



CLINICOPATHOLOGICAL CORRELATION IN LEPROSY LESIONS: STUDY IN A TERTIARY CARE INSTITUTE

Pathology

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ABSTRACT

Introduction: Leprosy continues to be a relevant public health concern in developing regions, despite significant progress in its control. The disease presents along a broad clinical and immunological spectrum, making diagnosis challenging—particularly in borderline forms. This study investigates the clinicopathological correlation in leprosy, with an emphasis on the role of histopathology and bacterial index (BI) in refining diagnosis. **Methods:** A total of 72 clinically suspected leprosy cases were studied over a two-year period in a tertiary care hospital in Surat, Gujarat. Skin biopsies were processed for routine histopathology and Fite-Faraco staining. Each case was classified according to the Ridley-Jopling system. Correlation between clinical diagnosis, histological subtype, and BI positivity was analysed. **Results:** The majority of patients were males (81.9%), with the highest incidence observed in the 21–40 year age group. Lepromatous leprosy (LL) was the most frequently diagnosed form both clinically (38.9%) and histologically (36.1%). Concordance between clinical and histological diagnoses was observed in 65.3% of cases, with the strongest agreement in LL (78.6%) and histoid leprosy (75%). Borderline forms showed moderate correlation, reflecting diagnostic challenges in this subgroup. Fite-Faraco positivity was noted in 58 cases (80.6%), with higher BI grades strongly associated with multibacillary forms. The sensitivity of staining was significantly higher when correlated with histopathological classification than with clinical suspicion. **Conclusion:** This study reinforces the importance of histopathology and BI evaluation in the diagnosis and classification of leprosy. Inconsistencies in clinical diagnosis, especially within borderline subtypes, highlight the need for tissue biopsy and staining for accurate categorization. Integrating clinicopathological correlation into routine practice ensures better diagnostic precision and guides more effective disease management.

KEYWORDS

Leprosy, Ridley-jopling Classification, Histopathology, Fite- Faraca Stain

INTRODUCTION

Leprosy is a major public health problem in developing countries including India and it presents in different clinico-pathological forms depending on the immune status of the host⁽¹⁾ Although the prevalence of leprosy has declined significantly over the past 50 years it remains a public health concern and continues to carry a significant social stigma for those affected.

The cell mediated immune response to infection is the basis for the development of a particular type of leprosy.⁽²⁾ Histopathological examination not only confirms cases that may be overlooked in clinical or epidemiological assessments but also aids in precise subtype identification. Ridley and Jopling (R-J) were the first to suggest a histopathological subdivision of leprosy on an immunological basis into the following types: Indeterminate (IND), Tuberculoid (TT), Borderline tuberculoid (BT), Borderline (BB), Borderline lepromatous (BL) and Lepromatous (LL)⁽³⁾. Clinical classification is based primarily on the appearance of lesions and stage of lesion. Moreover, a significant number of leprosy cases—particularly those in the borderline spectrum (BT, BB, BL)—exist within a shifting immunological spectrum. Histology, therefore, provides a more accurate snapshot of recent changes in a patient's position along the leprosy spectrum.

MATERIALS AND METHOD

The present descriptive study was conducted in the Department of Pathology in tertiary care hospital Surat, Gujarat over a period of two years from July 2023-June 2025. The study population included 72 clinically suspected cases of leprosy. Clinical history, including patient age, sex, and the provisional clinical diagnosis, was recorded. Skin biopsies were obtained and preserved in 10% formalin before being forwarded to the Department of Pathology. Once properly fixed, the samples underwent standard tissue processing, followed by embedding in paraffin and microtome sectioning. The prepared sections were stained using Hematoxylin and Eosin (H&E) as well as Fite-Faraco stain to identify acid-fast bacilli. Each case was then categorized based on the Ridley-Jopling classification. Bacteriological index (BI) was subsequently reviewed as given in table 1.

Table 1: Bacillary Index

BI is expressed in logarithmic scales:	
1 + (1 bacillus in every 100 fields).	
4	International Journal of Scientific Research

2 + (1 bacillus in every 10 fields).
3 + (1 bacillus in every field).
4 + (1-10 bacilli in every field).
5 + (10-100 bacilli in every field).
6 + (More than 100 bacilli and even globi in every field).

