70(7.69%), pure neuritic 46(5.05%), histoid 19(2.08%), indeterminate 18(1.97%) and tuberculoid (TT)10 (1.09%). (Table 3). Clinically thickened peripheral nerves were found in 815(89.5%) patients. In 174 (21.34%) patients single nerve was involved and multiple nerve involvement was seen in 641(78.65%) patients. Ulnar nerve was the most frequently nerve involved 505(55.49%). (Fig. 1), (fig. 2).

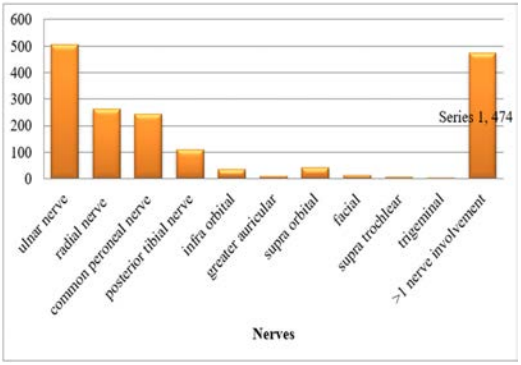

Fig. 1: Distribution of Cases Based on Nerve Thickening

Fig. 2: Pure Neuritic Hansen Involving Median Nerve

BL leprosy cases increased steadily from 9(3.51%) cases in 2010 to 46(17.96%) cases in 2019 . LL leprosy cases showed a steady growth of cases over the study period with a slight decrease of cases in 2011 i.e. 7 (3.66%) and from 2015 21(8.20%) cases to 34(17.80%) in 2019. (Fig. 3).

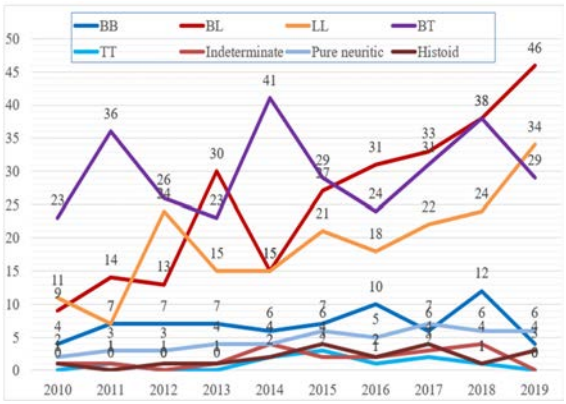

Fig. 3: Time Line Distribution of Cases Based on the Type of Clinical Variant

Bacillary index records were given in (Table 3) which showed that slit skin smear were positive in 679 (74.62%) patients. It is evident that there is gradual increase of smear positive cases over the years.(Fig. 4).

Table 3: Distribution of Cases Based on Bacillary Index

Slit skin smears	No. of cases
Negative	231(25.38%)
1+	96(10.54%)
2+	29(3.18%)
3+	95(10.43%)
4+	211(23.18%)
5+	78(8.56%)
6+	170(18.68%)
Total	910

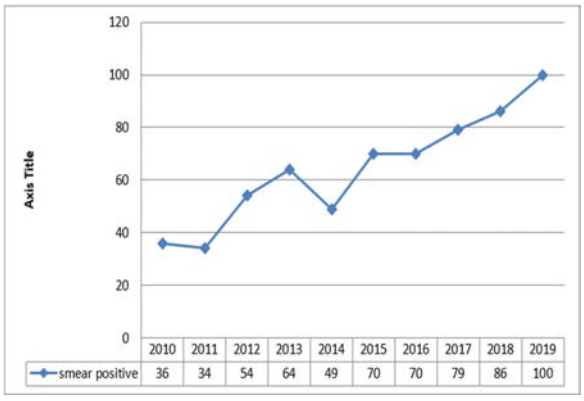

Fig. 4: Time Line Distribution of Smear Positive Cases

Type 1 lepra reaction was observed among 186 cases(20.43%) and type 2 lepra reaction was observed among 131(14.39%).(Table 4) (Fig. 5), (Fig. 6).

