Section: DVL

Original Research Article

ROLE OF DERMOSCOPY IN CUTANEOUS NEGLECTED TROPICAL DISEASES AND CORRELATION WITH CLINICAL FEATURES AND HISTOPATHOLOGY

Vasav Rathore[1], Vishal Sharma[2], Saroj Kumari[3], Tripatjot Singh[1], Fanish Godara[1]

[1]*PG Resident, Department of Dermatology Venereology and Leprosy, Maharishi Markandeshwar Medical College and Hospital, Himachal Pradesh, India*
[2]*HOD Prof DVL Department of Dermatology Venereology and Leprosy, Maharishi Markandeshwar Medical College and Hospital, Himachal Pradesh, India*
[3]*Assistant Professor Department of Dermatology Venereology and Leprosy, Maharishi Markandeshwar Medical College and Hospital, Himachal Pradesh, India*

Received *: 29/05/2026*
Received in revised form *: 07/07/2026*
Accepted *: 24/07/2026*

Corresponding Author:
Dr. Vasav Rathore,
PG Resident, Department of Dermatology Venereology and Leprosy, Maharishi Markandeshwar Medical College and Hospital, Himachal Pradesh, India.

DOI: 10.70034/ijmedph.2026.3.351

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (3); 2201-2207

ABSTRACT

Background: Skin Neglected Tropical Diseases (SNTDs) are infectious diseases that predominantly affect populations in resource-limited settings and are associated with significant morbidity, disability, and social stigma. Dermoscopy is a rapid, non-invasive diagnostic tool that aids in the early recognition of characteristic skin lesions and complements conventional diagnostic methods. The objective is to evaluate the clinical spectrum and dermoscopic features of skin neglected tropical diseases and correlate dermoscopic findings with histopathological features.

Materials and Methods: This analytical cross-sectional study was conducted over 18 months in the Department of Dermatology, Venereology and Leprosy, Maharishi Markandeshwar Medical College and Hospital, Solan, Himachal Pradesh. Seventy-eight patients aged 12–80 years with clinically suspected and laboratory-confirmed skin neglected tropical diseases were enrolled. All patients underwent detailed clinical examination, dermoscopic evaluation using a DermLite DL5 dermoscope, and appropriate laboratory and histopathological investigations. Data were analyzed using descriptive statistics.

Results: The mean age of participants was 29.43 ± 15.95 years, with most patients in the 12–20-year age group (39.7%). Males constituted 56.4% of cases. Parasitic infections accounted for 89.7% of SNTDs, with scabies being the commonest disease (71.8%), followed by pediculosis (11.5%), Hansen's disease (7.7%), and cutaneous leishmaniasis (6.4%).Dermoscopy demonstrated characteristic findings including burrows and the delta-wing sign in scabies, visible nits in pediculosis, yellow tears and white starburst structures in cutaneous leishmaniasis, and yellow-orange structureless areas with reduced hair follicles in Hansen's disease. Dermoscopic findings correlated well with histopathological observations.

Conclusion: Dermoscopy is a valuable, rapid, and non-invasive adjunct for diagnosing SNTDs, improving diagnostic accuracy and facilitating early management, particularly in resource-limited settings.

Keywords: Skin neglected tropical diseases; Dermoscopy; Scabies; Cutaneous leishmaniasis; Hansen's disease; Pediculosis; Histopathology.

INTRODUCTION

Neglected Tropical Diseases (NTDs) are a group of communicable diseases caused by bacteria, viruses, parasites, fungi, and toxins that predominantly affect populations living in tropical and subtropical regions.[1] These diseases are closely associated with poverty, poor sanitation, overcrowding, inadequate healthcare access, and limited public awareness, making them a significant public health concern in

