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**Original Research Article**

# Resurgence of leprosy in post elimination era

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## ABSTRACT

**Background:** Leprosy is a slowly progressive mildly infectious disease caused by *Mycobacterium leprae* primarily affecting skin and peripheral nerves. After introduction of multidrug therapy in the country recorded leprosy case load has come down. In December 2005, India announced elimination of leprosy as public health problem at national level under the NLEP but new cases are still being registered.
**Methods:** It was a hospital based cross sectional study conducted on over 109 leprosy patients attending a tertiary care hospital in Narhe, Pune during the period from 1st January 2018 to 31st December 2018. The statistical package for Social Sciences (SPSS) for Windows version (16.0) was used to analyze the data (SPSS Inc., Chicago, IL). Statistical significance was declared at $p<0.05$ or mentioned otherwise.
**Results:** Out of 109 patients, 57 were new and 52 were old. Maximum patients belong to age group 40-49 years, 25 patients had type 1 reaction and 18 had type 2 reaction. Out of which 83 were on treatment and 12 are defaulter, 9 were in relapse, 6 patients released from treatment.
**Conclusions:** In post elimination era of leprosy still new cases have been registered and hence the burden and morbidity of the disease is still high in the community. It strongly suggests that by early detection, increasing the duration of treatment and by increasing the community awareness, utilizing information, education and communication at all levels, we can hope to reduce the burden of disease in the community and to achieve the dream of leprosy free India.

**Keywords:** Leprosy, Post elimination era, Multidrug therapy

## INTRODUCTION

Leprosy also referred as Hansen's disease is a slowly progressive, mildly infectious disease caused by *Mycobacterium leprae*. It is the oldest disease entity affecting human being. It mainly affects the skin, peripheral nerves, mucosa of the upper respiratory tract, and the eyes but it can affect any organ or tissue in the body.[1,2] *Mycobacterium leprae* an acid fast rod shaped bacillus which was discovered by Gerhard Henrik Armauer Hansen in 1873 in Norway.[3,4]

Leprosy is considered important mainly because of its potential to cause permanent and progressive physical deformities with serious social and economic consequences. Leprosy can occur in all ages ranging from early infancy to very old age. There are numerous social factors which favors the spread of the disease in the community such as poverty and poverty related circumstances (e.g., overcrowding, poor housing, lack of education, lack of personal hygiene).[5]

Leprosy can be classified as paucibacillary (PB) in which 1 to 5 skin lesions are present with decreased or loss of sensation or only one nerve is involved. Where as in multibacillary (MB) more than 5 skin lesion are present with decreased or loss of sensation or 2 or more nerves are involved.[6]

Ridley Jopling classified leprosy clinically into tuberculoid tuberculoid (TT), borderline tuberculoid (BT), mid borderline (BB), borderline lepromatous (BL) and lepromatous leprosy (LL) type.[7,8]

India has achieved the goal of elimination of leprosy with prevalence rate of <1/10,000 population by the end of December 2005. But still India shares more than half of the total global leprosy burden till date. Total 219075 new leprosy cases detected world-wide in 2011. India contributed to 58.1% of the global disease burden.[9] The most relevant epidemiological measure of the burden of leprosy is the incidence of disease, because incidence is difficult to measure directly, the 'case detection rate' should be used as proxy for incidence rate. One of the strategies adopted to minimize the leprosy burden has been to reduce the Annual new case detection rate (ANCDR) to <10/100000. The ANCDR of India as a whole has reduced by only 0.42% between 2007 and 2012, in 2014 the new case detection rate in India was 0.99/10,000.[10]

In spite of introduction of multidrug treatment since last 30 years burden of leprosy have not declined as expected, Still the new cases has been reported.[11]

In view of the above we conducted this study to assess and analyze the scenario of the burden of the disease in post leprosy elimination era. Objectives of the study was to identify new leprosy cases amongst the patient attending outpatient department, to study the burden of disease by assessing the old leprosy cases who are on treatment, completed the treatment or defaulters and to study the clinical profile of leprosy patients in post leprosy elimination era.

