

## A RETROSPECTIVE STUDY OF HISTOMORPHOLOGICAL SPECTRUM OF HANSEN'S DISEASE IN A TERTIARY CARE CENTRE OF BARABANKI AREA

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Received: 07 January 2023, Revised and Accepted: 25 February 2023

### ABSTRACT

**Objectives:** Hansen's disease is a chronic granulomatous infectious disease caused by *Mycobacterium leprae*. Early detection is essential to prevent the disease's spread and disability. Due to the multitude of morphologies, it may be difficult to accurately diagnose certain cases based solely on clinical signs; therefore, histopathology is crucial for definitive diagnosis. The study aims to investigate the various histological forms of leprosy over a year in a tertiary care hospital.

**Methods:** It was a retrospective study that included 25 leprosy cases that were clinically and histopathologically diagnosed from July 2021 to August 2022 in a tertiary care center.

**Results:** The majority of the cases were from the second decade with the male predominance of the cases (M:F=1.5:1). According to histomorphology, tuberculoid leprosy was the most common type (36%), followed by borderline tuberculoid (24%), borderline lepromatous (16%), lepromatous leprosy (8%), borderline leprosy (8%), histoid leprosy (4%), and indeterminate leprosy (4%). Ziehl-Neelsen staining for acid-fast bacilli demonstrated positivity in 8 cases.

**Conclusion:** As the clinical spectrum of leprosy is diverse, histopathology is the gold standard for the diagnosis and a key tool in obtaining a conclusive diagnosis.

**Keywords:** Histomorphology, Hansen's disease, Tuberculoid, Borderline, Lepromatous, Histoid.

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### INTRODUCTION

Leprosy, commonly known as Hansen's disease, is a chronic granulomatous disease caused by the *Mycobacterium leprae*, which was first identified by Sir Gerhard Armauer Hansen in 1873 [1]. Leprosy has been declared (prevalence rate < 1/10,000 population) as an important public health problem in our country. Its eradication was achieved successfully by the National Leprosy Eradication Program. Around 60% of leprosy cases worldwide are in India [2]. Any age group can be affected by it [3]. Peripheral nerves and the skin are the primary areas which are affected [4]. Acid-fast bacilli (AFB) on tissue biopsy and histomorphology are necessary for accurate diagnosis [5,6]. Leprosy-related physical impairments commonly create severe social stigma and hostility toward patients and their families. The causative organism must therefore be found and eliminated to control communicable diseases [7-9]. In contrast, the clinical classification only describes the gross appearances of the lesions. In 1966, Ridley and Jopling defined precise criteria for the histological typing of leprosy [10]. The suspected case of leprosy which are missed clinically are confirmed histopathologically. The purpose of the current study was to histologically diagnose leprosy and classify the disease into tuberculoid (TT), borderline tuberculoid (BT), midborderline (BB), borderline lepromatous (BL), and lepromatous leprosy (LL), based on histomorphological factors [11]. A type that does not fall within one of the five categories is referred to as an indeterminate form. Histoid leprosy is a rare form of LL that manifests as nodules or plaques over skin that appear normal.

Leprosy reactions are caused by an immune response between the host and *M. leprae*. It is divided into two types- Type 1 and Type 2.

Type 1 is cell-mediated hypersensitivity reaction which is commonly present in BT, BB, and BL forms. In these cases, common clinical

manifestations are hyperesthesia, erythema, edema, subsequent scaling, and sometimes neuritis and ulceration.

Type 2 are humoral hypersensitivity reactions which are commonly present in LL and occasionally BL forms. This reaction is immunologically characterized by immune complex deposits in tissue, blood, and lymphatic vessels. The most common manifestation is the rapid appearance of painful erythematous subcutaneous nodules accompanied by fever and change in patient's general health.

The aim and objectives of this article are to investigate the various histological forms of leprosy over a year in a tertiary care hospital. Hence, a cornerstone in the accurate diagnosis and management of this illness.

### METHODS

#### Study area and design

A retrospective study was done in the Department of Pathology in collaboration with the Department of Dermatology, Mayo Institute of Medical Sciences, Barabanki (Uttar Pradesh), from July 2021 to August 2022, having a sample size of 25, which were collected from Dermatology department.

