



Defacement Due To Dereliction: A Cross Sectional Record-Based Study Of Magnitude, Trend And Types Of Deformity In Leprosy Patients At Tertiary Care Hospital In Western Gujarat, India

¹Dr. Neela M. Patel, ²Dr. Avanita D. Solanki, ³Dr. Khushbu R. Modi, ^{4*}Dr. Niraj V. Dhinoja, ⁵Dr. Ruchitra Sarkar, ⁶Dr. Tithi Shah

¹Professor and Head, ²Associate Professor, ³Assistant Professor, ^{4*,5}Third Year Post Graduate Resident

⁶Second Year Post Graduate Resident,

Department of Dermatology,

Venereology and Leprosy, AMCMET Medical College, Ahmedabad, Gujarat, India

***Corresponding Author:**

Dr. Niraj V. Dhinoja

Third Year Post Graduate Resident, Department of Dermatology,

Venereology and Leprosy, AMCMET Medical College, Ahmedabad, Gujarat, India

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Abstract

Aims and Objective:

This study was conducted to determine trend, distribution, severity and frequency of deformity among leprosy patients, in relation to various demographic, clinical and reaction pattern.

Materials and Methods:

It was a retrospective record based cross sectional study done at Department of Dermatology, venereology and Leprosy, Gujarat; during period of August 2010-August 2020. Data regarding clinical history, examination, presence or absence of deformity (at the time of diagnosis, during or after treatment), development of lepra reaction were obtained and analyzed by SPSS 27 software.

Results:

Out of 568 patients, 307 patients had deformity, among them 35.18% were females and 64.82% were male. Maximum deformities were present in 20-40 years and hands were most common part affected by deformity. Anesthesia of hands and feet was most common type deformity followed by gross deformity like clawing of digits, foot drop and ulcers. Pure neuritic (100%) and lepromatous leprosy (67.28%) were commonly found to have deformity than other types. There was statistically significant association between lepra reaction and development of deformity ($p < 0.05$). Grade 2 deformity among newly diagnosed patients was 19.90%; which is significantly high and suggestive of late presentation of cases. Though in last 10 years deformity showed decreasing pattern but the objective of zero grade 2 deformity rate is still not achieved.

Conclusion:

Leprosy is a chronic infectious disease and is a major cause of preventable deformity in developing countries. Longer the duration of disease, Higher the chances of deformity and that's why early diagnosis is important

Keywords: Leprosy, Deformity, Deformity trend, Social stigma, Western India

Introduction

Leprosy is one of the oldest known diseases; has been mentioned in ancient Indian, Egyptian and Chinese literatures. [1] It is caused by Mycobacterium leprae

which is an obligate intracellular, acid-fast organism. Man is the only natural host.

Leprosy is classified based on the status of cell mediated immunity of the affected person. While patients with good CMI will have tuberculoid leprosy (tuberculoid and borderline tuberculoid), patients with poor CMI will have lepromatous leprosy (borderline lepromatous and lepromatous).

The major concern is about development of crippling deformities and disabilities due to infiltration of tissue or nerve trunk by bacilli, which are very much associated with social stigma and rendering patient isolated and unemployed. Despite aggressive implementation of National Leprosy Elimination Programme (NLEP), the goal of zero Grade 2 deformity (G2D) has not been yet met.^[2] It is possible to prevent disabilities with early diagnosis and treatment, makes leprosy important cause of preventable deformity and leading cause of permanent physical deformity in the world.^[3] Besides early detection and management of all new leprosy cases, present focus is on prevention of disabilities and provision of rehabilitative services for leprosy patients. Thus, a new initiative has been implemented named 'Disability Prevention and Medical Rehabilitation' (DPMR) with primary objectives to prevent disabilities and worsening of existing deformities in all leprosy affected persons.^[4]

Two types of deformities are encountered: Primary deformity due to direct damage to nerves and skin by *M. leprae* and secondary deformity due to indirect damage to tissue with primary deformity.^[5]

Successful introduction of multi drug therapy in 1982 by WHO, provided the basis of leprosy elimination program. In 2019, among newly detected cases globally, 57% cases were from

India.^[6] Prevalence rate of leprosy in India on march 2020 was 0.57/10000 population and Grade 2 disability rate is 1.96/million population which is still eons away from achieving the objective of zero G2D.

^[7] G2D rate is an important indicator of leprosy control programme as higher rate suggests that leprosy is being detected late and there may be hidden cases in the community. Thus, an effective leprosy control programme should identify hidden and apparent leprosy cases early thereby preventing deformity at earliest.

