

## Clinico-Social Determinants of Disability among New Leprosy Patients: Study from a Teaching Hospital in Rural Area of West Bengal, India.

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**Abstract:** Presence of disability among new leprosy patients reflects the efficiency of case detection machinery of that area, therefore it reflects the progress in leprosy control programme. Knowledge of the risk factors for disability among new leprosy patients are essential for prevention of disability and rehabilitation services.

**Objectives:** To study the prevalence of severity, site and nature of disability alongwith association of some clinico-social determinants.

**Materials & Methods:** A cross-sectional study was carried out among 244 new leprosy patients attending a rural teaching hospital situated in an endemic district of West Bengal by observation and clinical evaluation. Data were analysed by univariate and binary logistic regression.

**Results:** Prevalence of grade 1 was 11.5%,grade 2 was-8.6%.Feet followed by hands were the commonly involved site and loss of sensation followed by cracks\ulcer were the common natures of disability. Male gender, manual occupation, registration delay, MB leprosy and increased number of thickened nerves were the determinants of disability.

**Conclusion:** Recognizing the disease early with prompt treatment both pharmaceutical and **other measures** are crucial for reducing disability burden in leprosy patients.

**Keywords:** New leprosy patients, Disability, Type of leprosy, Registration Delay.

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### I. Introduction

Leprosy is more than a biological disease. The disease can nowadays be medically cured, but the sickness of leprosy still remains. Widespread implementation of multidrug therapy in leprosy since 1981,has been extremely successful to reduce the global leprosy burden including India. In the year April,2015 leprosy prevalence globally was 0.31 per 10000 population while India had .69 per 10000 population, contributing 58.85% of global leprosy burden. In 2009,WHO launched the Enhanced Global Strategy for leprosy control where prevention of disability has been given a much more prominent place for 2011-2015,under which grade 2 disability among **new** cases has been suggested as a robust marker to monitor the results of leprosy control activities in a country. Globally New Grade 2 Disability was 6.6% in 2015 and in India it was 4.61% -indicating lack of awareness about early signs of leprosy and health seeking response of the community ,alongwith response of the health system to recognize and treat leprosy at the earliest opportunity. Leprosy is one of the major causes of preventable disability. Both magnitude and severity of disability in leprosy measure indirectly the disease transmission in the community and rapidity of case detection. WHO expert committee called for a target of reduction of new G2D cases to < 1 case per million population by the end 2020.<sup>[1-5]</sup>

Various clinico-social factors like age, gender, occupation, type of leprosy ,number of thickened nerves, registration delay etc. might be associated with disability in leprosy affected persons.<sup>[2,6]</sup> Searching for some of these factors among new leprosy patients may contribute to the prevention of disability activities under leprosy control programme. With this perspective this cross-sectional study was undertaken in a tertiary care hospital in rural area of West Bengal, India to find out the frequency, severity, site and nature of disability among new leprosy patients alongwith association of some socio-demographic and clinical factors.

### II. Methodology

A cross-sectional observational study was undertaken from the skin O.P.D of Bankura Sammilani Medical college & Hospital, a tertiary care hospital situated in a district of the western part of West Bengal, India. Since long this district was well known for its leprosy endemicity.The study was in accordance with Helsinki Declaration of 1975,as revised in 2000. Before data collection, IEC clearance and written permission from administrative authority of this tertiary care hospital was undertaken. Informed verbal consent was taken

from the participants, privacy was maintained and they were ensured about the confidentiality. All the 'new leprosy patients'<sup>[7]</sup> who had attended this hospital during data collection period, willing to participate, were eligible to be included in this study.

