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ANALYZING THE CONCORDANCE OF HISTOPATHOLOGICAL FINDINGS & CLINICAL ASSESSMENT WITH BACTERIOLOGICAL INDEX IN SLIT SKIN SMEARS IN HANSEN'S DISEASE

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Abstract

Background: Leprosy or Hansen's Disease caused by Mycobacterium Leprae, a chronic granulomatous disease, is one of the oldest diseases known to mankind. This study highlights utility of Bacteriological Index in slit skin smears in diagnosing and its concordance with clinical & histopathological changes in Hansen's disease. **Materials & Methods:** A Cross-sectional study of 60 patients clinically suspected of or diagnosed with Leprosy visiting outpatient department of dermatology, venereology and leprology during period of February 2022 to April 2024 was conducted. Demographic data, presenting complaints, clinical diagnosis, slit skin smear reports and histopathological diagnosis of leprosy patients was collected from case-sheets and registers. Bacteriological Index was noted from slit skin smear reports. Histopathological details of skin biopsies was collected. Data was categorised & analysed to assess concordance **Aim:** To study concordance of histopathological findings and clinical assessment with bacteriological index in slit skin smears in different types of Leprosy

Results:

1. Out of 60 clinically suspected patients, maximum of 21 patients (35%) were in third decade and male predominance with 39 cases (65%)
2. On histopathological examination, 57 cases were positive for Hansen's disease. 19cases were Borderline Tuberculosis (31.6%)
3. Slit skin smears demonstrated AFB in 34 cases (56.6%) and maximum sensitivity of 91.6% in lepromatous leprosy
4. In study, highest concordance of bacillary index with histopathological findings was seen in lepromatous leprosy (90%) followed by borderline cases
5. Clinico-histopathological concordance was maximum in lepromatous leprosy (82%) and borderline tuberculoid (78%)

Conclusion:

1. Leprosy patients vary in clinical & histopathological features depending on host immune response.
2. Correlation of histo-morphological findings with slit skin smear will be helpful for better patient management.

Keyword: Leprosy, Bacteriological index, slit skin smear

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Introduction

Leprosy or Hansen's disease is a chronic granulomatous disease caused by Mycobacterium Leprae affecting skin & peripheral nerves. The pathogenesis of leprosy is complex and its clinicopathological manifestations are the result of host-parasite interactions.[1,2] The prevalence rate of leprosy has declined from 0.69 per 10,000 in 2014-15 to 0.45 per 10,000 in 2021-22.[3]

The worst affected countries were India and Brazil as well as other countries in Sub-Saharan Africa and Southeast Asia.[4]

The disease manifests itself in two polar forms, namely lepromatous and tuberculoid leprosy, lying on both sides of a wide range. Between these two polar forms lie the borderline and intermediate forms.[5] Ridley & Jopling classified leprosy as: tuberculoid (TT), borderline tuberculoid (BT), mid-borderline (BB), borderline lepromatous (BL), and lepromatous (LL)

Aim

1. To study concordance of histopathological findings and clinical assessment with bacteriological index in slit skin smears in different types of Leprosy

Objectives

1. To study histopathological features in different types of leprosy
2. To study & determine sensitivity of bacteriological index in Slit skin smear of leprosy patients
3. To determine age & sex distribution & clinical profile of leprosy patients

Materials And Methods

Study design- After obtaining approval by Ethics committee, cross-sectional study of clinically suspected or diagnosed patients with Leprosy was conducted.

Study duration– Patients visiting from February 2022 to March 2024 with complaints of skin lesions, tingling and numbness, deformity and others were included in the study

Study site- Outpatient department of dermatology, venereology and leprology at a tertiary care centre during the mentioned period was conducted.

Sample size- 60 patients that visited out patient department during the study period

Study Method- Demographic data, presenting complaints, clinical notes, slit skin smear reports and histopathological diagnosis of clinically suspected cases of leprosy was collected from case-sheets and registers. Bacteriological Index was noted from slit skin smear reports.

Slit skin smear examination- Slit skin smear examination is a valuable diagnostic tool. The most common sites for taking smears are- 1) lobe of the right ear, 2) forehead, 3) chin, and 4) left the gluteal region in the men and left upper thigh in the women.

Bacteriological Index- The concentration of bacilli in smears is known as the bacterial or bacteriological index and includes living and dead bacilli.[6]

Ridley's logarithmic measurement was utilised to grade number of bacilli in slit skin smears and mean BI was calculated for each patient.