All age groups and both sexes of clinically diagnosed leprosy patients were included in this study. Dermatologists took 4 mm lesional skin punch biopsies and sent to the pathology department in plastic container having 10% neutral buffered formalin. Biopsies were fixed and processed, ideally within 24 h. After fixation, the tissues were prepared, embedded in paraffin, and serial slices measuring 4-5 microns were cut. These sections were then stained with Hematoxylin and Eosin for morphological evaluation and Ziehl-Neelsen for bacilli identification. Histopathological findings and the bacteriological status were noted

and the diagnosis of leprosy was confirmed and classified according to Ridley and Jopling classification. Indeterminate and cases of histoid leprosy - a rare variant of lepromatous leprosy - were also included in this study.

#### Microscopic study

The findings used for microscopic diagnosis are involvement of sub-epidermal zone, granuloma formation, lymphocytic infiltrate, epithelioid cells, giant cell, storiform pattern of spindle cells, nerve involvement, presence of *M. leprae* and other cellular elements in biopsy sections (Figs. 1-6).

#### RESULTS

Twenty-five cases of histopathologically confirmed leprosy from July 2021 to August 2022 were analyzed in this retrospective study. Patients in this study ranged in age from 11 to 60 years, followed by the age groups 31-40, and 41-50 (each 6 cases, 24%) shown in Table 1. Based on this study, males accounted for the majority of leprosy cases (15 cases, or 60%) compared to females having male to female ratio 1.5:1 (Table 2). Based on the histopathology of 25 skin biopsies, tuberculoid leprosy (of which there were 9 cases, 36%) was the most prevalent type, followed by borderline tuberculoid (6 cases, 24%), borderline lepromatous (4 cases, 16%), borderline leprosy (2 cases, 8%), lepromatous leprosy (2 cases, 8%), histoid (1 case, 4%), and indeterminate leprosy (1 case, 4%) as shown in Table 3. Ziehl-Neelsen staining was used to detect AFB in each of the 25 cases, and it was found positive in 8 cases

(32%). All lepromatous, borderline, and histoid cases of the disease demonstrate the presence of AFB bacilli, while tuberculoid and borderline tuberculoid cases lack bacilli.

Overall, there were 10 cases of leprosy reaction (40%), of which type 1 reaction was observed in 6 cases and type 4 reaction in 3 cases (Table 4).

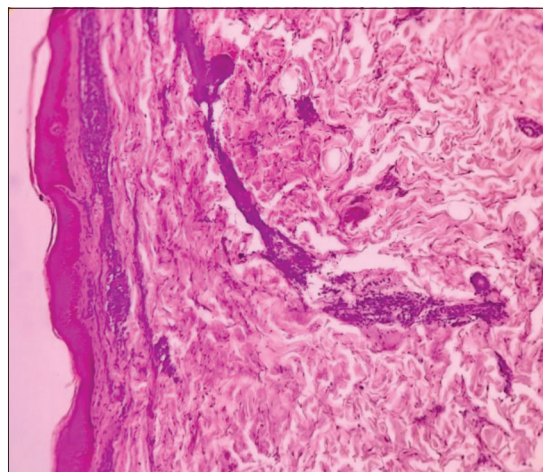


Fig. 3: Borderline leprosy ( $\times 10$ )

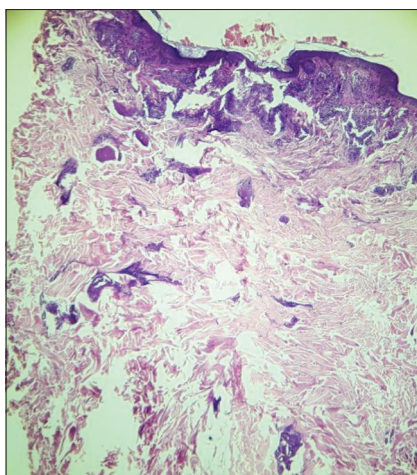


Fig. 1: Tuberculoid leprosy ( $\times 10$ )

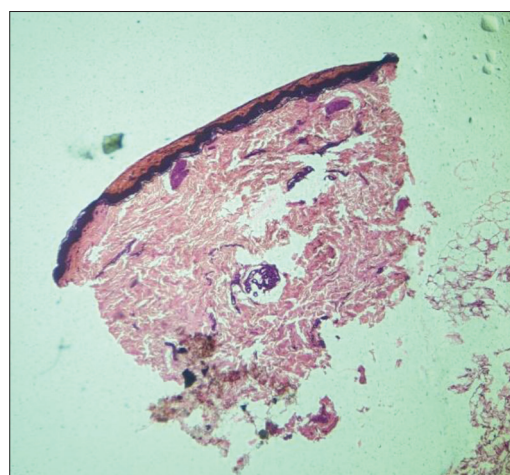


Fig. 4: Indeterminate leprosy ( $\times 10$ )

