

## Dermoscopic Insights in Leprosy: A Cross-sectional Observational Study from a Tertiary Care Centre

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Leprosy is a chronic granulomatous disease with diverse clinical manifestations, often complicating diagnosis. Dermoscopy, a non-invasive diagnostic tool, facilitates real-time, magnified visualisation of cutaneous morphological features imperceptible to the naked eye. This study has been carried out to assess dermoscopic features across the leprosy spectrum and correlate them with histopathological findings. This cross-sectional observational study was conducted at the Dermatology Outpatient Department of Maharishi Markandeshwar Institute of Medical Sciences and Research, Mullana. Thirty-six newly diagnosed, untreated patients with clinically suspected leprosy were enrolled. All patients underwent detailed clinical evaluation followed by dermoscopic examination of the most representative lesion using a handheld dermoscope. Slit-skin smear (SSS) examination was performed in all cases and stained using Ziehl–Neelsen technique, and graded according to the bacillary index (BI). Skin biopsy was performed in each patient for histopathological confirmation, and acid-fast bacilli (AFB) were also assessed. Dermoscopic findings were studied across different spectrum of leprosy and correlated with histopathological features. Among the 36 patients (male-to-female ratio: 1.77:1), borderline tuberculoid (BT) and borderline lepromatous (BL) were the most prevalent clinical types (27.8% each). Slit-skin smear examination demonstrated acid-fast bacilli (AFB) positivity in 83.3% of patients, with the majority showing low to moderate bacillary load; BI 1+ was the most frequent grade. Histopathologically, AFB were absent in 50% of cases, while positive biopsies exhibited bacillary indices ranging from 1+ to 6+. Dermoscopic evaluation revealed characteristic findings, including localised white structureless areas (61.1%), reduced white pinpoint dots (69.4%), decreased appendages (63.9%), diffuse erythema (69.4%), out-of-focus vessels (61.1%), and peripilar scaling (72.2%). A broken pigment network was the most consistent dermoscopic feature (88.9%). Clinical and histopathological diagnoses were concordant in 72.2% of patients. It is concluded that dermoscopy enhances the clinical evaluation of leprosy by revealing subtle morphological changes that correlate well with histopathological findings. The reduction in eccrine gland openings and hair follicle density represents a key diagnostic feature of paucibacillary leprosy and helps distinguish it from other infectious and non-infectious granulomatous dermatoses. Simple, rapid, and non-invasive, dermoscopy serves as a practical adjunct that improves diagnostic confidence and supports early, accurate classification in routine clinical practice.

**Keywords:** Leprosy; Dermoscopy; Granuloma; Histopathology; Pigment Network

### Introduction

Leprosy, or Hansen's disease, is a chronic

granulomatous infection caused by *Mycobacterium leprae* and *Mycobacterium*

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*lepromatosis*, primarily affecting the skin and peripheral nerves. It is known for its remarkably long incubation period and its potential for causing irreversible nerve damage if not diagnosed early. Despite being one of the oldest known diseases, leprosy continues to pose diagnostic challenges due to its diverse clinical presentations and ability to mimic other dermatoses (Singh et al 2015, Han et al 2009). Clinical variations are dictated by the host's immune response, with rare forms like histoid (Karthikeyan 2015) and reactional states such as type 1 (reversal) and type 2 (erythema nodosum leprosum) adding to diagnostic complexity.

Dermoscopy has emerged as a non-invasive, bedside diagnostic tool that enhances visualisation of subsurface skin features not visible to the naked eye. It enables early recognition of leprosy-specific patterns such as white and yellowish-brown structureless areas, broken pigment networks, white shiny streaks, and vascular changes. Unique dermoscopic patterns like sunflower-like or crown vessel arrangements have been particularly useful in identifying histoid leprosy and lepra reactions (Lallas et al 2014, Sonthalia et al 2019, Chopra et al 2019). The integration of dermoscopy into routine evaluation may significantly enhance diagnostic accuracy and facilitate early intervention, ultimately improving patient outcomes. For developing acceptable guidelines, experience from different centres is needed. This study aims to evaluate the dermoscopic characteristics across the leprosy spectrum and correlate these findings with histopathological features.

### Materials and Methods

An observational, cross-sectional study was conducted in the Department of Dermatology at Maharishi Markandeshwar Institute of Medical Sciences and Research (MMIMSR), Mullana,

Ambala, Haryana. The study was carried out over a period of approximately 1 year, from April 2024 to April 2025, following approval from the Institutional Ethics Committee (IEC No. 2939). Written informed consent was obtained from all participants prior to enrolment.

A total of 36 newly diagnosed leprosy patients were included in the study using a consecutive sampling method. Eligible participants were adults ( $\geq 18$  years) of either sex with clinical features of leprosy. Patients with pure neuritic leprosy or those unwilling to participate were excluded. Detailed clinical, dermatological, and neurological examinations were performed, and patients were clinically classified according to the consensus classification of leprosy approved by the Indian Association of Leprologists (IAL 1982) and NLEP classification (NLEP 2013) used in routine practice in India. Ridley–Jopling classification (Ridley & Jopling 1966) was used only for clinicopathological correlation. Indeterminate leprosy was classified separately as per the IAL system (IAL 1982). WHO grading system was used to assess deformity of the eyes, hands, and feet. Dermoscopic evaluation was performed using the Dino-Lite Edge 5MP AM7515 dermoscope. Polarised non-contact mode was used to assess vascular features and scaling, while polarised contact mode was employed to visualise appendageal structures. The most representative lesion in each patient was examined with dermoscope and were described using 5 standardized domains according to the International Dermoscopy Society (Errichetti et al 2020)–vessels, scales, appendageal findings, other structures (structureless areas, colors) and specific clues. Slit-skin smear (SSS) examination was performed in all enrolled patients and graded according to the bacillary index (BI). Acid-fast bacilli (AFB) were also assessed histopathologically. A biopsy was taken from the same lesion evaluated by dermoscopy, and

samples were subjected to histopathological examination by an experienced pathologist blinded to the clinical and dermoscopic findings. Correlation of dermoscopic features with clinical diagnosis and histopathology was performed. Data were entered in Microsoft Excel and analysed using IBM SPSS Statistics version 26. Descriptive statistics such as frequencies and percentages were calculated. The chi-square test and Fisher's exact test were used to compare categorical variables, with a p-value < 0.05 considered statistically significant. Agreement between clinical and histopathological diagnoses was assessed using Cohen's Kappa statistic ( $\kappa$ ), interpreted as follows: <0.20 = poor, 0.21–0.40 = fair, 0.41–0.60 = moderate, 0.61–0.80 = substantial, and 0.81–1.00 = almost perfect agreement.

### Results

Among the total 36 newly diagnosed cases of leprosy, 23 (63.9%) were males and 13 (36.1%) were females, with a ratio of 1.77. Most of the individuals, 24 (66.7%), were from rural areas, whereas 12 (33.3%) belonged to urban areas. A large proportion, 32 (88.9%), of the participants were married, while only 4 (11.1%) were

unmarried. In terms of educational status, a significant number were uneducated, 22 (61.1%), followed by graduates, 7 (19.4%). Based on occupation, 12 (33.3%) of the patients were housewives, and 9 (25%) each were farmers and self-employed. The most common clinical types observed were borderline tuberculoid (BT) and borderline lepromatous (BL) leprosy, each seen in 10 (27.8%) patients. Tuberculoid leprosy (TT) was diagnosed in 1 (2.8%) patient, while mid-borderline (BB) leprosy was observed in 2 (5.6%) patients. Indeterminate leprosy (IL) was observed in a single patient (2.8%). These findings reflect the clinical spectrum of leprosy, with a predominance of borderline forms in this cohort. 3 (8.3%) cases of histoid leprosy were also included in our study. Additionally, lepra reactions were diagnosed in several patients, with Type 2 reaction present in 3 (8.3%) and Type 1 reaction in 2 (5.6%). Slit-skin smears were performed in all patients included in the study. Slit-skin smear examination showed that 30 out of 36 patients (83.3%) were positive for acid-fast bacilli, while 6 patients (16.7%) were smear-negative. Most smear-positive cases showed a low to moderate bacillary index, with 1+ being the most frequent

