

A Retrospective Hospital Based Study on Deformities in Leprosy Patients in Leprosy Elimination and Post Covid Era in Southern India

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Mycobacterium leprae is the causative agent of leprosy, a chronic illness that affects skin, and peripheral nerve system. Even after leprosy was officially proclaimed eliminated as a public health issue in India in December 2005, new leprosy cases continue to arise. While leprosy can be easily treated in most cases, disabilities in a section of leprosy are cause of immense concern. This study has been carried out to analyze the grade and type of deformity among leprosy patients attending Dermatology Department of Bangalore Medical College, a tertiary care hospital. The present retrospective hospital-based study was carried out on all leprosy patients attending Dermatology (outpatient and inpatient) with deformities were included in the study from 11 January 2023 to – 11 January 2024. 52/122 total leprosy cases (41.8%) attending our hospital had deformities/ disabilities. Out of a total 51 patients with deformities, thirty-six (70.6%) were male and 15 were female (29.4%), the mean age observed in our patients was 38.84 years. Most cases had lepromatous leprosy. Out of 51 patients, twenty-six cases (50.98%) had grade 1 deformities, and 25 cases (49.01%) had grade 2 deformities. Forty (78.43%) had a history of reactions. Forty-one (80.39%) cases were multibacillary (MB) and 10 (19.6%) patients were paucibacillary (PB) types. Clinical examination and basic examination can identify a variety of deformities. Early detection of illness and abnormalities can aid in informing patients about leprosy and preventing the disease's progression to serious consequences, especially those resulting in disabilities. More extensive MB disease and reactions appear to be associated with disabilities. Two-third of the patients in this group reported with disabilities/ deformities which indicates the problem of access to early and appropriate management of leprosy and its complications. Whether the problem is due to ignorance or due to other enabling factors should be investigated. The present study indicates the need for further in-depth studies and appropriate interventions at community level.

Keywords: Leprosy, Deformity, Disability, Multibacillary Leprosy.

Introduction

Mycobacterium leprae is the causative agent of leprosy, a chronic granulomatous illness mostly affecting the skin and peripheral nervous system.

To eradicate the disease adequate understanding of its clinical aspects including disabilities and epidemiology is required (Jopling & McDougall 1996, Yawalkar 2002). A decade after achieving

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a significant milestone of elimination as public health problem it was a stagnating situation (NLEP 2015-16). Since leprosy has been linked to deformities/ disabilities that are severely debilitating, the World Health Organization has classified it as a major health issue. Even if a patient receives a successful course of treatment, the defects that cause such severe social shame and ostracism are major contributing factors. Leprosy-related abnormalities (hospitalizations due to reactions and disabilities) lead to enormous labour losses and economic losses for society, in addition to causing suffering for patients (Srinivasan & Dharmendra 1978, Thappa 1994). The degree of disability experienced by newly diagnosed leprosy patients is a predictor for both the rate of case detection and the spread of the disease within the population (Ganapati et al 1996).

Even with significant attempts to lower the disease burden, leprosy continues to be one of the most common infectious illnesses in the world, causing peripheral neuropathy and disability. Leprosy has been eliminated, and its prevalence has decreased across the world, including in India, owing to the widespread use of MDT (Withington et al 2003).

In December 2005, India accomplished the National Health Policy 2002's target of eliminating leprosy as a problem affecting the general population, which is defined as less than a single case per 10,000 people. The current NLEP's vision is a leprosy-free India with zero infection and disease, zero disability, zero stigma, and zero discrimination. The goal of the current Global Leprosy Strategy 2021–2030, "Accelerate towards achieving Interruption of Leprosy Transmission in India," is aligned with broader global health trends, including the move towards multi-disease service integration, digitalization, and accountability, and addresses key challenges such as human resource capacity, surveillance,

and antimicrobial resistance. The burden of disease now also includes those in need of mental health support. The strategy focuses on nations creating "zero-leprosy roadmaps" and offering chemoprophylaxis to all contacts of confirmed cases. It also encourages the use of focused active case detection and the possible introduction of a safe and effective vaccine (NSP 2023-2027).

