

Grade 2 disability among leprosy patients: A pilot study from an endemic area of Central India

Bada Shravani¹, Satyaki Ganguly¹, Arvind K. Shukla², Namrata Chhabra¹,
Neel Prabha¹, Divya Sachdev³, Soumil Khare⁴

Departments of ¹Dermatology and ²Community and Family Medicine, All India Institute of Medical Sciences, ³Consultant Dermatologist, Sachdev Nursing Home and Diagnostic Center, Raipur, ⁴Department of Dermatology, Venereology and Leprosy, BRLSABV Medical College, Pendri, Rajnandgaon, Chhattisgarh, India

ABSTRACT

Background and Aim: Deformities and disabilities in leprosy lead to significant morbidity to the individual and financial burden to the family. As the prevalence of leprosy is higher in central India, this study was conducted to know the burden of deformity and disability among leprosy patients in central India and the factors associated with it. **Materials and methods:** This was a hospital-based, cross-sectional study, conducted on 50 new or on treatment or released from treatment leprosy patients, attending the Dermatology OPD of a tertiary care institute in Central India. Disability was graded as per the WHO criteria for disability grading of hands and feet. **Results:** Grade 2 disability was found among 32% of the patients with leprosy, whereas a total of 60% of our patients had either grade 1 or grade 2 disabilities. Trophic ulcer was found among 20% and claw hand among 14% of leprosy patients. We found significant associations of lepromatous leprosy with trophic ulcer ($p = 0.004$) and grade 2 disability ($p = 0.012$). All patients with claw hands and 80% of the patients with trophic ulcers presented to the healthcare facility at least 6 months after the onset of symptoms. **Conclusions:** We found very high rates of disability and deformity among leprosy patients indicating possible huge burden of morbidity among leprosy patients in central India. The significant association of lepromatous leprosy with trophic ulcer and grade 2 disability indicated delayed presentation and diagnosis of lepromatous leprosy patients. Our results underlined the need for large scale community-based studies on disability and deformity among leprosy patients in Central India. These results also call for better training of primary level healthcare workers for early detection and management of deformities and disabilities as well as better patient education for leprosy patients regarding hand and foot care.

Keywords: Central India, G2D, Grade 2 disability, leprosy

Introduction

Leprosy continues to be a significant public health problem in spite of an effective treatment regimen; Multi Drug Therapy (MDT) and negligible mortality, on account of the significant and often permanent deformities and disabilities. Deformity refers

to the visible defect, whereas disability refers to the functional impairment. World Health Organisation (WHO) introduced a grading system for disability in leprosy in 1960 and further modified it in 1988, which is being used currently.^[1]

The frequency of disability, specifically WHO grade 2 disability (G2D) rate, has often been used as an indicator for the magnitude of the morbidity due to leprosy in the community.^[2] At the same time, early detection and management of patients with WHO grade 1 disability (G1D) is more important for the prevention of development of deformities among leprosy patients.

Address for correspondence: Dr. Satyaki Ganguly, Associate Professor, Department of Dermatology, All India Institute of Medical Sciences, Raipur - 492 099, Chhattisgarh, India.

E-mail: satyakiganguly@yahoo.co.in

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Both disabilities and deformities result in increase in the healthcare-related cost, and impact the productivity of the individual with financial and social implications. WHO launched the global leprosy strategy for 2016–20, which focuses upon achieving the following targets:^[3]

- Zero G2D among pediatric leprosy patients.
- Reduction of new leprosy cases with G2D to less than one case per million population.
- Zero countries with legislation allowing discrimination on basis of leprosy.

Majority of the leprosy patients in our country are diagnosed and managed in primary care settings such as primary or community health centres. Leprosy patients attend these centres on a monthly basis to collect the MDT blister packs made available free-of-cost by the Indian government. This presents a unique opportunity to the primary care physicians for early detection of deformities and disabilities among leprosy patients as well as detailed counselling regarding care for anaesthetic hands and feet to prevent further progression and increase in the disability.