**Exclusion criteria:** Old leprosy patients, had any other debilitating chronic diseases, not willing to participate. Data were collected by interview, clinical examination and review of OPD tickets from registered new leprosy patients (already diagnosed by the designated medical officer) but before collecting antileprotic drugs. This study presents the analysis of 244 'New leprosy patients' who were diagnosed for the first time as suffering from leprosy and who had not taken Multi Drug Therapy for leprosy in the past. Type of leprosy was categorized following National Leprosy Eradication Programme guideline.<sup>[7]</sup> WHO 3-point disability scale, 1998 was followed for hands, feet and eye. Where grade 0 means no impairment, grade 1 relates to sensory impairment. Any visible impairment like cracks/wounds, absorption of fingers/toes, clawing of fingers/toes, contractures, wrist/foot drop or any other impairment were recorded as grade 2 disability of hands and feet. For grade '2' disability of eye visible impairments like lagophthalmos, corneal opacities and iridocyclitis, loss of eye brows were recorded. Visual acuity was tested in a semi dark area by Snellen's chart for each eye separately at 6 meter distance. When the patients failed to read top most letter of Snellen's chart, his/her vision was less than 6/60. Except visible cataract, any visual acuity <6/60 was taken as due to leprosy, other causes could not be excluded. For grade 1 disability of eye WHO expert committee in its 7<sup>th</sup> report does not recommend testing the corneal sensibility under field conditions for safety reasons. Corneal sensitivity was done only in those patients who were observed to blink infrequently (less than 5 times per minute). For overall disability grade of a patient the maximum grading at any of these sites was considered.<sup>[8]</sup>

In case of children aged  $\leq 14$  years accompanying guardians were interviewed. All the information were collected in the pretested, semi-structured interview schedule developed from literature survey and leprosy experts' opinion. Final schedule consisted of some socio-demographic variables like age, gender, religion, caste, literacy status, occupation, income, registration delay, Type of leprosy, involved thickened peripheral nerves, presence of WHO 3-point disability grade. Registration delay was defined as time gap between noticing of first symptoms of leprosy and coming to the health facility to be registered and treated as new leprosy patient with MDT.<sup>[9]</sup> It was noted as per statement of the patients and validated by local event calendar, though chance of recall bias could not be completely eliminated. Collected data were analyzed using SPSS version 16. Data were analysed in proportions, chi sq. test and binary logistic regression. Dependant variable was the presence or absence of disability which was binary variable. So binary logistic regression model was applied for adjusted OR. Continuous variables like age, income were converted into binomial or multinomial form as the case may be. P value < .05 was considered as significant.

### III. Results

This study analysed the 244 new leprosy patients. It was evident from Table 1 that among the interviewed new leprosy patients 79.9% had no disability, 11.5% had grade 1 and 8.6% had grade 2 disability. Feet (13.9%) were the commonly involved site followed by Hands (10.2%). Eyes were affected in 3.3% of the patients. In hands 10.3% had loss of sensation and 2.9% had cracks/ulcers. Mobile claw fingers were found among 1.6% patients and 1 patient had contracture in Hands. In feet, loss of sensation was the most commonly (13.9%) found nature of disability followed by ulcers \cracks\absorption of fingers in 7.0% of patients. Foot drop were found in 4 patients (1.6%) and 2 patients (0.8%) had mobile claw toes. Loss of corneal sensation were found in 2.9% patients and 3 patients (1.2%) each had lagophthalmos and severe visual impairment. Ulnar nerves were the commonly involved thickened nerves (29.5%) followed by Post Tibial (18.9%), Popliteal \Common Peroneal (15.2%), Great Auricular (5.7%) and radial (2.4%) nerves.

Association of some socio-demographic variables and disability among new leprosy patients are depicted in Table 2. It showed that 11.5% patients aged  $\leq 14$  years had disability. As the age of the patients increased the proportion of disability also increased (16.1% for 15-28 yrs., 22.1% for 29-42 yrs., 28.9% for  $\geq 43$  yrs.), but this was not statistically significant. More proportion of Male had (23.5%) disability than Females (14.7%). Hindu patients had more disability (22.6%) and patients belonged to the General category had less proportion (19.7%) of disability than rest (20.5%). Proportion of disability were more among Ever married group (22.8%) than never married (13.7%). No significant relation was found between literacy level and proportion of disability among new leprosy patients. Significantly more proportion of disability were found among those patients engaged in manual occupation than rest of the study population ( $P=0.000$ ). Proportion of disability were more among those patients had per capita income  $\leq$  Rs.500 than  $>$  Rs.500 (23.0% vs. 15.2%) though this was statistically not significant. It was seen from Table 3 that significantly ( $P=0.000$ ) more proportion of Multibacillary patients had disability compared to Paucibacillary cases (MB-31.3% vs PB-10.6%). When the number of skin lesions were  $\leq 5$ , 20.9% patients had disability whereas this proportion became 17.9% for those patients had  $> 5$  skin lesions. Significantly ( $P=0.000$ ) more proportion of leprosy patients had disability who had