The draft Global Leprosy Strategy for the period 2021– 2030 is in line with the "Ending the neglect to

attain the Sustainable Development Goals – a road map for neglected tropical diseases 2021–2030" with the rate of new G2D cases to be reduced to 0.12 per million population.^[6]

Materials And Methods:

Study design:

It was a retrospective cross-sectional record-based study.

Study location and duration:

It was done at Department of Dermatology, venerology and leprosy, for the period of 10 years, between August 2010 to August 2020 after obtaining Institutional ethics committee approval.

Data collection and analysis:

Data regarding demography (Age, sex, socioeconomic status, occupation), clinical history (presenting complaints, duration of disease, precipitating factors, family history) and clinical examination (complete cutaneous examination, peripheral nerve and sensory-motor examination and disability) and laboratory investigations (complete blood count, SSS and lesional skin biopsy) were recorded. Patients diagnosed as having leprosy either paucibacillary or multibacillary, based on clinical and slit skin smear examination.^[8] Patients also underwent skin biopsy and histopathological examination. Leprosy cases were further classified based on Ridley-Jopling classification.^[9] Cases of leprosy who developed disability were graded according to WHO disability grading (WHO 1988).^[10]

Data was analysed using Microsoft Excel 2019 and SPSS 29 (Statistical Package for the Social Sciences 29) software.

Ethical clearance:

The study was done after taking approval form institutional review board. Confidentiality of all the data study was maintained throughout this study.

Results:

Among 568 leprosy patients, 344(60.56%) were male and 244(39.44%) were female and male to female ratio was 1.5:1. Out of 568 patients, 307 (54.05%) patients developed deformity, of which 64% were male and 36% were female with male to female ratio

1.8:1. 2/3rd of the patients were illiterate and most affected by deformity. Around half of our patients were labourers and formed the major bulk among the patients with deformity. [Table-1]

Patient were between 11-84 years with mean age of 47.5 years. Most common age group affected with leprosy was 20-40 years (42.07%). Highest no. of patients affected with deformity belongs to 20-40 years (42.67%) followed by 41-60 years [Table-2].

Most of the patients had presented with complaints regarding skin lesion and neuropathy related symptoms like tingling-numbness, objects falling from hand and slippage of chappals (motor weakness). While 1/3rd of the patients directly presented with deformity. Some (8.9%) patients also had signs and symptoms of lepra reaction at presentation. [Table-3]

Disabilities were common in patients with longer duration of disease, more no. of skin lesions, nerve involvement and who interrupted their treatment in between. [Table-4]

Deformities were more common in MB leprosy than PB leprosy. Total 194 (56.06%) patients developed deformity among MB leprosy. 38.76% patients had grade 2 deformity out of total patients with deformity which corresponds to G2D rate of 21/100 newly diagnosed patient [Table-5]. Type of leprosy (PB/MB) was not significantly correlated with deformity. (p value >0.005)

1/3rd patients were of borderline tuberculoid leprosy which is followed by borderline lepromatous and lepromatous leprosy. Out of which deformities were more common in pure neuritic leprosy (100%) and lepromatous leprosy (64.8%), followed by borderline lepromatous leprosy (63.3%) and borderline tuberculoid leprosy (59.47%). [Table-6]

Patient with type 2 lepra reaction developed deformity more commonly than type 1 lepra reaction. Out of 111 patients with the history of type-1 lepra reaction, 65.76% patients developed disabilities [Table-7].

Feet were the most commonly affected site followed by hand and anaesthesia was the most frequent deformity among both of them. Conjunctival congestion or redness was most common disability

affecting eyes. Most common visible/G2D was ulcers over feet. [Table-8]

Out of 307 patients, 226 (73.61%) patients had multiple deformities while 27.38% had single deformity [Table-9].

Among newly diagnosed patients 36.79% patients had either grade-1 or 2 deformities. 51.67% patients had G2D among total newly diagnosed patients with deformity [Table-10].

Trend of leprosy deformity in past 10 years is depicted in table-11 and chart-1 shows decrease in the percentage of patients with leprosy deformity.