**Table 1: Distribution of slit-skin smear and histopathological bacillary index in leprosy patients (N=36).**

| Bacillary Grade | SSS – Number (%) | BI in Biopsy – Number (%) |
|-----------------|------------------|---------------------------|
| 0               | 6 (16.7%)        | 18(50%)                   |
| 1+              | 12 (33.3%)       | 2 (5.6%)                  |
| 2+              | 5 (13.9%)        | 3 (8.3%)                  |
| 3+              | 7 (19.4%)        | 2 (5.6%)                  |
| 4+              | 4 (11.1%)        | 1 (2.8%)                  |
| 5+              | 2 (5.6%)         | 5 (13.9%)                 |
| 6+              | —                | 5 (13.9%)                 |
| <b>Total</b>    | <b>36 (100%)</b> | <b>36 (100%)</b>          |

SSS: Slit-skin smear BI: Bacillary index N: Sample size

grade. On histopathological examination, acid-fast bacilli were negative in 18 out of 36 patients (50%). Among the remaining cases, bacilli were graded from 1+ to 6+. This finding reflects the known variability in tissue bacillary load across the leprosy spectrum. (Table 1)

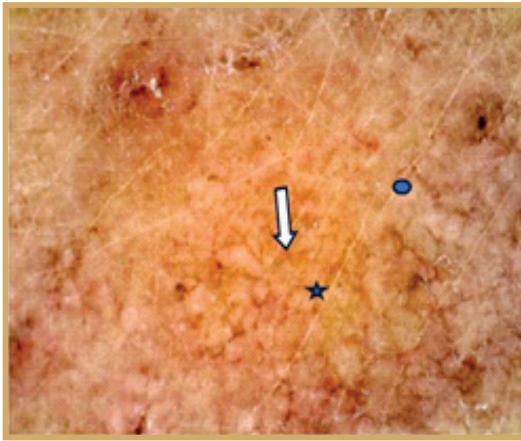
Slit-skin smear showed predominantly low to moderate bacillary load, whereas biopsy demonstrated a wider spectrum, including cases with numerous bacilli, reflecting better sensitivity of histopathology in detecting tissue bacillary burden.

Among the Tuberculoid pole (TT), lesions were well-demarcated, hypopigmented to erythematous plaques with sensory loss. Dermoscopically, the most frequent findings included localised white structureless areas, peripilar scaling, reduced white pinpoint dots

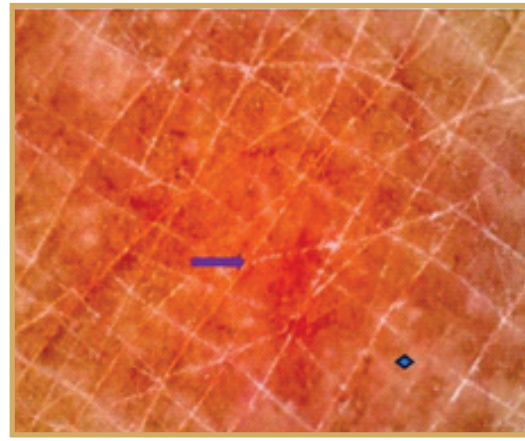
and out-of-focus vessels, with a broken pigment network seen in most cases. Histopathologically, it is characterised by well-formed granulomas composed of epithelioid cells and Langhans giant cells, with peri-appendageal and perineural infiltration (Fig. 1). In BT, perifollicular (peripilar) scaling, reduced white pinpoint dots, and a broken pigment network were particularly prominent, correlating with partial destruction of skin adnexa noted on histology (Fig. 2). This consistent reduction in eccrine gland openings (visualised as white pinpoint dots) along with decreased hair follicle density was observed, particularly in paucibacillary forms. This represents a key diagnostic dermoscopic feature and helps distinguish leprosy from other infectious and non-infectious granulomatous dermatoses.



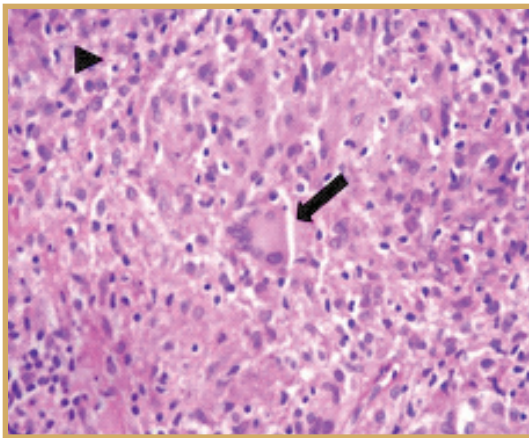
**Fig. 1(a):** Clinical image showing single, well- defined hypopigmented patch over face.



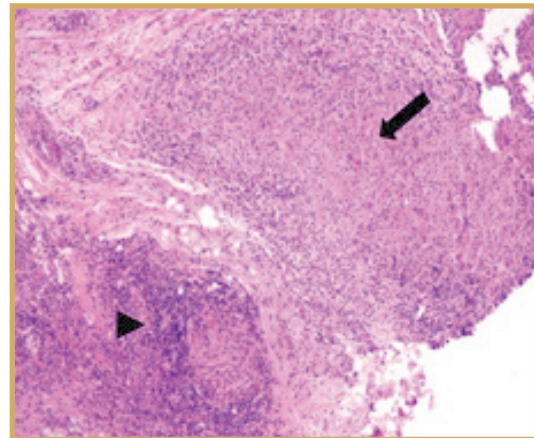
**Fig. 1(b):** Dermoscopy of affected area shows yellow- brown structureless area (star), broken pigment network (blue circle), reduced white dots (white arrow) and paucity of hair follicles (Dinolite 5MP AM7515, magnification X10).



**Fig. 1(c):** Dermoscopy shows scaling in skin crease (purple arrow), localized white structureless area (diamond)(Dinolite 5MP AM7515, magnification X10).



**Fig. 1(d):** Histomicrograph (H&E,100x), (TT) show well formed epithelioid cell granulomas with Langhans type giant cells (Black arrow) surrounded by marked lymphocytic infiltrate (arrow head).

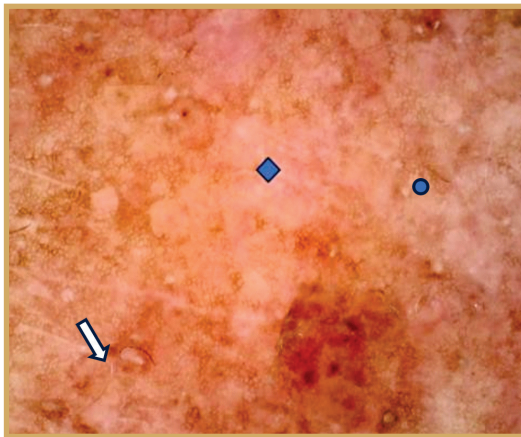


**Fig. 1(e) :** Histomicrograph (H&E,100x), (TT) show superficial and deep dermis shows presence of multiple well formed epithelioid cell granulomas with Langhans type giant cells (Black arrow) surrounded by marked lymphocytic infiltrate (arrow head).

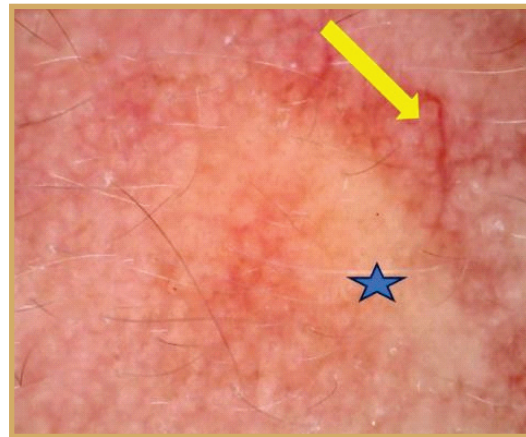
**Fig. 1 (a-e):** Clinical, dermoscopic and histopathology pictures of tuberculoid leprosy (TT).