## METHODS

This was a cross sectional study conducted on 109 leprosy patients who were attending to dermatology outpatient department of a tertiary care hospital in Narhe, Pune over a period of one year from 1st January 2018 to 31st December 2018. The study included all leprosy patients reporting to hospital and excluded those patients who are not willing to participate in the study. New as well as old leprosy patients were enrolled for the study. All patients received appropriate treatment. The statistical package for Social Sciences (SPSS) for Windows version (16.0) was used to analyze the data (SPSS Inc., Chicago, IL). Statistical significance was declared at $p<0.05$ or mentioned otherwise

After obtaining institutional ethical committee approval 109 willing leprosy patients were enrolled. Written informed consent was obtained from all patients and relevant data such as name, age, sex, occupation, address, duration of disease etc were recorded. A detailed clinical history was taken and clinical examination was done with reference to size, shape, number, distribution, location, extent of the lesion, nerve function impairment and deformities. Skin biopsy and slit skin smear examination for acid fast bacilli were performed. After clinico-histopathological correlation, patients were classified and data was analyzed. Patients were classified according to Ridley Jopling classification and in addition to it in pure neuritic (PN) and histoid leprosy (HL).[7,8]

## RESULTS

In our study total 109 cases of Hansen's disease were enrolled over a period of 1 year.

### *Age distribution*

In the present study, out of 109 patients the youngest patient was 6 years old and the eldest was 80 years. The maximum number of patients in this study belonged to the 40-49 years age group whereas the least number of patients i.e., 3 were belonged to the less than 10 years and more than 70 years age groups (Table 1).

**Table 1: Distribution of patients according to age.**

| Age (in years) | TT | BT | BB | BL | HL | LL | PN | Total N (%) |
|---|---|---|---|---|---|---|---|---|
| **Less than 10** | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 3 (2.8) |
| **10-19** | 0 | 5 | 0 | 1 | 0 | 1 | 1 | 8 (7.3) |
| **20-29** | 5 | 11 | 0 | 4 | 0 | 1 | 0 | 21 (19.3) |
| **30-39** | 0 | 7 | 1 | 5 | 0 | 4 | 0 | 17 (15.6) |
| **40-49** | 0 | 16 | 0 | 5 | 1 | 1 | 1 | 24 (22.0) |
| **50-59** | 0 | 8 | 0 | 3 | 3 | 2 | 0 | 16 (14.7) |
| **60-69** | 1 | 9 | 0 | 3 | 2 | 2 | 0 | 17 (15.6) |
| **>70** | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 3 (2.8) |
| **Total** | 6 | 59 | 1 | 22 | 6 | 13 | 2 | 109 |

Tuberculoid leprosy (TT), borderline tuberculoid leprosy (BT), borderline borderline leprosy (BB), borderline leprosy (BL), histioid leprosy (HL), lepromatous leprosy (LL) and pure neuritic leprosy (PN).

***Distribution of patients according to occupation***

Maximum number of patients 37 (33.9%) were found to be labourer. The next common was farmers 36 (33%). In both the occupations, maximum number of patients were observed are of BT leprosy i.e., 19 (Table 2).

***Distribution of patients according to residence***

Out of 109 patients, majority of patients are from different states of Maharashtra i.e., 95 (87.2%), followed by Uttar Pradesh (5.5%) and Hyderabad (3.7%) (Table 3).

**Table 2: Distribution of patients according to occupation.**

| Occupation | TT | BT | BB | BL | HL | LL | PN | Total N (%) |
|---|---|---|---|---|---|---|---|---|
| **Driver** | 0 | 4 | 0 | 2 | 0 | 1 | 0 | 7 (6.4) |
| **Farmer** | 1 | 19 | 0 | 8 | 3 | 5 | 0 | 36 (33.0) |
| **Housewife** | 1 | 9 | 0 | 3 | 1 | 3 | 0 | 17 (15.6) |
| **Labourer** | 3 | 19 | 0 | 8 | 2 | 4 | 1 | 37 (33.9) |
| **Mechanic** | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 (0.9) |
| **Shopkeeper** | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 2 (1.8) |
| **Student** | 1 | 7 | 0 | 0 | 0 | 0 | 1 | 9 (8.3) |
| **Total** | 6 | 59 | 1 | 22 | 6 | 13 | 2 | 109 |

Tuberculoid leprosy (TT), borderline tuberculoid leprosy (BT), borderline borderline leprosy (BB), borderline leprosy (BL), histioid leprosy (HL), lepromatous leprosy (LL) and pure neuritic leprosy (PN).