By executing programs in highly endemic areas or communities, it also seeks to prioritize detection among higher-risk groups, thereby enhancing coverage and access for marginalized sectors. This will lead to the goal of having less than one grade-2 disability (G2D) rate per million populations, as well as earlier detection and decrease of individuals with G2D at the time of diagnosis. G2D has gradually decreased every five years between 1995 and 2010 in leprosy-endemic nations, particularly in India, where it has decreased by 53.7% .

Evaluation of disabilities is a crucial indicator of leprosy control. Grade 1 assessments—despite being more crucial for preventing disability—are frequently ignored. For limiting and mitigating disability, a prompt diagnosis of Grade 1 disability and appropriate intervention is therefore imperative. Many leprosy patients' suffering will undoubtedly be lessened by the search for related causes. The current cross-sectional investigation was conducted with this viewpoint in mind.

With this scenario, this retrospective observational study was conducted in the Dermatology Department of Bangalore Medical College, a tertiary care center in South India between January 2023 and January 2024 to study the grade and type of deformity among leprosy cases, with an emphasis on newly diagnosed leprosy patients with focus on relevant clinical and epidemiological factor/parameters (Raghavendra et al 2017).

Patients and Methods

The retrospective study was hospital-based, carried out at the Department of Dermatology and Venereology of Bangalore Medical College, after due approval from the institutional ethics and research committees. All leprosy patients attending Dermatology outpatient (33 patients) and Inpatient (18 patients) with deformities, irrespective of treatment status, were included in the study from 11 January 2023 to 11 January 2024. Ridley & Jopling (1966) and the classification recommended by the Indian Association of Leprologists (IAL 1982) were followed by the leprosy center record. Leprosy was classified into MB and PB for treatment purposes in accordance with WHO recommendations as followed by National Leprosy Eradication Programme (NLEP 2019) of India. Age, sex, occupation, presenting complaints, reaction upon presentation, AFB smear result, clinical diagnosis, WHO classification, type of deformity/ disability,

and deformity grade using the WHO grading system were among the variables documented (Brandsma & van Brakel 2003).

For the patient sample in the present study, descriptive statistics were generated for the following variables: laboratory, clinical, and demographic. While frequency and percentages were used to summarize qualitative data, mean values and standard deviations were used to express quantitative variables. Microsoft Excel was used for data analysis.

Results

During the study period (11th January 2023 to 11th January 2024) 122 leprosy patients attended the OPD/ indoor of our hospital. Of which 51 (41.8%) had disabilities/ deformities- 50.98% had grade 1 disabilities (G1D) whereas 49.01 (%) had grade2 deformities/ disabilities (G2D).

Findings about 51 patients with disabilities included in the study are summarized below:

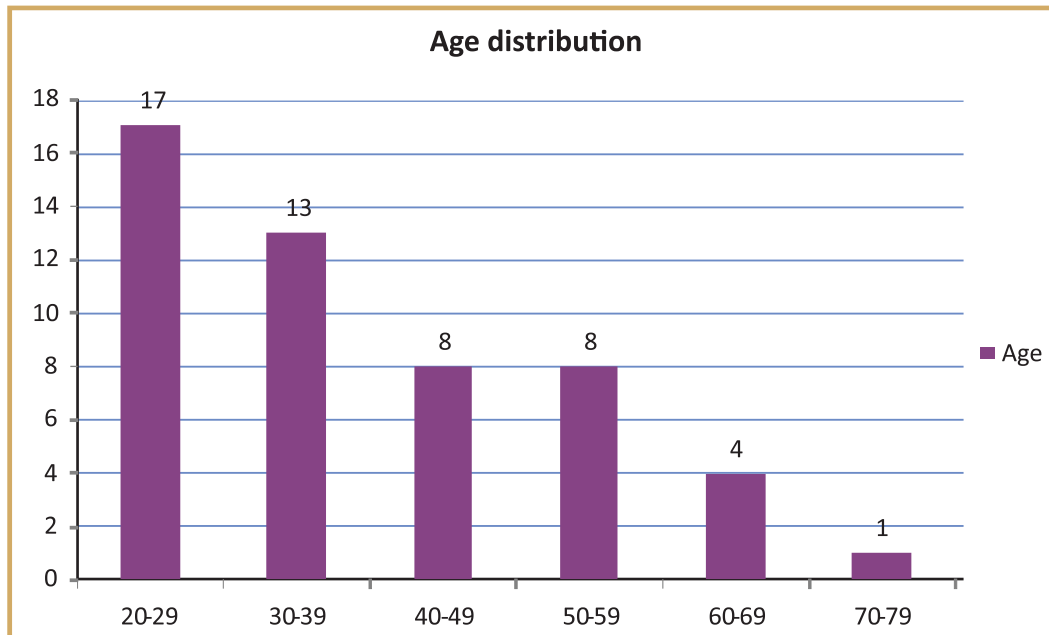


Fig. 1 : Age distribution of study subjects.

