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Original Article

Clinico-Epidemiological Profile of Leprosy in Post Elimination Era: A Hospital Based Study

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In December 2005, National leprosy Eradication Programme of India announced elimination of leprosy as a public health problem at national level. However, a significant number of new cases continue to be diagnosed in India. This study was carried out in Department of Dermatology, Venerology and Leprology, AIIMS, Patna where we have retrospectively analysed the clinicoepidemiological profile of of registered cases of leprosy between January 2016 and December 2017. Out of 464 fresh / default leprosy patients who reported to our department, a majority proportion (24.35%) belonged to 30 to 39 years age group followed by 20-29 yr (23.49%) 40-49 yr (19.39%), remaining belonged to other age groups. There was male preponderance. By occupation most of patients were farmers and labourers. Borderline Tuberculoid (29.41%) was the most frequent morphological type, but the proportion of Lepromatous Leprosy (21%) was significant. Overall, multi-bacillary leprosy (80.17%) cases were the most dominant type. 34.91% patients presented in reaction, among these Type 1 in 40.74% and type 2 in 59.25%. Disabilities were found in 172 (37.06%) patients with Type 1 disabilities in 76 (16.37%) patients and Type 2 disabilities in 96 (20.68%) patients. Clinically thickened peripheral nerve enlargements were recorded in 421 patients (90.73%). Ulnar nerve was found to be the most commonly involved nerve. History of contact was present in 10.34% of cases. 296 (63.79%) patients belonged to rural area whereas 168 (36.28%) belonged to urban area. Very high proportion of multi-bacillary cases, reactions and also high disability rates indicate the need for in depth studies at community level and appropriate remedial public health measures.

Key words : Profile, Leprosy, Elimination Era, Epidemiology, Disabilities

Introduction

Leprosy is a chronic disease, infectious in some cases, caused by *Mycobacterium leprae*. It primarily affects the peripheral nervous system and secondary involve skin and certain other tissue. Leprosy occurs in all ages ranging from early infancy to very old age. Leprosy expresses itself in different clinic pathological forms depending on the immune status of the host. The standard research classification follows that of Ridley and Jopling (Ridley and Jopling 1996), which is based on immuno-pathologic data. Leprosy exhibits a spectrum of clinical characteristics that correlate with the histopathological changes and the

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immunological stats of the individual. At one end of the spectrum is Tuberculoid Tuberculoid leprosy (TT), which is manifested with few lesions and a paucity of organisms. At the other end is Lepromatous Lepromatous leprosy (LL), in which there are numerous lesions with myriad bacilli and an associated absence of cellular immune response. In between theses poles are Borderline Tuberculoid (BT), Borderline Borderline (BB) and Borderline Lepromatous (BL) leprosy. Polar forms (TT and LL) are the most stable and the Borderline forms (BB) are the most labile. It is well known that leprosy is considered an important disease mainly because of its potential to cause permanent and progressive physical deformities/ disabilities with serious social and economic consequences.

The registered global prevalence of leprosy was 192713 cases (0.25/10000 population) at the end of 2017 (WHO Global leprosy update 2017). In 1982, MDT came into use, in response to the recommendation of WHO study group, Geneva (1981). In 1991, World Health Assembly resolved to eliminate Leprosy at a global level by the year 2001. Leprosy was declared eliminated as a public health problem in India at national level in the month of December 2005, with prevalence less than one per 10000 populations. However, still India continues to top the table globally as far as detection of new cases of leprosy. Three countries with the highest burdens, India, Brazil and Indonesia accounted for 80.2% of the new caseload globally in 2017 (WHO Global leprosy update 2017). According to NLEP data (2016-17), In India, a total of 1,35,485 new cases were detected during the year 2016-17, which gives Annual new case detection rate (ANCDR) 10.17 per 100,000 population, as against 127,334 new cases were detected during the year 2015-16. A total number of 88166 leprosy cases were recorded on 1st April 2017 with PR 0.66 per 10,000 populations as against 86,028 cases in April 1, 2016. Detailed information on new leprosy cases detected during 2016-17 indicates the proportion of MB (49.57%), Female (39.17%), and Child (8.7%). A total number of 11792 child cases were recorded indicating the child case rate of 8.7%. As on 31st March 2017, Bihar reported a PR > 1 - 10,000 population and total number of new cases detected was 21818. Thus, Bihar is one of the Indian states with high endemicity for leprosy. At present, Bihar is one of the 10 states and Union Territories in India where the proportion of childhood cases is more than 10% of newly detected cases. There were 4 districts in Bihar with more than 1000 new cases during the year 2016-17, also some districts with ANCDR> 10/100,000 population (NLEP 2016-17). Areas of endemicity still prevail in Bihar. It was the availability of effective multidrug treatment that led to the thought of leprosy elimination despite little understanding of its epidemiology. Knowledge and understanding of the epidemiological profile is an essential pre-requisite to plan studies at community level to assess and address public health needs there may be change in clinico-epidemiological profile of disease. Hence, the current study was undertaken to analyse the spectrum and other epidemiologically relevant characteristics of Leprosy in our tertiary care hospital located in Capital of Bihar.