**2(a): Clinical image showing single ill- defined lesion over face.**

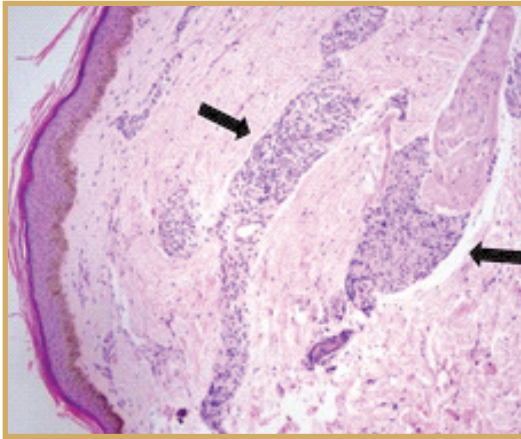


**2(b)**

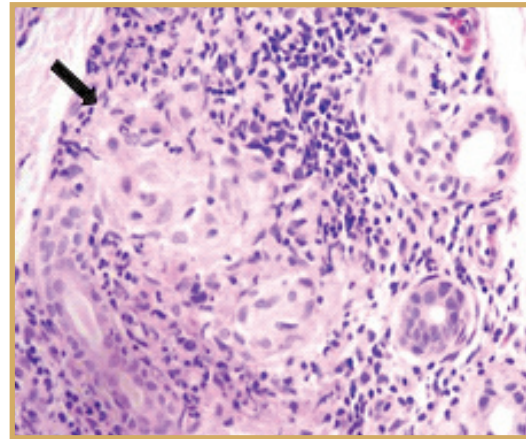


**2(c)**

**Dermoscopy of affected area 2(b) localized white structureless areas (diamond), broken pigment network (Blue circle), paucity of eccrine gland openings and hair follicles (White arrow); 2(c) yellow- brown structureless area(star), linear irregular vessel (yellow arrow) (Dinolite 5MP AM7515, magnification X10)**



**2(d): Histomicrograph (H&E,100x), (BT) show multiple perineural and periadenexal epithelioid cell granulomas surrounded by lymphocytic inflammatory cell infiltrate (black arrow).**



**2(e): Histomicrograph (H&E,100x), (BT) shows well- formed epithelioid cell granulomas surrounded by lymphocytic inflammatory cell infiltrate (black arrow).**

**Fig. 2 (a-e): Clinical, dermoscopic and histopathological pictures of borderline tuberculoid leprosy (BT).**

In the mid-borderline (BB) spectrum (Fig. 3), lesions were less well-defined, with dermoscopy showing a combination of follicular plugging, peripilar scaling and linear irregular vessels. Histology showed moderate granulomatous infiltrate with both epithelioid cells and foamy histiocytes, often surrounding adnexal structures. In the borderline lepromatous (BL) group, patients presented with multiple, poorly defined plaques and nodules. Dermoscopically, BL cases exhibited extensive scaling in skin creases, diffuse yellowish-brown structureless areas, diffuse erythema, reduced white pinpoint dots, brown circles (perifollicular pigmentation) and linear irregular vessels. Histopathology revealed ill-formed granulomas, foamy macrophage infiltration, and a characteristic Grenz zone, with occasional nerve involvement. Dermoscopic features such as out-of-focus vessels, telangiectasia, and loss

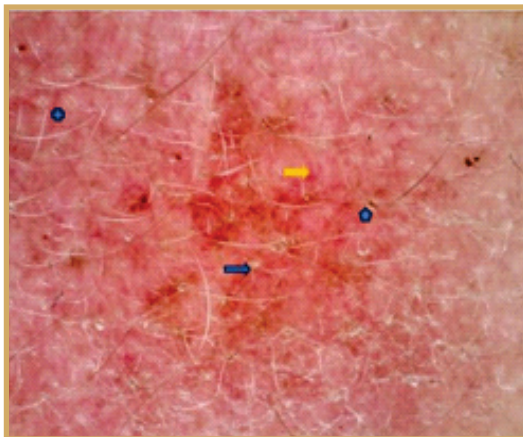
of hair follicles closely reflected the histological damage to dermal appendages and vasculature (Fig. 4).

The lepromatous leprosy (LL) cases revealed widespread dermoscopic changes, including diffuse erythema, prominent telangiectasias, scaling, a broken pigment network, and yellowish-brown structureless areas. Histologically, these lesions showed dense, diffuse infiltration of foamy macrophages, a prominent Grenz zone, and widespread appendageal and nerve destruction (Fig. 5). Dermoscopy was particularly helpful in highlighting the vascular alterations and appendageal loss, correlating well with the histopathological destruction.

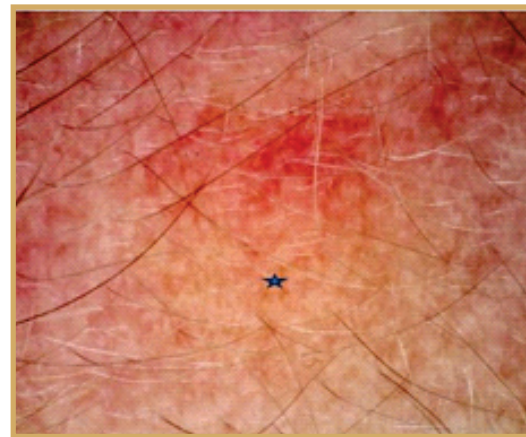
In type 1 (reversal) reaction (TYR1), dermoscopy revealed intense diffuse erythema, scaling, and linear irregular vessels, indicating dermal oedema and vascular dilation. Histologically,

**3(a)****3(b)**

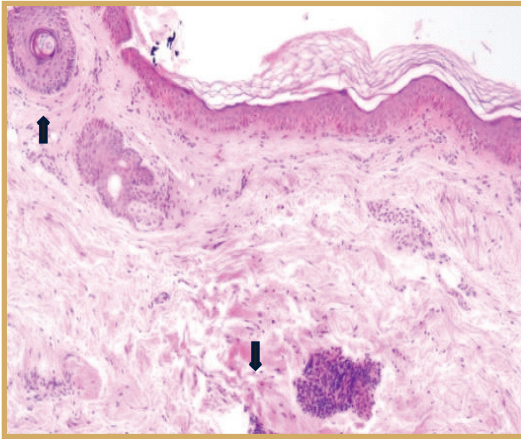
**Clinical picture showing multiple erythematous plaques with punched out appearance**



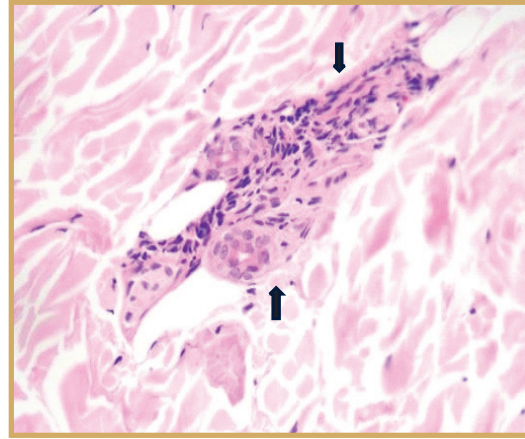
**3(c): Dermoscopy of affected area shows linear irregular Vessel (yellow arrow), rosettes (Blue cross), follicular keratotic plugs (blue pentagon), peri-pilar scaling (blue arrow). The appendages are relatively preserved. Findings may represent mild Type 1 reaction as evidenced by follicular plugs, peripilar scaling. (Dinolite 5MP AM7515, magnification X10)**



**3(d): Yellow- brown structureless area (star), linear branching vessels (Yellow arrow) (Dinolite 5MP AM7515, magnification X10)**



**3(e):** Histomicrograph (H&E, 100x), (BB) show mild periadenexal, perineural and perivascular lymphomononuclear infiltrates.