thickened nerves  $\geq 2$  (47.1%) than patients had  $\leq 1$  nerve. This table also showed that patients who registered  $\geq 12$  months after for treatment, 72.2% had disability which was 11.1% for those registered within 12 months. This findings was also statistically significant ( $P < .000$ ). Proportion of disability were found to be more (25.0%) who gave history of coming to the contact of leprosy patients before their disease than who had not (19.0%). Association between presence of disability (outcome variable) and different predictor variables such as age, gender, socio-economic factors, type of leprosy, registration delay were further analyzed by binary logistic regression, findings of which were seen in Table 4. Predictor variables which were found to be significant for presence of disability among new leprosy patients were gender, manual occupation, registration delay, Type of leprosy, number of skin lesions.

#### IV. Discussion

Leprosy is dreaded most of all diseases, not because it kills, but because the disability it causes making it a disease apart in many people's minds. WHO's 2011-2015 Enhanced Global leprosy strategy has emphasized the reduction of leprosy disability as an effort to maintain leprosy control. The present study presents the report of 244 new leprosy patients attended a peripheral teaching hospital in an endemic district (for leprosy) of West Bengal, India. Proportion of grade 1 and grade 2 disability in our study were more compared to National average (grade 1-5.18%, grade 2-4.61%) and West Bengal (grade 1-4.02%, grade 2-4.52%),<sup>[4]</sup> and also other study done by R.P. Croft and others in Bangladesh (grade 1-9.61%, grade 2-5.97%).<sup>[10]</sup> Reason of which might be that this tertiary care hospital is situated in a leprosy endemic district of West Bengal. Other different studies in the Indian continent also found more proportion of disability among new leprosy patients compared to our study.<sup>[11,12,13]</sup> This study found that feet were the commonly involved site of disability followed by hands similar to other study done by Wim H van Brakel & others in Indonesia.<sup>[14]</sup> But the other studies showed hands followed by feet were the commonly involved sites in leprosy disability.<sup>[12,13,15,16]</sup> We have seen that loss of sensation and ulcer were the commonly found nature of disability as found in other study.<sup>[12]</sup> Similar to other study we have also found that Ulnar nerve followed by Post Tibial and Lateral Popliteal were the commonly involved thickened peripheral nerves.<sup>[12]</sup> But the study in Bangladesh, R.P. Croft has seen Post Tibial followed by Ulnar nerve were the commonly involved peripheral nerves.<sup>[10]</sup> We have seen that proportion of disability increases along with increase in age of the patients similarly shown by other studies.<sup>[11,16,17]</sup> Reason might be that older patients came after longer duration of the disease. Our study showed males had more disability similarly shown by other studies.<sup>[12,15,16,18]</sup> It may be either due to biological differences-disease develops more rapidly in males or environmental factors like manual occupation, outdoor habits and smoking etc in which males are more involved. All these factors increase the vulnerability of male patients towards secondary impairments in already involved nerves having sensory or motor nerve function impairment. This study showed that Hindu patients had more proportion of disability which was in contrast to the findings shown by Pankaj Kumar Jain & others in Gwalior district where they had shown Muslims had more disability.<sup>[12]</sup> This difference might be due to cultural differences in different religion influencing the health seeking behaviour of the patients. Surprisingly our study had found no significant differences between the literacy level and presence of disability unlike other study.<sup>[12]</sup> We have seen that patients engaged in manual occupation like labourer, farmer, carpenter, rickshaw puller etc had more disability similarly shown by other studies.<sup>[12,13]</sup> Nerve involvement is inevitable in leprosy. As a result from loss of sensation in hands and or feet and often with motor weakness those patients engaged in manual occupation or have to walk for long distances is likely to be suffered from secondary disabilities from injuries, burns, thorn prick etc. Significantly more proportion of Multibacillary patients were suffering from disability similarly shown in other studies.<sup>[12,13,15]</sup> If the pathogenesis of the disease is considered, in multibacillary leprosy more areas of skin and nerves will be invaded by *M. leprae*. So it is quite likely that these patients will be more impaired. This is supported by our another findings that significantly more proportion of disability were found as the number of involved thickened nerves increased similarly shown by other studies.<sup>[11,16]</sup> It is the nerve damage which is the cause of deformity and disability. Disability were significantly found more among those patients who registered late for initiating treatment with MDT which was in concordance with other studies.<sup>[11,13,16]</sup> This findings supports that early detection and adequate treatment of neural impairment is useful in reducing disability. The case control study in Ethiopia done by W. Bekri & others had showed that reducing the registration delay is the most productive of all activities aimed at preventing disability.<sup>[9]</sup> Richardus et al in their study in Bangladesh concluded that early diagnosis and subsequent activities for prevention of disability could prevent impairments in more than 30% of all patients in Bangladesh, more than any intervention at a later stage could achieve.<sup>[19]</sup> More proportion of patients gave history of coming in contact with leprosy patients who had disability. Though this findings was not significant, but the study in Indonesia Anna M Sales & others showed that proximity to index new case and bacillary load were the established risk factors for developing leprosy.<sup>[20]</sup> In Infectious disease epidemiology the multilevel analyses are applied to determine the influence of different associated factors for the outcome of a disease. This study was further analysed by binary logistic regression, findings of which supported that gender, manual occupation,