Gender: Out of a total 51 patients, thirty six (70.6%) were male and 15 were female (29.4%), with the male-to-female ratio being 2.4:1.

Age: Most patients were in their 2nd decade (n = 17, 33.3%) and 3rd decade (n = 13, 25.49%). The mean age observed in our patients was 38.84 years with an SD 1.88 years, and the range was 20–79 years (Fig. 1). 38/51 (74.5 %) were between 20-50 years, most important period for livelihood earning.

Type of leprosy: Most cases had lepromatous leprosy (n = 23, 45.09%), while 14 cases (27.45%) belonged to borderline lepromatous leprosy, 9 patients (17.64%) had borderline tuberculoid spectrum, 3 patients (5.88%) had pure-neuritic, and 1 patient (1.96%) had histoid Hansen and mid-borderline Hansen (Fig. 2).

Lepra Reactions: In the current study, out of 51 patients with deformities, forty (78.43%) had a history of reactions. Type 1 reactions accounted

for 12 (23.5%) of the 40 cases, whereas type 2 reactions made up 28 (54.9%).

Classification into MB and PB types: Out of 51 patients, forty-one (80.39%) cases were multibacillary (MB), and 10 (19.6%) patients were paucibacillary (PB).

Relation of deformities/ disabilities to treatment: Out of 51 cases, thirty-four (66.6%) cases presented with deformity before treatment i.e new cases; around 15 patients (29.4%) presented with deformity during treatment with MB-MDT, among them six cases (11.76%) showed up within three months of beginning of treatment; four patients (7.84%) showed up within six months; two (3.92%) patients within nine months of treatment; three patients (5.88%) showed up within a year; one (1.96%) patient showed up with a reaction after being released from treatment; and one (1.96%) patient was a defaulter (Fig. 3).

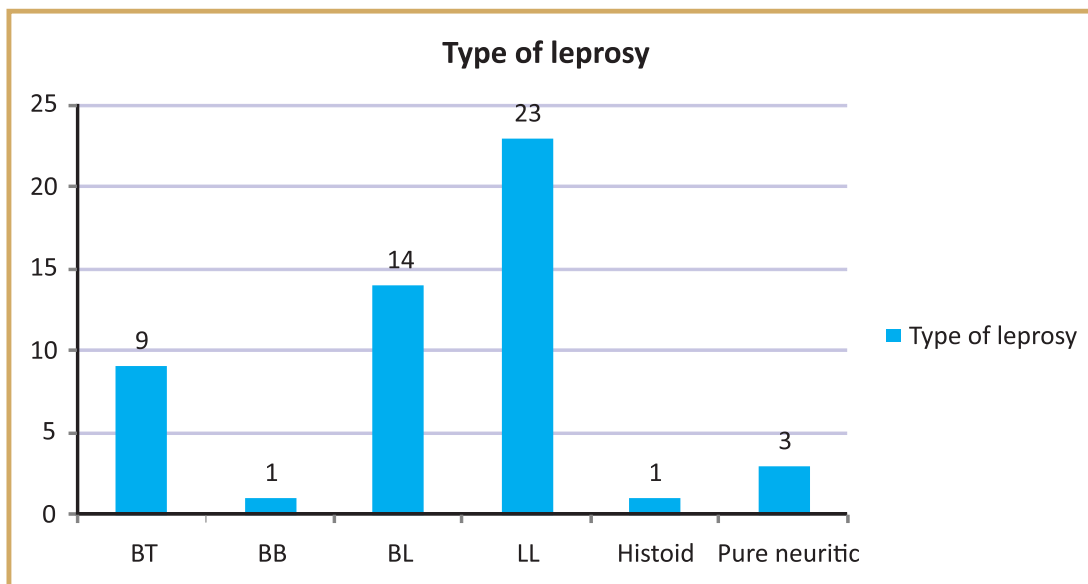


Fig. 2: Type of leprosy in the patients studied.

