International Journal of Research in Dermatology
Agrawal N et al. Int J Res Dermatol. 2023 May;9(3):96-102
http://www.ijord.com

DOI: https://dx.doi.org/10.18203/issn.2455-4529.IntJResDermatol20231161

Original Research Article

Clinico-epidemiological study of leprosy in a tertiary care hospital of Eastern India

Nisha Agrawal, Tirtha Raj Saha, Jayanta Kumar Barua, Gautam Banerjee, Kingshuk Chatterjee, Saswati Halder, Prabal Samanta*

Department of Dermatology, School of Tropical Medicine, Kolkata, West Bengal, India

Received: 13 January 2023
Revised: 13 February 2023
Accepted: 18 February 2023

***Correspondence:**
Dr. Prabal Samanta,
E-mail: prabalnbmc90@gmail.com

ABSTRACT

Background: Accurate diagnosis of leprosy is of paramount importance, because delays and misdiagnosis are more common in non-endemic zones. It has a long incubation period, varied clinical presentations, and reaction states which can present in any point of lifetime, becoming more challenging for proper management of this enigmatous disease.
Methods: This was conducted as an institution based cross- sectional study over a period of 12 months. 100 patients were selected. Inclusion and exclusion criteria were maintained. Data collected was checked, tabulated, statistically analysed and compared with existing literature.
Results: In our study, majority, 49% belonged in age group of 41-60 yrs, only 6% were less than 20 years old. Male: female ratio was 3.34. 62% were from rural areas. Family history of Hansen was present in 5%. 6% had Histoid while 5% had pure neuritic representing least common subtypes. Most common occupations were Housewives (19%), shopkeepers (16%) and office workers (16%). 59% presented with hypoesthesia, 28% with fever. 59% belonged to borderline, 27% belonged to polar spectrum. Trophic ulcers were found in 20%, clawing of digits in 27%.
Conclusions: Leprosy is still a pressing problem in our country. A considerable number of children and adolescents get affected indicating high rate of transmission in community. A comprehensive approach includes proper diagnosis, treatment, and identification of reaction patterns, prevention of disability and deformities, and implementation of rehabilitation measures.

Keywords: Leprosy, Hansen's disease, Tuberculoid, Lepromatous, Borderline, Histoid

INTRODUCTION

Leprosy is a chronic, infectious, granulomatous disease caused by Mycobacterium leprae. It mainly affects the cooler areas of the body, notably the skin and peripheral nerves. Its diagnosis is established based on the clinical, neurological, slit-skin smear and histopathological examination of the patient. The term leprosy is a tribute to the Norwegian physician Gerhard Armauer Hansen, who identified the bacillus *Mycobacterium leprae* as the cause of the disease in 1873.[1] *M. leprae* is a straight or slightly curved rod shaped bacillus, with rounded ends, measuring 1.8-5 microns in length and 0.2-0.5 microns in diameter. In smears, it is red stained with fuchsin using the Ziehl-Neelsen stain and because of its high lipid content, it does not get discoloured when washed with alcohol and acid, thus being acid-fast bacilli. When Gram staining is used, *M. leprae* is gram-invisible, appearing as negatively stained images, called ghosts, or as bead like Gram positive bacilli.[2,3] *M. leprae* mainly infects macrophages

and Schwann cells. It has never been grown in artificial media. It remains viable for 9 days in the environment.[2-6] The main route of transmission is the nasal mucosa.[7,8] Less commonly, it can occur by skin erosions.[8,9] Other transmission routes, such as blood, vertical transmission, breast milk, and insect bites are also possible. Three cardinal signs have remained the basis for the basis of clinical diagnosis of leprosy.[10] Anaesthetic/ hypoanaesthetic skin lesion(s), Thickened peripheral nerve(s) with impairment of sensations in the area supplied, Acid-fast bacilli in the skin smear.