RESULT AND OBSERVATION

The study included skin biopsies from 72 clinically suspected leprosy patients, comprising 59 males (81.9%) and 13 females (18.1%) with male to female ratio (M:F) of 4.5:1. Participants ranged in age from 17 to 97 years, with most cases falling within the 21 to 40-year age group (47.22%) followed by 37.50% in 41 to 60 years (Table 2)

Table 2: Sex Wise Age Distribution

AGE (Years)	MALE	FEMALE	TOTAL
<20	1 (1.69%)	0 (0%)	1 (1.39%)
21-40	28 (47.46%)	6 (46.15%)	34 (47.22%)
41-60	22 (37.29%)	5 (38.46%)	27 (37.50%)
61-80	7 (11.86%)	2 (15.38%)	9 (12.50%)

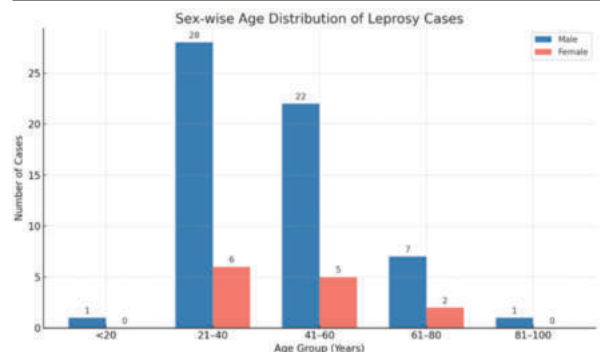


Figure 1: Sex wise Age Distribution of Leprosy cases.

Among the cases clinically evaluated, the most frequently observed subtype was lepromatous leprosy (LL), (Table 2) accounting for 28 cases (38.9%). This was followed by borderline lepromatous (BL)

leprosy in 22 cases (30.6%) and borderline tuberculoid (BT) leprosy in 15 cases (20.8%).

Histopathological examination demonstrated a differing distribution of subtypes. LL remained the most prevalent, confirmed in 26 cases (36.1%), followed by BL in 21 cases (29.2%) and BT in 11 cases (15.3%).

Clinicohistopathological concordance was observed in 47 of the 72 cases, yielding an overall agreement rate of 65.3%. The highest concordance was noted in LL cases (78.6%), followed by histoid leprosy (75.0%), TT (66.7%), BL (54.5%), and BT (53.3%). No concordance was observed in the BB and IL subtypes, likely due to the absence of clinical diagnoses in these categories.

Table 3: Clinico-Pathological Concordance

Clinically Suspected Subtypes of Leprosy	Histopathological Diagnosis								Agreement	Percentage Of Parity (%)	
	TT	BT	BB	BL	LL	IL	ENL	Histoid			
TT	3	2	1	0	0	0	0	0	2	66.7	
BT	15	1	8	0	4	0	2	0	8	53.3	
BB	0	0	0	0	0	0	0	0	0	-	
BL	22	0	2	0	12	4	1	1	2	54.5	
LL	28	0	0	0	4	22	0	1	1	22	78.6
IL	0	0	0	0	0	0	0	0	0	-	
Histoid	4	0	0	0	1	0	0	0	3	3	75.0
Total	72	3	11	0	21	26	3	2	6	47	65.3

Out of 72 clinically and histopathologically confirmed cases of leprosy, 57 cases (79.2%) exhibited a positive bacterial index (BI ≥ 1+), while 15 cases (20.8%) showed no detectable bacilli (BI = 0).

Table 4: Correlation of Fite Faraco positivity with histopathological diagnosis

Bacterial Index	TT	BT	BB	BL	LL	IL	ENL	Histoid	Total
	3	11	0	21	26	3	2	6	
1+	0	2	0	0	0	0	0	0	2
2+	0	0	0	0	0	0	0	0	0
3+	0	0	0	6	0	0	0	0	6
4+	0	0	0	12	8	0	1	2	24
5+	0	0	0	3	17	0	1	4	25
6+	0	0	0	0	1	0	0	0	1
Total	0	2	0	21	26	0	0	0	58

DISCUSSION

A definitive diagnosis of leprosy cases cannot be reached based on clinical examination alone; thus the diagnostic accuracy is enhanced through the histopathological examination⁽⁴⁾.