**Table 3: Distribution of patients according to residence.**

| Residence | TT | BT | BB | BL | HL | LL | PN | Total N (%) |
|---|---|---|---|---|---|---|---|---|
| **Chhattisgarh** | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 (0.9) |
| **Hyderabad** | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 4 (3.7) |
| **Madhya Pradesh** | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 (0.9) |
| **Maharashtra** | 5 | 51 | 1 | 19 | 6 | 11 | 2 | 95 (87.2) |
| **Orissa** | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 (0.9) |
| **Patna** | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 (0.9) |
| **Uttar Pradesh** | 0 | 4 | 0 | 2 | 0 | 0 | 0 | 6 (5.5) |

Tuberculoid leprosy (TT), borderline tuberculoid leprosy (BT), borderline borderline leprosy (BB), borderline leprosy (BL), histioid leprosy (HL), lepromatous leprosy (LL) and pure neuritic leprosy (PN).

***New or old cases***

Out of 109 patients, 57 (52.3%) were new cases studied during the study; while 52 (47.7%) were found to be old cases.

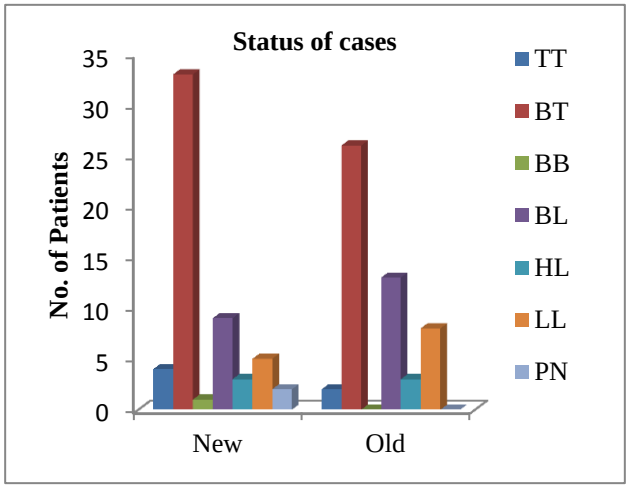


**Figure 1: New and old patients.**

In both the cases, numbers of BT leprosy patients were observed to maximum i.e., 33 new and 26 old cases respectively (Figure 1).

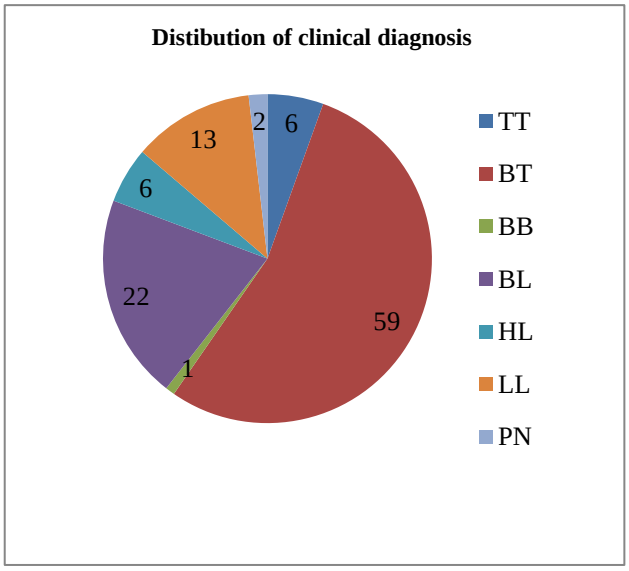


**Figure 2: Type of leprosy.**

***Type of leprosy***

Out of 109 patients 59 (54.1%) were BT, 22 (20.2%) BL, 6 (5.5%) TT, 6 (5.5%) HL, 13 (11.9%) LL, 1 (0.9%) BB and 2 (1.8%) PN (Figure 2).

***Type of lepra reaction***

In a total of 109 patients, 25 patients (22.9%) had type I reaction which was seen in 20 BT patients i.e., (80.0%); 4 BL patients i.e., (16.0%) and 1 HL patient i.e., (4.0%). Total 18 patients (16.5%) had type 2 lepra reaction i.e., in 8 patients of BL (44.4%); 8 patients of LL i.e., (44.44); 1 patient of BT and HL (5.56%) respectively (Figure 3).