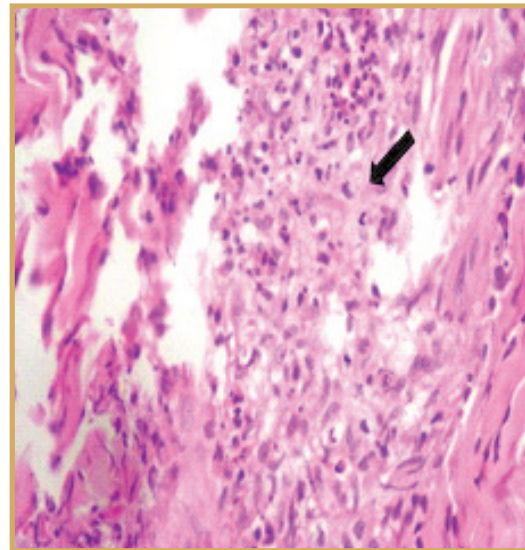


**3(f):** Histomicrograph (H&E, 400x), (BB) show mild periadenexal lymphomononuclear infiltrates.

**Fig. 3 (a-f):** Clinical, dermoscopic and histopathological pictures of mid borderline leprosy (BB).



**4(a):** Clinical picture showing multiple ill-defined erythematous plaques present over back.

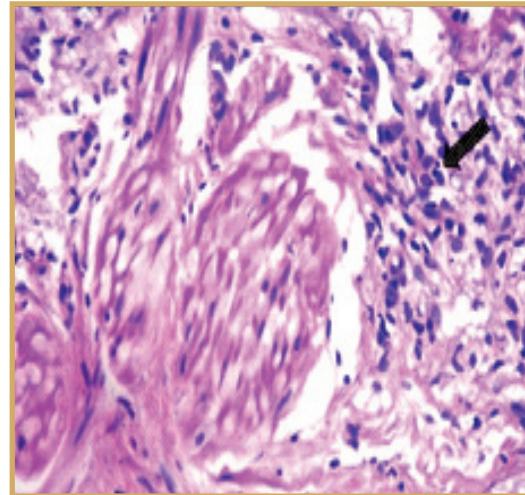


**4(b):** Histomicrograph (H&E, 400x), (BL) shows admixture of multiple epithelioid cells with occasional Langhans giant cells, foamy histiocytes and few polymorphs (Black arrow).

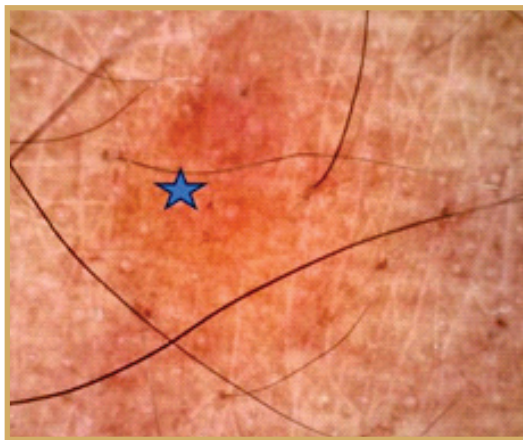
**Fig. 4 (a & b):** Clinical, dermoscopic and histopathological picture of borderline lepromatous leprosy (BL).



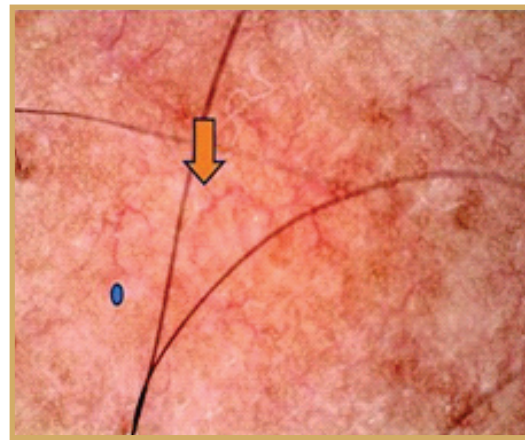
**5(a): Clinical picture showing a case with multiple papules and nodules over trunk**



**5(b): Histomicrograph (H&E, 400x), (LL) show perineural aggregates of foamy histiocytes admixed with lymphocytes (Black arrow).**



**5(c)**



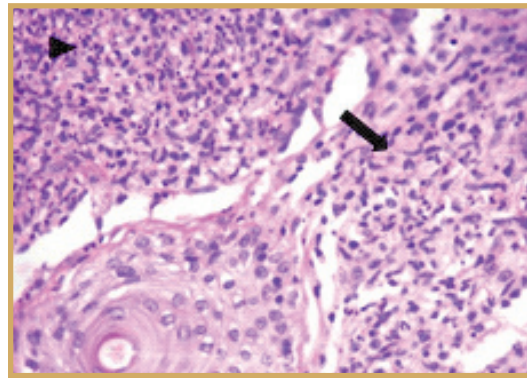
**5(d)**

**Dermoscopy of affected area shows 5 (c) Yellow-brown structureless area (blue star); 5(d) broken pigment network (blue circle), Telangiectic vessels (orange arrow) (Dinolite 5MP AM7515, magnification X10)**

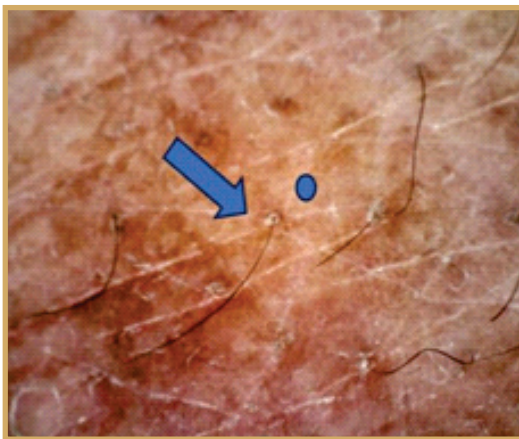
**Fig. 5 (a-d): Clinical, histopathological and dermoscopic picture of lepromatous leprosy (LL).**



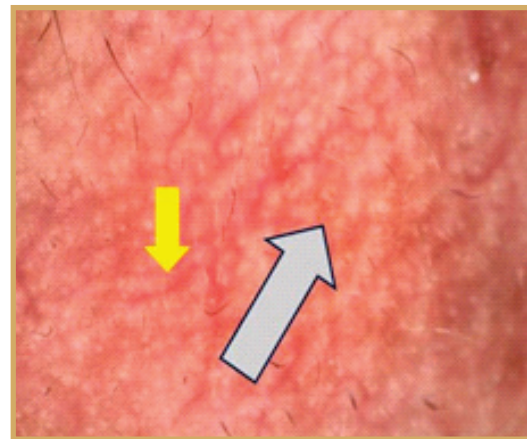
**6(a)** Clinical picture showing multiple erythematous plaques with few necrotic lesion over trunk



**6(b)** Histomicrograph (H&E, 400x), (ENL) shows peri adnexal epithelioid cell granulomas with presence of epithelioid cells, foamy histiocytes (black arrow) and superimposed marked neutrophilic infiltrate (arrowhead).



**6(c)**

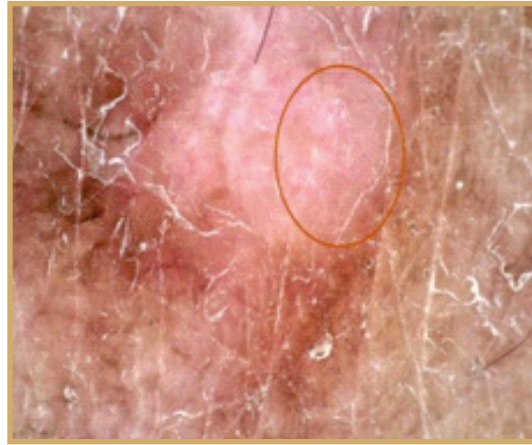


**6(d)**

there was oedema, granuloma fragmentation, and perivascular inflammation. Type 2 reaction (TYR2) showed similar dermoscopic patterns, with the addition of dotted and telangiectatic vessels, corresponding histologically to neutrophilic infiltrates and vasculitis (Fig. 6)

Histoid leprosy cases displayed a unique clinical presentation of multiple, umbilicated,

skin-coloured papules and nodules (Fig. 7). Dermoscopy of lesions showed a sunflower-like appearance with perilesional hyperpigmentation and crown vessels. Overall, the most consistent dermoscopic features across the spectrum included broken pigment network (88.9%), peripilar scaling (72.2%), reduced white pinpoint dots (eccrine openings) (69.4%), diffuse



6(c)

Dermoscopy of affected areas shows 6 (c) broken pigment network (blue circle), peripilar scaling (blue arrow); 6(d) linear irregular vessel (yellow arrow), diffuse erythema (grey arrow); 6(e) milky red area (red circle) (Dinolite 5MPAM7515, magnification X10)

Fig. 6 (a-e): Clinical, dermoscopic and histopathological picture of type 2 reaction.