The classification system of Ridley and Jopling uses the concept of spectral leprosy based on clinical, immunological and histopathological criteria.[11,12] The borderline form is divided into borderline tuberculoid (BT), borderline lepromatous (BL) and mid-borderline (BB) forms. Leprosy reactions result from changes in the immune balance between the host and M.leprae. These are acute episodes that primarily affect the skin and nerves, also having systemic manifestations like fever, joint pain, nausea, vomiting, abdominal pain etc. They may occur during the natural course of the disease, throughout treatment or after it. They are classified into 2 types- Type 1 and 2 reactions.[13,14] In type 1, also called as reversal reaction, there is Erythema, inflammation and tenderness in the existing leprosy lesions along with systemic symptoms like fever, joint pain etc. in type 2 reaction, also called as Erythema Nodosum Leprosum, there is appearance of crops of reddish, tender papules, nodules and plaques all over the body which may present with some unique systemic features like ocular and testicular inflammation. WHO proposed an MDT (Multidrug therapy) for the treatment of leprosy.[15] The first line drugs are rifampicin, dapsone and clofazimine. In paucibacillary cases, it is given for 6 months while in multibacillary cases, it is for 12 months.

Relapsed multibacillary patients are also retreated with triple therapy regardless of any change in classification. [16] Several new drugs bactericidal for *M. leprae* have been identified- fluoroquinolones, minocycline and clarithromycin. Treatment of reactions is aimed at controlling acute inflammation, easing pain, reversing nerve and eye damage and reassuring the patient. MDT should be continued. Neuritis or moderately inflamed skin lesions should be treated with corticosteroids. Standardized courses of prednisolone have been used, starting at 40mg daily, reducing by 5mg every 2-4 weeks.[17] Erythema nodosum leprosum is a difficult condition of treat, and frequently requires therapy with high dose steroids (80mg daily, tapered down rapidly) or thalidomide. Thalidomide 400mg daily is superior to steroids in controlling ENL, and is the drug of choice for young men with severe ENL.[18]

Lastly, complete rest is very crucial for effective cure of all lepra reactions. There was a WHO-led campaign to eliminate leprosy as a public health problem. Although this focuses resources and energy on leprosy, the effect of a target-driven approach was eventually counterproductive.[19] Many vaccines have also been developed for leprosy like the BCG vaccine, *Mycobacterium indicus pranii* (MIP) or *Mycobacterium w*, Indian Cancer Research Centre (ICRC) Bacillus, *Mycobacterium vaccae*, *Mycobacterium habana*, purified recombinant antigens etc. Leprosy patients continue to present in many countries and will need proper diagnosis and treatment, and proper counseling of patients along with suitable rehabilitation programmes.

Aim and objectives

Aim and objectives of current study were to study the clinical and epidemiological profile of patients suffering from leprosy and to study the Reaction types and complications arising out of the disease and its treatment.

METHODS

It is an institution based cross-sectional study which was conducted over a period of 12 months starting from March 2021 to February 2022. The study population consisted of consecutive patients attending the Dermatology OPD and Hansen Clinic. A total of 100 patients were taken in the study. All consecutive patients with clinical diagnosis of leprosy, confirmed by histopathological examination wherever necessary, were selected for enrolment. A written informed consent was provided to the patients. The study protocol was presented in front of the Ethical Committee and proper ethical clearance was obtained. All the inclusion and exclusion criteria were fulfilled before enrolment.

Inclusion criteria

Inclusion criteria for current study were; New patients of all age groups and both sex with clinical diagnosis of leprosy, Patients with all clinical types of leprosy and Patients willing to participate in the study.

Exclusion criteria

Exclusion criteria for current study were; Old diagnosed patients of leprosy on treatment and follow up, Severely ill patients with leprosy and Patients unwilling to participate in the study.

The study variables included were epidemiological parameters like age, sex, occupation, religion, income status, educational status, family history and clinical parameters like duration of disease, distribution of lesions, morphological variant, associated complaints and associated deformities. Various study tools were used like OPD registers, case sheets, patient consent form, weighing machine, measuring tape, gloves, cotton with spirit, digital camera, microscopy, AFB stain etc. The data collected was checked for completeness, tabulated, statistically analysed and compared with existing literature.

RESULTS

In our study, out of 100 patients, 77% were males while 23% were females. There were no transgender patients (Figure 1).

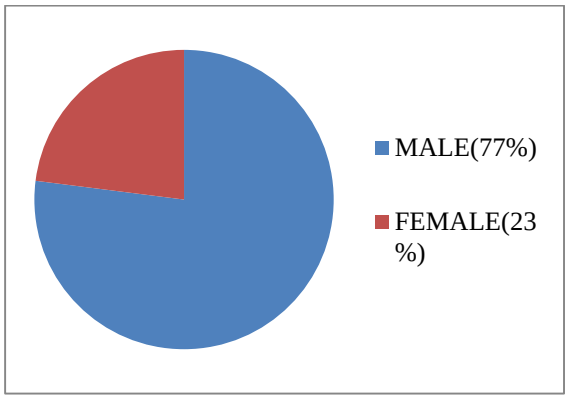

Figure 1: Gender based distribution of patients.