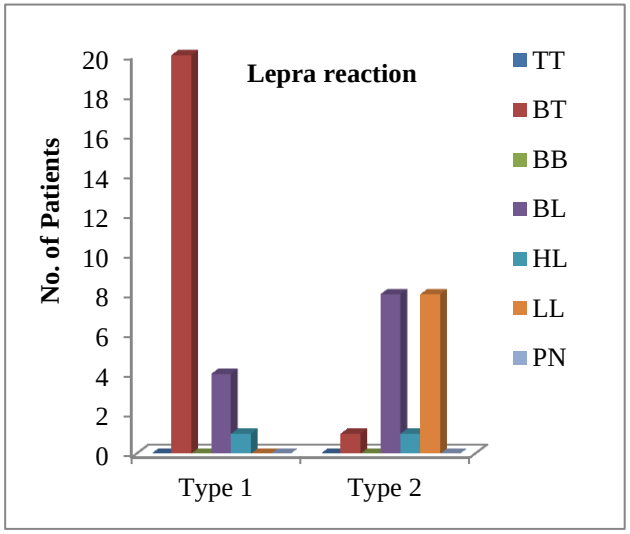


**Figure 3: Type of leprae reaction.**

***Duration of disease among patients***

Maximum number of patients 42 (38.5%) in this study had the duration of less than 1-5 years, lowest number of patients were observed in the duration of more than 10 years i.e. 4 (3.7%). BT leprosy patients were found to be more in all the groups of time duration of disease (Table 4).

***Paucibacillary or multibacillary***

Total number of patients 19 (17.4%) in this study had the PB leprosy type of skin lesions during the disease, while 90 patients (82.6%) were observed to be with MB leprosy type of skin lesions (Table 5).

***Type of deformities***

Out of 109 patients that were studied, amongst patients of BT trophic ulcers were found to be in 16 (14.6%) and claw hand in 15 (13.7%).

In BL, 5 (4.58%) patients were having ulcer and 4 (3.66%) with claw hand. Amongst LL, 4 (3.66%) patients had claw hand, and several other deformities like madarosis, leonine facies, lagopthalmos and anesthesia along nerves were also observed in some of the patients (Figure 4).

***Defaulter or relapse***

Out of 109 patients, 12 (11.0%) were defaulters. Total 6 patients (5.5%) were successfully released from treatment (Figure 5).