7(a): Clinical picture showing - multiple skin-colored papules and nodules over arm.



7(b): Dermoscopy of affected nodule show crowning of vessels (Red arrow) (Dinolite 5MP AM7515, magnification X10).

Fig. 7 ( a & b): Clinical and dermoscopic picture of histoid leprosy (HL).

erythema (69.4%), scaling in skin creases (69.4%), and localised white structureless areas (61.1%) (Table 2).

The distribution of dermoscopic features across the leprosy spectrum was assessed in a cohort of 36 patients, with findings categorised based on structural, appendageal, vascular, scaling and pigmentary changes (Table 3).

Clinical and histopathological diagnoses were made which were concordant in 26 of 36 patients (72.2%). The highest concordance was observed in polar forms, whereas comparatively lower agreement was noted in borderline spectra,

reflecting the well-recognized immunological variability and clinicopathological overlap characteristic of these subtypes. Overall clinicopathological agreement was statistically significant (Cohen's  $\kappa = 0.77$ ,  $p < 0.001$ ), indicating substantial agreement beyond chance (Table 4). Type-wise analysis using Fisher's exact test did not demonstrate statistically significant differences in concordance across individual leprosy subtypes. Despite numerically reduced concordance in borderline forms (BT–BL), the absence of statistical significance is likely attributable to small subgroup sample sizes.

**Table 2: Frequency distribution of dermoscopic features in leprosy patients (N= 36).**

| <b>Dermoscopic Findings</b>                    | <b>Frequency (N)</b> | <b>Percentage (%)</b> |
|------------------------------------------------|----------------------|-----------------------|
| Broken pigment network                         | 32                   | 88.9%                 |
| Peripilar scaling                              | 26                   | 72.2%                 |
| Scaling in skin crease                         | 25                   | 69.4%                 |
| Diffuse erythema                               | 25                   | 69.4%                 |
| Reduced white pinpoint dots (eccrine openings) | 25                   | 69.4%                 |
| Reduced appendages                             | 23                   | 63.9%                 |
| Localized white structureless area             | 22                   | 61.1%                 |
| Out-of-focus vessels                           | 22                   | 61.1%                 |
| Brown circles (Perifollicular pigmentation)    | 19                   | 52.8%                 |
| Linear irregular vessels                       | 17                   | 47.2%                 |
| Localized yellowish-brown structureless area   | 16                   | 44.4%                 |
| Diffuse scaling                                | 13                   | 36.1%                 |
| Localised scaling                              | 12                   | 33.3%                 |
| Telangiectasia                                 | 12                   | 33.3%                 |
| Follicular plugging                            | 11                   | 30.6%                 |
| Diffuse yellowish brown structureless area     | 8                    | 22.2%                 |
| Peripheral erythema                            | 4                    | 11.1%                 |
| Accentuated pigment network                    | 4                    | 11.1%                 |
| Crown vessels                                  | 2                    | 5.6%                  |
| Comma hair                                     | 1                    | 2.8%                  |
| Dotted vessel                                  | 1                    | 2.8%                  |

**Table 3: Distribution of patients according to dermoscopic findings in different types of leprosy (N=36).**

| Dermo-<br>scopic<br>Finding                             | IL (1)      | TT (1)      | BT<br>(10) | BB (2)     | BL<br>(10) | LL (4)    | HL<br>(3)    | TYR1<br>(2) | TYR2<br>(3)  | Total<br>(36) |
|---------------------------------------------------------|-------------|-------------|------------|------------|------------|-----------|--------------|-------------|--------------|---------------|
| <b>STRUCTURELESS AREA (SA)</b>                          |             |             |            |            |            |           |              |             |              |               |
| <b>Localized Yellowish Brown SA (16)</b>                | 0<br>(0%)   | 1<br>(100%) | 5<br>(50%) | 1<br>(50%) | 3<br>(30%) | 2 (50%)   | 1<br>(33.3%) | 1 (50%)     | 2<br>(66.7%) | 16<br>(44.4%) |
| <b>Diffuse Yellowish Brown SA (8)</b>                   | 0<br>(0%)   | 0<br>(0%)   | 0<br>(0%)  | 1<br>(50%) | 5<br>(50%) | 0 (0%)    | 1<br>(33.3%) | 0<br>(0%)   | 1<br>(33.3%) | 8<br>(22.2%)  |
| <b>Localized White SA (22)</b>                          | 1<br>(100%) | 1<br>(100%) | 7<br>(70%) | 1<br>(50%) | 8<br>(80%) | 2 (50%)   | 1<br>(33.3%) | 0<br>(0%)   | 1<br>(33.3%) | 22<br>(61.1%) |
| <b>APPENDAGEAL FINDINGS</b>                             |             |             |            |            |            |           |              |             |              |               |
| <b>Reduced White pinpoint dots (25)</b>                 | 1<br>(100%) | 1<br>(100%) | 5<br>(50%) | 1<br>(50%) | 9<br>(90%) | 3 (75%)   | 2<br>(66.7%) | 1 (50%)     | 2<br>(66.7%) | 25<br>(69.4%) |
| <b>Brown circles (Perifollicular pigmentation) (19)</b> | 1<br>(100%) | 0<br>(0%)   | 6<br>(60%) | 1<br>(50%) | 6<br>(60%) | 2 (50%)   | 0<br>(0%)    | 1 (50%)     | 2<br>(66.7%) | 19<br>(52.8%) |
| <b>Reduced Appendages (23)</b>                          | 1<br>(100%) | 0<br>(0%)   | 7<br>(70%) | 1<br>(50%) | 8<br>(80%) | 2 (50%)   | 1<br>(33.3%) | 2<br>(100%) | 1<br>(33.3%) | 23<br>(63.9%) |
| <b>VASCULAR FINDINGS</b>                                |             |             |            |            |            |           |              |             |              |               |
| <b>Out-of-focus vessels (22)</b>                        | 1<br>(100%) | 1<br>(100%) | 5<br>(50%) | 1<br>(50%) | 6<br>(60%) | 4 (100%)  | 1<br>(33.3%) | 1 (50%)     | 2<br>(66.7%) | 22<br>(61.1%) |
| <b>Linear Irregular Vessels (17)</b>                    | 1<br>(100%) | 0<br>(0%)   | 4<br>(40%) | 1<br>(50%) | 5<br>(50%) | 2 (50%)   | 1<br>(33.3%) | 1 (50%)     | 2<br>(66.7%) | 17<br>(47.2%) |
| <b>Telangiectasia (12)</b>                              | 0<br>(0%)   | 0<br>(0%)   | 2<br>(20%) | 1<br>(50%) | 4<br>(40%) | 1 (25%)   | 0<br>(0%)    | 1 (50%)     | 3<br>(100%)  | 12<br>(33.3%) |
| <b>Crown Vessels (2)</b>                                | 0<br>(0%)   | 0<br>(0%)   | 0<br>(0%)  | 0<br>(0%)  | 0<br>(0%)  | 1 (25%)   | 1<br>(33.3%) | 0<br>(0%)   | 0<br>(0%)    | 2<br>(5.6%)   |
| <b>Peripheral Erythema (4)</b>                          | 0<br>(0%)   | 1<br>(100%) | 1<br>(10%) | 0<br>(0%)  | 2<br>(20%) | 0<br>(0%) | 0<br>(0%)    | 0<br>(0%)   | 0<br>(0%)    | 4<br>(11.1%)  |
| <b>Diffuse Erythema (25)</b>                            | 1<br>(100%) | 0<br>(0%)   | 7<br>(70%) | 1<br>(50%) | 7<br>(70%) | 3 (75%)   | 1<br>(33.3%) | 2<br>(100%) | 3<br>(100%)  | 25<br>(69.4%) |