Discussion:

Even though wide availability MDT and extensive implementation of NLEP, there are still lacunae which need to be addressed as they lead to delay in diagnosis and deformity. Once deformity is developed it will remain for long and adversely affects financial condition, psycho-social health and interpersonal relations of the patients. Prevalence of deformity due to leprosy ranges from 16-80%^[11-16] in various studies done in India, which made us to search the reasons for the same and this serves the base of this study. Multiple body parts (i.e., hands, feet and/or eyes) involvement may be considered severe than single body part involvement.^[13]

A total 568 patients were diagnosed with leprosy in last 10 years with an average of 57 newly diagnosed patients per year and 1.2 patients per week. Most of the patients with deformities were illiterate and labourer. Ahmedabad being major industrial hub of the state and the country, majority of our patients were migrants and it may be the reason of high no. of leprosy patients. 307 (54%) patients were having deformity and it was attributed to low education, social stigma, low socio-economic status, poor nutrition-low immunity, more attention to work than health, ignorant behaviour leading to late presentation to health care centre and delay in diagnosis. So, we need more trained health care workers at primary and secondary health care centre to identify these patients early.

In our study incidence of disability (54.05%) was higher than Ishore et al 2019 (15%)^[4], Sanker A et al 2020 (16%)^[12], Girish A. et al 2016 (23.5%)^[14], BB IYERE 1990(38%)^[15]; lower than Raghavendra B.N.

et al. 2017 (80%)^[11] and similar to Patel NR 2016^[13] and Seshadri et al 2015 (53%)^[16]. This observation suggests that prevalence of deformity is in decreasing trend except in endemic states due to early diagnosis and treatment.

Males were affected more than females in terms of disease and deformity both. It may be due to the fact that males have more chances of contact and more exposure to hard work. Male predominance was also reported in Ishore et al 2019^[4], Sanker A et al 2020^[12], Raghavendra B.N. et al. 2017^[11], Sheshadri et al 2015^[16].

The most common age group affected with leprosy as well as deformity was 20-40 years that is economically most productive age group and deformity will hamper their working capacity leading to early presentation. Similar finding was reported by Ishore et al 2019. In a study done by Zhang Guocheng et al 1990^[17] most common age group affected was 45-54 years and same finding in Girish A. et al 2016^[14] which may be due to may be ignorance of the disease by themselves as well as by family members.

Feet (180/374, 48.12%) were most common site involved followed by hands (110/374, 29.41%) and eyes (84/374, 22.45%). Anaesthesia of skin (grade-1 deformity) was the most common deformity in hands and feet. Ulcers were the most common G2D. In a study by Girish A. et al 2016^[14], BB IYERE 1990^[15] and Chavan et al 2005^[18] showed similar findings. Improper care of anaesthetic limbs and recurrent unnoticed trauma leads to ulcers and later on paralytic deformity due to nerve damage. In our study, some patients had both grade-1 and grade-2 deformity which are included individually in separate group, of which grade-1 deformity was seen in 240 (78.17%) patients.

Total 203 patients developed lepra reaction either at presentation, during MDT or after completing MDT. Type 1 lepra reaction was more common than type 2 lepra reaction. There is statistical significance between lepra reaction and development of deformity ($p < 0.05$).

Deformities were more common in patients with MB leprosy (56%) than PB leprosy (51%) which may be attributed to high bacillary load and more no. of peripheral nerve involvement and more incidences of

lepra reaction. Increase in MB cases may also be due to late identification of leprosy cases^[12]. Though there was no statistically significant association between MB or PB leprosy with development of lepra reaction ($p > 0.05$).

100% patients with pure neural leprosy developed deformities followed by lepromatous leprosy (64.8%) and borderline lepromatous leprosy (63.33%). Overall diagnosis of borderline tuberculoid leprosy was common; survey done by Sanker A et al 2020^[12], Thakkar et al 2014^[19] and Sharma et al 2008^[20] also showed borderline tuberculoid leprosy to be more common.

Out of 568 patients, 209 (68.07%) patients had deformity at onset of starting MDT, 91 (29.24%) patients during MDT and only 7 patients (2.28%) after RFT. This trend shows effectiveness of MDT and importance of early commencement of treatment. Proportion of G2D among newly diagnosed patients is 19.09%, indicated that cases are still being detected late suggesting active leprosy transmission which needs active surveillance in search of these cases presenting late and implementation of elimination programme needs to be reviewed periodically.

Lastly, the trend of deformity in our study showed a decreasing pattern with highest cases in 2010 and lowest in 2020, matching to recent studies as mentioned earlier; must be due to effective MDT. It should be noted that no. of patients diagnosed with leprosy are low during Aug 2019 to Aug 2020; which may be ascribed to COVID-19 situation, where in patients were hesitating to visit health care facility and immigration of patients to their native place.

It should be clear that though overall deformity rate has been reduced but G2D rate is still way before the national and state guideline and the exact reason for this discordance needs to be explored.

