

## Clinico-Epidemiological Study of Untreated Multibacillary Leprosy Patients Visiting a Tertiary Care Hospital in Madurai

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India had attained elimination of leprosy as public health problem at the national level in December 2005. Despite this, there has been an increasing occurrence of new multibacillary (MB) cases of leprosy at several centres and areas. This study was undertaken to assess the clinical and epidemiological parameters of such cases as these are considered to be much more important because of their known higher infectivity and morbidity. A total of 61,080 new outpatients attended the Dermatology Department in a Tertiary Care centre in Madurai for a period of one year (August 2015 to July 2016). There were 172 leprosy patients undergoing treatment in this period and of these 97 were newly detected cases of leprosy. Of the 97 new patients, 67 (69%) patients were found to have multibacillary (MB) leprosy whereas remaining 30 were of paucibacillary (PB) type. These newly diagnosed were investigated for clinical profile, AFB positivity and epidemiological parameters. It was found that borderline tuberculoid (BT) cases were the majority with 41 patients (61.1%) followed by 12 patients (17.9%) with lepromatous leprosy and 7 patients (10.4%) BL types respectively. Other borderline groups were comparatively small. 25/67 (37.3%) were in reaction of which 23 (34.3%) and two (2.9%) had type 1 and type 2 reactions respectively. It was observed that the incidence of disabilities was very high (overall=35/67, 52.2%; 11.9% Grade 2 with one child also having Grade 2 disability) in our study population. About 41.8% of these patients were also smear positive. All these characteristics indicate delayed diagnosis. Of these 49 (73.1%) were residents of Madurai district. Further some patients from Dindigul, Virudhunagar, Sivaganga, Tirunveli and Thoothikudi were also there in the study group suggesting the need to improve the access and confidence in the services in these areas. Among the study population, 13.4% of patients had household contact suffering from leprosy in the family. Of the four children in our study three had traceable history of household contact with leprosy. Also a new untreated case of multibacillary leprosy was detected among the contacts during their screening. The possibility of undetected or untreated leprosy patients among the contacts or community emphasises the need of proper and periodic contact screening/periodic surveys to detect especially in the post elimination era. Community level studies in these geographical areas appear necessary.

**Keywords:** Leprosy, multibacillary, disability, contact, screening, elimination

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## Introduction

Leprosy is a chronic infectious disease caused by *Mycobacterium leprae*, which primarily affects the skin and the peripheral nerves. At the sub national level as well as in some districts endemic pockets are still encountered although elimination was achieved in December 2005 at the national level. Before 1997 the National Leprosy Eradication Programme (NLEP) was a vertical programme, centralised and activities like direct screening of communities were being performed by trained staff (Rao et al 2002). Since then, due to reduced incidence, the programme was integrated into state services and the case reporting is voluntary.

In the absence of active screening delay in diagnosis occurs and resultant untreated and unrecognised reservoirs in the community may increase. While some of paucibacillary (PB) cases may have role in transmission, multibacillary cases have higher potential of spreading disease. Due to the insidious onset and relatively asymptomatic nature of disease in these patients, the diagnosis is delayed. This is unfortunate as these patients have the highest infectivity, the potential to develop disabilities and life-long morbidity. Hence this study was undertaken by enrolling new multibacillary leprosy patients visiting our Tertiary Care Hospital in South Tamil Nadu for a period of one year in order to find out the trends of disease and epidemiological parameters among such patients.

## Materials and Methods

This was a prospective observational study conducted in the Department of Dermatology, Government Rajaji hospital, Madurai Medical College, Madurai during a period of one year from August 2015 - July 2016. Ethical clearance from the Ethical Committee of the college was obtained for the study. All the outpatients visiting

the department were screened for features suggestive of leprosy and the newly diagnosed multibacillary (MB) cases were included in the study.