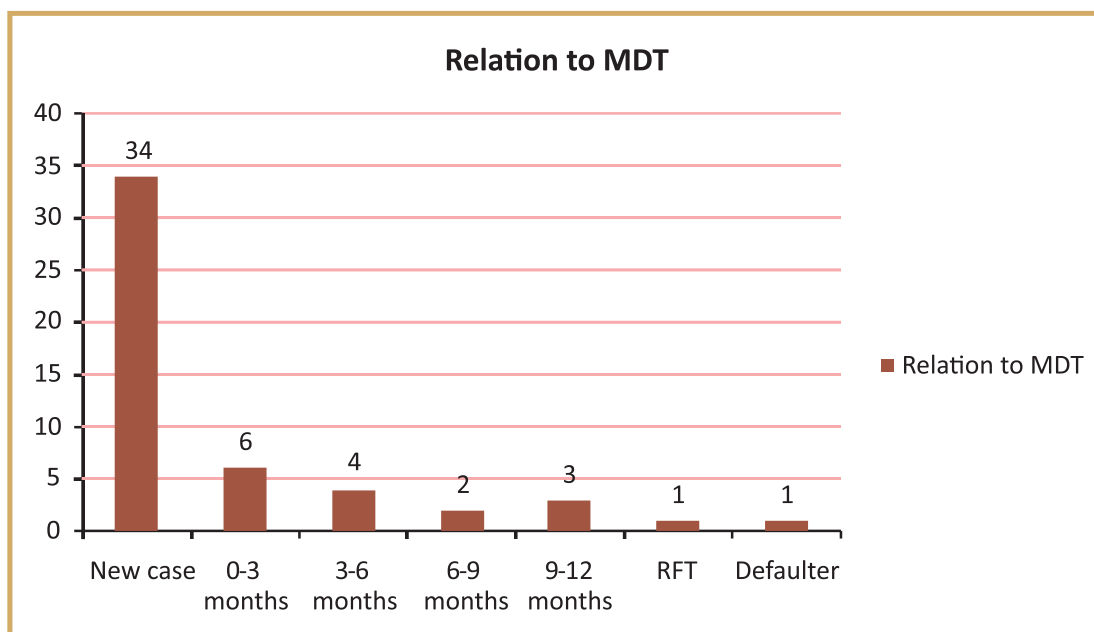


Fig. 3 : Relation of occurrence of deformity/ disability to treatment.

Table 1 : Types of specific deformities/disabilities of hand, feet and face.

Specific deformity/ disability	Number of patients	Percentage (%)
UPPER LIMB		
Reaction hand	10	19.6
Shortening of fingers	2	3.92
Swan neck deformity	6	11.76
LOWER LIMB		
Reaction foot	2	3.92
Intrinsic plus toes	1	1.96
FACE		
Madarosis	32	62.74
Saddle nose	20	39.21
Leonine facies	14	27.45
Rat bitten ears	2	3.92
Buddha ears	12	23.52

Grade of deformities/disabilities: Out of 51 patients, twenty-six cases (50.98%) had grade 1 deformities, and 25 cases (49.01%) had grade

2 deformities of the hands and feet. Grade 2 deformity of the eye, i.e., lagophthalmos, was seen in two patients (3.92%).

Types of specific deformities/disabilities of hand, feet and face: In the hands, reaction hand was seen in majority of patients (n=10, 19.6%), followed by swan neck deformity (n=6, 11.76%), shortening of fingers (n=2, 3.92%) . In feet, reaction foot was more common (n=2, 3.92%) than intrinsic plus toes (n=1, 1.96%). In face madarosis in (n=32, 62.74%) patients, followed by saddle nose (n=20, 39.21%), leonine facies (n=14, 27.45 %), buddha ears (n=12, 23.52%), rat bitten ears (n=2, 3.92%) (Table 1).