Conclusion:

Though leprosy has been eliminated from India since December 2005 but leprosy cases are continuously popping up as it has long incubation period and there is an ice berg of cases in community that are involved in constant disease transmission and disease related deformities. Looking at association of clinical parameters and deformity; longer duration of illness, more no. of skin lesion and nerve involvement are crucial in deformity development. Deformities can be

prevented by early diagnosis and timely institution of MDT.

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Table 1: Disability distribution in various demographic variable

Demographic parameter	Disability		Total (n=568)
	Present	Absent	
Gender			
Male	199 (58%)	145 (42%)	344 (60.56%)
Female	108 (48.21%)	116 (51.8%)	224 (39.44%)
Education			
Literate	47 (27.9%)	121 (72.02%)	168 (29.57%)
Illiterate	260 (65%)	130 (32.5%)	400 (70.42%)
Occupation			
Housewife	57 (28.7%)	141 (71.2%)	198 (34.85%)
Skilled worker	10 (38.46%)	16 (61.53%)	26 (4.5%)
Student	20 (50%)	20 (50%)	40 (7%)
Labourer	220 (72.3%)	84 (14.7%)	304 (53.5%)

Table 2: Age Distribution

Age(year)	No. of patients	Patients with disabilities
<20	66 (11.61%)	19 (6.18%)
20-40	239 (42.07%)	131 (42.67%)
41-60	172 (30.28%)	110 (35.83%)
61-80	86 (15.14%)	45 (14.65%)
>80	5 (0.8%)	2 (0.6%)
Total	568 (100%)	307 (100%)

Table 3: Distribution of patients according to mode of presentation

Mode of presentation	Total no. of patients
Skin lesions and neuropathy related	305(53.69%)
Reaction	51 (8.9%)
Deformity	212 (37.32%)
Total	568

Table 4: deformity associated with various clinical parameters

	Disability		Total
	Present	Absent	
Duration of illness			
<6 months	11 (12.65%)	76 (87.35%)	87 (15.31%)
6 month – 1 year	144 (52.5%)	130 (47.5%)	274 (48.23%)
>1 year	152 (73.5%)	55 (26.5%)	207 (36.44%)
No. of skin lesions			
Single	-	20 (100%)	20 (3.5%)
2-5	113 (56%)	89 (44%)	202 (35.5%)
>5	194 (56.07%)	152 (43.93%)	346 (61%)
No. of nerve involvement			
Single	-	6 (100%)	6 (1%)
2-5	114 (56.15%)	90 (44.33%)	203 (36%)
>5	194 (56.07%)	152 (43.93%)	346 (61%)
None	-	11(100%)	11 (2%)
Defaulter			
Yes	76 (43%)	101 (57%)	177 (31.16%)
No	231 (59%)	160 (41%)	391 (68.84%)

Table 5: deformity distribution according to type of leprosy

Grade of deformity	PB	MB	Total
Grade-1	74 (39.36%)	114 (60.63%)	188
Grade-2	39 (32.77%)	80 (67.22%)	119
Total	113	194	307

Table 6: Deformity distribution according to clinical diagnosis

	Total no. of patients	Patients with disability
Lepromatous leprosy	125 (22%)	81 (64.8%)
Borderline lepromatous leprosy	120 (21.12%)	76 (63.33%)
Mid borderline leprosy	39 (6.86%)	5 (12.82%)

Borderline tuberculoid leprosy	190 (33.45%)	113 (59.47%)
Tuberculoid leprosy	81 (14.26%)	19 (23.45%)
Pure neurotic leprosy	13 (2.28%)	13 (100%)
Total	568 (100%)	307

Table 7: Lepra rection and deformity

Type of Lepra reaction	Total No. of patients	Patients with disabilities
Type 1	111 (54.67%)	73 (65.76%)
Type 2	92 (45.03%)	72 (78.26%)
Total	203 (100%)	145 (71.42%)

(Chi Square test- 4.62, *p* value- <0.05)

Table 8: Site wise distribution of deformity

Type of deformity	Male	Female	Total
Eye			
Conjunctival congestion/ redness	20	12	32
Blurring of vision	7	5	12
Lagophthalmos	9	7	16
Corneal insensitivity	5	5	10
Madarosis	8	6	14
Hands			
Anaesthesia	36	20	56
Claw hand	18	16	31
Ulcers	7	3	10
Resorption of digits	5	2	7
Other	2	2	4
Wrist drop	2	-	2
Feet			
Anesthesia	74	36	110
Claw toes	4	3	7
Foot drop	2	1	3
Ulcers	28	18	46

Resorption of digits	5	2	7
Other	4	3	7
Total	236 (63.1%)	138 (36.9%)	374

Table 9: Number of deformities

Deformity	No. of patients
No deformity	261
Single deformity	81 (26.39%%)
Multiple deformity	226 (73.61%)