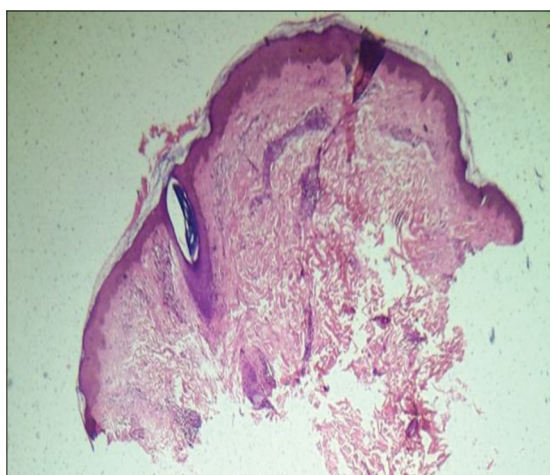


Fig. 2: Borderline tuberculoid leprosy ( $\times 10$ )

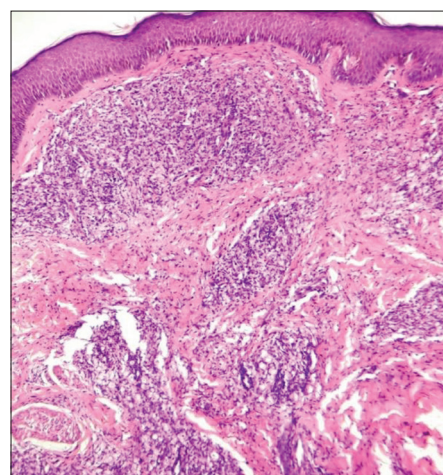


Fig. 5: Histoid leprosy ( $\times 10$ )

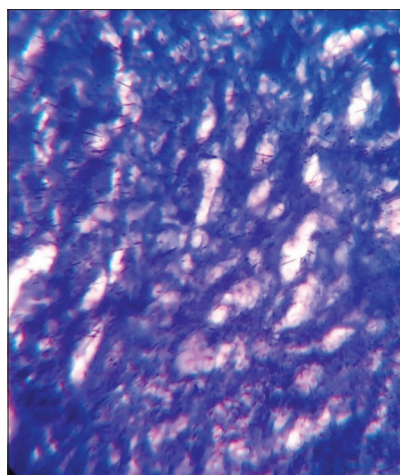


Fig. 6: Z-N staining positive

## DISCUSSION

For the study of all aspects of leprosy epidemiology, treatment, and disability prevention accurate diagnosis is crucial. The gold standard for diagnosing and classifying leprosy is histopathological investigation, which is still a crucial technique today.

A total of 25 skin biopsies from patients with clinically confirmed leprosy were received over the course of the one-year study period.

All cases of leprosy in the current investigation were histopathologically diagnosed using the Ridley-Jopling classification. For analysis, the present study also included the histioid and indeterminate forms of leprosy [10,11].

In our study the most common affected age group is 11-30 years (44%) followed by 31-40 years age group (24%) and 41-50 years (24%). This finding is in contrast to other study done by Shivaani *et al.*, Perona *et al.*, Shree *et al.*, Maya *et al.* and Chintal *et al.* and found maximum number of cases was seen in the age group of 21-30 years (31.85%), followed by 31-40 years (26.52%), followed by 41-50 years age group (17.69%) [9,12-17].

Our study showed male predominance (60%), with a male to female ratio of 1.5:1, which is similar to findings made by other researchers like Vahini *et al.*, Veena *et al.*, Soni *et al.*, Roy *et al.* and Shree *et al.* showing male predominance with 72.5%, 82%, 97%, 68.97% and 82% respectively [7-9,13,14].

