A Clinical and Microbiological Correlation of Hansen's Disease in Rural Tertiary Care Hospital of Southern Rajasthan

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Abstract

Introduction: Leprosy is an ancient, chronic granulomatous infectious disease caused by *Mycobacterium leprae*, principally affecting the skin and peripheral nerves. Leprosy is both a bacterial and an immunologic disease. The clinical manifestations of leprosy are variable and can mimic a variety of other skin diseases. Thus, microscopic examination plays an important role in early diagnosis and management. Leprosy remains a worldwide public health concern as a result of the development of drug-resistant isolates.

Aim: The aim was to study the clinical and microbiological correlation of all suspected cases of Hansen's disease.

Materials and methods: A Prospective observational analytical study was conducted on all clinically suspected leprosy cases from Department of Dermatology. Demographic, clinical details of the patients were obtained from Hospital Information System (HIS). Sample collection was done in Department of Dermatology by slit skin smear and multiple slides were prepared. Slides received in Mycobacteriology section of Microbiology were heat fixed and stained by Modified Z.N. stain. Microscopic examination of slides was done to confirm presence of *Mycobacterium leprae*. Bacteriological and morphological index were also studied.

Results: The male-to-female ratio was 7:1. The agreement between microbiological and clinical diagnoses was more than 90% in all the subclasses except for border line tuberculoid leprosy (BT) and tuberculoid leprosy (TT) which showed an agreement of 86.5% and 88.4%, respectively. The sensitivity of clinical diagnosis ranged from 69.70% for indeterminate to 100% for histoid and neuritic types. The specificity ranged from 90% for BT and TT to 100% for neuritic leprosy.

Conclusion: Clinical diagnosis of early leprosy lesions offers difficulties even to experienced dermatologists as a patient presents in different clinicopathological

forms, depending on host immune status. Thus, the correlation between clinical, histopathological and bacteriological features is required for diagnosis and classification of leprosy. Nerve damage is irreversible; therefore, early detection and treatment is important to prevent Grade 2 disabilities.

Keywords: *Mycobacterium leprae*, leprosy, morbidity, Nerve damage, tuberculoid leprosy, neuritic leprosy.

Introduction

Leprosy is an ancient, chronic granulomatous infectious disease caused by *Mycobacterium leprae*, principally affecting the skin and peripheral nerves [1]. It is highly contagious, but its morbidity is low because a large portion of the population is naturally resistant to this disease. Its diagnosis is established based on skin and neurologic examination of the patient. Early diagnosis is very important. The timely and proper implementation of treatment prevents sequelae and physical disabilities that have an impact on the individual's social and working life, which are also responsible for the stigma and prejudice regarding this disease. Leprosy is a neglected tropical disease (NTD) which still occurs in more than 120 countries, with more than 200000 new cases reported every year. The disease is transmitted through droplets from the nose and mouth. Prolonged, close contact over months with someone with untreated leprosy is needed to catch the disease. The disease is not spread through casual contact with a person who has leprosy like shaking hands or hugging, sharing meals or sitting next to each other. Moreover, the patient stops transmitting the disease when they begin treatment. India is considered the point of origin of leprosy with skeletal evidence of the disease dating to 2000 B.C. The disease is thought to have spread through trade and war to other parts of Asia, the Middle East, North Africa, and later Europe and the Americas. Despite India being declared “Leprosy Eliminated” in 2005, the country still accounts for over half (52%) of world's new leprosy patients, said Union Health Minister Mansukh Mandaviya in a written message of the National Strategic Plan and Roadmap for Leprosy 2023-2027 [2, 3]. Leprosy is endemic in several states and union territories of India, with the annual case detection rate of 4.56 per 10000 population.

The clinical manifestations of leprosy are variable and can mimic a variety of other skin diseases [4]. Thus, microscopic examination plays an important role in early diagnosis and management of leprosy. This study aims to update dermatological, epidemiological, clinical and etiopathogenic leprosy aspects.

National Leprosy Eradication Program implemented in India to eradicate leprosy

1955-National Leprosy Control Programme (NLCP).