Chhattisgarh, with its prevalence rate of 2.08/10000 population (2019-20), is one of the seven states or union territories in India, which is yet to achieve elimination of leprosy.^[4]

A thorough literature search showed studies conducted on disabilities and deformities in leprosy in diverse geographical areas like Brazil, Ethiopia, and Eastern and Southern regions of India, but very few from the central part of India, which has a relatively higher prevalence.^[5-8]

Materials and Methods

This was a hospital-based cross-sectional study conducted from 1 July 2018 to 31 October 2018. All the leprosy patients including new, partially treated, on treatment, and released from treatment, who visited the dermatology department were included in the study after taking informed consent. Leprosy patients with coexistent neurological deficits due to causes other than leprosy such as cerebrovascular accident and so forth were excluded. This study was conducted in accordance with the Helsinki declaration of 2000 and was carried out only after obtaining the Institutional Ethics Committee clearance. Demographic details, duration of illness, and treatment status of the patient were noted down. Detailed cutaneous examination, peripheral nerve examination, sensory examinations for glove and stocking anaesthesia, and voluntary muscle testing were done and noted down in the case taking proforma. The presence of partial or complete claw hand and foot drop were noted down.

The weight-bearing areas of the body (like the plantar aspect of feet, medial and lateral malleoli) were examined for the presence of trophic ulcers.

Based on the presentation of the patient and findings on clinical examination, the patient was classified as having tuberculoid (TT)/

borderline tuberculoid (BT)/mid-borderline (BB)/borderline lepromatous (BL)/lepromatous (LL) forms and paucibacillary/multibacillary (according to NLEP-modified WHO classification). Presence of lepra reaction (type 1/type 2) was also noted down.

Grading was done according to the WHO criteria for disability grading of hands and feet among leprosy patients.

WHO disability grading for hands and feet^[1]:

- Grade 0 – No anaesthesia, no visible deformity or damage
- Grade 1 – Anaesthesia present, but no visible deformity or damage
- Grade 2 – Visible deformity or damage present.

Results

The total number of patients included in the study was 50, out of which 64% (n = 32) were males and 36% (n = 18) were females (M: F = 1.7:1). Most of the patients belonged to the age group of 20-29 years (40%) [Table 1].

Majority (62%) of our patients presented after 6 months of onset of symptoms of leprosy.

Out of total 50, 26% of the patients (n = 13) were untreated, 56% (n = 28) were on treatment, 2% (n = 1) were partially treated, and 16% (n = 8) had completed their treatment.

The proportion of borderline tuberculoid (BT), borderline lepromatous (BL), and lepromatous patients (LL) were almost equal according to the Ridley–Jopling classification [Table 2].

Upon analysing the distribution of the patients according to NLEP-modified WHO classification, 94% (n = 47) of them were found to have multibacillary (MB) type of leprosy, whereas only three had paucibacillary (PB) type.

A total of 23 (46%) patients were diagnosed with lepra reaction. Type 1 reaction was seen in nine patients and type 2 reaction

Table 1: Age-wise distribution of patients

Age group	Number of patients
<20	4
20-29	20
30-39	12
40-49	4
≥50	10

Table 2: Clinical spectrum of leprosy patients

Ridley-Jopling classification	No. and % of patients
Lepromatous (LL)	16 (32%)
Borderline lepromatous (BL)	16 (32%)
Borderline tuberculoid (BT)	15 (30%)
Tuberculoid (TT)	3 (6%)

in 13 patients, and a single patient had evidence of both type 1 and 2 reactions.

Analysis of the deformities showed 20% (n = 10) had trophic ulcers and 14% (n = 7) had claw hand. Out of the 10 patients with trophic ulcer, 70% (n = 7) belonged to the LL Spectrum. Lepromatous leprosy was significantly associated with trophic ulcer ($p = 0.004$) by Chi-square test [Table 3]. Out of seven patients with claw hand, three (42.8%) belonged to BL spectrum. Three patients had both claw hand and trophic ulcer.