Material and Methods

This two years study was conducted in the Department of Dermatology, Venerology and leprology in AIIMS, Patna. We have retrospectively analysed the data retrieved from our leprosy clinic register for Jan 2016 to Dec 2017. All freshly diagnosed cases as well as defaulters requiring treatment were included in this analysis. The leprosy register included details of their demographic profile, occupation, a detailed

clinical history, physical examination finding, slit skin smear and skin biopsy reports. Diagnosis of leprosy was made clinically, histopathologically and bacteriologically by standard criteria (Ridley and Jopling 1966, IAL 1982). Disability grading criteria was that of WHO (Brandsma and van Brakel 2003). These cases were classified into paucibacillary (PB) and multi-bacillary (MB) types for treatment purposes as were WHO criteria (WHO 1994) followed by NLEP (2009). Descriptive statistical analysis was carried out as per study need and objectives.

Results

Among 464 patients included in this study, more than 2/3 (67%) were between 20-49 years of age - 24.35% were in the age group of 30-39 years, followed by 20-29 years (23.49%) and 40-49 yr (19.39%). The rest of the age wise distributions of patient are given (Fig. 1). There were 296 (63.79%) males and 168 (36.20%) female. 5.60% were children (patients below 15 year of age). Cases from rural area i.e. 296 (63.79%) were higher than cases from urban area i.e. 168 (36.20%). By occupation maximum number of cases were farmers 120 (25.86%), followed by labourers 82 (17.67%). Occupation wise distribution of all patients is presented in Table 1.

Clinically majority of the patients 136 (29.31%) belonged to Borderline Tuberculoid (BT) group, followed by Lepromatous Leprosy (LL) 98 (21.12%), Borderline Lepromatous (BL) 79 (17.02%), Borderline Borderline (BB) 42 (9.05%), Pure Neuritic 46 (9.91%), Tuberculoid 24 (5.17%), Indeterminate form 21 (4.52%), and lastly Histoid leprosy 18 (3.87%) (Table 2). Compared with PB (19.82%) the proportion of multibacillary cases, MB (80.17%) as per WHO classification (followed by NLEP) was observed to be very high (Table 3). All MB cases were positive for acid fast bacilli in their slit skin smears.