1970s-Multi Drug Therapy. Dapsone treatment continued.

1982-Multi Drug Therapy (MDT) came into use.

1983-National Leprosy Elimination Programme (NLEP).

1993-2000-The 1st phase of World Bank supported NLEP implemented.

1998-2004: Modified 2004: Modified Leprosy Elimination Leprosy Elimination Campaign 2001-2004-World Bank supported NLEP II.
2005-India achieved elimination National Level.

NLEP: Phased Approach Achievements
1st phase (1993-1994)-prevalence rate reduced 24 (1992) to 3.7/10,000.
2nd phase (2001-02 to 2003-04)-Decentralization integration Elimination.

Leprosy Prevalence (PR): 0 84 /10 000 (M h 31 2006) 0.84 /10,000 pop. (March 31, 2006) (Elimination-1/10,000).

Terminologies used
Point prevalence: The number of persons with a disease at a specified point in time in a defined population.

Period prevalence: The number of persons with a disease in a defined population within a specified period of time.
The reasons for emergence of new cases in post elimination era, is the long incubation period of leprosy which range from few weeks to 30 years. Thus, the cases appear "hidden" and the numbers cannot go up or down suddenly [5]. Furthermore, social stigma prevents most patients from seeking medical treatment until it is too late [6].

Aim: The aim was to study the clinical and microbiological correlation of all suspected cases of Hansen's disease.

Materials and Methods: A Prospective observational study was conducted on all confirmed and clinically suspected cases of leprosy. As clinical manifestations of leprosy are variable and can mimic a variety of other skin diseases.

Diagnosis of Leprosy is based on at least one of three cardinal signs:
i) Hypopigmented skin patch with loss of or reduced sensation.
ii) Enlarged nerve.
iii) Slit skin smear positive for leprosy bacilli (WHO recommendation).

So, for confirmation of case after clinical examination slit skin smear were send by Department of Dermatology to Mycobacteriology section of Central Laboratory for confirmation of Lepra bacilli. Modified ZN stain was used for confirming Lepra bacilli by microscopic observations. All those Slit skin smears found positive for lepra bacilli; Bacteriological index (BI) and (morphological index (MI) was also calculated and reported. Skin biopsy of all cases were sent, and final diagnosis was made based on clinical and histopathological correlation.
All positive cases from January 2021 to January 2023 are included in this study. Demographic, clinical details of the patients were retrieved from Dermatology Department and HIS.

Observations

Patients	Age/Sex	Final Diagnosis	Skin	Nerve	Reaction	BI	MI SFGB	Sensation	Ulcer	New/old
1.	53/M	BL	+	-	2	1	30%	-	Absent	Defaulter
2.	42/M	BT	+	+	-	2	40%	-	Present	New
3.	19/F	HH	+	+	1	3	20%	-	Present	New
4.	49/M	BL	+	+	2	1	30%	-	Present	New
5.	50 /M	BL	+	+	2	2	10%	-	Absent	Defaulter
6.	55/M	BT	+	-	1	1	10%	+	Absent	New
7.	58/M	BT	+	-	-	1	20%	+	Absent	New
8.	55/M	LL	+	-	1	1	30%	+	Absent	New

BL: Borderline Lepromatous.
BT: Borderline Tuberculoid.
HH: Histoid Hansen.

1. Type 1 Reaction.
2. Type 2 Reaction/ENL.

BI: Bacteriological Index.
MI: Morphological Index.
SFGB: Solid Fragmented Granular Bacilli.

Results: The male-to-female ratio is 7:1. The agreement between microbiological and clinical diagnoses was more than 90% in all the subclasses except for borderline tuberculoid leprosy (BT) and tuberculoid leprosy (TT) which showed an agreement of 86.5% and 88.4%, respectively. The sensitivity of clinical diagnosis ranged from 69.70% for indeterminate to 100% for histoid type. The specificity ranged from 90% for BT and TT to 100% for neuritic leprosy.