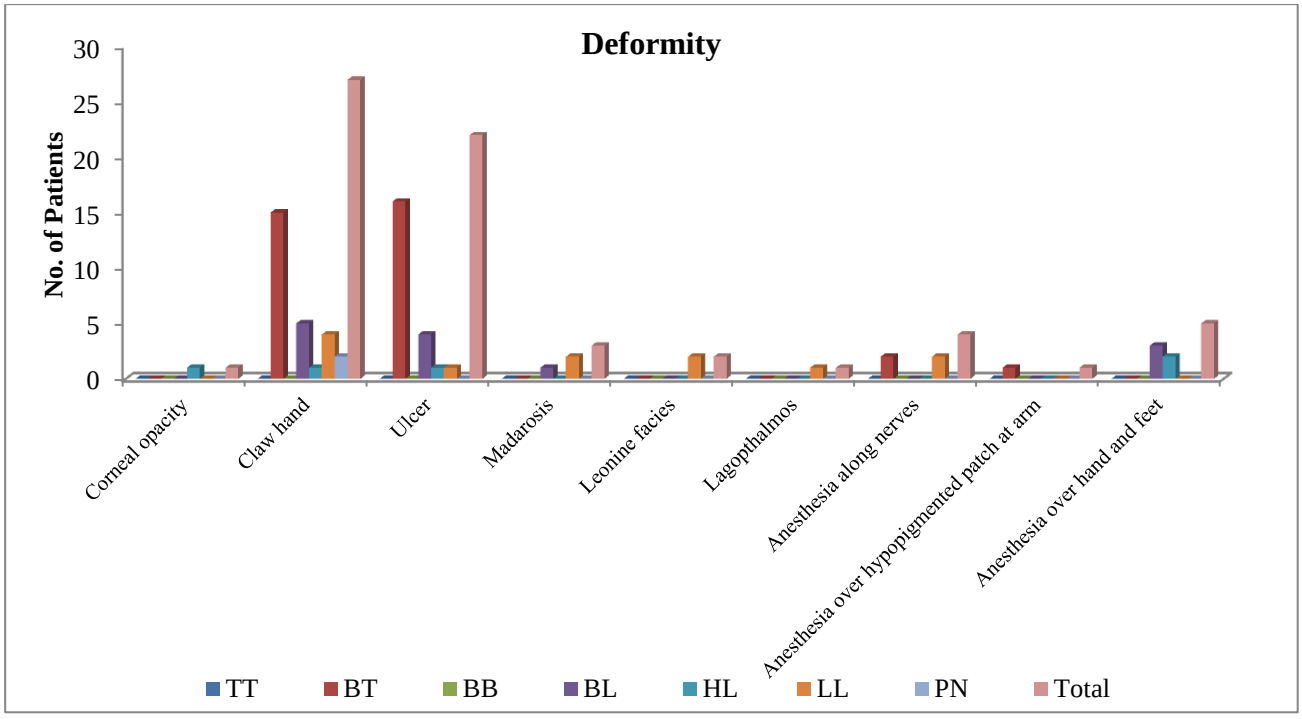


**Figure 4: Type of deformities.**

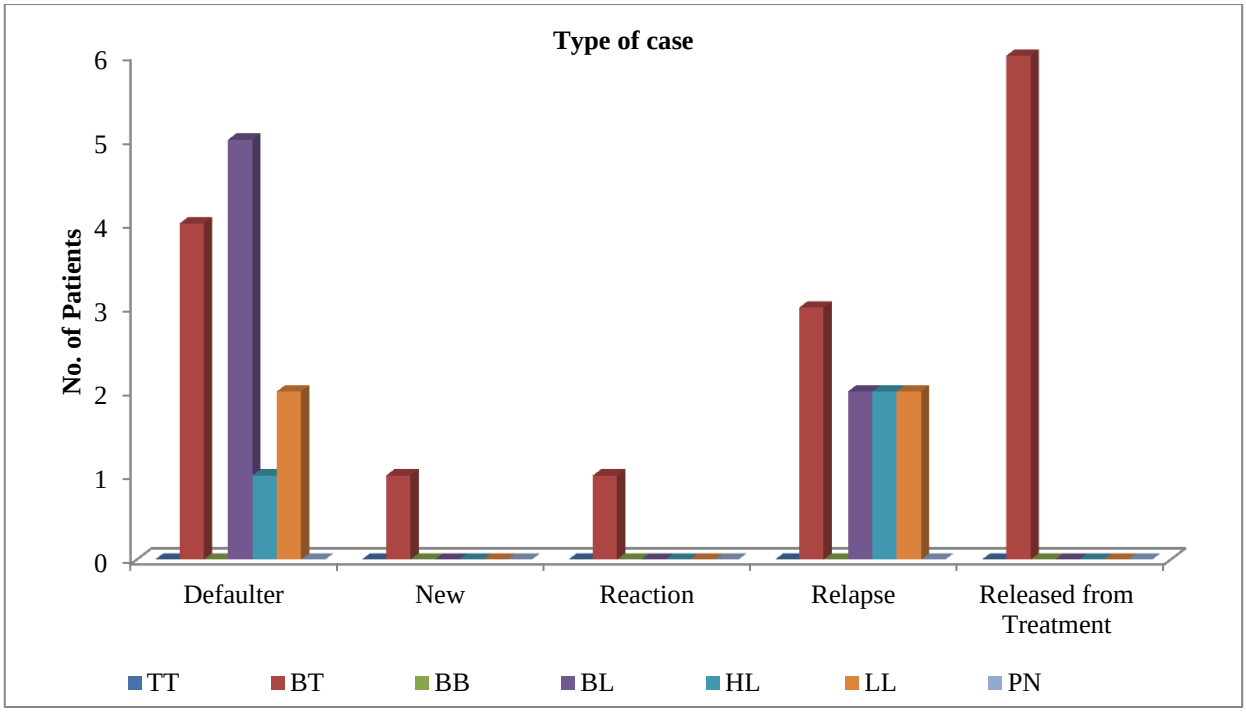


**Figure 5: Type of cases.**

**Table 4: Duration of disease among patients.**

| Duration | TT | BT | BB | BL | HL | LL | PN | Total N (%) |
|---|---|---|---|---|---|---|---|---|
| **<6 months** | 2 | 18 | 1 | 7 | 3 | 5 | 0 | 36 (33.0) |
| **6-11 months** | 2 | 16 | 0 | 4 | 1 | 2 | 2 | 27 (24.8) |
| **1-5 years** | 2 | 21 | 0 | 11 | 2 | 6 | 0 | 42 (38.5) |
| **6-10 years** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 (0.0) |
| **>10 years** | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 4 (3.7) |

Tuberculoid leprosy (TT), borderline tuberculoid leprosy (BT), borderline borderline leprosy (BB), borderline leprosy (BL), histioid leprosy (HL), lepromatous leprosy (LL) and pure neuritic leprosy (PN).