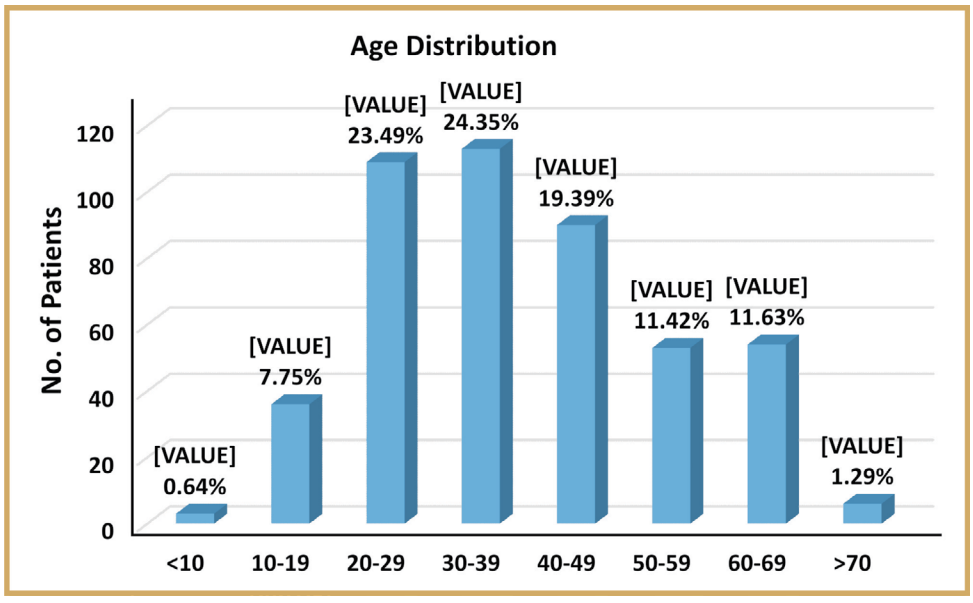

Fig 1 : Age distribution of leprosy cases included in the study (both numbers and percentages shown)

Table 1 : Occupation of patients

S.No	Occupation	No. of Patients	Percentage (%)
1.	Students	64	13.79
2.	Farmers	120	25.86
3.	Housewives	64	13.79
4.	Labourers	82	17.67
5.	Employees	58	12.50
6.	Unemployed	26	5.60
7.	Businessmen	50	10.77

Table 2 : Clinical Disease spectrum among various patients

S.No	Spectrum	No of cases	Percentage(%)
1.	TT	24	5.17
2.	BT	136	29.31
3.	BB	42	9.05
4.	BL	79	17.02
5.	LL	98	21.12
6.	Indeterminate	21	4.52
7.	Pure Neuritic	46	9.91
8.	Historid Leprosy	18	3.87

Table 3 : Classification of cases according to WHO (MB and PB types)

	Numbers of patients	Percentage (%)
Paucibacilliary	92	19.82
Multibacilliary	372	80.17

Multiple nerves were found to be thickened in 323 patients (69.61%). Ulnar nerve was the most common nerve involved, followed by common peroneal nerve, Radial nerve, Median nerve, Radial cutaneous nerve, Greater auricular nerve, Sural nerve in decreasing order, as shown in Table 4.

It was observed that 172 (37.06%) patients suffered from various types of deformities/ disabilities. Prevalence of type 2 deformities/ disabilities in 96 (20.68%) of cases was higher than type 1 deformities 76 (16.37%). Age wise distribution of patients having disabilities is summarised in Table 5.

Among the total 464 patients, 162 (34.91%) had signs and symptoms of reactions. 66 (44.85%) patients had lesions suggestive of type 1 reaction

Table 4 : Age wise distribution of disabilities in leprosy cases

Age Group	Grade -1	Grade-2
<20 years	3	18
20 - 39 years	32	33
40- 59 years	28	30
>60 years	13	15

Table 5 : Pattern of Nerve involvement

S.No.	Nerve	Number of Patients	Percentage (%)
1.	Ulnar nerve	360	77.58
2.	Common peroneal nerve	284	61.20
3.	Greater auricular nerve	62	13.36
4.	Median nerve	117	25.21
5.	Radial nerve	132	28.44
6.	Radial cutaneous nerve	63	13.57
7.	Sural nerve	32	6.89

Total number and percentage is more than 100 due to multiple nerve involvement in same patient.

while 96 (59.25%) had lesions suggestive of type 2 reactions.

History of contact was elicitable in 48 (10.34%) of total patients. The contacts included were household contacts (7.75%) and neighbourhood contacts (2.58%). The status of contact either multibacillary or paucibacillary was not available from the records.

Discussion

India has been successful in controlling leprosy and eliminating it at public health level (below 1/10,000 of population). Despite that l in post elimination era, new cases leprosy continued to be reported from different parts of India. The most recent studies or reports also indicate that leprosy is still not eliminated in all districts. A retrospective study was done by Mehta et al (2009) to compare the number of new cases of leprosy detected in the pre-elimination phase (2004-05) and in the post elimination phase (2006-07) which showed an increased number of cases being detected in the post elimination phase. Leprosy itself is not difficult to treat but there are some unique characteristic associated with this disease, which makes a need for special attention.

Out of 464 patients in our study group, majority of patients 222 (47.84%) belonged to the age group of 20-39 yrs i.e. productive phase of life in both sexes. Similar observations were also made by other researchers (Veena 2008, Relhan et al 2016, Kulkarni 2016, Hazarika et al 2017). Increased incidence in this group indicates vulnerability because of greater mobility and increased opportunity for contact in big population. In addition, these group having selfmotivation for health seeking behaviour.