The MB cases were defined according to National Leprosy Eradication Programme (NLEP) criteria as those with six or more skin lesions or more than one peripheral nerve involvement. The other patients with paucibacillary (PB) leprosy and those whose treatment were started before the period of study were excluded.

Informed written consent was obtained and a pre-set proforma was used to collect the needed details. This included the age, sex and locality of the patient with presenting complaints and duration of the same. Also the number of skin lesions, the nerve involvement, disabilities and reactional status was noted. While WHO (1998) classification of MB/PB as used by NLEP was used in the study for treatment purposes, these patients were also classified into clinical types as per criteria of Indian Association of Leprologists (IAL 1982). Disabilities were graded by criteria of WHO (Brandsma & van Brakel 2003). Slit skin smear examination for acid fast bacilli was also done. Further the screening of household contacts was carried out.

## Results

A total of 61,080 new patients of various diseases related to the skin attended the Department of Dermatology during a period from August 2015 to July 2016. A total of 172 leprosy patients also attended the outpatient department during this period. There were 75 patients already on treatment with a proportion of 43.6% of the total. Apart from them 97 new cases of leprosy were seen who did not give any history of taking anti leprosy treatment or drugs. These constituted 56.4% of the total leprosy patients. Of these 30 were PB and 67 were MB. All the 67 new MB

patients were included in the study. The MB proportion was thus 69% (67/97).

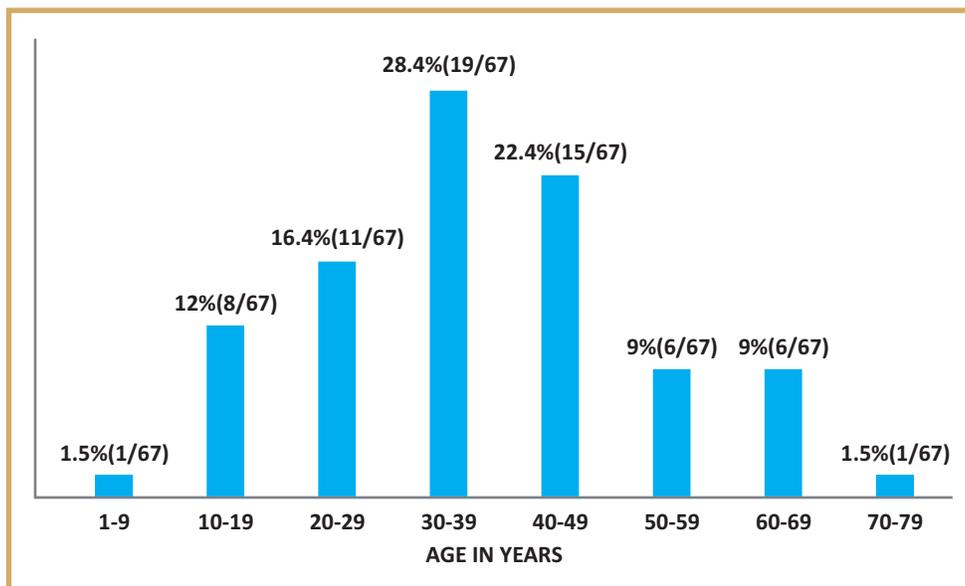
**District wise distribution of cases :** The district-wise distribution of the patients is shown in Table 1. Except for a migrant labourer from Orissa all patients were from Tamil Nadu. Of these 49 (73.1%) were residents of Madurai district. Few patients from Dindigul, Virudhunagar, Sivaganga, Tirunelveli, Thoothukudi districts also visited our OPD for treatment.

**Table 1 : District-wise distribution**

District	Number of patients/ Total patients (Percentage)
Dindugul	4/67 (6.0)
Tirunelveli	1/67 (1.5)
Madurai	49/67 (73.1)
Thoothukudi	1/67 (1.5)
Virudhunagar	3/67 (4.5)

**Age wise distribution :** Age wise distribution of cases is shown in Fig 1. It was observed that patients in the fourth decade of age were the most represented group with a total of 28.4% followed by 40-49 and 20-29 years age groups. There were 63 (94%) adults and four (6%) were children aged 14 years or below. Among the adults, 47 (74.6%) were males and 16 (25.4%) were females. Of the children only one was a male.