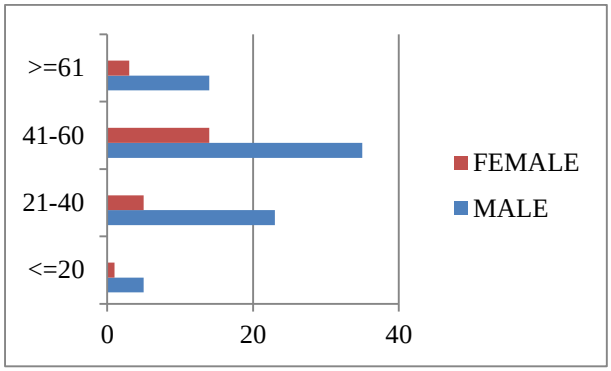

Figure 2: Age group based distribution of patients.

Table 1: Distribution of patients according to occupation.

Occupation	Male	Female	Total N (%)
Security guard	1	0	1 (1)
Driver	3	0	3 (3)
Farmer	13	0	13 (13)
Housewife	0	19	19 (19)
Office worker/clerk	16	0	16 (16)
Shopkeeper	15	1	16 (16)
Labourer	10	0	10 (10)
Teacher	4	2	6 (6)
Unemployed	9	0	9 (9)
Student	5	1	6 (6)
Waiter	1	0	1 (1)
Total	77	23	100

Majority (49%) belonged to the age group of 41-60 yrs while 28% in the group of 21-40 yrs. 17% were more than 60 yrs of age while only 6% were below 20 yrs (Figure 2). Majority of the patients were Hindus (52% being Hindu males and 13% Hindu females). 22% were Muslim males and 10% were Muslim females. 3% were of other religious affiliations.

Table 2: Distribution according to educational status.

Education	Male	Female	Total N (%)
Illiterate	20	6	26 (26)
Primary	22	7	29 (29)
Secondary	8	2	10 (10)
Higher secondary	12	5	17 (17)
Graduate	15	3	18 (18)
Total	77	23	100

Table 3: Distribution according to spectrum of disease.

Spectrum	Male	Female	Total N (%)
Indeterminate	1	2	3 (3)
TT	12	3	15 (15)
BT	31	8	39 (39)
BB	1	1	2 (2)
BL	11	7	18 (18)
LL	10	2	12 (12)
Histoid	6	0	6 (6)
Pure neuritic	5	0	5 (5)
Total	77	23	100

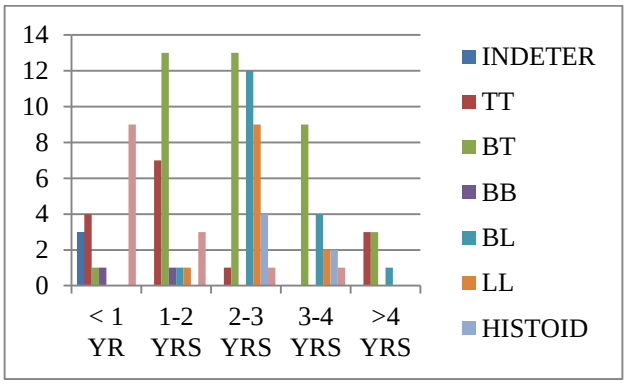

Figure 3: Distribution according to duration of onset of disease.

Majority of the patients belonged to rural areas- 62% while 38% had urban residences. Only 5 patients had a positive family history of Hansen 2 Borderline Tuberculoid, 2 Borderline Lepromatous and 1 tuberculoid patient had positive family history. In case of occupation, 16% were office workers, 13% farmers, 15% shopkeepers, 10% labourers, 9% (males) were unemployed while 19% were unemployed (Table 1). Majority (29%) had achieved primary education followed by illiterate (26%). 17% had completed higher secondary education while 10% had their secondary education. 18% of them were graduates (Table 2). 37% of the patients had monthly income between Rs.500-2000. 35% had monthly income between Rs.2000-10,000. 14% each belonged to the groups of less than Rs.500 and more than Rs. 10,000 per month.

