



Original Article

Pattern of Hansen's Disease in Central India

Authors

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Abstract

Background-Leprosy, also known as Hansen's disease (HD), is long term infection caused by the bacilli *Mycobacterium leprae* and *Mycobacterium lepromatosis*. Infections are without symptoms and typically remain this way from 5 to as long as 20 years. Symptoms that develop include granulomas of the nerves, respiratory tract, skin, and eyes. This may result in a lack of ability to feel pain and thus loss of parts of extremities due to repeated injuries or infection due to unnoticed wounds.^[4] Weakness and poor eyesight may also be present. The peripheral nerve injury has been associated with physical disability and is considered to be the most serious complication of leprosy. The diagnostic tests including nerve conduction velocity testing and ultrasound of ulnar nerve may reveal the defect in the nerve before the disease become clinically more apparent.

Results-50 patients of leprosy were assessed for disability degree, including 46% female and 54% males (table 1). The mean age of the patients was 38.8 years with median age of 38 years. Majority of the patients has low education; 38% had between 0-4 years education, 32% had education between 5-9 years and 30% above ≥ 9 years (table 1). 74% of the patients had more than two nerves involved. According to the operational classification, there was a Prevalence of Paucibacillary disability 10.88% (table 2). In most of the cases 82% had no leprosy reaction. The most frequent clinical forms were boderline tuber culoid (46%) and indeterminate (14%) and borderline number (14%). Regarding the degree of disability 78% had leprosy grade 0, 18% had grade 1 and 4% had grade 2.

Conclusion-The study showed that number of affected nerves, leprosy reaction, operational classification and clinical presentation were the main factors associated with the development of physical disabilities. Sonography and electrophysiology were complementary for identifying ulnar nerve neuropathy in patients with leprosy, with clinical symptoms as the reference standard. This reinforces the role of sonography in the investigation of leprosy ulnar neuropathy.

Sural nerve biopsy in experienced hands is safe and that it has revealed pathological changes of significance in this group of patients.

Keywords - Hansens Disease, Central India.

INTRODUCTION

Leprosy, also known as Hansen's disease (HD), is long term infection caused by the bacilli *Mycobacterium leprae*^[1,2] and *Mycobacterium lepromatosis*.^[3] Initially, infections are without symptoms and typically remain this way from 5 to

as long as 20 years.^[2] Symptoms that develop include granulomas of the nerves, respiratory tract, skin, and eyes.^[2] This may result in a lack of ability to feel pain and thus loss of parts of extremities due to repeated injuries or infection due to unnoticed wounds.^[4] Weakness and poor

eyesight may also be present. ^[4] Leprosy continues to be a challenge to health worldwide, with about 250 000 new cases being detected every year. Despite widespread implementation of effective multidrug therapy, leprosy has not been eliminated. A third of newly diagnosed patients has nerve damage and might develop disabilities, although the proportion varies according to several factors, including level of self-care. There is also a need to study clinical outcomes and to find out the group of people more affected with the disease, to find out association with the literacy and working habits. The peripheral nerve injury has been associated with physical disability and is considered to be the most serious complication of leprosy. The diagnostic tests including nerve conduction velocity testing and ultrasound of ulnar nerve may reveal the defect in the nerve before the disease become clinically more apparent.

OBJECTIVES

1. To evaluate the clinical profile of Hansen's disease with respect to sensory involvement, thickness of ulnar, affected nerves, skin lesions, lepra reactions if any and comparing with who class, distribution in various age groups, affected nerves and as per occupation.
2. To compare the sensory involvement of ulnar and median nerves of both upper limbs.
3. To evaluate the characteristic changes in ulnar nerve by ultrasound of ulnar nerve at elbow.
4. To compare the nerve biopsy finding of sural nerve in different groups.

METHODS

Overall Design

This is an Observational study of leprosy carried out in Hamidia hospital Bhopal.

Settings: Study being carried out at Hamidia hospital Bhopal in Madhya Pradesh, a Tertiary

Centre where patients are referred and being treated.

Study Subjects

Data collected with patients coming in OPD

Sample Size: 50 patients.

Inclusion Criteria: Patients were being recruited for the study who were diagnosed case of Hansen's disease.