**Spectrum of disease :** On assessing the spectrum of leprosy among the newly diagnosed cases (Table 2), it was found that borderline tuberculoid (BT) cases were the majority with 41 patients (61.1%) followed by 12 patients (17.9%) with lepromatous leprosy and 7 patients (10.4%) BL types respectively. Other borderline groups were comparatively small (Table 2). A total of 62 patients (92.5%) had more than five skin lesions. All the other patients fulfilled the criteria of multibacillary leprosy by either having more than



**Figure 1 : Age-wise distribution of patients**

**Table 2 : Spectrum of disease among the study population**

Spectrum of disease	Number of patients/ Total patients (Percentage)
BT	41/67 (61.1)
BT-BB	1/67 (1.5)
BB-BL	3/67 (4.5)
BL	7/67 (10.4)
LL	12/67 (17.9)
BB	2/67 (3.0)
BL-LL	1/67 (1.5)

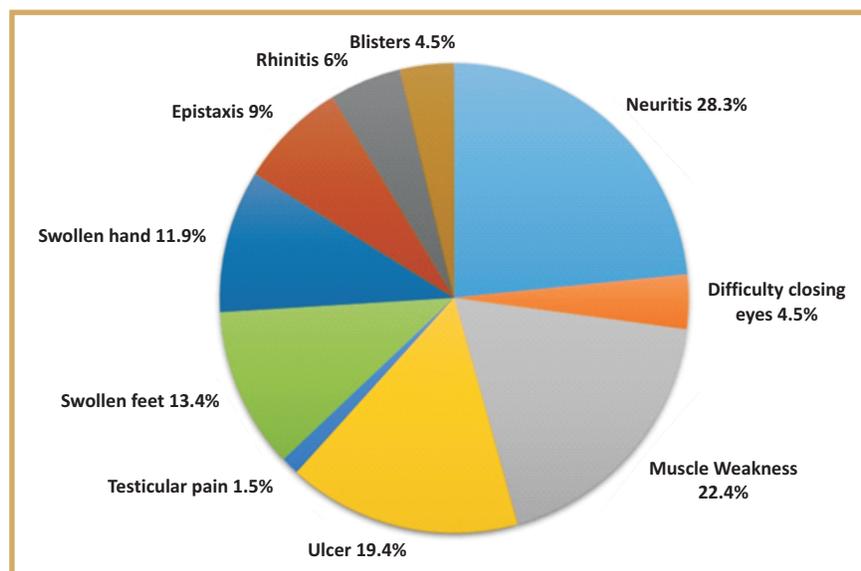
a single nerve trunk involvement or had positive slit skin smears.

**Reactions:** There were 25 patients (37.3%) in reaction of which 23 (34.3%) and two (2.9%) had type 1 and type 2 reactions respectively. One child presented with a type 1 reaction.

**Presenting Symptoms :** Among the presenting symptoms (Fig 2) 19 (28.3%) had neuritis, 15 (22.4%) had muscle weakness, 13 (19.4%) had ulcer, nine had swelling of the feet (13.4%), eight (11.9%) had swelling of hands, six (9%) had epistaxis, four (6%) had rhinitis, three (4.5%) each had blisters and history of difficulty in closing eyes and one (1.5%) had testicular pain.

**Nerve involvement :** On assessing the nerve involvement (Table 3), it was noted that 62 patients (92.5%) had some form of nerve involvement, with ulnar nerve being the most commonly involved (71.6%), followed by lateral popliteal nerve (58.2%), posterior tibial nerve (46.3%), sural nerve (41.8%) and radial cutaneous nerve (40.3%).