Table 4: Distribution according to type of reaction in each spectrum of leprosy.

Type of reaction	Indeter	TT	BT	BB	BL	LL	Histoid	Pure Neuritic	Total
Type 1	0	0	5	0	5	0	0	0	15
Type 2	0	0	0	0	6	8	2	0	16
Nil	3	15	29	2	7	4	4	5	69
Total	3	15	39	2	18	12	6	5	100

Table 5: Distribution according to body site affected.

Spectrum	Face N (%)	Trunk N (%)	Upper limb N (%)	Lower limb N (%)	Genitalia N (%)
Indeterminate	0	1 (33)	2 (67)	0	0
TT	3 (20)	9 (60)	2 (13)	1 (7)	0
BT	7 (18)	37 (95)	33 (85)	15 (38)	0
BB	1 (50)	2 (100)	2 (100)	2 (100)	0
BL	4 (22)	18 (100)	16 (89)	17 (94)	0
LL	12 (100)	12 (100)	12 (100)	8 (67)	5 (42)
Histoid	6 (100)	6 (100)	6 (100)	6 (100)	0
Pure neuritic	0	0	4 (80)	1 (20)	0

Table 6: Proportion of patients presenting with different types of deformities in each spectrum of leprosy.

Deformity	Indeter	TT	BT	BB	BL	LL	Histoid	Pure neuritic	Total
Clawing of digits	0	0	16	0	5	1	0	5	27
Foot/wrist drop	0	0	4	0	1	0	0	0	5
Trophic ulcer	0	0	13	0	6	0	0	1	20
Lagophthalmos	0	0	3	0	1	0	0	0	4

In case of clinical presentations, majority of the patients had borderline tuberculoid (39%), followed by borderline lepromatous (18%), tuberculoid (15%), lepromatous (12%) and histoid (6%).

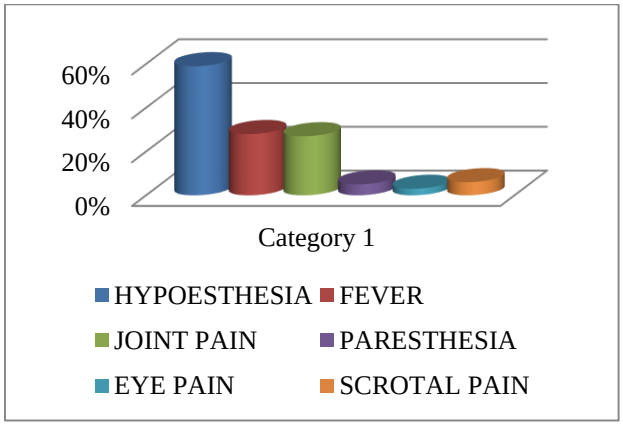

Figure 4: Proportion of patients with different presenting complaints.

Only 3 patients had Indeterminate, 2 had mid-borderline while 5 patients had Pure Neuritic Hansen. (Table 3). Majority (40%) had onset of disease between 2-3 yrs before presenting to us, followed by 26% who had onset before 1-2 yrs. 18% had onset between 3-4 yrs back, 9% had in less than 1 year before while 7 patients had onset of more than 4 years (Figure 3). 69% of the patients did not have any reactions. 15% had Type 1 while 16% had Type 2 reactions. 10 BT, 11 BL and 8 LL patients had reactions.

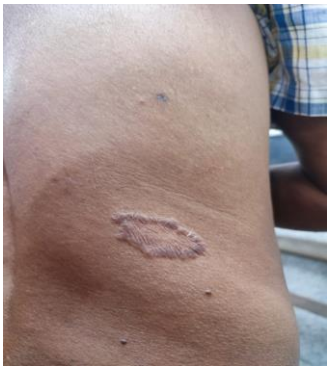

Figure 5: Tuberculoid Hansen.

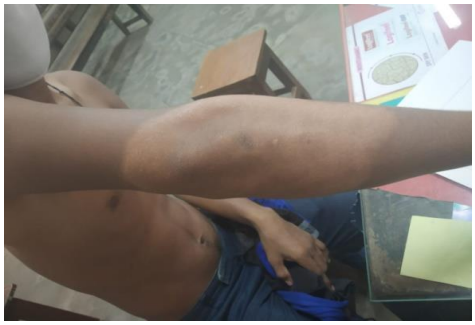

Figure 6: Borderline tuberculoid Hansen.