All patients with claw hand and 80% of the patients with trophic ulcers presented to the healthcare facility at least 6 months after the onset of symptoms.

The patients were divided into three groups using the WHO grading for disabilities of hands and feet. There were 28% (n = 14) patients with grade 1 disability and 32% (n = 16) patients with grade 2 disability.

So, a total of 60% (n = 30) of our patients had either grade 1 or grade 2 disability. Majority (81.2%) of our G2D patients presented 6 months after the onset of symptoms of leprosy, which was not statistically significant. However, 41.9% of patients diagnosed after 6 months developed G2D, whereas only 15.7% of patients diagnosed before 6 months developed G2D.

Among untreated patients, 30.7% developed G2D, similar to 30.6% of patients on treatment or completed treatment developed G2D.

The proportion of lepromatous patients (56.2%) were the highest among G2D patients according to the clinical type [Table 4]. This was statistically significant ($p = 0.012$) by Chi-square test.

Upon analysing the distribution of G2D patients according to NLEP-modified WHO classification, all of them (100%; n = 16) were found to have multibacillary type of leprosy. About 43.7% of G2D patients were suffering from lepra reaction; 30.4% of

leprosy patients with lepra reaction developed G2D as against 33.3% of patients without reaction. About 22.2% of patients with type 1 reaction developed G2D, whereas 30.7% of patients with type 2 reaction developed G2D.

Discussion

Our study showed a male preponderance with majority of the patients belonging to the age group of 20–29 years, similar to majority of the studies, although leprosy shows no specific gender predisposition.^[5-7,9] The community-based study done in Indonesia showed the male predominance, but majority of the patients were older.^[10] Most of our patients presented after 6 months, similar to a previous Indian study from Eastern India, and a study from Ethiopia, indicating lack of access to healthcare in developing countries.^[6,7]

Majority of our patients were new or were on treatment, similar to the African study.^[6]

High proportion of lepromatous patients in our study was different from previous Indian data.^[8,11] This is alarming because patients belonging to lepromatous are the most infective.

We had only three patients classified as PB and the rest MB, similar to studies done in Ethiopia and Indonesia where the number of MB patients were more than PB patients.^[6,10] However, in contrast, previous studies done in India and Bangladesh show more PB leprosy patients.^[7,9] This could possibly be due to the fact that we used the NLEP modification of the WHO classification of PB and MB by adding the number of nerves involved. Some of the previous studies do not explicitly mention whether they classified MB and PB based on the number of skin lesions alone or the number of nerves involved were also taken into account. Once the number of thickened nerves were taken into account, more patients were classified as MB, who otherwise would have been classified as PB based on the number of lesions. Another possible reason could be a more thorough examination of our patients, in a tertiary care centre, leading to more patients being classified as MB, in contrast to patients diagnosed and examined at primary care levels.

We found trophic ulcer (20%) to be the most common deformity followed by claw hand (14%). In contrast, Kavya Shree *et al.*^[8] from Hubli, Karnataka found claw hand (7.4%) to be the commonest deformity rather than trophic ulcer (5.4%). The markedly higher percentage of anaesthesia and deformities could be possibly explained by more severely affected patients attending this apex healthcare facility.^[6,7] This could also indicate deficiency in counselling the patients in the primary level regarding hand and foot care. Lepromatous leprosy was significantly associated with trophic ulcer, possibly because of the presence of glove and stocking anaesthesia in them. Further, lepromatous patients because of absence of early symptoms, present late, as seen in our study, increasing the chances of deformities.