Table 4: Distribution of Cases Based on Type of Leprosy and Type of Reaction(n=910)

		Type of reaction	
Type of leprosy	**No. of cases**	**Type 1**	**Type 2**
LL	191(20.98%)	5	90
BL	256(28.13%)	100	17
BT	300(32.96%)	44	2
BB	70(7.69%)	20	2
TT	10(1.09%)	0	0
Histoid	19(2.08%)	0	0
Indeterminate	18(1.97%)	0	0
Pure neuritic	46(5.05%)	1	0
Total	910	170(18.68%)	115(12.36%)

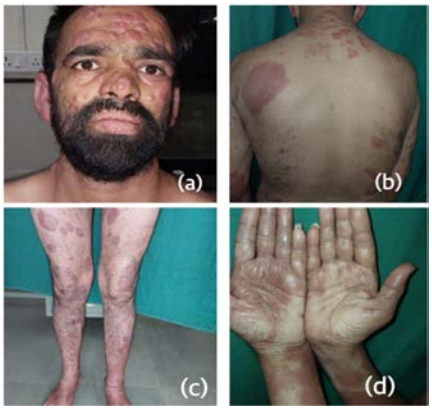

Fig. 5: BL Hansen's Disease with Type 1 Reaction
(a) Multiple Erythematous, Edematous Plaques with Nodules Over Face with Erythema and Edema Over Both Ear
(b) Multiple Erythematous Plaques with Scaling Present Over Back and Bilateral Upper Limb
(c)Multiple Erythematous Plaques with Scaling Present Over Bilateral Lower Limb
(d) Multiple Erythematous Plaques Over Palm and Forearm

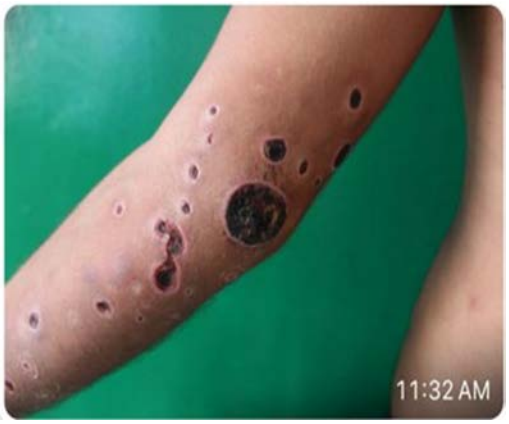

Fig. 6: Type 2 Lepra Reaction

Deformity was observed in 539 cases of which grade 2 deformity was observed in 268 cases (29.45%) and grade 1 deformity was observed among 371 cases (40.76%). Grade 1 and grade 2 deformities were maximum among the MB leprosy with 289(77.89%) and 251(93.65%) respectively. Thus there is significant association between type of leprosy and deformity.[$\chi 2$ =29.51, P=0.00001] (Table 5).There was steady increase in grade 2 deformities from 18 (6.71%) in 2010 to 42 (15.67%)in 2019.(Fig. 7) (Fig. 8).

Table 5: Simple Logistic Regression Analysis of Factors Associated with Deformity

	Deformity		
Gender	**Grade 1**	**Grade 2**	**P-value**
Male	233(62.80%)	168(62.68%)	
Female	138(37.19%)	100(37.31%)	
Total	371	268	0.975
Type of reaction			
Type 1	31(56.36%)	46(56.02%)	
Type 2	24(43.63%)	36(43.90%)	
Total	55	82	0.975
Type of leprosy			
MB	289(77.89%)	251(93.65%)	
PB	82(22.11%)	17(6.34%)	
Total	371	268	0.00001
Age			
1-15yrs	14(3.71%)	5(1.86%)	
16-30yrs	132(35.57%)	79(29.47%)	
31-45yrs	140(37.73%)	76(28.35%)	
46-60yrs	50(13.47%)	63(23.50%)	
61-75yrs	31(8.35%)	43(16.04%)	
76-90yrs	6(1.61%)	2(0.74%)	
Total	371	268	0.975

Fig. 7: Complete Claw Hand with Resorption of Fingers

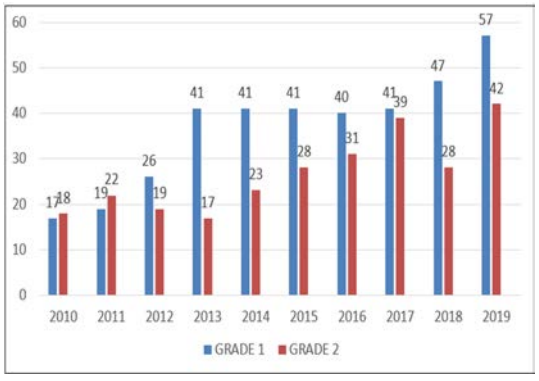

Fig. 8: Year Wise Distribution of Cases Based on the Deformity

Table 6: Comparison of Various Leprosy Indicators with Present Study, NLEP National and Global