Types of visible paralytic deformities of hand, feet and face: In the hands, the majority of the patients had flattening of the thenar and hypothenar eminences (n = 37, 72.54%), followed by guttering (n = 35%, 68.62%); Wartenberg's sign (n = 35%, 68.62%), partial claw hand deformity (n = 23, 45.09%), complete claw hand (n = 8, 15.68%), ape thumb (n = 2, 3.92%), and wrist drop (n = 1, 1.96%) were seen. In the feet, guttering (n=13, 25.49 %) was most common, thereafter

claw toes (n=12, 23.52%), collapse of arch (n=6, 11.76 %), and foot drop (n=4, 7.84%). In the face, lagophthalmos was seen in two patients (3.92%) (Table 2).

Types of deformities/ disabilities of hands, feet and face associated with anaesthesia: In the hands, most of the patients had xerosis (n = 23, 45.9%), followed by blisters (n = 20, 13.7%), fissures (n = 12, 23.52%), callus (n = 8, 15.68 %), and trophic ulcer (n = 4, 7.84%) deformities were also noted. In the feet, most of the patients had xerosis (n = 45, 88.23%), followed by callus (n = 36, 70.58%), fissures (n = 28, 54.90 %), trophic ulcers (n=25 49.01%), glove and stocking anaesthesia (20, 39.12%) and lastly blister in 4 patients 7.84% (Table 3).

Distribution of deformities/ disabilities across spectrum of leprosy: Among 23 cases of lepromatous leprosy patients, the most common type of deformity observed was paralytic in 19 patients followed by anaesthetic in 11 patients

Table 2 : Types of visible paralytic deformities of hands, feet and face.

Paralytic deformities/disabilities	Number of patients	Percentage (%)
UPPER LIMB		
Claw hand (partial)	23	45.09
Claw hand (complete)	8	15.68
Guttering	35	68.62
Flattening of thenar and hypothenar eminence	37	72.54
Wrist-drop	1	1.96
Wartenberg sign	35	68.62
Ape thumb deformity	2	3.92
LOWER LIMB		
Foot drop	4	7.84
Clawing of toes	12	23.52
Guttering	13	25.49
Collapse arch	6	11.76
FACE		
Lagophthalmos	2	3.92

Table 3 : Types of deformities/disabilities of hands, feet and face associated with anaesthesia.

Deformity/ disability associated with anaesthesia	Number of patients	Percentage (%)
UPPER LIMB		
Xerosis	23	45.09
Callus	8	15.68
Fissures	12	23.52
Blister	20	39.21
Trophic ulcer	4	7.84
LOWER LIMB		
Glove and stocking anaesthesia	20	39.12
Xerosis	45	88.23
Callus	36	70.58
Fissure	28	54.90
Blister	4	7.84
Trophic ulcer	25	49.01

Table 4 : Distribution of deformities/ disabilities among different types in spectrum of leprosy.

	Paralytic deformity/ disability	Anaesthetic deformity/ disability	Specific (Those caused by direct infiltration of bacilli)
Lepromatous leprosy	19	11	6
Borderline lepromatous	9	6	6
Borderline tuberculoid	7	3	-
Pure neuritic	2	1	-
Mid-borderline	-	1	-
Histoid leprosy	-	1	-

and specific deformities in 6 patients. In borderline lepromatous types, paralytic deformity/ disability was the most common type in 9 patients followed by anaesthetic in 6 patients and specific deformities (madarosis, leonine facies, saddle nose, reaction hand, shortening of fingers) in 6 patients. Among borderline tuberculoid spectrum, paralytic deformity was again the most common type in 7 patients followed by anaesthetic in 3 patients. Two patients of pure neuritic had paralytic deformity/disability i.e foot

drop and one patient had anaesthetic i.e trophic ulcer. mid borderline and histoid leprosy patient had anaesthetic deformities/disabilities (Table 4).

Discussion

Our study attempts to understand the disabilities/ deformities in patients coming for treatment of our tertiary care centre, demographic and other clinical characteristics. Male-to-female ratio of cases of our study group 2.4:1. In a study conducted by Raghavendra et al (2017), the

male-to-female ratio was 3.5:1. Peters & Eshiet (2002) reported the male to female ratio of 2:1. These are usual ratios of males to females for a long time, in different parts of India and across the world. Most of these patients were in their 2nd decade (n = 17, 33.3%) and 3rd decade (n = 13, 25.49%). The mean age observed in our patients was 38.84 years with a SD of 1.88 years, and the range was 20–79 years, which is like the study by Raghavendra et al (2017) most common age group affected was 21–30 years (20%), followed by 41–50 years (18%), and 61–70 years (18%). Reddy & Bansal (1984) in pre-MDT era had reported in their study that 30.76% were over 40 years old. Kumar et al (2001) reported that 65% of the patients in their study group were over the age of 59. Except for burden on working age groups, nothing else appears relevant.