| SCALING PATTERN                  |          |          |           |          |         |          |           |          |           |            |
|----------------------------------|----------|----------|-----------|----------|---------|----------|-----------|----------|-----------|------------|
| <b>Localized Scaling (12)</b>    | 0 (0%)   | 0 (0%)   | 4 (40%)   | 1 (50%)  | 3 (30%) | 1 (25%)  | 2 (66.7%) | 0 (0%)   | 1 (33.3%) | 12 (33.3%) |
| <b>Diffuse Scaling (13)</b>      | 0 (0%)   | 0 (0%)   | 3 (30%)   | 1 (50%)  | 3 (30%) | 2 (50%)  | 0 (0%)    | 2 (100%) | 2 (66.7%) | 13 (36.1%) |
| <b>Peripilar Scaling (26)</b>    | 0 (0%)   | 0 (0%)   | 10 (100%) | 1 (50%)  | 6 (60%) | 4 (100%) | 0 (0%)    | 2 (100%) | 3 (100%)  | 26 (72.2%) |
| <b>In Skin Crease (25)</b>       | 0 (0%)   | 1 (100%) | 6 (60%)   | 1 (50%)  | 8 (80%) | 4 (100%) | 2 (66.7%) | 1 (50%)  | 2 (66.7%) | 25 (69.4%) |
| <b>Follicular Plugging (11)</b>  | 0 (0%)   | 0 (0%)   | 4 (40%)   | 1 (50%)  | 4 (40%) | 0 (0%)   | 0 (0%)    | 1 (50%)  | 1 (33.3%) | 11 (30.6%) |
| ABNORMALITIES IN PIGMENT NETWORK |          |          |           |          |         |          |           |          |           |            |
| <b>Broken (32)</b>               | 1 (100%) | 1 (100%) | 10 (100%) | 2 (100%) | 8 (80%) | 3 (75%)  | 2 (66.7%) | 2 (100%) | 3 (100%)  | 32 (88.9%) |
| <b>Accentuated (4)</b>           | 0 (0%)   | 0 (0%)   | 3 (30%)   | 0 (0%)   | 1 (10%) | 0 (0%)   | 0 (0%)    | 0 (0%)   | 0 (0%)    | 4 (11.1%)  |
| OTHER FINDINGS                   |          |          |           |          |         |          |           |          |           |            |
| <b>Comma Hair (1)</b>            | 0 (0%)   | 0 (0%)   | 0 (0%)    | 0 (0%)   | 0 (0%)  | 1 (25%)  | 0 (0%)    | 0 (0%)   | 0 (0%)    | 1 (2.8%)   |
| <b>Dotted Vessel (1)</b>         | 0 (0%)   | 0 (0%)   | 0 (0%)    | 0 (0%)   | 0 (0%)  | 0 (0%)   | 0 (0%)    | 1 (50%)  | 0 (0%)    | 1 (2.8%)   |

Indeterminate leprosy (IL), Tuberculoid leprosy (TT), Borderline tuberculoid (BT), Mid-borderline leprosy (BB), Borderline lepromatous (BL), Lepromatous leprosy (LL), Histoid leprosy (HL), Type 1 reaction (TYR1), Type 2 reaction (TYR2).

**Table 4: Clinical–histopathological correlation across leprosy spectrum.**

| Leprosy Type                | Clinical Diagnosis (n) | Final Histo-pathological Diagnosis (n) | Concordant Cases | Concordance (%) | p-value* |
|-----------------------------|------------------------|----------------------------------------|------------------|-----------------|----------|
| Indeterminate (IL)          | 1                      | 1                                      | 1                | 100             | 1.000    |
| Tuberculoid (TT)            | 1                      | 1                                      | 1                | 100             | 1.000    |
| Borderline Tuberculoid (BT) | 10                     | 13                                     | 10               | 76.9            | 0.316    |
| Mid-Borderline (BB)         | 2                      | 3                                      | 2                | 66.7            | 1.000    |
| Borderline Lepromatous (BL) | 10                     | 5                                      | 5                | 50.0            | 0.278    |
| Lepromatous (LL + Histoid)  | 4 + 3                  | 10                                     | 4                | 57.1            | 0.679    |
| Type 1 Reaction             | 2                      | 1                                      | 1                | 50.0            | 1.000    |
| Type 2 Reaction             | 3                      | 2                                      | 2                | 66.7            | 1.000    |

p-value calculated using Fisher's exact test comparing concordant versus discordant cases for each subtype against all other categories combined. Overall agreement assessed using Cohen's kappa ( $\kappa = 0.77$ ,  $p < 0.001$ ).

**Table 5: Dermoscopic features, histopathological correlates, and pathological interpretation.**

| <b>Dermoscopic Feature</b>               | <b>Typical Appearance</b>                                   | <b>Histopathological Correlation</b>                                | <b>Pathological Interpretation</b>                                                          |
|------------------------------------------|-------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Decreased / Absent Pigment Network       | Faded, patchy or absent reticular pigment pattern           | Reduced melanin in basal layer; melanocyte dysfunction              | Neural involvement and cytokine-mediated melanocyte suppression leading to hypopigmentation |
| Yellowish–Orange Areas /                 | Structureless yellowish-orange background                   | Dermal granulomas composed of epithelioid cells ± foamy macrophages | Dense dermal granulomatous infiltrate alters light reflection                               |
| Diffuse Erythema                         | Pink to red background                                      | Dilated dermal blood vessels; inflammatory infiltrate               | Active inflammation and vasodilatation                                                      |
| Branching / Linear Telangiectasia        | Arborizing or linear vessels over lesion                    | Dilated superficial and mid-dermal vessels                          | Chronic inflammation and angiogenesis, especially in borderline and lepromatous spectrum    |
| Loss of Skin Appendage Openings          | Absent hair follicle and sweat duct openings                | Destruction/infiltration of adnexal structures                      | Granulomatous infiltration and nerve damage affecting adnexa                                |
| White Shiny Areas / Chrysalis Structures | Bright white streaks under polarized dermoscopy             | Dermal fibrosis; compact collagen bundles                           | Chronicity and healing response with collagen remodelling                                   |
| Xerosis / Scaling                        | Fine white scales                                           | Hyperkeratosis, mild acanthosis                                     | Epidermal turnover alteration due to autonomic nerve dysfunction                            |
| Reduced / Absent Hair                    | Sparse or absent terminal hairs                             | Follicular destruction or miniaturization                           | Granulomatous infiltration around hair follicles and nerve supply                           |
| Yellow Dots                              | Discrete yellow round structures                            | Follicular plugging with keratin/sebaceous material                 | Adnexal involvement and altered follicular function                                         |
| Shiny White Structureless Areas (PLD)    | Homogeneous white zones                                     | Dermal oedema or fibrosis                                           | Lepra reaction or chronic inflammation                                                      |
| Background Coppery Hue                   | Brownish–copper coloration                                  | Dense inflammatory infiltrate with hemosiderin                      | Chronic inflammation with erythrocyte extravasation                                         |
| Vascular Polymorphism                    | Combination of dotted, linear, and linear branching vessels | Mixed inflammatory infiltrate with vascular proliferation           | Seen in borderline spectrum reflecting immunological instability                            |

**Table 6: Comparative clinical, dermoscopic, and histopathological features of BT, BB, and BL leprosy.**

| Parameter                         | Borderline Tuberculoid (BT)                                                                               | Mid-Borderline (BB)                                                           | Borderline Lepromatous (BL)                                                                 |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| <b>Clinical features</b>          | Few, well-defined hypopigmented/erythematous plaques; marked sensory loss; asymmetrical nerve involvement | Multiple ill-defined plaques; variable sensory loss; multiple nerves involved | Numerous, symmetrical infiltrated plaques; mild sensory loss; symmetrical nerve involvement |
| <b>Dermoscopic background</b>     | Yellowish-white structureless areas                                                                       | Yellowish-brown structureless areas                                           | Diffuse yellowish-brown structureless areas                                                 |
| <b>Pigmentary changes</b>         | Broken/reduced pigment network                                                                            | Altered or broken pigment network                                             | Reduced or absent pigment network                                                           |
| <b>Vascular pattern</b>           | Sparse linear irregular vessels                                                                           | Prominent linear irregular vessels                                            | Dilated, out-of-focus vessels                                                               |
| <b>Appendageal involvement</b>    | Reduced hair follicles and white pinpoint dots                                                            | Partial loss of hair follicles and white pinpoint dots                        | Marked loss or absence of appendageal structures                                            |
| <b>Histopathological features</b> | Well-formed epithelioid granulomas with peri-neural and peri-appendageal involvement                      | Poorly formed granulomas with mixed cellular infiltrate                       | Sheets of foamy macrophages with diffuse infiltration                                       |

Dermoscopic features were also correlated with histopathological findings (Table 5). Important findings were:

- **Tuberculoid spectrum (TT/BT):** Fewer vessels, prominent loss of appendages, focal orange areas corresponding to compact granulomas.
- **Borderline spectrum (BT–BB–BL):** Marked vascular polymorphism, patchy orange-yellowish areas, variable pigment loss.
- **Lepromatous spectrum (LL):** Diffuse yellowish-orange background, numerous telangiectasia, preserved epidermis early.