Leprosy indicator	Present study (%)	NLEP National (%) 2019	Global (%) 2019	Global (%) 2022
MB	75.16	52.3	64.5	68.9
Females	38.79	39	39.6	38.9
Childhood leprosy	6.04	7.7	7.9	5.9
Grade 2 deformity	29.45	3.05	5.4	5.1

Drug side effects were observed among 62 cases (6.81%) of which 36 cases(3.95%) showed side effects towards clofazamine, rifamipicin in 17(1.86) and due to dapsone 9 (1%) patients. Biopsy records were available for 494 (54.3) leprosy cases. Borderline tuberculoid leprosy was the most common histological diagnosis. Clinico histopathological correlation was observed in 349 cases (70.7%).

The Government of India has launched National Strategic Plan (NSP) and Roadmap for Leprosy (2023-27), which focuses on awareness for zero stigma and discrimination, early case detection, prevention of disease transmission by prophylaxis and web-based information portal for reporting of leprosy cases. With various intervention introduced under NLEP , number of new leprosy cases 1,25,785 in 2014-15, come down to 75,394 in 2021-22 accounting for 53.6% of global new leprosy cases. Maharashtra was among the states showing a prevalence of 1.2 according to 2022-2023 state wise report of NLEP higher than the national average[11]. Maximum cases were observed in the age group 16-30 yrs with about 330 cases (36.26%) which is in concordance with Kenit P Ardeshna[12], Jindal[13]. The childhood leprosy account for 55(6.04%), comparable finding reported by Grover[14] (7.06%), Kenit P Ardeshna[12] (7.24%), Mushtaq[15] (8.6%) which is lower as compared to 9.6% as reported by Singal[16], 14.2% in Adil[17] and 12.3% in Thakkar and Patel[18]. This is a strong indicator of ongoing transmission of leprosy in the community. The present study show that more males were affected as compared to females and male: female ratio was 1.57:1. Similar findings noted by other studies[17-21]. Study by Vengarakath Puthiyapura Reyila[22] showed male to female ratio was 3:1, Mushtaq[15] (3.4:1), Agrawal[23](3.34:1) which is higher than our study. Male predominance may be due to industrialization, urbanization, more opportunities in males for social or jobs, differences in health-seeking attitude of males and females. In the current study history of contact was elicited among 192 (21.09%) patients which corroborates with study done by Patil[24] (25%) while slightly higher percentage reported by Nigam[25] (30.7%). Low incidence of positive family history seen in a study conducted by Agrawal[23] (5 %) and Salodkar[26] (9.5%).Van Beers[27] observed that when there is a neighborhood contact, risk of a developing leprosy is four times and up to nine times higher when there is intra-familial contact. This signify the importance of detailed contact history and screen family members whenever possible. Percentage of MB cases 684 (75.16%) in the present study was significantly greater than PB cases 226(24.84%) though at a lower frequency than reported by previous literature[12,15,20,28]. This observation may be seen because of our being a tertiary care institute where severe cases with reaction and disability are referred from peripheral health care. High proportion of MB cases indicates there are inaccessible pockets, where leprosy is diagnosed late despite intensive efforts taken at national level. BT leprosy was more common pole of leprosy in 300 (32.96%) patients which is less than observation made by Agrawal[23] (39%),Tiwary[28] (56.9%), Kenit P Ardeshna[12] (45.8%), Rehlan[29] (60.25%), Chhabr[30] (56.3), Musht[15] (34.3%), Vashisht[20] (71.5%). Second most common spectrum found in our study was BL leprosy 227(28.13%) which is less as compared to Adil[17] (38.2%) and Shah[21] (39%).High proportion of BT cases in present study can be attributed to relatively easier diagnosis as patches in this spectrum are well defined and easily notice by patients with early sensory loss which leads a patient to report earlier than BL/LL spectrum where clinical symptoms are generally absent or develop late. An important finding in our study was increasing trend of BL and LL leprosy over past 10 years which is in consistence with Mushtaq[15] and Sasidharanpillai[31]. In this study 46(5.05%), patients were of pure neuritic leprosy similar to observation of Mahajan[32] (4.6%) and by Dongre[33](5.5%) and higher than that reported by Shah[21] 11(2.75%), Adil[17] 3(1.33%) while very less as compared to Thakkar and Patel[18] 45 (18%) and Kolleri[34] 75 (8.5%). The proportion of histoid leprosy 19(2.08%) in our study is parallel to Nair[35] 8 (2.48%), Shah[21] 11(2.25%), Mahajan[32](2.7%). The continued occurrence of histoid leprosy is a matter of concern as these cases have a high bacillary load and serve as a reservoir of infection to others. We observed in our study patient had a higher proportion of type 1 reaction 186(20.43%) as compared to type 2 reaction 131(14.39%) this was in concordance with recent studies[23,36]. This was contradictory to the previous literature where type 2 reaction was more common[24,32,37,38]. Higher proportion of type 1 reaction in the present study may be attributed to higher prevalence of BT cases. In this study multiple nerve involvement was reported in majority of patients 641(78.65%) but at a lower frequency than reported by Rehlan[29] (81.1%) and Chhabra[30] (88.9%) and slightly higher frequency as reported by Mushtaq[15] (74%).