6+ - more than 1000 bacilli in an average field
5+ - 100 to 1000 bacilli in an average field
4+ - 10 to 100 bacilli in an average field
3+ - 1 to 10 bacilli in an average field
2+ - 1 to 10 bacilli in 10 fields
1+ - 1 to10 bacilli in 100 fields

Histopathological examination- Full thickness skin biopsies from clinically diagnosed or suspected patients of Hansen's disease was taken. The samples were then sent to department

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of Pathology in 10% Formalin for Hematoxylin & Eosin (H & E) staining. In order to demonstrate lepra bacilli in biopsy sample, Ziehl-Neelsen staining was also done whenever required.

Tuberculoid leprosy (Fig.1) on histopathological examination demonstrated epithelioid cell granulomas with langhan's giant cells (Fig.2) and lymphocytes. Lepromatous leprosy (Fig.3) has macrophage infiltration, clear subepidermal zone (grenz zone) and atrophic epidermis.

In order to classify the disease clinically & histopathologically, Ridley-Jopling criterion was used. Data was categorised & analysed to assess concordance.

Study material

Skin biopsies, slit skin smear reports, Leprosy registers and case-sheets

Inclusion criteria

1. Clinically suspected or diagnosed patients with Leprosy who have not taken any prior treatment

Exclusion Criteria

1. Patients already on treatment or who have completed multi-drug therapy
2. Relapsed cases after completing MDT

Statistical analysis

The data was recorded in excel sheets. Accordingly, concordance and sensitivity was calculated for the mentioned parameters.

Results

1. 60 clinically diagnosed cases of leprosy were included in this study. Considering age, maximum of 21 patients (35%) were in 3rd decade followed by 17 in 4th decade. The oldest patient was 85 years old and youngest was 12 years old. [Table 1]
2. The study depicted male predominance with 39 cases (65%) and male:female ratio of 1.5:1 was seen. [Graph 1]
3. On clinical diagnoses, there were 15 cases of BT (25%) followed by TT (23.3%) and BL (21.6%) [Table 2]
4. On histopathological examination out of 60 clinically diagnosed cases, 57 were positive for Hansen's disease.
5. In the present study, most common Histopathological diagnosis was BT (31.6%).The other common diagnosis were TT (20%) & LL (18.6%) [Table 3, Graph 2]
6. Concordance of histopathological diagnosis with clinical diagnosis was maximum in lepromatous leprosy (81.8%) and BT (78%) [Table 4]
7. Slit skin smear demonstrated AFB positivity in 56.6 % of clinically diagnosed cases [Graph 3]
8. Bacteriological Index was 1+ in 9 cases and 6+ in 2 cases [Table 5]
9. Bacteriological Index was negative in 43.4% of cases, High sensitivity of slit skin smear examination for AFB in LL (91.6%) was observed when the bacillary load was high.
10. In study, highest concordance of bacillary index with histopathological findings was seen in lepromatous leprosy (90%) followed by borderline cases. [Table 6]

Table 1: Age wise Distribution

Age (in years)	Number of cases (Percentage)
0-10	0
11-20	4 (6.6 %)
21-30	7 (11.6 %)

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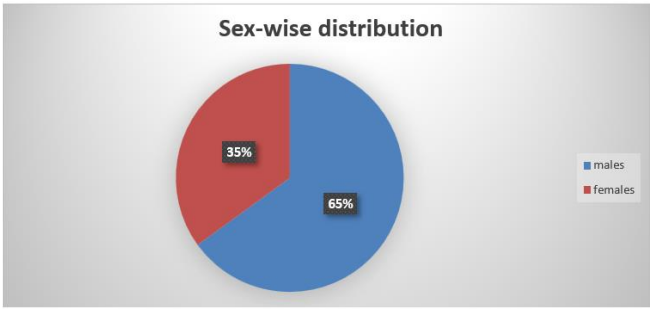
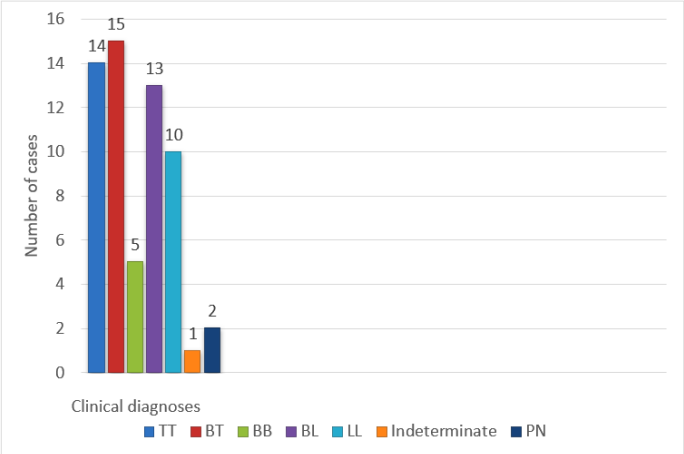
31-40	21 (35 %)
41-50	17 (28.3 %)
51-60	6 (10%)
51-70	3 (5 %)
71-80	1 (1.6 %)
>80	1 (1.6 %)
Total	60