Nevertheless, leprosy in young patients points towards endemicity of the disease. It is well known that disease occurrence in leprosy is often related to age at detection rather than age at the onset of disease.

Male preponderance as seen in our study also found in other studies (Rizvi et al 2015, Kadam et al 2016, Relhan et al 2016, Hazarika et al 2017). This can be explained as a fact that males go for outdoor work more as compared to female, thus more exposure and higher chance of getting the infection. There is also difference in health seeking behaviour of male and female. However, in a study by Suri et al (2014) almost equal incidence was observed in both sexes. Practically no difference is noted when the opportunity for contact remains the same (Chaturvedi 1984).

The percentage of childhood leprosy in the current study was 5.60%. The percentage reported in earlier studies were 7.59% by Relhan et al (2016) and 10.2% by Tiwary et al (2011). Thus, proportion of childhood leprosy was slightly on lower side, however, it is not certain if this is due to treatment seeking behaviour of people. In our study there is rising proportion of female patients and declining trend in childhood leprosy. This could be due to females being the closest contacts of the children and now a day's female came forward for treatment due to increased female literacy and changing social customs. Tiwary et al (2011) also found there is negative correlation between proportion of female patients and childhood leprosy. The high childhood leprosy percentage is an indicator of active disease transmission in the community and deserves special attention.

In the present study the disease was most common among the farmers 120 (25.86%) followed by labourers 82 (17.67%). Giridhar et al (2012) found maximum number of cases were labourers (34.6%) followed by service employee (29.6%). Swarnakumari et al (2015) found the disease was most common among the coolies (43.81%) followed by agricultural labourer (9.8%). This is again as observed earlier due to the factors like low economic status, which is associated with illiteracy, overcrowding, poor personal hygiene and malnutrition in agricultural workers and labours. In addition, there are more exposures in labours.In our study, maximum numbers of patients are in borderline spectrum (BT+BB+BL) with major proportion of of BT cases. This was similar to the observations made by Chhabra et al (2015), Swarnakumari et al (2015), Bajjaragi et al (2012), and Jindal et al (2009) found clinically maximum cases were LL. Percentage of lepromatous cases was also more common in study conducted at Udaypur in 2015. In present study, number of lepromatous leprosy patients was not highest but still alarming because it is just followed by BT. Increased population of LL indicates either immunologically depressed population or delay in approach to treatment. The less number of patients in TT and IL may be due to misdiagnosis or spontaneous regression with good CMI. Late presentation of tuberculoid cases automatically leads to detection of more patients in BT and BB group thus increasing borderline spectrum. Incidence of Histoid leprosy was slightly higher in our study (3.87%) as compared to study done by Kaur et al (2003) (1.8%). Further, detection of Histoid leprosy cases requires expertise and also the bacilliary load being very high in these patients so, they become potential reserviour of infection in the community (Palit and Inamdar 2007). A total of 34.91% patients reported signs of reactions compared with others such as 34.9% (Singal and Sonthalia 2013), 37.4% (Chhabra et al 2015) and 23.4% (Relhan et al 2016) have reported such high rates Thakkar and Patel (2014) had a lower percentage (9.6%). In our study incidence of T2R

were higher than T1R. Almost similar results were reported by Tiwary et al (2011), Jindal et al (2009), Singh et al (2013) and Increased incidence of T2R can be explained on the basis of increased proportion of lepromatous leprosy. With regard to the recurrences single episode was more common in type I reaction and multiple episodes in type II reaction. It is very essential to recognize reactional leprosy irrespective of the type of reaction. This is because the patients with type I reaction are more prone for deformities, whereas the patients with type II reaction are more prone for systemic complications.