Total 2 Histoid patients had reactions. Indeterminate, tuberculoid and pure neuritic cases did not present with any reactions (Table 4).

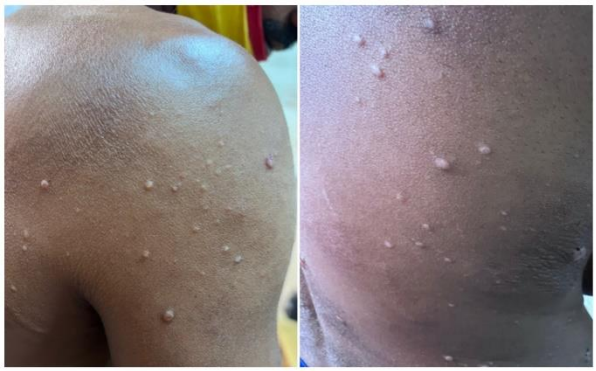

Figure 7: Histoid Hansen.

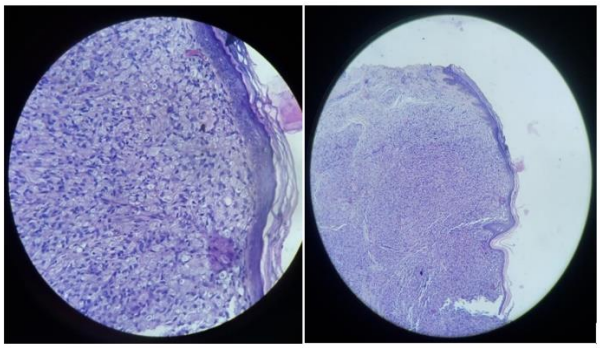

Figure 8: Histopathology of Histoid Hansen- typical storiform pattern.

On taking distribution according to body area affected in account, we divided it into 5 principal body areas- face, trunk, upper limb, lower limb and genitalia. In indeterminate Hansen, upper limb is the most common affected site with 67% having involvement. In TT, trunk is most commonly affected in 60% of patients. In BT, trunk is the most common affected site (95%) followed by upper limbs. (85%). In BL, the trunk is affected in all the patients. Lower limb is almost always affected (94%). In LL, all patients have involvement of face, trunk, upper and lower limbs. 42% have genital involvement. In Histoid, all patients have face, trunk, upper and lower limb involvement. In pure neuritic Hansen, 80% are affected along the course of ulnar while 20% are affected along the course of common peroneal nerve (Table 5). The various presenting complaints with which the patients presented to use were fever, joint pain, eye pain, scrotal pain, hypoesthesia etc. 59% of the patients presented with hypoesthesia followed by fever in 28%, joint pain in 27%, eye pain in 6%, paresethesia in 5%, and scrotal pain in 3% (Figure 4). Various deformities with which the patients presented were clawing of digits, foot drop/wrist drop, trophic ulcer, lagophthalmos etc. 27% presented with clawing of digits, 20% had trophic ulcers, 5% had foot &/or wrist drop while 4 patients had lagophthalmos. All patients with foot/wrist drop belonged to BT group. Among 27 patients with clawed digits, 15 belonged to the BT group, while 4 patients each to the Pure Neuritic and BL group. Among the 20 patients with trophic ulcer, 13 belonged to BT, 6 to BL and 1 in the pure neuritic group. Out of the 4 patients of lagophthalmos, 3 belonged to BT while 1 to BL. Thus, it is evident that BT patients have the major share of deformity followed by BL. Patients with indeterminate and Pure Neuritic Hansen did not present with any deformity (Table 6). The numbers show the number of patients in which that body part is affected in that particular spectrum, while the percentage in the bracket shows the proportion of patients in that particular spectrum where that body part is affected.