registration delay, Multibacillary leprosy and increasing number of skin lesions were the predictor variables significantly played the role of determinants of disability among new leprosy patients. There were some limitations of our study. Some other risk factors like lepra reactions could have been searched for. Registration delay although verified through local event calendar ,recall bias could not be completely eliminated.

### V. Conclusion

The findings of our study adds further evidence that though the clinical factors are the major determinants of disability in leprosy patients but they are influenced by social factors . Therefore early detection, treatment with MDT and other need based, patients specific support services are essential to progress towards WHO's enhanced global strategy(for 2011-15) to reduce disability burden among leprosy patients.

**Table 1:** Distribution of the interviewed new leprosy patients according to WHO disability grade, site, nature of disability and involved thickened nerves (n=244).

Variables	Number	Percentages
<b>WHO disability grade</b>		
Grade 0	195	79.9
Grade 1	28	11.5
Grade 2	21	08.6
<b>Site of Disability</b>		
Hands	25	10.2
Feet	34	13.9
Eyes	08	03.3
<b>Nature of Disability</b>		
<b>Hands</b>		
Loss of sensation	25	10.3
Cracks\Ulcers	07	02.9
Mobile claw fingers	04	01.6
Contractures	01	00.4
<b>Feet</b>		
Loss of sensation	34	13.9
Cracks\Ulcers\Absorption	17	07.0
Mobile claw toes	02	00.8
Foot drop	04	01.6
<b>Eyes</b>		
Loss of corneal sensation	07	02.9
Loss of Eye brow\Eye lashes	02	00.8
Unable to light eye closure(lagophthalmos)	03	01.2
Unable to tight eye closure	02	00.8
Severe visual impairment(<6/60)	03	01.2
<b>Involved thickened nerves</b>		
Ulnar	72	29.5
Radial	05	02.4
Lateral Popliteal\Common Peroneal	37	15.2
Post Tibial	46	18.9
Great Auricular	14	05.7

**Table 2:** Presence of disability and socio-demographic variables of the study population (n=244).

Variables	Disability present No. (%)	Disability Absent No. (%)	X <sup>2</sup>	df	p
<b>Age in years</b>					
≤ 14(n=26)	03 (11.5)	23 (88.5)	4.44	3	.217
15-28(n=113)	14 (16.1)	73 (83.9)			
29-42(n=86)	19 (22.1)	67 (77.9)			
≥ 43(n=45)	13 (28.9)	32 (71.1)			
<b>Gender</b>					
Male(n=149)	35 (23.5)	114 (76.5)	2.77	1	.096
Female(n=95)	14 (14.7)	81 (85.3)			
<b>Religion</b>					
Hindu(n=199)	45 (22.6)	154 (77.4)	4.4	2	.111
Muslim(n=18)	02 (11.1)	16 (88.9)			
Others(n=27)	02 (07.4)	25 (92.6)			