In the present study, 172 (37.06%) patients were found to be suffering from various types of deformities/disabilities, as compared to other studies 54.47% by Jindal et al in (2009), 26.5% by Relhan et al (2016) and 8.10% by Kulkarni (2016). Another study by Kadam et al (2016) found that none of none of the patients had deformity. National figures also show overall grade 2 disability rates of lower than 5% (NLEP 2016-17). Reasons behind these deformities might be late diagnosis, multibacillary disease due to high bacilliary load, improper/ inadequate treatment of reactions/ neuritis and lack of proper counselling. Jindal et al (2009) also found, if MB ratio is high, one does expect higher deformity rates too. Proportion of type 1 deformities was lower than type 2 deformities also seen in study done by Tiwary et al (2011) and Relhan et al (2016). The higher rate of grade 2 deformity could be correlated with higher prevalence of multibacillary cases, multiple nerve thickening, high rate of leprae reaction and delayed diagnosis. The prevalence of grade 2 deformity is one of the most widely used epidemiological indicators to measure the progress of the national leprosy eradication programme as it is visible and can be reliably measured. However, in some studies proportion of type 1 deformities was higher than type 2 deformities (Jindal et al 2009). It is clear that these proportions will vary from area to area, also in different hospital settings and it will be important to focus on community based studies.

In our study, nerve involvement is seen in almost every patients. Multiple nerve thickening is seen in most of the cases. Ulnar nerve (360, 77.58%) was the most commonly affected nerve. Almost similar finding obtained by Relhan et al (2016) and Kadam et al (2016). History of contact present in 10.34% patients (including household contact and neighbourhood contact) but status of contact (PB/MB) was not available from record. Previous studies have reported percentage of household contact as 6.19% by Relhan et al (2016), 5.9% by Jindal et al (2009), 9.2% by Chhabra et al (2015) and 4.8% by Kadam et al (2016). The risk of transmission of leprosy increases upto 9 times in intrafamilial contact. This fact makes the screening of family members of leprosy patients essential. In our study, the percentage of multibacillary cases was higher than paucibacillary cases. This is similar to the findings reported by several others (Mathan and Devan 2016, Mohite and Dugavale 2011, Relhan et al 2016), Tiwary et al 2011). The possible reasons for this could be, in contrast to active case, detection where in cases are detected early, voluntary reporting to health facility occurs late when the disease is relatively advanced and begins to bother individuals. Thus, proportion of multibacillary is an indicator of delayed diagnosis. So again, there is need for active case detection, improving health education and keeping high index of suspicion by the healthcare professional. The proportion of MB cases is an important epidemiological indicator of performance of programme, further MB leprosy cases are considered more infectious and more responsible for disease transmission.

However, in some studies proportion of paucibacilliary has been reported to be higher than multibacillary (Giridhar et al 2012, Suri et al 2014). It is understood that there will be variations from area to area depending upon the control of leprosy in that region.

This difference can be attributed to regional variation and different socioeconomic and immune status in studied population. All multibacillary patients had a positive slit-skin smear, which highlights the importance of this test as a valuable tool for aiding in diagnosis beside histopathology. In our study, cases from rural area were higher than cases from urban area. Similar results obtained by Giridhar et al (2012), Kulkarni et al (2016) and Kadam et al (2016). In rural residency patterns there is concept of living get together along with social gathering which may promote transmission of disease also there is illiteracy, poor health services and communication gap. As such rural population is more than urban in Bihar and India, further larger number may be coming to our Tertiary Care Centre for seeking treatment due to complications like reactions/ disabilities.

Conclusion

Early diagnosis and complete treatment is the cornerstone of leprosy control because it prevents transmission of disease as well as deformities. However, this is happening, as the number of cases having deformities getting downfall but on another side cases of lepromatous leprosy is getting rise. Our study points out to the fact that the proportion of multibacillary cases is still highand deserves attention as elimination of leprosy is highly aimed at the present juncture. Hence, it is imperative to have in depth knowledge and clarity regarding the diagnosis and classification of leprosy cases especially at the field level. After leprosy was no longer considered as a public health problem, its services has been integrated into the general health system. Still some high endemic pockets of leprosy may continue to persist in India. In such a scenario the main principles of leprosy control should be :

1. Locate these high endemic pockets, and upgradation of PHC for early diagnosis and complete treatment along with proper management of Reactions and Deformities.
2. Better health education for increasing the awareness about Leprosy. In addition, issues relating to stigma, discrimination and rehabilitation need to be tackled in a more integrated and inclusive manner.

Main limitation of our present study is its being based the retrospective analysis of only 2 years reporting to a Tertiary care Centre. So further studies are required to gain in depth knowledge regarding disease spectrum and profile as well as other deterimants of leprosy in the community from where these cases came from. Such information will help in better planning for preventive measures, early diagnosis and management.

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