Ulnar nerve was the most common thickened nerve, similar to observation of Sirisha[39], Lasry-Levy[38]. The deformity rate in newly diagnosed leprosy cases was 70.21% which was much higher than those reported by Thakkar[18] (42.8%) , Patel[40] (53.14%) which was less as compared to Patil and Sherkhane[24] where 82.46% (94) of patients showed deformities. Grade 2 deformity in our study (29.8%) higher than those reported by Mushtaq[15] (20.1%) ,Rehlan[29] 6 (19.03%), Jindal[13] 21 (17.8% and Shetty[41] 22 (12%). Continued high grade 2 deformity rate among new cases due to high proportion of multi bacillary cases. Increasing trend of Smear-positive cases and grade 2 deformity over the 10-year period which is consistent with the recent studies which suggest the continue transmission of leprosy in a community[15,31]. Clinico histopathological correlation was observed in 349 cases (70.7%) which is lower than reported by Chhabra[30] (78.8%), Kenit P Ardeshna[12]. We observed high proportion of MB cases, childhood leprosy, grade 2 deformity and lepra reaction as compared to NLEP data is a big concern. (Table 6). The present study highlighted important finding is a increasing trend of smear positive cases, BL and LL leprosy with grade 2 deformity and high proportion of childhood leprosy and lepra reaction. This may be due to suboptimal awareness and stigmatization of the leprosy in the community. Proper information, education and communication model should be ensure that the stigma against leprosy patients in the community do not delay the early detection of new cases, initiation of MDT and follow-up of existing cases. This objective can be achieved by strengthening of the health system at the center and state level to align it with the vertical and effective implementation of the Leprosy eradication programme. To address these challenges and effectively eradicate leprosy NLEP advocated a three-pronged approach of (a) "leprosy case detection campaign (LCDC)" in highly endemic districts., (b) focused leprosy awareness campaign using ASHA and multipurpose health workers in "Hot Spots," where new cases with Grade 2 Disability (G2D) are detected and (c) area-specific plans for case detection in hard to reach areas[10]. In spite of continuous efforts taken by NLEP, there are many reasons why there is no decline in occurrence of new leprosy cases over last decade such as resources were taken from the control of leprosy and given to other areas, such as HIV and tuberculosis, rapid merging of leprosy services into the general medical health services, efforts towards further reducing the duration of therapy and reduced attention to research and funding of leprosy programme[10].

Limitation: The present study has certain limitations. This Study is based on retrospective evaluation of a medical record of leprosy patients. So available data was limited to those patients who reported to us directly or referred and non-expandable. Other limitation was as study conducted at a tertiary hospital, so large proportion of cases had severe complications and there sequelae were referred from either primary or secondary health care center resulting higher number of MB cases and grade 2 deformity. Larger population-based studies could be more informative to plan remedial measures.

CONCLUSION

In the post elimination era a huge number of cases were detected with increasing trend of borderline lepromatous leprosy, multibacillary and grade 2 deformity is a matter of concern which signify the delay in diagnosis, management and reaction leading to deformities and disability. Our findings highlight the need for implementation of effective measures and provide high-quality leprosy services to ensure appropriate health seeking behaviour and reducing social stigma.

Declaration of Patient Consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of Interest: There are no conflicts of interest.

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