Graph 1: Sex wise distribution

Table 2: Distribution of Clinically diagnosed cases

Clinical Diagnosis	Number of cases (percentage)
TT	14 (23.3 %)
BT	15 (25 %)
BB	5 (8.3%)
BL	13 (21.6%)
LL	10 (16.6 %)
Indeterminate	1 (1.6%)
PN	2 (3.3%)
Total	60



Graph 2: Clinically diagnosed cases

Table 3: Distribution of cases as per histopathological diagnosis

Histopathological diagnosis	Number of cases (%)
TT	12 (20 %)
BT	19 (31.6 %)

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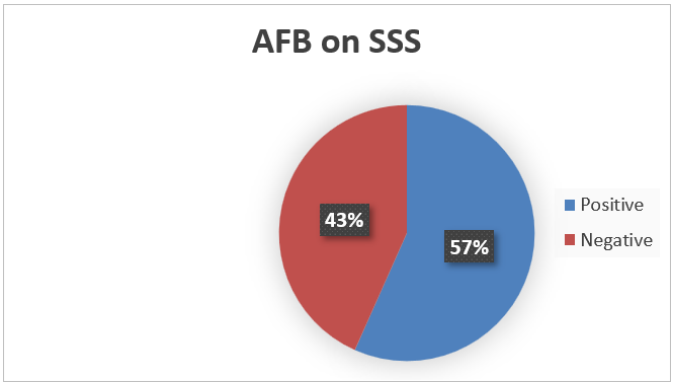
BB	3 (5 %)
BL	10 (16.6 %)
LL	11 (18.3 %)
Indeterminate	2 (3.3%)
Pure neutitic	0
Negative	3 (5 %)
Total	60

Table 4: Concordance of histopathological diagnosis with clinical diagnosis

HPE (no. of cases)	TT	BT	BB	BL	LL	Ind	PN	Concordance (%)
TT (12)	9	3						75%
BT (19)	2	15		2				78%
BB (3)		1	1	1				33.3%
BL (10)			2	7	1			70%
LL (11)				2	9			81.8%
Ind (2)						1	1	50%
Negative (3)	2						1	0

Table 5: Distribution of cases according to Bacteriological Index (Ridley Scale)

Bacteriological Index	Number of cases
0	26
1+	9
2+	4
3+	7
4+	6
5+	6
6+	2
Total	34 (56.6 %)



Graph 3: AFB positivity on SSS examination

Table 6: Correlation of Histopathological Diagnosis and Bacteriological Index

HPE	AFB-	1+	2+	3+	4+	5+	6+	Sensitivity (%)	Concordance (%)
TT (12)	6	6						66%	50%

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BT (19)	9	3	2	3	2			67.8%	52.6%
BB (3)	1		1	1				75%	66.6%
BL (10)	4			1	4	1		71.4%	60%
LL (11)	1		1	2		5	2	91.6%	90%
Indeterminate (2)	2							-	-
Negative (3)	3							-	-

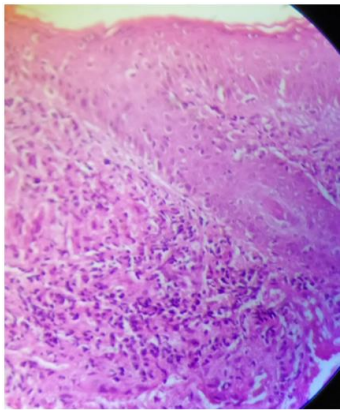

Figure 1: Tuberculoid Leprosy (HPE with H&E stain, 40x)

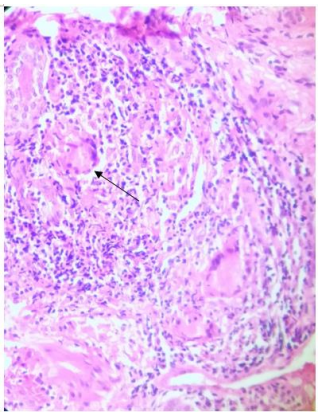

Figure 2: Granuloma with giant cell (HPE with H&E stain, 40x)

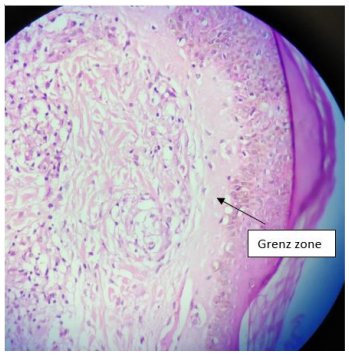

Figure 3: Lepromatous Leprosy (HPE with H&E stain, 40x)