Table 3: Lepromatous leprosy was significantly associated with trophic ulcer ($P=0.004$)

RJ spectrum	No of patients with trophic ulcer	No of patients without trophic ulcer	Total
LL	7	9	16
Other than LL	3	31	34
Total	10	40	50

Table 4: The proportion of lepromatous patients were highest among G2D patients according to the clinical type ($P=0.012$)

RJ type	G2D	Non-G2D	Total
LL	9	7	16
Non-LL	7	27	34
Total	16	34	50

We found 46% of our patients in reaction at the time of examination probably due to the fact that patients with leprosy reaction are more likely to visit a tertiary referral centre like ours. The higher percentage of type 2 reaction is expected as majority of our patients belonged to LL and BL spectrum. A comparable higher percentage of type 1 reaction was recorded in the African study (28% type 1 and 18% type 2)^[6] and one of the Indian studies.^[8]

Our study showed a much higher percentage of grade 1 and grade 2 disability [Table 5] compared to the previous Indian studies as well as the study from Bangladesh.^[7-9,12] However, the study from Ethiopia showed higher rate of G1D but a lower rate of G2D.^[6] The Indonesian study showed a similar rate of G1D but a higher rate of G2D, although they had followed a completely different methodology of community-based study with active seeking of patients with disability, explaining the higher G2D.^[10] Interestingly a recent study from Shaanxi province of China showed a very similar rate of G2D (31%)^[13] and an even higher rate of G2D was reported from Eastern India.^[14] Higher rates of disability in our study could be due to the small sample size of our pilot study, making the patients less representative of the leprosy patients in this area. Other possibilities are a true higher disability rate as the prevalence of leprosy is higher in this part of India with strain on resources and consequent decrease in quality of care resulting in late detection of deformities and disabilities. This study was conducted in an apex institute; hence patients with more severe and complicated disease could be attending the OPD, yet another reason for the higher rates of disability.

We attempted to find out the association of G2D with different patient factors like gender, age group, duration of illness, treatment status, clinical type, presence of reaction, and so on. None of the possible associations were statistically significant except the association of LL with G2D. This was due to the small sample size of our pilot study. However, majority of G2D patients were diagnosed 6 months after onset of symptoms, even though this was statistically insignificant. All patients with G2D had MB leprosy. These results were similar to the Ethiopian study and the studies conducted in India, which showed association of disability with longer duration of symptoms.^[6,7]

Table 5: The percentage of leprosy patients with disability in different studies

Studies	Area	Grade 1 disability	Grade 2 disability
Present Study (n=50)	Chhattisgarh, India	28%	32%
Sarkar <i>et al.</i> ^[7] (n=244)	West Bengal, India	11.5%	8.6%
Kavya Shree <i>et al.</i> ^[8] (n=500)	Karnataka, India	5.2%	14.8%
Withington <i>et al.</i> ^[9] (n=2364)	Bangladesh	8.7%	6.4%
van Brakel <i>et al.</i> ^[10] (n=1327)	Indonesia	28%	48.7%
Shumet <i>et al.</i> ^[6] (n=513)	Ethiopia	40.2%	25.7%
Rathod <i>et al.</i> ^[12] (n=200)	Gujrat, India	21.25%	6.31%
Zhang <i>et al.</i> ^[13] (n=477)	China	-	31.03%
Das <i>et al.</i> ^[14] (n=114)	West Bengal, India	54.39%	38.6%

However, our study was not without its limitations. This study was a time-bound, hospital-based, cross-sectional study with a small sample size, all being limiting factors for the generalization of the findings.

In summary, we found very high rates of disability and deformity among leprosy patients indicating possible huge burden of morbidity among leprosy patients in central India. Trophic ulcer was the most common deformity found by us. The significant association of LL with trophic ulcer and G2D indicated to delayed presentation and diagnosis of LL patients as well as inadequate patient education about care of anaesthetic hands and feet. This calls for better training of primary healthcare providers and routine detailed examination of household contacts of leprosy patients to achieve early diagnosis of leprosy in general and LL in particular. Our results underlined the need for large scale community-based studies on disability and deformity among leprosy patients in Central India. These results also call for better training of primary level healthcare providers for early detection and management of deformities and disabilities as well as better patient education for leprosy patients regarding hand and foot care.

Take home message

1. High rates of deformities and disabilities are important causes of morbidity among leprosy patients in central India.
2. Early diagnosis of LL at the primary care level with improved patient education about care of anaesthetic limbs should prevent development of G2Ds.
3. Rehabilitation of leprosy patients with disability deserves more resources.

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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