In our present study, lepromatous leprosy (n = 23, 45.09 %) was major disease type, while 14 cases (27.45%) belonged to borderline lepromatous leprosy, 9 patients (17.64%) had borderline tuberculoid spectrum, 3 patients (5.88%) had pure-neuritic, and 1 patient (1.96%) had histoid Hansen and mid-borderline Hansen each. This finding is consistent with the findings of Jindal et al (2009), who reported that most patients (33.12%) had lepromatous leprosy, with BT coming in second (28.22%). Similar results were found by Bishnoi et al (2019), with most cases being LL (30.7%), followed by BT (27.8%) and BL (19%). Tegta et al (2019) also documented the highest percentage of lepromatous leprosy cases (32.1%), closely trailed by borderline lepromatous cases (31.2%). In contrast to present study Kumar et al (2001) reported that 30.5% of patients belonged to the BT spectrum. In the study reported by Raghavendra et al (2017) the proportion of BT cases was 34%, which is higher compared to other forms of leprosy. The highest percentage of lepromatous leprosy that exists is a concerning

situation that may be related to disruptions in medical facilities during the Covid pandemic phase brought on by lockdown and restricted movement. Systemic steroid therapy for treating Covid-19 and immunological suppression brought on by Covid-19 itself may have exacerbated the issue by lowering cell mediated immunity (CMI) and increasing the incidence of LL. More research is needed to determine how the Covid virus and vaccination impacted immunological processes, which may have an impact on leprosy infection and development of disease across the spectrum. During the pandemic, lockdown and limited movement caused a decline in case detection, missed cases, delayed and non-treatment cases, and defaulters, all of which may have contributed to an increase in LL cases. As our focus is on development of deformities/disabilities, comparison can be meaningful if all cases are analysed not only in hospital settings but also in the field. Our study suggests that emphasis should be placed on more extensive BL/LL disease types.

In the present study, out of 51 patients with deformities, forty cases (78.43%) had a history of reactions. Type 1 reactions accounted for 12 (23.5%) of the 40 cases, whereas type 2 reactions made up 28 (54.9%). In a study by Kar & Job (2005), reactions were present in 55 (20%) children, of which 11 had deformities. In our study, forty-one (80.39%) cases were multibacillary cases, and 10 (19.6%) patients were paucibacillary and had deformities, which is like the findings of studies by Daniel et al (2019), Schreuder (1998), and De Oliveira et al (2003). Thus, multibacillary cases with extensive disease and having reactions appear to be more predisposed to disabilities/deformities.

Considering the COVID-19 pandemic scenario, it is therefore reasonable to anticipate delays in the diagnosis, treatment, morbidity management,

disability prevention, and other services rendered by healthcare facilities. Furthermore, it is to be expected that disease monitoring programs such as population-based surveys and regular surveillance will end. This has a substantial impact on leprosy control initiatives and paints a troubling and deceptive picture of the disease's spread throughout the country, especially in the wake of the COVID-19 pandemic (da Paz et al 2022).

Out of 51 patients, twenty-six cases (50.98%) had a grade 1 deformity, and 25 cases (49.01%) had a grade 2 deformity. This is similar to the studies done by Sarkar et al (2012) and Sanker et al (2020). Most common specific deformity in hand was, reaction hand was seen in ten patients (19.6%), followed by swan neck deformity (n=6, 11.76%), shortening of fingers (n=2, 3.92%), w. In feet, reaction foot was more common (n=2, 3.92%) than intrinsic plus toes (n=1, 1.96%). In face madarosis in 32(62.74%) patients, followed saddle nose (n=20, 39.21%), leonine facies (n=14, 27.45 %), Buddha ears (n=12, 23.52%), rat bitten ears (n=2, 3.92%) (Sardana & Khurana 2020). In a study by Bhagyashree (2022), the most common hand deformity was shortening of fingers in 13 patients and banana fingers in 10 patients. In the feet, fixed foot deformities were present in 10 patients. Among 146 patients, 28 had madarosis, 23 had nodularity of the face, and collapse of the nose was present in eight.