Exclusion Criteria: Patients at risk of a neuropathy other than leprosy, i.e. diabetes, alcoholism, risk group for HIV infection; patients with a family history of hereditary neuropathy, and patients over 60 years of age.

RESULTS

TABLE No.1 - Characteristics of Leprosy Cases

VARIABLES	n	PERCENT AGE (%)
AGE GROUPS(YRS)		
15-30	14	28%
31-60	36	72%
SEX		
FEMALE	23	46%
MALE	27	54%
EDUCATION LEVEL(YRS)		
0-4	19	38%
5-8th	16	32%
≥9	15	30%
SKIN LESIONS		
≤5	45	90%
>5	5	10%
AFFECTED NERVES		
≤2	27	74%
>2	13	26%
WHO CLASSIFICATION		
PAUCIBACILLARY	42	84%
MULTIBACILLARY	8	16%
LEPRA REACTION		
NO	41	82%
YES	9	18%
CLINICAL FORMS		
INDETERMINATE	7	14%
BORDERLINE TUBERCULOID	23	46%
BORDERLINE	8	16%
LEPROMATOUS	12	24%
DEGREE OF DISABILITY		
GRADE 0	39	78%
GRADE 1	9	18%
GRADE 2	2	4%

TABLE No. 2 Clinical Factors Associated with the Occurrence Disability in Leprosy Patients

VARIABLES		DISABILITY	
	N	YES (%)	NO (%)
AGE GROUPS(YRS)			
15-30	14	2(14.28)	12(85.71)
31-60	36	9(25)	27(75)
SEX			
FEMALE	23	5(21.73)	18(78.26)
MALE	27	6(22.22)	21(77.77)
EDUCATION LEVEL(YRS)			
0-4	19	4(21.05)	15(78.94)
5-8th	15	3(20)	12(80)
≥9	16	4(25)	12(75)
SKIN LESIONS			
≤5	45	7(15.55)	38(84.44)
>5	5	4(80.0)	1(20.0)
AFFECTED NERVES			
≤2	27	10(37.03)	17(62.96)
>2	23	0(0.0)	23(100)
WHO CLASSIFICATION			
PAUCIBACILLARY	42	4(9.52)	38(90.47)
MULTIBACILLARY	8	7(87.5)	1(12.5)
LEPRA REACTION			
NO	41	3(7.3)	38(92.68)
YES	9	8(88.88)	1(11.11)
CLINICAL FORMS			
INDETERMINATE	7	1(14.28)	6(85.71)
TUBERCULOID	23	0(0.0)	23(100.0)
BORDERLINE	7	1(14.28)	6(85.71)
LEPROMATOUS	12	9(75.0)	3(15.0)

TABLE NO. 3 Showing Changes in Amplitude, Velocity and Latency in Unlar Nerve

SHOWING CHANGES IN AMPLITUDE, VELOCITY AND LATENCY IN UNLAR NERVE			
TYPE OF LEPROSY	AMPLITUDE REDUCED	VELOCITY REDUCED	LATENCY INCREASED
PAUCIBACILLARY	10	9	9
MULTIBACILLARY	6	4	3

TABLE NO. 4 Showing Changes In Amplitude, Velocity And Latency In Median Nerve

SHOWING CHANGES IN AMPLITUDE, VELOCITY AND LATENCY IN MEDIAN NERVE			
TYPE OF LEPROSY	AMPLITUDE REDUCED	VELOCITY REDUCED	LATENCY INCREASED
PAUCIBACILLARY	5	5	5
MULTIBACILLARY	5	5	5

TABLE NO. 5 Nerve Conduction Velocity Changes As Per Occupation In Median Nerve

OCCUPATIPON	AMPLITUDE REDUCED	VELOCITY REDUCED	LATENCY INCREASED	TOTAL
FARMER	4	4	4	4
LABOURER	3	3	3	3
STUDENT	1	1	1	1
HOUSEWIFE	2	2	2	2

50 patients of leprosy were assessed for disability degree, including 46% female and 54% males (table 1). The mean age of the patients was 38.8 years with median age of 38 years. Majority of the patients has low education; 38% had between 0-4 years education, 32% had education between 5-9 years and 30% above ≥ 9 years (table 1). 74% of the patients had more than two nerves involved.