**Relationship among noticing some symptom, reporting for treatment and disabilities :** A total of 35 patients (52.2%) came for treatment within one year of onset of symptoms, while 26 (38.8%)



**Figure 2 : Presenting symptoms among the patients**

**Table 3 : Nerve involvement among the study population**

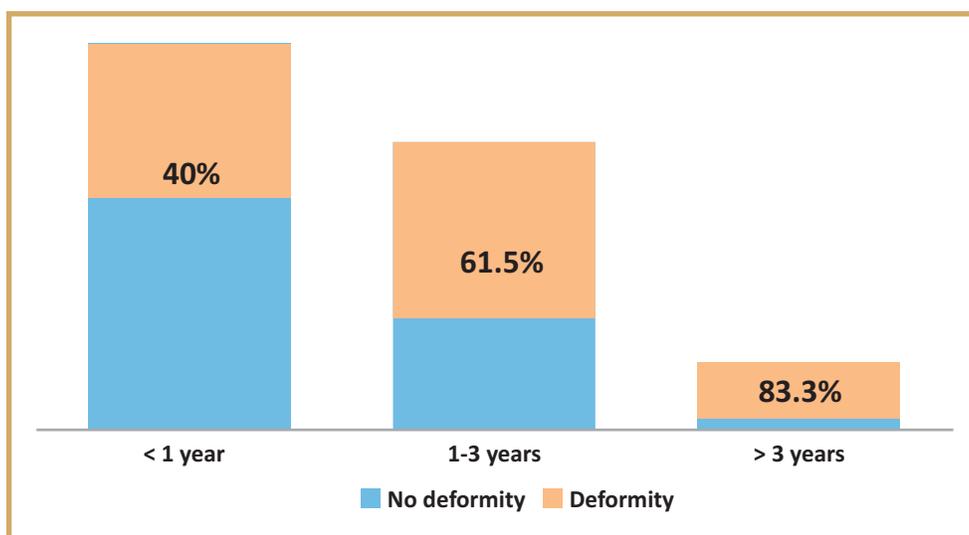
Nerve involved	Number of patients/ Total patients (Percentage)
Supratrochlear nerve	3/67 (4.5)
Supra orbital nerve	5/67 (7.5)
Infra orbital nerve	2/67 (3.0)
Facial nerve	3/67 (4.5)
Greater auricular nerve	11/67 (16.4)
Clavicular nerves	3/67 (4.5)

presented after one to three years of symptoms and six (8.9%) after three years of onset. Of the 32 patients presenting after one year of symptoms, 16 (50%) had BT leprosy and eight (25%) had lepromatous leprosy. While assessing the presentation among the individual spectra, it was found that 16 (39%) of BT patients presented after a year of symptomatic disease while eight (66.7%) of the 12 patients with lepromatous disease presented late.

A total of 35 patients (52.2%) presented with disabilities. There were 27 patients (40.3%) with Grade 1 disability and eight patients (11.9%) with Grade 2 disability. One child also had Grade 2 disability. The Eyes, Hands, Feet (EHF) scores of patients ranged from zero to 11. Of the 12 cases with lepromatous spectrum, nine (75%) had deformities while only 1 (43.9%) of the 41 BT cases had deformities. Fig 3 shows the relationship between duration of symptoms and presence of deformity. It was observed that there was clear relationship between duration of symptoms and disability rates. Among the patients presenting late, deformities were seen in greater numbers. Also 15 (60%) of the 25 patients in reaction had deformities.

**AFB positivity :** Of the 67 patients, 28 (41.8%) had skin slit smears positive for AFB. Of the 41 BT patients eight were smear positive.

**Contact tracing :** As regard to contacts of patients, nine (13.4%) patients could be traced to a household contact of leprosy. Of these one patient had two positive leprosy cases in her



**Figure 3 : Relationship between duration of symptomatic disease and disabilities**

household and all the others had a single case of leprosy in their families.