Demographic Characteristics

During the study period of two years, 72 skin biopsies were clinically diagnosed as leprosy. In present study majority of cases were males (81.9%) and the male to female ratio was 4.5:1. This finding is consistent with studies done by Semwal S⁽³⁾ Tiwari M⁽⁶⁾ and Shivamurthy V⁽⁷⁾ Various factors, such as greater occupational exposure, sociocultural behaviour, and environmental contact, may contribute to the increased incidence in males.

Leprosy can be seen in any age group. The most affected age group in our study was between 21–40 years (47.2%), consistent with the age distribution reported in previous studies. This working-age group may have greater mobility and exposure, increasing the risk of transmission. Conversely, very few cases (1.39%) were observed below 20 years of age, possibly due to the extended incubation period of Mycobacterium leprae.

Clinico-Pathological Concordance

Due to its variable presentation of leprosy, clinical diagnosis alone is frequently insufficient for accurate classification.

Out of 72 clinically diagnosed cases, histopathological confirmation was achieved in 65.3% of cases overall. The highest clinicopathological concordance was seen in LL cases (78.6%), followed by histoid leprosy (75%), and TT leprosy (66.7%).

BT and BL subtypes showed lesser agreement, with concordance rates of 53.3% and 54.5% which could be due to the dynamic nature of the patients' immunity in the borderline spectrum, which is also reflected in the different histology obtained from different sites in these patients as also noted in older studies⁽⁸⁾

Like study of Lobo et al (2014)⁽⁹⁾ there were no cases classified as BB leprosy. Mid-borderline leprosy represents the most immunologically unstable form, often presenting with lesions of varying morphology within the same patient which may explain the absence of such cases in present study.

Bacterial Index

Out of 72 clinically suspected cases of leprosy, 58 cases (80.6%) demonstrated positivity for lepra bacilli on Fite-Faraco staining. The bacterial index (BI) revealed complete concordance of BI positivity with multibacillary forms such as (BL), (LL), and histoid variants, whereas (BT) cases were limited to low-grade positivity (1+). No bacilli were detected in (TT), (BB) which aligns with the known spectrum of bacillary distribution also seen in study by Tilva KK⁽¹⁰⁾

The sensitivity of Fite-Faraco staining for clinically diagnosed BL and LL cases was 54.5% and 78.6%, respectively, whereas it improved to 76.2% and 100% when correlated with histopathological diagnosis. This difference was statistically significant, reinforcing that Fite-Faraco staining correlates better with histological subtyping than with clinical assessment alone.

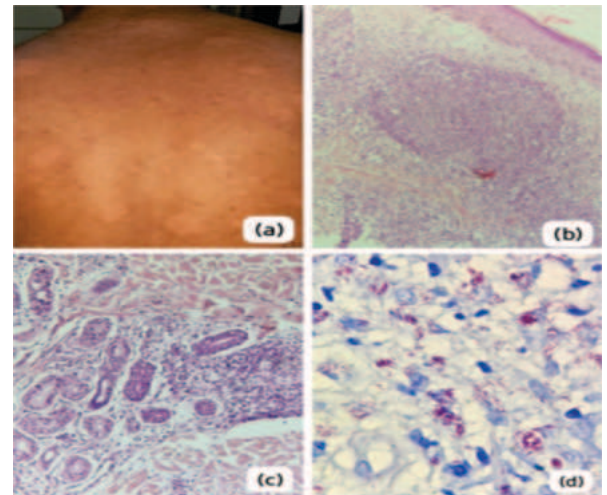


Figure 2: Borderline Lepromatous Leprosy- (a) Multiple well defined hypopigmented plaques, (b) lymphohistiocytic granulomas (H&E x10) (c) Peri-adnexal foamy histiocytic collections (H&E x40); (d) Fite faraco stain: positive for Acid fast bacilli (100X)

CONCLUSION

The findings of this study highlight the continued relevance of histopathological evaluation and bacterial index (BI) assessment in the accurate diagnosis and classification of leprosy, especially in settings where clinical variability can hinder early detection and precise subtyping. Performing histopathological examination of the most infiltrated lesion in each case, followed by thorough clinicopathological correlation, can significantly enhance diagnostic accuracy. This approach helps determine the patient's exact status within the dynamic immunopathological spectrum of leprosy, which is essential for appropriate management.

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