- **Lepra reactions:** Increased erythema, oedema-related white areas, and prominent vascularity.

Complete concordance among clinical, dermoscopic, and histopathological diagnosis is not expected in borderline leprosy (BT, BB, BL) due to immunological instability; however, combined evaluation improves diagnostic confidence and appropriate classification (Table 6).

Dermoscopy significantly contributed to a better understanding of disease activity and extent by non-invasively correlating with underlying histopathological changes, especially in reactional states and the lepromatous spectrum (Table 7).

**Table 7: Summary of clinical, dermoscopic and histopathological findings in different types of leprosy.**

| Leprosy Type | Clinical Findings                                                                                                                   | Dermoscopy Findings                                                                                                                                                                                                                                                                                                                                                               | Histopathological Findings                                                                                                                                                                                                          |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>IL</b>    | <ul style="list-style-type: none"> <li>Hypopigmented patch</li> </ul>                                                               | <ul style="list-style-type: none"> <li><b>Reduced white pinpoint dots</b></li> <li><b>Brown circles (Perifollicular pigmentation)</b></li> <li>Localized white area</li> <li>Reduced appendages</li> <li>Out-of-focus vessels</li> <li>Broken pigment network</li> </ul>                                                                                                          | <ul style="list-style-type: none"> <li>Perivascular infiltrate</li> <li>Peri- adnexal infiltrate</li> </ul>                                                                                                                         |
| <b>TT</b>    | <ul style="list-style-type: none"> <li>Erythematous plaque</li> <li>Loss of sensation</li> </ul>                                    | <ul style="list-style-type: none"> <li><b>Localized white structureless area</b></li> <li>Localized yellowish- brown area</li> <li><b>Reduced white pinpoint dots,</b></li> <li>Reduced appendages</li> <li>Out-of-focus vessels</li> <li>Broken pigment network</li> </ul>                                                                                                       | <ul style="list-style-type: none"> <li>Perivascular infiltrate</li> <li>Peri- adnexal infiltrate</li> <li>Well-formed granuloma consisting of epithelioid cells, Lymphocytes, Langhans giant cells</li> </ul>                       |
| <b>BT</b>    | <ul style="list-style-type: none"> <li>Erythematous plaque</li> <li>Loss of sensation</li> <li>Hypopigmented patches</li> </ul>     | <ul style="list-style-type: none"> <li>Peripilar scaling</li> <li>Broken pigment network</li> <li>Localized white area</li> <li>Reduced appendages</li> <li><b>Brown circles (Perifollicular pigmentation)</b></li> <li><b>Reduced white pinpoint dots</b></li> <li>Linear irregular vessels</li> <li>Scaling in skin creases</li> <li>Accentuated pigment network</li> </ul>     | <ul style="list-style-type: none"> <li>Perivascular infiltrate</li> <li>Peri-adnexal infiltrate</li> <li>Ill-formed granuloma consists of Epithelioid cells, Lymphocytes, Histocytes, Langhans giant cells, Plasma cells</li> </ul> |
| <b>BB</b>    | <ul style="list-style-type: none"> <li>Erythematous plaques</li> <li>Loss of sensation</li> </ul>                                   | <ul style="list-style-type: none"> <li>Broken pigment network</li> <li>Localized yellowish-brown area</li> <li>Localized white area</li> <li><b>Reduced white pinpoint dots</b></li> <li><b>Brown circles (Perifollicular pigmentation)</b></li> <li>Linear irregular vessels</li> <li>Peripilar scaling</li> <li>Scaling in skin creases</li> <li>Follicular plugging</li> </ul> | <ul style="list-style-type: none"> <li>Perivascular infiltrate</li> <li>Peri- adnexal infiltrate</li> <li>Ill- formed granuloma consists of epithelioid cells, Lymphocytes Langhans giant cells</li> </ul>                          |
| <b>BL</b>    | <ul style="list-style-type: none"> <li>Erythematous plaques</li> <li>Loss of sensation</li> <li>Epistaxis</li> <li>Fever</li> </ul> | <ul style="list-style-type: none"> <li><b>Reduced white pinpoint dots</b></li> <li>Localized white areas</li> <li>Reduced appendages</li> <li>Peripilar scaling</li> <li>Diffuse yellowish-brown areas</li> </ul>                                                                                                                                                                 | <ul style="list-style-type: none"> <li>Perivascular infiltrate</li> <li>Peri adnexal infiltrate</li> <li>Ill-formed granuloma consists of epithelioid</li> </ul>                                                                    |

|              |                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                        |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              | <ul style="list-style-type: none"> <li>• Hypopigmented patches</li> <li>• Pedal edema</li> </ul>                                                                   | <ul style="list-style-type: none"> <li>• Linear irregular vessels</li> <li>• Broken pigment network</li> <li>• Diffuse erythema</li> <li>• Follicular plugging</li> <li>• Accentuated pigment network</li> </ul>                                                                                                                                   | <ul style="list-style-type: none"> <li>cells, Histiocytes, Lymphocytes, Foamy cells,</li> <li>• Grenz zone</li> </ul>                                                                                                                                                  |
| <b>LL</b>    | <ul style="list-style-type: none"> <li>• Papules/nodules</li> <li>• Loss of sensation</li> <li>• Erythematous plaques</li> </ul>                                   | <ul style="list-style-type: none"> <li>• out -of -focus vessels</li> <li>• Broken pigment network</li> <li>• <b>Reduced white pinpoint dots</b></li> <li>• Reduced appendages</li> <li>• Localized white areas and yellowish-brown areas</li> <li>• Linear irregular vessels</li> <li>• Comma hair</li> </ul>                                      | <ul style="list-style-type: none"> <li>• Perivascular infiltrate</li> <li>• Peri- adnexal infiltrate</li> <li>• Pan-dermal infiltrate consists of epithelioid cells Lymphocyte, Foamy cells, Histiocytes Langhans giant cells</li> <li>• Grenz zone</li> </ul>         |
| <b>HL</b>    | <ul style="list-style-type: none"> <li>• Papules/nodules,</li> <li>• Pedal edema</li> <li>• Epistaxis</li> <li>• Loss of sensation</li> <li>• Fever</li> </ul>     | <ul style="list-style-type: none"> <li>• Broken pigment network</li> <li>• Reduced white <b>pinpoint</b> dots</li> <li>• Scaling in skin creases</li> <li>• Localized yellowish-brown area and white area</li> <li>• Out-of-focus vessels</li> <li>• Reduced appendages</li> <li>• Linear irregular vessels</li> </ul>                             | <ul style="list-style-type: none"> <li>• Perivascular infiltrate, Peri- adnexal infiltrate</li> <li>• Pan-dermal infiltrate of epithelioid cells Lymphocytes, Histiocytes, Foamy cells</li> <li>• Grenz zone</li> </ul>                                                |
| <b>TYR-1</b> | <ul style="list-style-type: none"> <li>• Erythematous plaques</li> <li>• Epistaxis</li> <li>• Fever</li> <li>• Loss of sensation</li> <li>• Pedal edema</li> </ul> | <ul style="list-style-type: none"> <li>• Diffuse erythema</li> <li>• Diffuse scaling</li> <li>• Peripilar scaling</li> <li>• Broken pigment network</li> <li>• Reduced appendages</li> <li>• Out-of-focus vessels,</li> <li>• Telangiectasia</li> <li>• Scaling in skin creases</li> <li>• Follicular plugging</li> <li>• Dotted vessel</li> </ul> | <ul style="list-style-type: none"> <li>• Perivascular infiltrate</li> <li>• Peri- adnexal infiltrate</li> <li>• Pan-dermal infiltrate of epithelioid cells Lymphocytes, Histiocytes Langhans giant cells, Plasma cells</li> </ul>                                      |
| <b>TYR-2</b> | <ul style="list-style-type: none"> <li>• Erythematous plaques</li> <li>• Loss of sensation</li> <li>• Ulcers</li> <li>• Fever</li> <li>• Papule/nodule</li> </ul>  | <ul style="list-style-type: none"> <li>• Broken pigment network</li> <li>• Diffuse erythema</li> <li>• Telangiectasia</li> <li>• Reduced white <b>pinpoint</b> dots</li> <li>• Out-of-focus vessels</li> <li>• Linear irregular vessels</li> <li>• Follicular plugging</li> </ul>                                                                  | <ul style="list-style-type: none"> <li>• Perivascular infiltrate</li> <li>• Peri-adnexal infiltrate</li> <li>• Ill- formed granuloma composed of Lymphocytes, Histiocytes, Foamy cells</li> <li>• Grenz zone</li> <li>• Neutrophils</li> <li>• Dermal edema</li> </ul> |