Of the 10 contacts with leprosy, eight (80%) were MB cases and two (20%) were PB cases. Of the two with PB leprosy one was the child of a MB father. The other PB contact was a sibling and in this family both the siblings had acquired the disease from their father. This also supports the importance of screening contacts of patients with MB leprosy.

### Discussion

MB leprosy cases have been focused in our study due to their higher potential in transmission of disease and they may also reflect late reporting/detection. Of these a total of 97 new leprosy cases 30 were PB and 67 being MB cases. The MB proportion of 69% seen in our study was greater than the state and national averages of 51.27% and 41.97% respectively for the year 2015-2016 as reported by the NLEP (NLEP 2016). It is also higher than the 54.35% reported by the study by Bhat et al (Bhat and Chaitra 2013) in another South Indian referral hospital. The majority of our patients, that is, 61.1% had BT leprosy followed by lepromatous disease at 17.9%. This correlates with the study by Chhabra et al where 56.7% were BT cases and 8.1% had lepromatous leprosy (Chhabra et al 2015). In a study done by Tiwary et al (2011) in Delhi, an increasing number of BT leprosy cases were seen over a course of 15 years culminating in 56.9% in the year 2009. Thus BT leprosy seems to be the common presentation in populations across different parts of India.

About 41.8% of the patients were smear positive for AFB similar to the 56.58% noted in the study by Bhushan et al (2008). Among the 41 BT cases eight patients were smear positive and the remaining 33 patients were smear negative. Though slit skin smear has been termed as the weakest link in diagnosing leprosy, it has a specificity which nears 100%. As the smear positive patients are

the most infectious subgroup among the MB cases, this highlights the importance of slit skin smear as a tool with clinical and epidemiological significance.

Excepting a migrant labourer from Orissa (1.5%) all the other patients were residents of Tamil Nadu. The nature of employment of these cases is mainly either in the hotel or construction industry and they are sometimes road side dwellers (making and selling toys). There is a lower representation of migrant patients with leprosy in our study than the 10.4% as reported by Samuel et al (Samuel et al 2012). This under-reporting may also be true reflection of ground situation but could also be explained by the fact that these cases belong to a moving population who are not easily amenable to screening or regularly monitored treatment. The presence of disease in such people will largely go undetected. Also the chances of irregular treatment increases in such a population. Targeting them in leprosy detection activities will reduce the burden of disease and deformities.

The higher MB proportion of 69% in our study reflects the possibility of delayed diagnosis and a larger number of subclinical undetected leprosy cases in the community. According to the data collected from the office of the Deputy Director of Medical Services (Leprosy) Madurai, a total of 186 new leprosy cases were registered in the district from August 2015 to July 2016. Of these, there were 84 MB cases and 102 PB cases. Thus the MB proportion was 45.1%. Among the 84 new MB cases, 49 patients (58.3%) were contributed by the new MB patients detected in our study which means that there is some disconnect in the general health services and people availing services for leprosy. Reasons for patients coming from other districts could be similar but may also be due to their more faith in specialized services of medical college. In any case in depth studies on

these aspects are important for improving the access.

The age wise distribution showed that 28% belonged to the fourth decade similar to the study by Chhabra et al where 29% of the patients belonged to third and 20% to the fourth decades of life (Chhabra et al 2015). Also in our study 6% were children and this is comparable to the 9.3% reported by Chhabra et al (Chhabra et al 2015) and the 8.94% national average for the year 2015-2016 as reported by the NLEP (2016). In Tamil Nadu state 15.86% of all new leprosy cases for the same period were children. But of these, most were PB cases and MB cases among children constituted only 9.46%.

The presence of child cases is another indicator of continued transmission of disease and thus of undetected leprosy cases in the community. The females in our study constituted 23.8% of the new MB cases which is lower than the 36% reported by Bhat et al (Bhat and Chaitra 2013) and the national and state averages of 38.33% and 38.68%, respectively (NLEP 2016).