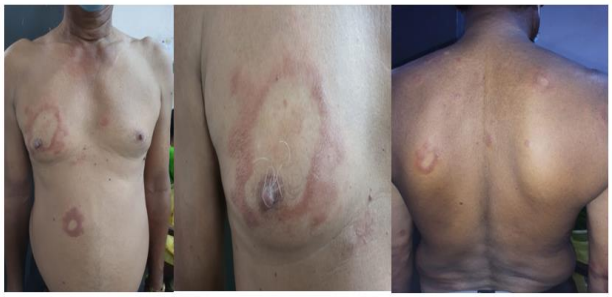

Figure 9: Mid borderline progressing towards borderline lepromatous Hansen.

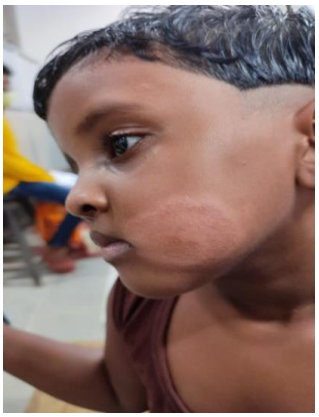

Figure 10: Borderline Tuberculoid Hansen in child.

DISCUSSION

Clinico-epidemiological study of Hansen looks at the various epidemiological profile of the patients like age, gender, occupation, family monthly income per capita, education level etc., while it also looks at the clinical aspects of the disease like spectrum of disease, lepra reaction types and deformities etc. It is an observational study. In our study, 49% of the patients belonged to the 41-60 yrs age group followed by those in the 21-40 yrs age group. Only 6% of the patients were less than 20 yrs of age. In a study conducted by Mohammad Adil et al, 47.1% of the patients were between 21-40 yrs of age and 14.2% were below 16 yrs, showing a comparatively younger age profile of the patients.[20]

In our study, 77% of the patients were males and 23% were females, the male: female ratio being 3.34, showing higher incidence of the disease among males. In a study conducted by Mohammad Adil et al, 67.6% of the patients were males and 32.4% were females, male: female ratio being 2.08:1 showing higher female patients in their study. In yet another study conducted by Nigam et al, the male: female ratio is 2.6:1.[21] In our study, 62% of the patients were from rural areas and 38% from the urban areas. In a study, conducted by Adil et al 52.4% of them belonged to rural areas while 47.6% of them from urban areas, showing comparatively higher urban population in their study.

In our study, family history of Hansen was found in 5% of the patients, but in a study conducted by Salodkar et al, 9.5% of the cases showed positive family history.[22] In both the studies, there is a low incidence of positive family history. But, in a study conducted by Nigam et al in 30.7% of the patients there was a positive family history. In a study conducted by Patil et al, 25% of the patients gave positive contact history, with majority of them being a positive family member.[23] In our study, 6% of the patients had Histoid while 5% of them had Pure Neuritic Hansen. In a study conducted by Sirisha et al 2.39% of them had Histoid while 4.19% of them had Pure Neuritic Hansen, indicating the lower incidence of these subtypes in the spectrum.[24] In our study, 31% of the patients presented with lepra reactions, out of them 15% were type 1 and 16% were type 2. In a study conducted by Sonkar et al 11.4% cases presented with reaction, out of them 72.2% had type 1 and 27.8% had type 2 reactions.[25] This shows higher incidence of Lepra reaction before institution of MDT in our study. In our study, housewives comprised 19% of the patients, followed by shopkeepers (16%) and office workers (16%). This was followed by farmers (13%) and labourers (10%). In a study conducted by Gupta et al 25% of the patients were farmers, 17% were labourers, 13% each were students and housewives.[26] This shows the greater share of farmers and labourers in their study. In our study, 59% of the patients presented with hypoesthesia, 28% with fever and 27% with joint pain. In a study conducted by Mahajan et al hypoesthesia was found in 69% of the cases, fever in 61% and joint pain in 41% of the patients.[27] This shows that the cardinal feature of hypoesthesia remains a common presenting feature among leprosy patients. In our study, 59% of the patients belonged to the borderline spectrum while 27% belonged to the polar spectrum. In a study conducted by Jindal et al 53.98% of the patients belonged to borderline spectrum followed by 33% in lepromatous leprosy and 5.52% in the polar tuberculoid spectrum.[28] Thus, both the studies show that borderline cases have higher prevalence than the polar cases. In our study, trophic ulcers were found in 20% of the patients while clawing of digits in 27% of the patients. In a study conducted by Bishnoi et al trophic ulcer was found in 6.8% of the patients, clawing of digits in 3.9% of the patients and wrist/foot drop in 2.92% of the patients.[29] In our study, foot/wrist drop is found in 5% of the patients. This shows higher incidence of trophic ulcers and clawed digits in our study in the initial presentation.