<b>Caste</b>			
General(n=117)	23 (19.7)	94 (80.3)	.025 1 .874
Rest(n=127)	26 (20.5)	101 (79.5)	
<b>Marital Status</b>			
Ever married(n=171)	39 (22.8)	132 (77.2)	2.64 1 .104
Never married(n=73)	10 (13.7)	63 (86.3)	
<b>Literacy status</b>			
Illiterate(n=05)	01 (20.0)	04 (80.0)	.297 3 .961
Just literate(n=12)	02 (16.7)	10 (83.3)	
Primary(n=13)	02 (15.4)	11 (84.6)	
Secondary and above(n=214)	44 (20.6)	170 (79.4)	
<b>Occupation</b>			
Manual(n=70)	23 (32.9)	47 (67.1)	9.98 1 .002*
Any other(n=174)	26 (14.9)	148 (85.1)	
<b>Per capita monthly income in Rs.†</b>			
□ 500(n=152)	35 (23.0)	117 (77.0)	2.18 1 .140
> 500(n=92)	14 (15.2)	78 (84.8)	
†Median value is Rs.500			

\*significant

**Table 3:** Association of disability and clinical parameters of the study population.(n—244)

Variables	Disability present No. (%)	Disability absent No. (%)	X <sup>2</sup> df P
<b>Type of leprosy</b>			
Pauci-Bacillary(n=132)	14(10.6)	118(89.4)	16.089 1 .000*
Multi-Bacillary(n=112)	35(31.3)	77(68.8)	
<b>Number of skin lesion\</b>			
≤ 5(n=177)	37(20.9)	140(79.1)	.271 1 .602
>5(n=67)	12(17.9)	55(82.1)	
<b>Number of thickened nerve\</b>			
□ 1(n=193)	25(13.0)	168(87.0)	29.287 1 .000*
□ 2(n=51)	24(47.1)	27(52.9)	
<b>Registration delay</b>			
< 12 months(n=208)	23(11.1)	185(88.9)	71.536 1 .000*
≥ 12 months(n=36)	26(72.2)	10(27.8)	
<b>History of contact</b>			
Yes(n=44)	11(25.0)	33(75.0)	.809 1 .368
No(n=200)	38(19.0)	162(81.0)	

\*significant

**Table 4:** Binary logistic regression analysis of disability and clinico-social variables.

Predictor variable	Exp(B)	P value	95% CI for Exp (B)	
			Lower	Upper
Sex(Female vs.Male)	11.649	.001*	2.704	50.184
Religion(Hindu)		.277		
Religion(Muslim)	.371	.410	.035	3.921
Religion(Christians&others)	.240	.147	.035	1.652
Caste(General vs rest)	.909	.861	.313	2.642
Marital status(Never married vs Ever married)	.873	.847	.219	3.478
Education		.306		
Education(Illiterate & JL)	.418	.587	.018	9.702
Education(Primary)	.851	.919	.039	18.581
Education(Secondary& above)	.188	.210	.014	2.568
Per capita income(≤Rs.500 vs > Rs 500)	.483	.220	.151	1.545
History of contact(Yes\No)	.848	.787	.256	2.812
Registration delay(< 12 ms vs ≥ 12 ms)	28.684	.000*	8.798	93.519
Type of leprosy(PB vs MB)	13.684	.002*	2.719	68.868
Number of skin lesion(≤5 vs >5)	.149	.007	.037	.595
Thickened nerve(≤1vs>2)	.901	.883	.223	3.639

Occupation( Manual vs any other)	25.443	.000*	5.848	110.707
Age ≤ 14		.583		
Age 15-28	.585	.598	.080	4.286
Age 29-42	.297	.294	.031	2.871
Age ≥43	.256	.276	.022	2.978
Constant	.058	.099		

\*significant

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