The higher number of male cases reflects a difference in the chances for exposure to the disease or in health seeking behaviour between the two sexes. If the goal of increased detection of female cases is to be reached, more intense screening and targeted approaches are required.

In our study there were seven patients with histoid leprosy among the 12 with lepromatous leprosy, contributing to a total of 10.4% of the total study population. This is higher than in the study of Mendiratta et al (2011) where 11 patients (1.14%) of histoid leprosy were detected in a nine year period. Also only four such cases were reported in the five year study by Chhabra et al (Chhabra et al 2015). There were five males and two female cases of histoid leprosy in our study making a sex ratio of 2.5:1, in comparison to the 4.5:1 in the study by Mendiratta et al (2011).

All of the seven patients were de novo cases which is higher than the six cases during the nine year study of Mendiratta et al (2011). The presence of a greater number of histoid leprosy patients and that too of de novo cases is an interesting phenomenon in our study.

There were 37.3% of patients in reaction in our study with 34.3% in type 1 reaction and 3% in type 2 reaction. This is similar to that reported by Chhabra et al (2015) with 37.5% of patients in reaction and 30.4% in type 1 and 7.1% in type 2 reaction. It is possible that reactions may have prompted some of these cases to seek treatment.

The duration of symptoms among the patients of our study varied from as short as one month to up to 13 years. Of the patients presenting late, the onset of neuritis, reactions and deformities prompted them to seek health care. Also about 66.7% of patients with lepromatous leprosy presented late and this denotes the asymptomatic nature of disease at this spectrum of leprosy.

Nerve involvement was seen in 62 patients (92.5%) similar to the 88.9% of the Chhabra et al study (Chhabra et al 2015). Also ulnar nerve was the most commonly affected nerve seen in 71.6% of our patients as compared to 72.9% seen in the Chhabra et al study (Chhabra et al 2015). The involvement of the posterior tibial and radial cutaneous nerves were comparable between our study and the study by Chhabra et al (Chhabra et al 2015). Posterior tibial nerve involvement was 46.3% in our study versus 47.3% in the study of Chhabra et al and radial cutaneous nerve involvement was 40.3% versus 41.7% respectively (Chhabra et al 2015).

The nerves of the head and neck were the least commonly involved in our study with 4.5% having facial nerve involvement as opposed to 11.2% as reported by Chhabra et al (2015).

A high incidence of neuritis was seen with 33% versus the 4.8% in the Chhabra et al study (Chhabra et al 2015). Further, in our study 52.2% of the patients had deformities at presentation with 40.3% having grade 1 and 11.9% with grade 2 deformities. The incidence of claw hand at 13.4% in our study contrasts with the 23.3% reported by Chhabra et al (Chhabra et al 2015). According to a case report, bilateral facial nerve involvement is a rarity in leprosy (Inamadar & Palit 2003). However this phenomenon was seen in two of three patients in our study who had facial nerve dysfunction. About 75% of lepromatous leprosy cases had deformities when compared to 43.9% of BT leprosy cases. This all shows the possible impact of delayed diagnosis. When correlating deformities and delay in presentation, it was seen that 40% of patients presenting within a year of symptoms had deformities. Whereas 61.5% and 83.3% of patients who presented in one to three years and more than three years of symptomatic disease respectively had deformities. This correlation was also noted in the study by Jindal et al (Jindal et al 2009) where a delay in diagnosis of more than two years resulted in an increased rate of deformities. Of the patients with disabilities, 42.9% were in reaction. This supports the conclusion drawn in the Santos et al study (Santos et al 2015) about the significance of reactional states in contributing to deformities in leprosy. Efficient and timely management of reactions and neuritis can bring down the disability rates and must be investigated by NLEP to improve the quality of services for leprosy in this area.

