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Original Article

A Clinico-epidemiological Study of Disabilities in Leprosy Patients from an Endemic Area of Central India

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People affected by leprosy are at risk of impairment, primarily due to delay in diagnosis. Despite increased efforts, reports from various studies suggest that leprosy is usually diagnosed late, and a high grade 2 disability (G2D) rate especially in untreated cases indicates delayed diagnosis. The study aims to determine the percentage of disabilities among leprosy patients and the association of G2D with various clinical-epidemiological factors. This retrospective study was conducted on 123 leprosy patients attending the Dermatology OPD of AIIMS, Raipur (India) a tertiary care institute in Central India from July 2020 to March 2022. All leprosy patients, including new, partially treated, on-treatment, and released-from-treatment patients, were included in the study. Clinico-epidemiological details of all leprosy patients presenting during this period were noted. 95% (118/123) were of multibacillary (MB) type as per WHO classification. G2D was found among 52.8% (65/123) of leprosy patients included in the study among which 12.3% had already completed treatment and 87.6% were newly diagnosed or under ongoing multidrug therapy. Claw hand was found in 34%, and trophic ulcer was found in 22.7% of leprosy patients. This study shows G2D to be more common in younger age (<45 years), disease duration > six months, ≥ two nerve trunk involvement, Multibacillary cases with BI ≥4, type 2 lepra reaction, and untreated/ undertreatment cases of leprosy; however, the difference was not statistically significant. The prevalence of G2D remains high in the post-leprosy elimination era due to multiple factors, the most important being the delay in initiating treatment and the magnitude of the burden of multibacillary cases. Community-based similar studies could better comprehend the extent and reasons of G2D in newly diagnosed, on treatment, and treated cases for implementing public health measures.

Keywords: Leprosy, Disability, Lepra Reaction, Claw Hand, Multibacillary, Trophic Ulcer

Introduction

Leprosy, or Hansen's disease, is a chronic disease primarily involving the skin and peripheral nerves. Over 60% of all new leprosy patients detected worldwide were Indians according to 2015 WHO data (Arif et al 2019). If not treated timely and appropriately, it can cause irreversible damage to the peripheral nerves, leading to loss of sensation and muscle function, resulting in visible deformities, functional impairments, and disabilities with serious health, social, and economic consequences. One of the major factors responsible for the stigmatization of leprosy patients is their identification in society

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due to visible deformities.

India has the highest leprosy burden, with 103819 new leprosy patients detected in the year 2022-23 (NLEP 2022-23), with 2.3% leprosy patients having grade 2 disability (G2D). With a prevalence rate of 2.29 per 10,000 people (2022-23), Chhattisgarh has the highest prevalence among Indian states and union territories. Patient delay is the leading cause of disability (G2D/G1D) in adult leprosy patients. A patient delay of over three months from the first symptom is an essential indicator of disability in adult leprosy patients (Srinivas et al 2019). Though, understandably, delay in diagnosis could be one of the leading causes of disability, it is also crucial to identify other associated factors to prevent or appropriately manage the disability in leprosy-affected patients. With this background, it was decided to carry out a record-based analysis of leprosy patients who came for treatment to Dermatology OPD of All India Institute of Medical Sciences (AIIMS), Raipur to estimate the clinical-social factors associated with G2D.

Materials and Methods

After obtaining clearance from the institutional ethics committee, a hospital record-based retrospective study was conducted on leprosy patients who came to the Dermatology department of AIIMS, Raipur from 1st July 2020 to 31st March 2022 over one year and nine months. All leprosy patients, including new, partially treated, on-treatment, and released-from-treatment patients, were included in the study. Patients who had disabilities due to causes other than leprosy, such as trophic ulcer in diabetic patients, traumatic deformity, and idiopathic facial palsy, were excluded. Demographic details, duration of illness, treatment, and reaction status of the patients with detailed cutaneous, motor, and sensory examination, as well as bacterial index, were noted in the records.

Patients were classified as per Ridley-Jopling (1966) and WHO classification (2018) based on clinical findings, bacterial index on slit skin smear examination, and histopathological information. Clinical evidence of lepra reaction, when present, was noted and the WHO grading system was used to assign grades to disabilities (Brandsma & van Brakel 2003).

Results

The total number of patients included in our study was 123; 69% (n=85) were males, and 31% (n=38) were females (M: F ratio- 2.2:1). The clinical-epidemiological details of the patients have been listed in Table 1. Most of the patients were under 45 years of age group (69%). Most of our patients (66%) presented after six months of onset of symptoms. Almost two-thirds of the patients belonged to urban areas (66.7%, n=82), whereas 33.3% (n=41) patients belonged to rural areas. 87.8% (n=108) patients were from Chhattisgarh, and 44.7% (n=55) patients belonged to Raipur district.

Upon analysing the distribution of the patients according to WHO classification, 95% (n=118) were diagnosed as multibacillary (MB), and 4% (n=5) as paucibacillary (PB) leprosy. 87.5% (n= 112) of patients presented with multiple nerve trunk enlargement.