Table 10: Distribution of disability according to treatment status

Treatment status	No. of patients with G2D rate deformity (Grade-1 or 2) out of 568	
Newly diagnosed	209 (36.79%)	108 (19.09%)
On MDT	91 (29.44%)	7 (1.2%)
RFT (released from treatment)	7 (1.2%)	4 (0.7%)
Total no. of patients	307	119

Table 11: Trend of Deformity

Duration	Total no. of patients	No. of patients with deformity	Percentage %
Aug 2010- Aug 2011	58	42	72.41
Aug 2011- Aug 2012	63	37	58.19
Aug 2012- Aug 2013	65	38	58.46
Aug 2013- Aug 2014	59	32	54.23
Aug 2014- Aug 2015	52	27	51.92
Aug 2015- Aug 2016	69	33	47.82
Aug 2016- Aug 2017	57	28	49.12
Aug 2017- Aug 2018	61	28	45.9
Aug 2018- Aug 2019	59	25	42.37
Aug 2019- Aug 2020	45	17	37.77
Total	568	307	

Chart 1: Deformity trend in last 10 years in present study

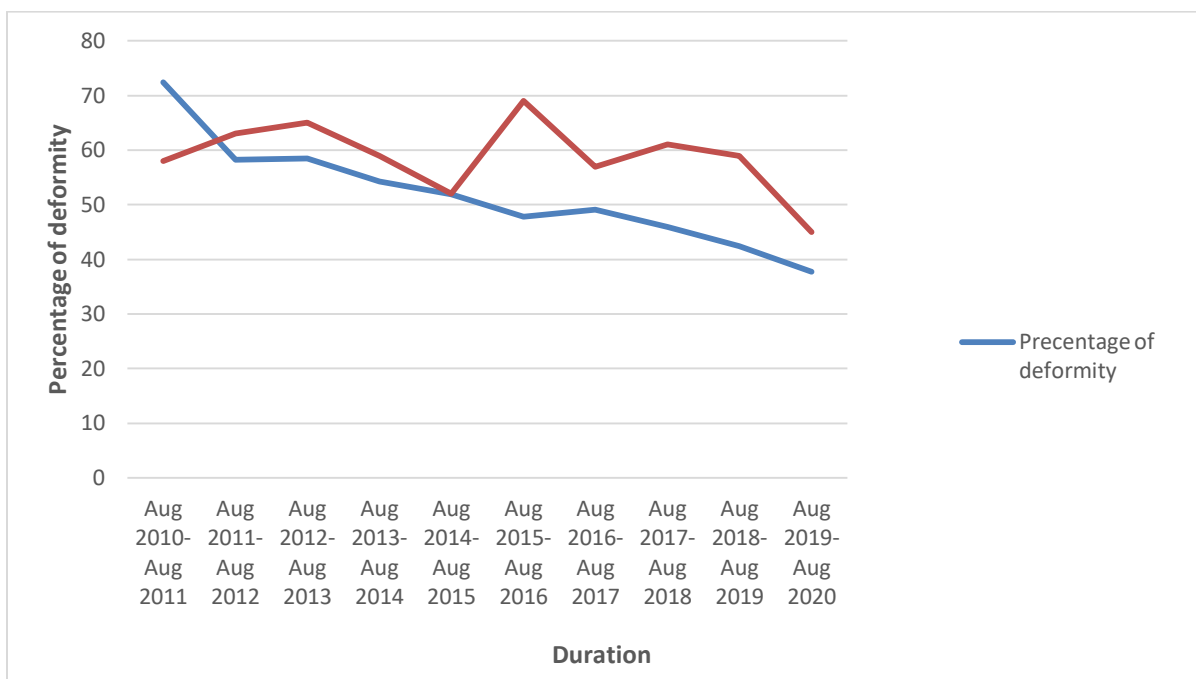


Table 12: Comparison with various studies

Parameters	Ishora et al ^[4]	Raghavendra et al ^[11]	Sanker et al ^[12]	Present Study
Age group with disability	15-29 years	21-30 years	31-40 years	20-40 years
M: F	1.6:1	3.5: 1	2.2: 1	1.5:1
Incidence of G2D	6.3%	26%	4.7%	21% %
% Of PB cases with deformity	0	-	-	36.8%
% Of MB cases with deformity	24.28%	-	-	63.2%
Most common site involved with disability	Feet	Feet	-	Feet
Most common grade of disability	Grade-1	Grade-2	Grade-1	Grade- 1