A total of nine patients (13.4%) had another patient with leprosy in the household. This reinforces the observation by van Beers et al (van Beers et al 1999) that a higher rate of disease acquisition (nine times) is seen in households with leprosy contacts. These contacts fell under various categories of treatment at the time of

screening. Most were either released from treatment or undergoing multidrug therapy at the time of screening. A single contact had undetected multibacillary leprosy who was diagnosed because of contact screening. Of the four children, three (75%) had traceable household contact with leprosy in our study. The study by Doull et al (1945) showed that an increased risk of acquiring disease is seen in children up to 14 years of age exposed to the disease and this is also reflected in our study. Of the 10 positive contacts in our study six (60%) were parents and 8 (80%) of the ten contacts were MB cases. An interesting case was an eight year old boy whose parents had migrated from an endemic region in Madurai district to a neighbouring district. The child was detected in a school survey and given MB-Multi Drug Therapy (MDT). On the contact screening done by us the child's father was diagnosed as a new case of lepromatous leprosy with claw hand. On further probing, it was found that this contact's brother residing in Madurai also had similar lesions but was unwilling to report for diagnosis and treatment. A few months later this elder brother reported with lesions of lepromatous leprosy and his daughter was found to have BT leprosy on further screening. Thus the presence of four patients with leprosy in the same family with transmission of disease to children denotes the importance of contact screening and surveys even in the post elimination era.

In the study by van Beers et al (1999) up to 78% of patients could be traced to another case of leprosy. The lower number of traceable contacts in our study reinforces the need for education about the disease. Also the stigma associated with this disease may be preventing some of the patients from seeking treatment and from disclosing the details of their illness or treatment to even close contacts who are, unfortunately, the

people at an especially higher risk of disease acquisition.

On studying the household contacts with leprosy it was found that the interval between the treatment of the first case in the household and the diagnosis of the second case varied from three to nearly thirty years. This signifies the importance of periodical screening of contacts, especially household contacts, for longer periods even after the completion of treatment. This is especially so for the patients with a history of Dapsone monotherapy or irregular treatment. Also information about the disease and the treatment should be given to both the patients and their family members to facilitate an appropriate suspicion of disease which will lead to earlier presentation of new cases and resultant reduced morbidity.

Conjugal leprosy was seen in one patient in our study. This entity of conjugal leprosy is considered a rarity (Mehta et al 2010) and in the study by Meléndez et al (Meléndez et al 2006) such patients made up 5.4% of the total contacts with leprosy.

The elimination of leprosy at the national level was achieved in December 2005. The process of integration of the vertical central programme for leprosy into the primary health care system was started in 1997 in Tamil Nadu and since then the practice of door to door surveys was discarded. With leprosy being an iceberg disease with a long incubation period and asymptomatic disease in some, this shift from screening to voluntary reporting by patients has resulted in a lacuna with continuing disease transmission in the community. By the time the patient seeks health care the chances are high that deformities are present and that the disease has spread to unwary contacts.

The issue of static trends in Annual New Case Detection Rates (ANCDR) and rising trends of

Grade 2 deformities as seen in the NLEP data of late has led to the observation that case detection did not match the disease occurrence and spread in the field level. The evidence of a gap between the cases detected and the actual disease in the community was acknowledged. Recommendations have been laid down to carry out periodic active case detection campaigns in endemic regions.

Leprosy Case Detection Campaigns (LCDC) (NLEP 2016) were planned by the Central Leprosy Division with an aim to intensify case detection and treat all the detected cases and thus deplete the source of infection and interrupt transmission of the disease. The Accredited Social Health Activists and Field Level Workers were trained and included in the implementation of Information Education Communication activities and house surveys to detect cases. This will help in elimination of leprosy in the district and sub-district level.

The increasing trends of new multibacillary patients and patients with deformities at presentation in the post elimination era warrant an intensification of leprosy control activities including thorough contact screening and active case detection as well as improved IEC activities. Only these will help in identifying the hidden sources of disease in the community and help break the silent chain of transmission.

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