Lepra reactions are an important cause of morbidity in leprosy patients. Erythema, nodosum, leprosum (ENL) (type II reaction) is an immunological complication affecting approximately 100% of the patients with BL (figure 1, 2) and 33% of BB [7]. Clinical diagnosis of early leprosy lesions is sometime difficult even to experienced dermatologists because of the varied clinical manifestations. Thus, we emphasized the importance of microscopic examination in all clinically suspected cases of HD for early diagnosis and treatment before any disability sets in.

A case number four (figure 3, 4, 5) presented with generalized ichthyosis and crusted erosion at elbow and knee. Skin lesions were not classical, for diagnosing leprosy, rather we suspected HIV with acquired ichthyosis and generalsied folliculitis. Patient was unable to walk due malaise and generalized weakness, we admitted him for further evaluation. On laboratory investigation HIV ELISA was negative and hemoglobin was 7 g/dl. We did slit skin smear for Z N staining and that turn out to be positive and thus started patient on Anti Leprosy treatment.

A hypoanesthetic patch was the most common clinical presentation in our study [6]. Since skin and nerves are the most common sites of *M. leprae* infection, signs and symptoms related to the skin and nerves were common [6]. Most common type of leprosy was borderline tuberculoid followed by borderline lepromatous in our study. We reported one case of histioid Hansen. All the borderline lepromatous cases present with Lepra reaction (Type 2 more common than Type 1). No visible deformity was noticed in any patients, although foot ulcer were present in three. All patients were started on Multi drug therapy along with treatment of lepra reaction if required as in 75% of our cases [8]. All patient are on regular treatment and improvement in symptoms.

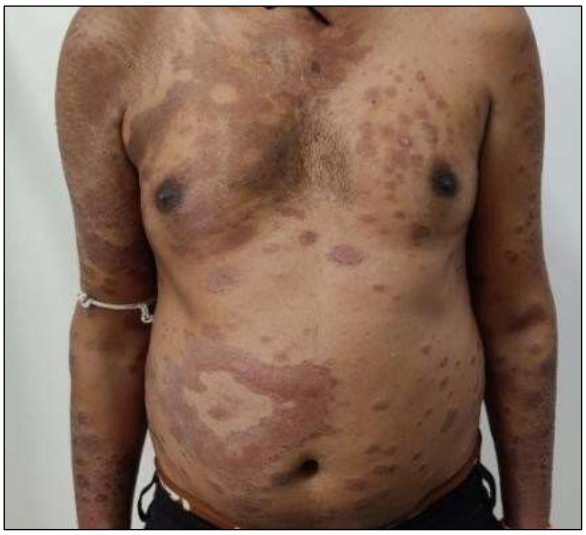

Fig 1: Borderline lepromatous leprosy with downgrading reaction

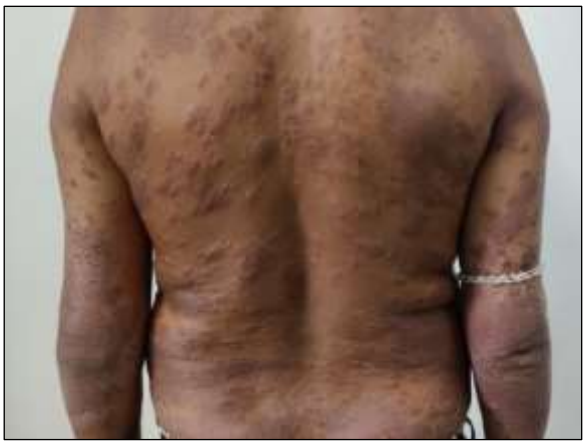

Fig 2: Borderline lepromatous leprosy with multiple skin-colored papules and plaques