52.8% of patients (n=65) had G2D, of whom 72% (n=47) were males, and 27.6% (n=18) were females (M: F=2.6:1). Most of the patients with G2D (69.2%, n=45) were under 45, and 30.7% (n=20) were more than 45 years old.

Most of our patients with G2D (76.9%, n=50) belonged to lower socioeconomic status. Almost 92.3% (n=60) of patients with G2D had involvement of more than or equal to two nerve trunks. Among 65 patients with G2D, 96.9% (n=63) belonged to the MB spectrum and only 2 to the PB spectrum.

Table 1 : Epidemiological and clinical characteristics of the study patients.

Variable	Grade 2 disability-Yes (n=65)	Grade 2 disability- No (n=58)	Chi-square	P value	Odds Ratio	CI
Age						
45 and below	45(69.2%)	40(68.9%)	0.001	0.975	1.01	0.47-2.17
Above 45	20(30.7%)	18(31%)				
Gender						
Male	47(72.3%)	38(65.5%)	0.662	0.416	1.37	0.64-2.96
Female	18(27.6%)	20(34.4%)				
SES						
Low SES	50(76.9%)	49(84.4%)	1.112	0.291	0.61	0.25-1.53
Middle and high	15(23%)	9(15.5%)				
Duration of disease (months)						
≤ 6	19(29.2%)	22(37.9%)	1.044	0.307	0.68	0.32-1.44
> 6	46(8) (70.7%)	36(3) (62%)				
No. of Nerve Trunks						
0-1	5(7.69%)	6(10.3%)	0.264	0.607	0.72	0.21-2.51
≥ 2	60(92.3%)	52(89.6%)				
WHO Type						
MB	63(96.9%)	55(94.8%)	0.345	0.557	1.72	0.28-10.66
PB	2(3%)	3(5.1%)				
Spectrum of Leprosy						
Lepromatous	42(64.6%)	33(56.8%)	0.907	0.636	1.59	0.56-4.48
Borderline lepromatous	15(23%)	15(25.8%)			1.25	0.39-4.04
Borderline Tuberculoid	8(12.3%)	10(17.2%)				
Reaction						
Type 1			11.076	0.0009	0.139	0.038-0.509
Yes	3(4.61%)	15(25.8%)				
No	62(96.9%)	43(74.1%)				
Type 2			2.683	0.101	0.55	0.27-1.13
Yes	23(35.3%)	29(50%)				
No	42(64.6%)	29(50%)				
Bacterial Index						
< 4	30(46.1%)	22(37.9%)	0.849	0.357	1.40	0.68-2.88
≥ 4	35(53.8%)	36(62%)				
MDT Treatment History						
Treated	8(12.3%)	3(5.1%)	1.916	0.166	2.57	0.65-10.20
Untreated/ongoing	57(87.6%)	55(94.8%)				

Out of 123 leprosy patients, 57% (n=70) patients presented with lepra reaction, out of whom 26% (n=18) had type 1 lepra reaction, and 74% (n=52) had type 2 lepra reaction. Among G2D patients, 40% (n=26) of the patients had lepra reaction; 4.61% (n=3) had type 1 reaction, and 35.3% (n=23) had type 2 lepra reaction. Of 43% (n=53) of patients without lepra reaction, 73% (n=39) had G2D.

64.6% (n=42) patients had lepromatous leprosy, 23% (n=15) had borderline lepromatous, and 12.3% (n=8) had borderline tuberculoid leprosy. Among G2D cases, 64.6% (n=42) belonged to lepromatous, 23% (n=15) belonged to borderline lepromatous and 12.3% (n=8) patients belonged to borderline tuberculoid spectrum of leprosy. The bacteriological index (BI) was high (≥4) in 58% (n=71) of our leprosy patients. In patients with G2D, 53.8% (n=35) had BI ≥ 4. Out of 123 patients, 91% (n=112) were under treatment.

Table 2 : Table 2: Frequency (percentage) of grade 2 disabilities among leprosy patients.

Deformity	n (%)
Lagophthalmos	1(0.81%)
Claw hand	42(34.14%)
Foot drop	7(5.69%)
Trophic ulcer	28(22.76%)
Non-trophic ulcer	16(13%)
Mutilation	1(0.81%)
Claw toes	6(4.87%)
Facial palsy	4 (3.25%)

Table 3 : Clinical and bacteriological characteristics of various deformities.

Deformity (n)	Lepromatous spectrum	BI ≥ 4	MB cases	Disease duration > 6 months	Type 2 lepra reaction	Type 1 lepra reaction	Without lepra reaction
Claw hand							
(n=42)	28/42 (66.7%)	19/42 (45.2%)	41/42 (97.6%)	36/42 (85.7%)	17/42 (40%)	-	25/42 (59.5%)
Trophic ulcer (n=28)	23/28 (82%)	6 /28 (21.4%)	28/28 (100%)	13/28 (46.4%)	6/28 (21.4%)	-	7/28 (25%)
Both claw hand and trophic ulcer (n=13)	12/13 (92.3%)	6/13 (46.1%)	13/13 (100%)	13/13 (100%)	6/13 (46.1%)	-	6/13 (46.1%)
Claw toes (n=6)	6/6 (100%)	-	6/6 (100%)	6/6 (100%)	3/6 (50%)	-	3/6 (50%)

Among G2D patients, 87.6% (n=57) were under treatment / newly diagnosed, and 12.3% (n=8) had completed treatment.