According to the operational classification, there was a Prevalence of Paucibacillary disability 10.88% (table 2). In most of the cases 82% had no leprosy reaction.

The most frequent clinical forms were boderline tuberculoid (46%) and indeterminate (14%) and borderline number (14%). Regarding the degree of disability 78% had leprosy grade 0, 18% had grade 1 and 4% had grade 2.

It was observed that more education was a protective factor for disability. The Multibacillary form increases the risk of disability. The presence of Leprea reaction was associated with a higher likelihood of disability.

When nerve conduction tests were done, it showed reduced conduction velocities besides changes in latency and amplitude in the affected nerves (table 3 and 4). The changes in sensory nerve conduction were more pronounced. Also, sensory latencies and amplitude changes were more severe than motor latencies and amplitude in those presents with muscle palsy.

The conduction velocities were found to be variably reduced in patients. Prolonged latencies were recorded in 17 patients (both ulnar and median) while no change was recorded in both ulnar and median nerves.

The chief complaints with which the patients presented to us was tingling and numbness in one or more upper or lower limbs. Some also complaints of Glove and stocking type sensory involvement (6 patients). 26% of patients presented to us with a history of progression of their symptoms. Nine of our patients were in Type 2 Leprea reaction while the rest had no such complaints. When examined for sensory impairment of touch, pain, temperature 10 of the patients complained of impaired sensation over corresponding neural distribution. Cranial nerve function was found to be normal in all the patients. Nerve conduction assessment revealed gross impairment of the conduction velocities, latencies and amplitude in all the patients consistent with the clinical findings of Hansen's disease (table 5 and 6). When high resolution ultrasonography of the ulnar nerve at elbow was done showed nerve thickening in 54% cases and 10% of the patients showed atrophic changes. None of the patients showed other ultrasonography findings like fibrosis or vascularization. On comparing the above mentioned findings with who class; 23 patients had Paucibacillary that was much more as compared to multibacillary leprosy which are just 4. Neural involvement in multibacillary was found to be clinically less. Out of the 26 patients who undergone sural nerve biopsy acid fast bacilli was found in 7 patients; mononuclear infiltrates in 24 patients, thickness of endo-peri-epi-neurium was found in 5 patients. Neuritis was the most common finding presented in the study.

DISCUSSION

In general, a frequency of patients with disabilities was found in Hamidia hospital Bhopal during 2 years of study. The main factors associated with the development of disabilities in patients with leprosy were the number of affected nerves, leprosy reactions, operational classification and the clinical form of the leprosy. Regarding operational classification there was a high rate of MB patients as observed in other studies. These high number suggest a late diagnosis, which may be due to difficult access to health care. In situations where patients have access to a health care system, they are diagnosed and classified as MB. Another factor that contributes to high rates of disability may be inadequate treatment, which is often due lack of professional knowledge.

The variability of sex, educational level and age were not associated with the occurrences of disability in multivariate analysis. However, in endemic regions, men have shown physical disability due to leprosy two to three times more frequently than females.^{[14][15]} Social behavior and difficult access to health services have been cited as reason for this differences. Studies have demonstrated an association between a high prevalence of leprosy and low socioeconomic status, social inequality, population growth, poor housing conditions, low income, and low level of education. Higher level of education has been considered a determining factor for disease improvement as well as protective factor for the occurrence of disability among leprosy patients.

Thus, level of education and the ability to understand guidelines regarding treatment are reflected in the development of disease and associated with the population's socioeconomic status. However, based on the results of the multivariate analysis, this study demonstrated that low educational level was not associated with the development of disability in leprosy. The lack of association of this factor may be due to the homogeneity of the population involved in this study.

The present study had some limitations. The data were collected from the patients coming to the

OPD leading to a loss of some information. Furthermore, it was not possible to obtain the time evolution of the disease due to failures in the registry.

Furthermore, the development of physical disability is proportional to the disease progression. This finding provides strong evidence that patients are being diagnosed late^[16], though this variable was not analyzed in this study due to a lack of data.

It is well known that sensory nerves are first to be affected in leprosy. Hence for early detection of leprosy, sensory nerve conduction parameters need to be measured.