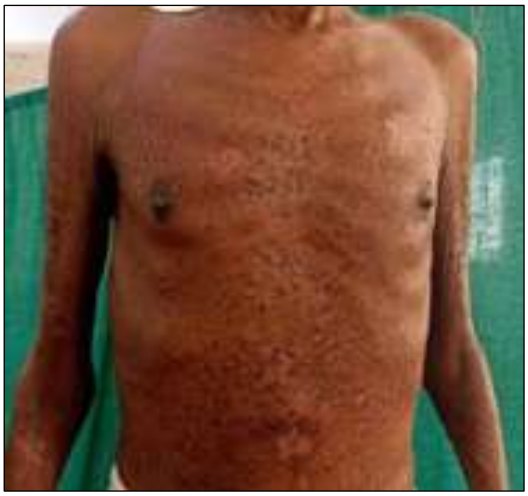

Fig 3: Icthysosis and folliculitis over chest and abdomen area

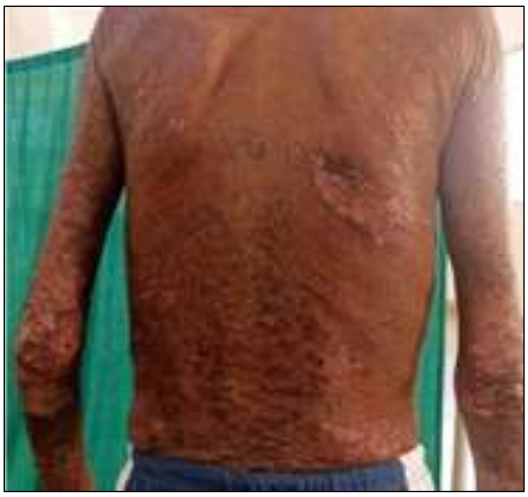

Fig 4: Icthyosis and folliculits with few skin-colored plaque over back and elbow

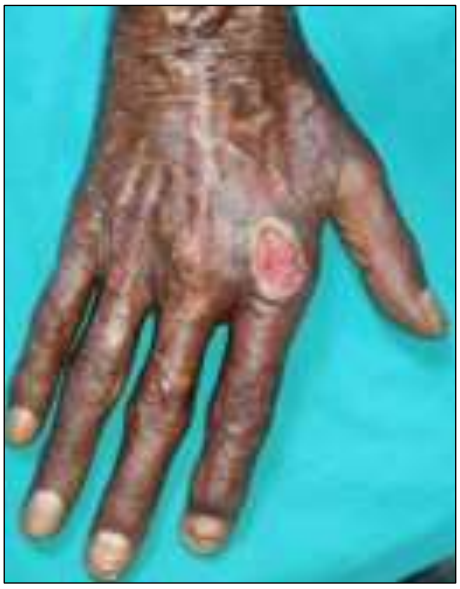

Fig 5: Single superficial ulcer over first metacarpal-phalynx joint

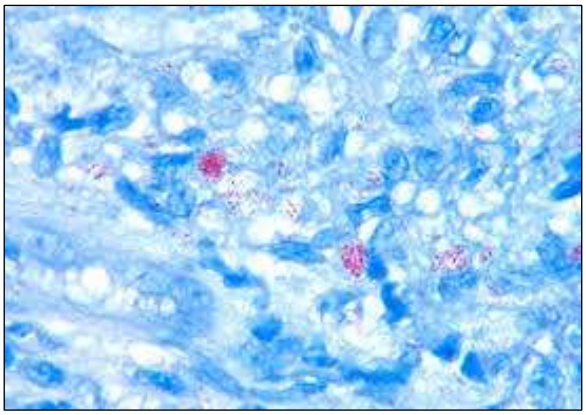

Fig 6: Microscopic examination of slit skin smear

Conclusion

There is significant reduction in prevalence rate of leprosy to 0.23/10,000 population worldwide in 2020. Despite this India had more than 50% of leprosy patients of the world, which necessities identifying the reasons for transmission and to adopt preventive measures to control the disease. Clinical diagnosis of early leprosy lesions offers difficulties even to experienced dermatologists as a patient presents in different clinicopathological forms, depending on host immune status. Thus, the correlation between clinical, histopathological, and bacteriological features is required for diagnosis and classification of leprosy. Nerve damage is irreversible; therefore, early detection and treatment is important to prevent Grade 2 disabilities [9].

Conflict of interest statement: There are no conflicts of interest.

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