Analysis of the deformities in 123 patients showed claw hand in 34.1% (n=42), trophic ulcer in 22.76% (n=28), and foot drop in 5.7% (n=5). Almost 10.56% (n=13) of the patients had both trophic ulcers and claw hands and 3.25% (n=4) had facial palsy. (Table 2) The clinical and bacteriological characteristics of various deformities have been tabulated in Table 3.

Discussion

Our study intends to investigate the percentage of various disabilities among leprosy patients. Male gender as a risk indicator for developing disability has been reported by Sarkar et al (2012), Moschioni et al (2010), and Kumar et al (2012). Males made up 69% (n=85) of leprosy patients with disabilities in this study. However, the association did not appear to be statistically significant. The rigorous physical work performed outside predisposes the already vulnerable patients to trauma, combined with postponing health care to avoid losing pay, which may be the cause of an increase in male cases with disability.

A 10-year retrospective study from Kerala reported that patients with leprosy who were over 45 years old were 2.3 times more likely to develop a disability than those who were 45 or younger (Sabeena & Bindu 2020). In the current study, leprosy patients under 45 years had a significantly higher number of G2D; however, the association was not statistically significant. Patients with low socioeconomic status were more commonly found to have G2D due to the lack of accessibility to optimum health care, according to similar previous studies (Yadav & Kar 2020). Education assists patients in developing a better understanding of the importance of early treatment and preventing deformities through timely access to healthcare facilities.

According to Sabeena & Bindu (2020), patients with more than one year of disease duration are 1.75 times more likely to develop a disability than those with less than one year of disease duration. In this study, we observed that patients with more than six months of disease duration are likelier to develop G2D than patients with shorter disease duration. This can be explained by the fact that the longer the duration, the greater the risk of disease progression, nerve damage, and subsequent sensory loss and disability. Longer disease duration also suggests a delay in diagnosis and treatment initiation, which reflects the community's failure to control leprosy.

According to a multibacillary cohort study, involving three or more nerves increases the possibility of disability development (Kumar et al 2012). According to our results, the involvement of more than or equal to two nerve trunks was more commonly associated with G2D. The greater the number of nerves affected, the greater the chance of G2D in leprosy patients.

According to Santos et al (2015), MB patients were more likely to develop disability than PB patients. In the current study, 96.9% of those with leprosy with G2D were MB types, while only 3% were PB types. However, the substantial percentage of G2D in MB cases did not appear statistically significant in this study. Patients with lepromatous leprosy had a higher risk of developing disabilities, as stated by similar studies (Santos et al 2015). Similar observations were noted in the current study (64.6% of G2D cases had lepromatous leprosy) but this association was not statistically significant.

Lepra reactions are one of the significant risk factors for developing disabilities due to immunologically mediated inflammation and nerve damage, as stated by previous studies by Santos et al (2015), de Paula et al (2019), and Ranque et al (2007). Although G2D was more common in type 2 lepra than in type 1

lepra reaction, we could not find any significant difference.

Leprosy patients with BI greater than or equal to 4 had a higher risk of suffering from G2D in the current study, which was found to be statistically insignificant. In a prospective cohort study by Kumar et al (2012), the incidence of disability was found to be slightly higher in early defaulters than in late defaulters, suggesting that the possibility of disability increases if treatment is not completed. Among G2D cases, only 12.3% (n=8) were treated cases, rest of the patients (87.6%, n=57) were either newly diagnosed or under treatment**.** Early treatment for leprosy is essential for reducing the risk of disability, and delaying treatment increases the risk of disability. 52.8% of our cases had G2D compared to 5.8% reported from Chhattisgarh (NLEP 2021-22), that can be explained since ours was a study from tertiary care center dealing mostly with referrals. Another hospital based study from Central India reported that a total of 60% patients had grade 1 or grade 2 disability whereas 32% had grade 2 disability (Shravani et al 2022). Ours was also a hospital-based study that could have high disability rates due to a higher proportion of MB leprosy cases (95.9% in our study compared to 65.94% reported from Chhattisgarh in the year 2021-22) and type 2 lepra reactions.

Conclusion

Leprosy remains a leading cause of peripheral neuropathy, deformity, and disability in the world. Despite the efforts by the National leprosy eradication program (NLEP), the prevalence of G2D among leprosy patients remains high, especially among endemic areas. Claw hand and trophic ulcer were the most common G2D observed in our cases. In this study, G2D was more commonly observed in patients with younger age (<45 years), disease duration more than six months, ≥ two nerve trunk involvement, MB type with BI ≥4, type 2 lepra reaction, and newly diagnosed/ under-treatment. It is imperative to study the factors contributing to G2D, especially in endemic areas, as targeted interventions based on these data might help reduce the community burden of G2D.

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