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Patient 1: Well-defined scaly hypoaesthetic patch on left elbow of a 40year old female, Clinically diagnosed as Borderline Tuberculoid Leprosy

Patient 2: Leonine facies in a 38 year old male diagnosed with Lepromatous Leprosy

Patient 3: Large annular Plaque with central clearing in a 50 year old male, clinically suspected as Borderline Leprosy

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Patient 4: A single ill-defined hypopigmented patch on right buttock in a 30 year old Contact, clinically diagnosed as Tuberculoid Leprosy

Discussion

Leprosy or Hansen's disease commonly affects peripheral nerves and skin but can also affect other sites such as reticuloendothelial system, eyes, bone and joints. This study presents a comprehensive analysis of 60 clinically diagnosed cases of leprosy, offering valuable insights into the demographic, clinical, and diagnostic characteristics of the disease

Maximum patients were in the age group of 21-40 years. This trend aligns with existing literature that suggests leprosy primarily affects adults in their productive years, thereby posing significant socio-economic challenges.[7]

Male predominance with 39 cases (65%) was similar to *Moorthy et al.* (65.05%)[8] & *Singh et al.* (60%) [9] and male:female ratio of 1.5:1 of our study was comparable to *Kumar et al.* (2014),[10] *Kaur et al.* (2003) [11] was seen. This finding is consistent with global epidemiological data indicating higher susceptibility or reporting rates among males.[12] Possible explanations for this gender disparity could include differences in occupational exposure, genetic factors, or healthcare-seeking behavior between males and females.[13]

Clinical and histopathological correlation

Clinically, the most common diagnosis was BT (25%) followed by TT (23.3%) and BL (21.6%) as shown in Table 3. Majority cases are of Borderline group and due to immunological instability these cases can shift in either direction of the spectrum. Histopathological examination confirmed Hansen's disease in 57 out of 60 cases and hence complete clinical assessment of suspected patients is important in cases of indeterminate, pure neuritic or other types of leprosy. The most frequent Histopathological diagnoses was BT (31.6%) similar to studies by *Singh et al.* [9] (31.7%) and *Nadia et al.* [14] (34.7%).

Concordance of histopathological diagnosis with clinical diagnosis, maximum in lepromatous leprosy (81.8%) similar to studies conducted by *Nadia et al.* (2015) [14] and *Nitesh Mohan et al.* (2013),[15] 79.2 % and 97.2% respectively. This high concordance rate in LL cases can be attributed to the distinct clinical presentation and significant bacillary load typical of LL, facilitating diagnosis [16]

Slit skin smear and Bacteriological Index

Slit skin smear demonstrated AFB positivity in 56.6 % of clinically diagnosed cases similar to *Tiwari et al.*[17] (55%)**.** Interestingly, 43.4% of cases had a negative bacteriological index supporting results of *Giridhar et al.* [18] (43.9%), indicating paucibacillary disease forms. These findings highlight the spectrum of leprosy, from paucibacillary to multibacillary forms, and underscore the necessity of combining clinical, histopathological, and bacteriological assessments for comprehensive diagnosis. High sensitivity of slit skin smear examination for AFB in LL (91.6%). The high bacillary load in LL accounts for the increased detection rate, reinforcing the slit skin smear's role in diagnosing multibacillary leprosy.[19]

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Concordance of Bacteriological Index with histopathological findings

The concordance between the bacillary index and histopathological findings was highest in LL cases (90%) comparable to results by *Premalatha et al.* [20] (88.8%) and *Giridhar et al.* [18] (100%) followed by borderline cases. This correlation further supports the utility of the bacteriological index in reflecting the bacillary load and guiding the diagnosis of leprosy subtypes

Conclusion

Prevalence rate of leprosy has declined from 0.69 per 10,000 in 2014-15 to 0.45 per 10,000 in 2021-22 [3]

Annual case detection rate per 1,00,000 in 2021-22 was 5.52 cases[3]

The demographic trends and gender disparities observed necessitate targeted public health interventions and awareness programs.

The majority of Leprosy cases are borderline, which require special attention because of their erratic immune status.

Slit Skin Smear is a simple yet useful procedure to detect AFB that has high sensitivity in lepromatous cases but has low specificity as only 56.6% of cases were positive for AFB.

Histopathological examination of skin biopsy is suggested in all clinically suspected cases of leprosy for appropriate diagnosis and better patient management.

Furthermore, the high concordance rates in certain leprosy forms highlight the potential for clinical diagnoses to be effectively supported by histopathological and bacteriological evaluations.

Continued research and advancements in diagnostic techniques are essential to improve leprosy management and ultimately achieve the goal of eradication

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