**Table 5: Pauci or multi bacillary leprosy.**

| PB/MB | TT | BT | BB | BL | HL | LL | PN | Total N (%) |
|---|---|---|---|---|---|---|---|---|
| **Paucibacillary leprosy (PB)** | 5 | 13 | 0 | 0 | 0 | 0 | 1 | 19 (17.4) |
| **Multibacillary leprosy (MB)** | 1 | 46 | 1 | 22 | 6 | 13 | 1 | 90 (82.6) |

Tuberculoid leprosy (TT), borderline tuberculoid leprosy (BT), borderline borderline leprosy (BB), borderline leprosy (BL), histioid leprosy (HL), lepromatous leprosy (LL) and pure neuritic leprosy (PN).

## DISCUSSION

The global leprosy situation has changed over last four decades after the introduction of multidrug therapy in 1982 with reduction of prevalence rate to less than 1/10000 by the end of 2005 in India. Although there has been significant reduction in prevalence, new cases continued to arise indicating continued transmission. Thus eradication of leprosy is a distant dream which demands relentless research. Still *Mycobacterium leprae* is not cultivable on artificial media and there is no effective vaccine. More studies and research should be done to develop new tools against leprosy.

### *Age distribution*

In the present study, the youngest patient was 6 years old and the eldest was 80 years. 3 were below 10 years of age. This finding is similar to the study conducted by Swarnakumari et al and Nair.[12,13]

In our study the maximum number of patients belonged to the age group 21-50 years. Similarly Swarnakumari et al, Santram et al, Samuel et al and Singh et al found the disease to be more common in the age group 21-40 years.[12-16] Thus the age incidence observed in the present study correlates well with the other studies.

***Sex distribution***

There were 78 males (85.02%) and female patients were 31 (14.98%). The male to female ratio was around 6:1. Santram et al and Swarnakumari et al also reported similar findings that 80% of males and 20% of females were affected by disease. Male preponderance could be attributed to their greater mobility and health seeking behavior.[12,14]

***Occupation***

Maximum number of patients 37 (33.9%) were labourers. The next common was farmers 36 (33.0%). Ankad et al and Swarnakumari et al also reported similar findings with higher incidence of leprosy among manual labourers and agricultural workers.[12,17] This is attributable to factors like low socioeconomic status, illiteracy, overcrowding, poor personal hygiene and malnutrition.

***Residence***

Majority of patients were from different parts of Maharashtra i.e., 95 (87.2%), followed by Uttar Pradesh (5.5%) and Hyderabad (3.7%). Migration for employment from the pockets with high leprosy transmission may increase the transmission in other areas.

***New or old cases***

Out of 109 patients, 57 (52.3%) were new cases; while 52 (47.7%) were old cases. Patients who were diagnosed for first time during the study and never exhibited any leprosy treatment were labelled as new cases. Whereas previously diagnosed patients either on treatment or released from treatment were labelled as old cases.

***Type of leprosy***

Out of 109 patients 59 (54.1%) were diagnosed as having BT, followed by 22 (20.2%) as BL, 6 (5.5%) TT, 6 (5.5%) HL and 13 (11.9%) LL. The BB and PN patients were found to be minimum 1 (0.9%) and 2 (1.8%) respectively. Swarnakumari et al found that 52.57% were BT, 6.70% as BL, 11.85% as LL, 1.54% as BB, 1.54% as IL.[12] Arora et al found BB and BL in 45% of patients, BT 27.5%, LL in 15.5%, pure neural in 9% and 1.3% in IL and TT patient.[18] Thus clinical types of leprosy observed vary form study to study and place to place. In present study borderline tuberculoid (BT) leprosy found to be the most common disease entity.