Limitations

The Limitation of this study was the relatively smaller sample size. As this study was conducted in the period of the COVID pandemic, lower number of patient footfall was observed in the OPDs in general. Thus, lesser number of patients could be taken in the study than expected. Therefore, it is encouraged that further clinico-epidemiological studies are done using a larger sample size. Also, as because it is a tertiary care centre, generally cases which are more severe or in advanced stages of disease attend our hospital. Thus, it might not be fully representative of the situation in the wider community. Still, from the data that we have obtained, we can confer that it is still getting transmitted in the community as we are getting child and adolescent cases.

CONCLUSION

Leprosy is a chronic, infectious disease that presents with a wide range of clinical manifestations ranging from various morphological skin lesions, nerve function impairment-both sensory and motor, deformities like clawing of digits, trophic ulcer and foot/wrist drop. There is also the development of leprosy reactions which result in fever, systemic upset, higher chances of nerve function impairment and deformities. Though Hansen has lower rate of mortality, its high level of morbidity and decrease in quality of life of the patient cannot be underestimated. In our study, majority of the patients belonged to the middle age and older age group and less patients in the children and adolescent group, this signifies that Hansen has a long incubation period which is the cause, it is not that much evident in children. However, the high incidence in children signifies higher rate of infection in the community. Though most of the patients belonged to rural areas, a moderate proportion of them belonged to the urban areas as well. Although most of the patients belonged to the lower socio-economic strata, a considerable number of patients were found in the middle-income group and a few patients in the higher income group. This proves the fact that Hansen cannot be ruled out in the middle or higher socio-economic group. A number of patients have completed their higher secondary education and few of them were even graduates. People in the higher socio-economic strata often feel embarrassed or anxious to visit the doctor in case of Hansen due to the social stigma associated with it. This can often result in delay in diagnosis and institution of treatment. Hansen has a huge burden of disabilities and deformities. It can add to considerable morbidity in the life of a person. It is important both for the patient and the doctor to take proper care of these disabilities and rehabilitation also forms an important part so that the patient can find alternative occupation and means of livelihood. In our study, too, we have seen patients presenting with various deformities like clawing of digits, foot drop, wrist drop, trophic ulcers etc. Thus, from our study, we can infer that leprosy is still prevalent in our community, in children as well, indicating community transmission, and therefore we propose further

skill development and training in prompt diagnosis and management of this disease.