In our cases, the most common paralytic deformity of hands was, flattening of the thenar and hypothenar eminences seen in thirty seven cases, (72.54%), followed by guttering (n = 35%, 68.62%); Wartenberg's sign (n = 35%, 68.62%), partial claw hand deformity (n = 23, 45.09%), complete claw hand (n = 8, 15.68%), ape thumb (n = 2, 3.92%), and wrist drop (n = 1, 1.96%) were seen. In the feet, guttering (n=13, 25.49 %) was most common, thereafter claw toes (n=12, 23.52%), collapse of arch (n=6, 11.76 %), and foot

drop (n=4, 7.84%). In the face, lagophthalmos was seen in two patients. (3.92%). In the study by Kumar et al (2004) ulnar palsy and claw hand alone or in combination with foot drop were the commonest paralytic deformities. In a study by Jain & Mishra (2014) among the patients with grade 2 deformities, the most common type observed was claw hand. Sukumar et al (2010) noted claw hand in 18 (60%) patients in their study. Most common anaesthetic deformity/disability observed in hands was xerosis in 23 patients (45.9%) followed by blister in 20 patients (13.7%), fissure in 12 patients (23.5%), callus in 8 patients(15.6%) and trophic/traumatic ulcer in 4 patients(7.84%). Sukumar et al (2010) reported ulcer and scars/cracks in hands in 17(57.6%) patients each.

Anaesthetic deformity observed in feet was xerosis in 45(88.2%) patients followed by callus in 36(70.5%), fissure in 28(54.90%) patients, trophic ulcer in 25(49%) patients, glove and stocking anesthesia in 20(39.1%) patients and blister in 4(7.84%) patients. Chavan & Patel (2011) noted trophic ulcer as the most common deformity in foot. Jain & Mishra observed plantar ulcer in 35% of patients and study conducted by Sukumar et al (2010) noted plantar ulcers in 20% of patients. Anaesthetic deformities in hands were similar to feet where xerosis (23 patients) the most common finding followed by formation of blisters (20 patients), fissure(12 patients), callosities(8 patients) and trophic ulcer(4 patients).

In our study it was found that paralytic deformities/ disabilities (72.5%) were most commonly observed across the spectrum of leprosy followed by anaesthetic deformities/ disabilities (41.1%) and specific deformities like madarosis, leonine facies, saddle nose, reaction hand, shortening of fingers in (23.5%) where as in study conducted by Daniel et al (2019), it was observed that anaesthetic deformities (82.2%)were more common followed by specific

deformities(30%).This variation can be attributed to the increase use of footwear and personal protective equipment during work which might have reduced visible deformities due to anaesthesia. Awareness and counselling of patients as well as type of impairment can also impact.

In our study group two-third of patients reported with disabilities/ deformities. This indicates the problem of access to early and appropriate management of leprosy and its complications. Whether the problem is due to ignorance or due to other enabling factors should be investigated.

Conclusion

Even though leprosy has been eliminated as a public health problem in India, new cases are still being recorded everywhere. The leprosy situation in a tertiary care hospital in Karnataka, India, is reflected by our study. This study raises concerns about high proportion of multibacillary cases, which is also seen in other regions of the nation. A greater numbers of MB cases point to delayed diagnosis and higher risk of transmission, indicating the necessity of maintaining community-based surveillance. Because leprosy carries an associated stigma and can result in permanent disability, it is important to address the presence of deformities/ disabilities, particularly grade 2 deformities. It would be important to strengthen the systems for early access to the people, increase awareness and assure timely adequate management of reactions for reducing the disabilities.

Numerous deformities have been linked to leprosy. It is crucial to take a thorough history and examine the patient at the time of presentation, particularly if they are experiencing sensory loss. When anaesthetic limbs are neglected, deformities may worsen and have undesirable effects. This study highlights the various types of deformities observed among leprosy patients in post elimination era and post covid era with

majority comprising of the new untreated patients and hence the need for increasing awareness among population, strengthen field-based interventions and early detection of the disease before disability arises. While the findings would be relevant for the population of catchment area, these should not be extrapolated unless confirmed by actual community level studies.

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