In our study, histopathology revealed that the TT type of leprosy was the most often found type in 9 cases (36%), followed by the BT type in 6 cases (24%), the BL type in 4 cases (16%), the BB and LL types in 2 instances, and the histioid and undetermined types in 1 case each. Similar study conducted by Mandhar *et al.*, Kumar *et al.*, Shivani *et al.*, and Shrestha *et al.*, the most prevalent type of leprosy was tuberculoid, accounting for 63.15%, 66%, 19.51%, and 41.67% of patients, respectively [9,12,13,18]. While in contrast to other published Indian studies shows Boderline tuberculoid was the most prevalent lepromatous lesion, with 56.7%, 72.5%, 34.5%, 36%, and 41% of cases, respectively, according to studies by Maya *et al.*, Nadia *et al.*, Erbenes *et al.*, and Tiwari *et al.* [17,19-21]. These variation can be due to regional differences, socioeconomic and immune status of population studied.

For reliable histological classification of all patients in the current study, we performed Z-N staining to identify AFB positive. The BL, LL, and histioid types all demonstrated significant bacterial indices. Our findings concurred with those of studies by Chintal *et al.* and Anusha *et al.* [16,22].

Table 1: Age-wise distribution of cases

| Age   | Number of cases | Percentage |
|-------|-----------------|------------|
| 11-20 | 3               | 12         |
| 21-30 | 8               | 32         |
| 31-40 | 6               | 24         |
| 41-50 | 6               | 24         |
| 51-60 | 2               | 8          |

Table 2: Sex-wise distribution of cases

| Sex    | Number of cases | Percentage |
|--------|-----------------|------------|
| Male   | 15              | 60         |
| Female | 10              | 40         |
| Total  | 25              | 100        |

Table 3: Distribution of cases according to type of leprosy

| Type of leprosy                | Number of cases |
|--------------------------------|-----------------|
| Indeterminate leprosy          | 1               |
| Tuberculoid leprosy            | 9               |
| Borderline tuberculoid leprosy | 6               |
| Borderline borderline leprosy  | 2               |
| Borderline lepromatous leprosy | 4               |
| Lepromatous leprosy            | 2               |
| Histioid leprosy               | 1               |
| Total                          | 25              |

Table 4: Distribution of leprosy according to type of reaction

| Type of reaction | Number of cases |
|------------------|-----------------|
| None             | 15              |
| Type 1           | 6               |
| Type 2           | 4               |
| Total            | 25              |

Table 5: Age-wise distribution of type of leprosy

| Type  | 11-20 years | 21-30 years | 31-40 years | 41-50 years | 51-60 years |
|-------|-------------|-------------|-------------|-------------|-------------|
| IL    | 0           | 1           | 0           | 0           | 0           |
| TT    | 1           | 5           | 2           | 1           | 0           |
| BT    | 2           | 1           | 2           | 1           | 0           |
| BB    | 0           | 0           | 0           | 2           | 0           |
| BL    | 0           | 0           | 2           | 2           | 0           |
| LL    | 0           | 0           | 0           | 0           | 2           |
| HL    | 0           | 1           | 0           | 0           | 0           |
| Total | 3           | 8           | 6           | 6           | 2           |

Table 6: Sex-wise distribution of type of leprosy

| Type  | Male | Female |
|-------|------|--------|
| IL    | 0    | 1      |
| TT    | 5    | 4      |
| BT    | 3    | 3      |
| BB    | 1    | 1      |
| BL    | 3    | 1      |
| LL    | 2    | 0      |
| HL    | 1    | 0      |
| Total | 15   | 10     |

## CONCLUSION

Although leprosy is thought to have been eradicated from India, it is still a problem in many places. In order to better understand the

pattern of the disease's occurrence, prevalence, transmission of the disease, diagnosis, preventative intervention, and management, it is still necessary to study and research the disease. To assess the many subtypes of leprosy, histopathological examinations are still the gold standard tool.

In order to improve classification and prognosis, particularly in the current post-elimination phase, histological biopsies of skin lesions should be performed in all leprosy cases. This is because clinical diagnosis of early leprosy lesions is quite challenging due to its clinical variability. The Ridley-Jopling classification, which is most useful for classifying leprosy, is based on clinical, histological, bacteriological, and immunological characteristics.

For accurate leprosy typing, histomorphology in combination with bacteriological index is more helpful than focusing on a single criterion. As a result, the burden of disease on society is lessened and clinicians are able to provide better care and disease management.

#### CONFLICT OF INTEREST

The author has no conflicts of interest to declare.

#### AUTHORS FUNDING

Self.

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