Indeterminate leprosy (IL), Tuberculoid leprosy (TT), Borderline tuberculoid (BT), Mid-borderline leprosy (BB), Borderline lepromatous (BL), Lepromatous leprosy (LL), Histoid leprosy (HL), Type 1 reaction (TYR1), Type 2 reaction (TYR2).

## Discussion

The classification and diagnosis of leprosy remain challenging due to its diverse clinical presentations and the dynamic nature of the host immune response, which frequently results in atypical and overlapping manifestations, particularly within the borderline spectrum. Although histopathological examination remains the definitive diagnostic modality, its invasive nature may limit feasibility in certain clinical settings. In this context, dermoscopy has emerged as a valuable non-invasive, point-of-care diagnostic adjunct that can supplement both clinical and histological assessments.

In the present study, leprosy patients were clinically examined and slit-skin smear examination was done which predominantly demonstrated a low to moderate bacillary load, whereas histopathological evaluation revealed a broader bacillary spectrum, including cases with numerous bacilli. This observation underscores the superior sensitivity of histopathology in assessing tissue bacillary burden and aligns with the established understanding of bacillary distribution across the leprosy spectrum.

Our study comprehensively evaluated dermoscopic findings across the clinical spectrum of leprosy and correlated them with corresponding histopathological changes. The most consistent dermoscopic features observed across various subtypes included yellowish-brown and white structureless areas, decreased or absent appendageal structures, and scaling. The yellowish-brown structureless areas, noted more frequently than the yellowish-orange hues described in earlier studies, likely reflect underlying dermal granulomas. The variation in colour perception may be attributed to the predominance of darker skin phototypes (Fitzpatrick IV–VI) in our study population. These structureless areas are analogous to the

classic dermoscopic hallmark of granulomatous disorders, arising from the mass effect of dermal granulomatous inflammation.

Histopathological correlation demonstrated that yellowish-brown areas corresponded to perivascular and periappendageal granulomas, while white structureless areas were associated with melanocyte loss and dermal collagen alteration. Similarly, reduced appendageal structures including eccrine gland openings and hair follicles, on dermoscopy reflected histological destruction or replacement of adnexal units by granulomatous infiltrates and this serves as a clinically relevant dermoscopic marker that aids in differentiating leprosy from other granulomatous dermatoses.

These correlations reinforce the biological basis of dermoscopic patterns observed in leprosy.

Subtype-specific dermoscopic variations were also identified. In the tuberculoid pole, features such as scaling, white structureless areas, and yellowish-brown structureless areas were more prominent, consistent with prior observations by Chopra et al (2019) and Mohta et al (2021). In borderline lepromatous (BL) and lepromatous leprosy (LL), features like accentuation of reticular pigmentation were prominent, reaffirming findings from earlier studies. (Ankad et al 2024, Vinay et al 2019)

Distinct dermoscopic patterns were observed in reactional states. Type 1 reaction (T1R) was characterised by prominent linear branching vessels, intense erythema, follicular plugging, and scaling. These findings parallel earlier reports and may reflect acute dermal inflammation and vascular dilatation. Type 2 reaction (T2R) exhibited a targetoid pattern consisting of a central yellowish structureless area surrounded by peripheral erythema, similar to patterns previously described by Agharia et al (2023). Recognition of such dermoscopic features may

facilitate early detection of lepra reactions, which is critical for preventing nerve damage and long-term deformities.

In histoid leprosy, a rare and distinct multibacillary variant, a characteristic petaloid arrangement of white structureless areas with crown vessels was observed. The absence of yellowish-orange background and milky pink areas, as reported in some studies, may be explained by the whorled proliferation of spindle-shaped histiocytes typical of histoid morphology (Acharya & Mathur 2020). These findings highlight the potential role of dermoscopy in differentiating histoid leprosy from other forms of leprosy and from other granulomatous dermatoses (Sameeha et al 2024).

Additional dermoscopic findings included reduced white pinpoint dots, suggestive of sweat gland opening loss, focal pigment network alterations, and the presence of linear and branching vascular structures. The combined interpretation of these features, particularly when dermoscopy is performed under pressure to enhance visualisation of subepidermal structures, may improve diagnostic specificity.

A key strength of this study lies in the systematic clinicodermoscopic–histopathological correlation across the leprosy spectrum, including rarer entities such as indeterminate and histoid leprosy, as well as lepra reactions. Furthermore, the predominance of darker skin phototypes provides additional insights into dermoscopic colour variations in pigmented skin, an area underrepresented in existing literature.

Although several dermoscopic findings observed in this study overlap with earlier reports, the spectrum-based correlation and inclusion of reactional states add meaningful clinical value. Dermoscopy offers a rapid, non-invasive, and reproducible adjunctive tool that enhances

diagnostic confidence, particularly in clinically ambiguous or borderline cases.

While dermoscopy is not routinely incorporated into leprosy evaluation, it provides important visualisation of underlying pathological processes. These observations hold particular relevance in the State Health System, where diagnosis and initiation of multidrug therapy are often undertaken by general physicians. Dermoscopic inputs may therefore serve as useful supplementary visual cues in early, atypical, or diagnostically challenging presentations.

### Conclusion

Dermoscopy represents a valuable adjunctive modality in the clinical evaluation of leprosy, enabling non-invasive, real-time visualisation of morphological changes that often remain inconspicuous on routine examination. The consistent identification of dermoscopic features such as broken pigment networks, white and yellowish-brown structureless areas, reduced appendageal openings, characteristic scaling patterns, and vascular alterations underscores its utility in assessing disease activity across the leprosy spectrum. The observed clinico-dermoscopic–histopathological correlation in this study reinforces the pathological basis and diagnostic relevance of dermoscopic findings, particularly in reflecting granulomatous inflammation, pigmentary disturbances, adnexal involvement, and vascular responses. Dermoscopy proved especially informative in borderline forms and reactional states, where clinical presentations are frequently variable and diagnostically challenging. The inclusion of indeterminate, reactional, and histoid cases further strengthens the clinical applicability of these observations. Given its rapidity, accessibility, and ease of use, dermoscopy may serve as a practical point-of-care tool that complements conventional clinical and histopathological

assessment. These findings hold particular relevance in routine practice within the Indian healthcare setting, where early recognition, accurate classification, and timely management remain critical for preventing complications and disability. Overall, dermoscopy enhances diagnostic confidence and offers meaningful support in the comprehensive evaluation and management of leprosy. As dermoscope may not be available in resource-limited settings it could be considered for such usage in departments/centres having this facility.

### Limitations

The study has several limitations, including a relatively small sample size, inclusion of only newly diagnosed patients, overlapping dermoscopic features across the spectrum, inability of dermoscopy to assess deeper neural involvement, and importantly, the absence of a control group comprising normal skin or dermoscopic evaluation of other dermatological conditions that may clinically mimic leprosy, which may affect the specificity of dermoscopic findings.

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