Neuropathy is one of the most frequent complications in leprosy patients manifesting as sensory, motor or autonomic deficit.

The destructive capability of granulomatous inflammation which is present in the tuberculoid leprosy is well known as and has often been accepted as the basic explanation for nerve injury in TT and BT patients.

Similarly, the disorganized and highly bacilliferous cutaneous infiltrates of lepromatous disease are replicated in the nerves of these patients. The mechanism of injury in lepromatous nerves, however, has been more difficult to explain. Since the nerves retain their basic integrity for some time and are able to maintain surprising level of function even when heavily infected.

The evaluation of electrophysiological study of nerve conduction is assessed by three criteria, i.e. velocity, amplitude and latency of the evoked response.

The amplitude of the evoked response is taken as summation of activities of axons within a nerve trunk. It has been observed in various neural electrophysiological studies that while the amplitude and the duration are within normal range, it is the sensory velocity that is important or at the lower limit of normal suggesting that leprosy results in diffuse neuropathy even in a stage when it cannot be detected by routine clinical testing. In the preclinical stage of the disease, where there are no signs and symptoms

suggestive of nerve damage, slowing of motor conduction velocity has been observed. This hidden stage of neural deficit escapes early and timely detection and later progress to manifest disease when certain defined quantum of nerve fibers become nonfunctional

Since it is the fast conducting fibers that are taken into accounts, which calculates nerve conduction velocities and the results may differ if slow conduction fibers are predominantly damaged. The sensory fibers are damaged earlier than motor fibers in leprosy; therefore, in the early stages of nerve damage, it is the sensory fibers that slow a greater quantum of impaired conduction velocities when compared with those in motor fibers. Conversely, as for the amplitude changes, they are more marked in the motor nerve fibers. In the present study 19 patients had impaired nerve conduction velocities along with decreased amplitude and latencies in all the cases. Sensory impairment was recorded more pronounced than motor deficit.

Interestingly, the conduction velocities of nerve recorded a zero value meaning some conduction continued to occur even when there was no response on clinical testing for sensory or motor function. This could be due to the discharges from the regenerating nerve fibers. Examination which is limited to defined segments. As expected, it is found that nerves are often enlarged in leprosy patients, especially in patients with a type 1 or 2 reaction. One of the three key signs of leprosy is the presence of enlarged nerves. Ascertaining the presence of enlarged nerves can be difficult, and for some nerves this is impossible because of their location. Additionally, it is impossible to assess the length of nerve abnormality by palpation. There is considerable inter-observer variability in assessing the presence of enlarged nerves by palpation. In contrast, US are a very precise assessment method as shown in a study of cadavers.

In our study more of the PB patients have thickened ulnar nerves showing the prevalence is more as compared to MB patients. Some patients have atrophic changes while non-showed fibrotic

or vascularization. So US is a useful tool to detect nerve changes early and more precisely as compared to clinical testing. Nerve biopsy segments taken from sural nerve showed neuritis as most common presentation. Whatever may be the stage of leprosy, it is the most common finding. Showing mild inflammatory changes tends to continue. Acid fast bacilli can also be seen in the biopsy segments when the bacterial load is high in nerves.

CONCLUSION

The study showed that number of affected nerves, leprosy reaction, operational classification and clinical presentation were the main factors associated with the development of physical disabilities. Better knowledge of the factors associated with the onset of disability due to leprosy is useful for disability prevention programs and can allow the progression of the disease to be monitored more clearly.

Sonography and electrophysiology were complementary for identifying ulnar nerve neuropathy in patients with leprosy, with clinical symptoms as the reference standard. This reinforces the role of sonography in the investigation of leprosy ulnar neuropathy.

Sural nerve biopsy in experienced hands is safe and that it has revealed pathological changes of significance in this group of patients. Enna et al, in an evaluation of biopsy of this nerve in leprosy. Furthermore, the procedure should certainly not replace the examination of well selected and processed skin biopsies, together with the use of routine slit-skin smears in the diagnosis and classification of this disease. For special investigations, however, it is a potentially valuable procedure which may throw light on the pathogenesis of leprosy in untreated, treated, and relapsed patients.

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