ACKNOWLEDGEMENTS

Authors would like to thank all faculties and colleagues who supported the study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Eidt LM. Breve historia da hanseniase: sua expansao do mundo para as Americas, o Brasil e o Rio Grande do Sul e sua trajetoria na saude publica brasileria. Saude Soc. 2004;13:76-88.
2. Cavaliere IAL, Costa SG. Isolamento social, sociabilidades e redes sociais de cuidados. Physis. 2011;21:491-516.
3. Cunha VS. solated 'like us' or isolated among us? The controversy within the National Academy of Medicine over compulsory isolation of leprosy sufferers. Hist Cienc Saude Manguinhos. 2010;17:939-54.
4. Opromolla PA, Martelli ACC. Terminology related to Hansen's disease. An Bras Dermatol. 2005;80:293-4.
5. Martelli ACC. Global leprosy situation, 2012. Wkly Epidemiol Rec. 2018;87:317-28.
6. Elimination of leprosy as a public health problem. Available at: https://www.who.int/news/item/26-04-2021-leprosy-(hansen-s-disease)-interrupting-transmission-and-achieving. Accessed on 20 November 2022.
7. Distribuicao da hanseniase no Brasil. Available at: ttps://scielosp.org/article/rpsp/2018. Accessed on 20 November 2022.
8. Aprova as directrizes para vigilancia, Atencao e Controle da hanseniase. Available at: https://bvsms.saude.gov.br/bvs/saudelegis/gm/2010/prt3125_07_10_2010.html. Accessed on 20 November 2022.
9. Talhari s, Grossi MA, Oliveira ML, Gontijo B, Talhari C, Penna GO. Hansen's disease: a vanishing disease? Mem Inst Oswaldo Cruz. 2012;107:13-6.
10. Penna MLF, Oliveira MLW, Carmo EH, Penna GO, Temporao JG. The influence of increased access to basic healthcare on the trends in Hansen's disease detection rate in Brazil from 1980 to 2006. Rev Soc Bras Trop. 2008;41:6-10.
11. Barbieri CL, Marques HH. Leprosy in children and adolescents: bibliographical review and current situation in Brazil. Pediatria. 2009;31:281-90.
12. Ignoti E, Rodrigues AM, Andrade VLG, Valente JG. Aplicacao de metodos de estimative da prevalencia de hanseniase no Estado de Mato Grosso. Rev Bras Epidemiol. 2004;7:155-66.
13. Goulart IB, Dias CM, Oliveira ACS, Silva AA, Alves RR, Quaresmin CR, et al. grau de incapacidade: indicador de prevalencia oculta e qualidade do programa de controle da hanseniase em um centro de saude-escola no municipio de Uberlandia- MG. Hansen int. 2002;27:5-13.
14. da Cunha MD, Cavaliere FA, Hercules FM, Duraes SM, de Oliveira ML, de Matos HJ. Os indicadores da hanseniase e as estrategias de eliminacao da doenca, em municipio endemic do Estado do Rio de Janeiro, Brasil. Cad Saude Public. 2007;23:1187-97.
15. Rees RJW, Young DB,. The microbiology of leprosy. In: Hastings RC, eds. Leprosy. 2nd ed. New York: Churchill Livingstone; 1994:49-83.
16. Nolte FS, Metchok B. Mycobacterium. In: Murray PR, Baron EJ, Pfaller MA, Tenover FC, Yolken RH, eds. Manual of clinical microbiology. 6th ed. Washington: American Society for Microbiology; 1995:400-37.
17. Shepard CC. Temperature optimum of Mycobacterium leprae in mice. J Bacteriol. 1965;90:1271-5.
18. Hastings RC, Brand PW, Mansfield RE, Ebner JD. Bacterial density in the skin in lepromatous leprosy as related to temperature. Lepr Rev. 1968;39(2):71-4.
19. Desikan KV. Viability of Mycobacterium leprae outside the human body. Lepr Rev. 1977;48:231-5.
20. Mohammad A, Syed SA, Mohammad M, Sabha M, Mehtab A, Annu P. Clinico-epidemiological study of leprosy from a North Indian tertiary care hospital. J Bacteriol. 1955;89:1132-7.
21. Nigam P. Clinico-epidemiological study of Leprosy in a rural population of Bundelkhand. Lepr India. 1977.
22. Salodkar AD. A clinico-epidemiological study of leprosy in arid North-west Rajasthan, Jodhpur. Indian J Lepr. 1995.
23. Patil AA, Sherkhane MS. Clinico-epidemiological study of Hansen disease patients attending a tertiary care centre in South India. Int J Community Med Public Health. 2016;23:2394-8.
24. Sirisha NL, Sangem S, Kumar AS, Pavani N, Kumar SC. Clinico-epidemiological study of Hansen's Disease (Leprosy) in patients attending Government General Hospital, Kadapa. Indian J Lepr. 2019.
25. Sonkar VK. A clinico-epidemiological study of leprosy in a tertiary care centre. IJCAR. 2018;7:14350.
26. Gupta R, Sinha R, Pradhan S. Clinico-epidemiological profile of leprosy in Post-elimination era: A Hospital based study. Indian J Lepr. 2019;91:197-205.
27. Mahajan R, Ninama K, Jain V, Bilimoria FE, Lakhani S. A 5 year study of leprosy patients in a tertiary care centre. Indian J Lepr. 2018;23:32-8.
28. Jindal N, Shanker V, Tegta GR, Gupta M. Clinico-epidemiological trends of leprosy in Himchal Pradesh: A 5 year study. Indian J Lepr. 2009;81(4):173-9.
29. Bishnoi S, Verma A, Nijhawan M, Bagri M, Nijhawan S, Sharma A. Leprosy. Gulf J Dermatol Venereol. 2019;26:1.

Cite this article as: Agrawal N, Saha TR, Barua JK, Banerjee G, Chatterjee K, Halder S, et al. Clinico-epidemiological study of leprosy in a tertiary care hospital of Eastern India. Int J Res Dermatol 2023;9:96-102.