***Type of lepra reaction***

In a total of 109 patients 43 (39.4%) had lepra reactions, 25 patients (22.9%) had type 1 lepra reaction and 18 patients had (16.5%) type 2 lepra reaction. Out of 25 patients suffering from type 1 lepra reaction 20 patients were BT (80.0%), 4 BL (16.0%) and 1 HL (4.0%). Out of 18 patients of type 2 reaction 8 were BL (44.4%), 8 were LL (44.44), 1 of BT (5.56%) and HL (5.56%) each. Arora et al found the reaction in 34% of their patients and type 1 reaction was significantly more compared to type 2 lepra reaction.[18] Swarnakumari et al found 8 (4.12%) patients out of 194 had type 1 lepra reaction out of which 7 were BT and 1 was BB patient and 10 (5.2%) had patients had type 2 lepra reaction out of which 8 were LL and 2 were HL.[12]

It is very crucial to identify leprosy reactions early irrespective of the type to minimize complications. As the patients with type 1 reaction are more prone for deformities which are responsible for stigmata attached to leprosy. Whereas the patients with type 2 reaction may develop systemic complications like iritis, episcleritis, dactylitis, epididymoorchitis, acute glomerulonephritis nerve pain, bone pain, pain in joints. Patient education is of paramount importance in management of leprosy reactions.

***Duration of disease among patients***

In our study out of 109 patients 63 (57.8%) reported within 1 year of the disease and 36 (33%) patients presented within initial 6 months. Further 42 (38.5%) reported late during 1 to 5 years and 4 (3.7%) reported even later after 10 years of the disease onset.

Swarnakumari et al reported duration of illness by the time of presentation was less than 6 months in 49.5%, 6-11 months in 20.6% of patients and 1-5 years in 26.3% patients.[12] Wim et al found the duration of disease to be up to 6 months in 30%, 7-12 months in 32%, 13-24 months in 17%, 25-36 months in 9.3 %, 37-60 months in 6.3% and more than 60 months in 5.4%.[19]

Early diagnosis and prompt treatment of leprosy is very crucial step towards leprosy elimination by decreasing disease transmission in community.

***Paucibacillary or multibacillary***

We observed 90 (82.6%) were MB type whereas 10 (17.4%) were PB type patients. Alahi et al also reported an increasing trend in MB leprosy out of 64 patients they observed 45 (70.31%) were MB type of leprosy and 19 (26.9%) as PB type.[9] The high incidence of MB leprosy cases poses a challenge to the leprosy elimination programme. They not only serve as a reservoir but also actively transmit the disease.

***Types of deformity***

Claw hand 27 of 109 (24.8%) and trophic ulcers 22 of 109 (20.2%) were the commonest deformities observed in our study. Other deformities encountered were corneal corneal opacity (0.9%), madarosis (2.8%), leonine facies (1.8%), lagopthalmos (0.9%), anaesthesia along nerves (3.7%), anaesthesia over patches (0.9%), anaesthesia over hands and feet (4.6%). Total 66 of 109 (60.5%) had

deformities. Among types of leprosy BT patients had highest deformities 34 (31.1%), 13 (11.9%) BL, 12 (11%) LL, 5 (4.5%) HL, 2 (1.8%) PN patients had deformities. Swarnakumari et al found 58 (29.9%) patients who showed deformities in the form of claw hand followed by, foot drop, trophic ulcer.[12]

***Defaulter or relapse***

Out of 109 patients, 12 (11.0%) were defaulters and 9 (8.3%) were in relapse. Total 6 patients (5.5%) were released from treatment. Patients was classified as defaulter if the scheduled 6 month treatment for PB leprosy is not completed in 9 months and 12 months treatment for MB leprosy is not completed in 18 months. Those who reported with in the period of 1-5 year of completing the treatment considered as relapse.

The reason for defaulting or non-adherence varied like social stigma, ignorance, initial improvement, communication gap with health system and financial constraints.

***Limitations***

Hospital based small sample size study. Incidence and prevalence cannot be calculated from study.

## CONCLUSION

Leprosy is a chronic infectious disease caused by *Mycobacterium leprae* which usually affects the skin and peripheral nerves. The disease is characterized by long incubation period ranging from months to years. Leprosy is a leading cause of permanent physical disability. Timely diagnosis and treatment of cases, before nerve damage has occurred, is the most effective way of preventing disability due to leprosy. Burden of leprosy is significant and there is continuous transmission as indicated by new cases. Post elimination in December 2005 focus has shifted away from the disease. Therefore we decided to conduct this study to assess the post elimination scenario. Though the burden of leprosy is declining globally, India is a major contributor to the disease load. In our opinion fixed duration of treatment is inadequate. Multibacillary and smear positive patients should be treated longer. Bacillary load and clinical examination should guide the duration of treatment. Target of leprosy treatment should be scaled beyond interruption of the disease transmission. A joint effort of public and private health care system is need of the hour to eradicate leprosy from the globe.

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