low- and middle-income countries.[2] According to the World Health Organization (WHO), over one billion people are affected by NTDs annually, with approximately 1.4 billion individuals requiring preventive or therapeutic interventions. Despite considerable progress in disease control, NTDs continue to impose a substantial burden through chronic morbidity, disability, social stigma, and economic loss.[3] The WHO currently recognizes 21 NTDs, many of which primarily affect the skin or present with characteristic dermatological manifestations.[4] Skin Neglected Tropical Diseases (SNTDs), including leprosy, cutaneous leishmaniasis, lymphatic filariasis, mycetoma, scabies, yaws, Buruli ulcer, and chromoblastomycosis, are responsible for considerable morbidity due to chronic ulceration, deformity, disfigurement, disability, and psychological distress.[5] Because these conditions are often visible, affected individuals frequently experience social discrimination and delayed healthcare seeking, highlighting the importance of early diagnosis and timely management.[6] Diagnosis of SNTDs remains challenging, particularly in resource-limited settings, as many patients present with nonspecific cutaneous manifestations such as papules, plaques, nodules, ulcers, scaling, pigmentation changes, and secondary bacterial infections that overlap with other dermatological disorders.[7,8] Confirmation generally relies on laboratory techniques including microscopy, histopathology, culture, serological assays, polymerase chain reaction (PCR), and enzyme-linked immunosorbent assay (ELISA).[9] Although these investigations remain the diagnostic gold standard, they are often expensive, time-consuming, technically demanding, and not readily available in peripheral healthcare facilities.[10,11] Dermoscopy has emerged as a valuable, non-invasive diagnostic tool that enables visualization of subsurface skin structures not visible to the naked eye. Using polarized or non-polarized light, dermoscopy enhances the identification of characteristic morphological patterns and has become an important adjunct in the diagnosis of inflammatory, infectious, and parasitic dermatoses.[12–14] Advances in digital and smartphone-assisted dermoscopy have further improved image documentation, teleconsultation, and point-of-care diagnosis, making the technique particularly useful in resource-constrained settings.[15-18] Characteristic dermoscopic findings, such as the "delta-wing jet" sign and scybalain scabies, yellow tears and vascular structures in cutaneous leishmaniasis, and follicular abnormalities in leprosy, facilitate rapid bedside diagnosis and guide appropriate laboratory investigations and treatment.[19,20] Although dermoscopy does not replace conventional diagnostic methods, it improves early clinical recognition, reduces unnecessary invasive procedures, and supports prompt therapeutic intervention.India continues to bear a significant burden of several skin-related NTDs; however, region-specific epidemiological data remain scarce, particularly from Himachal Pradesh.[21] Information regarding the prevalence, etiological spectrum, clinical presentation, dermoscopic findings, and histopathological characteristics is essential for strengthening surveillance, improving diagnostic strategies, and planning targeted public health interventions.[22,23] Therefore, the present study was design to evaluate the prevalence, etiological profile, clinical features, dermoscopic patterns, and histopathological characteristics of Skin Neglected Tropical Diseases among patients attending a tertiary care hospital in the Solan region of Himachal Pradesh.

MATERIALS AND METHODS

The present study was conducted as an analytical cross-sectional study to evaluate the dermoscopic features of cutaneous neglected tropical diseases (CNTDs) and to correlate these findings with the corresponding clinical and histopathological characteristics. The study was carried out in the Department of Dermatology, Venereology and Leprosy, Maharishi Markandeshwar Medical College and Hospital, Kumarhatti, Solan, Himachal Pradesh, India. The study was conducted over a period of 18 months.

Study Population: The study population comprised patients attending the dermatology outpatient and inpatient departments during the study period who presented with clinical features suggestive of cutaneous neglected tropical diseases. The diseases evaluated included Buruli ulcer, chromoblastomycosis, cutaneous larva migrans, dracunculosis, deep mycoses, endemic treponematoses, cutaneous leishmaniasis, leprosy, lymphatic filariasis, mycetoma, pediculosis, and scabies.

Inclusion Criteria

Patients fulfilling the following criteria were included in the study:

- Patients aged between 12 and 80 years.
- Patients with clinical suspicion of cutaneous neglected tropical diseases.
- Patients whose diagnosis was confirmed by appropriate laboratory and/or histopathological investigations.
- Patients who provided written informed consent to participate in the study.

Exclusion Criteria

The following patients were excluded from the study:

- Patients already receiving treatment that could alter the clinical or dermoscopic appearance of lesions.
- Patients unwilling to undergo the required diagnostic investigations.
- Patients who did not provide consent for dermoscopic examination.

Data Collection Procedure: After obtaining written informed consent, demographic details including age, sex, and occupation were recorded. A detailed clinical history was obtained with emphasis on the duration of illness, onset and progression of lesions, associated symptoms, history of contact, and previous treatment received. A comprehensive general physical examination and detailed dermatological examination were subsequently performed. The number, morphology, distribution, size, and anatomical location of lesions were documented using a predesigned case record proforma.

Clinical Photography: Standardized clinical photographs of representative lesions were obtained using the same digital camera under uniform natural lighting conditions to ensure consistency and facilitate comparison during analysis.

Dermoscopic Evaluation: Dermoscopic examination was performed using a DermLite DL5 handheld dermoscope. Lesions were examined under polarized, non-polarized, and ultraviolet (UV) illumination whenever indicated. Dermoscopic evaluation was performed up to the level of the reticular dermis, and all observed morphological features were systematically recorded. High-resolution dermoscopic images were captured using a Samsung Galaxy S24 Ultra smartphone attached to the dermoscope. The acquired images were archived and subsequently correlated with the corresponding clinical presentation and histopathological findings.

Laboratory and Histopathological Evaluation: Appropriate laboratory investigations were performed according to the suspected clinical diagnosis to establish the definitive diagnosis. These investigations included potassium hydroxide (KOH) mount, Gram staining, Fite-Faraco staining, slit-skin smear (SSS), skin biopsy for histopathological examination, and additional microbiological investigations whenever clinically indicated. The laboratory and histopathological findings were documented and correlated with the dermoscopic and clinical observations.

Outcome Measures

Primary Outcome: The primary outcome was the assessment of dermoscopic features observed in different cutaneous neglected tropical diseases and their correlation with the corresponding clinical findings.

Secondary Outcomes:

The secondary outcomes included:

- Correlation of dermoscopic findings with histopathological features.
- Estimation of the prevalence and spectrum of cutaneous neglected tropical diseases encountered during the study period.

Statistical Analysis: The collected data were entered into Microsoft Excel and subsequently analyzed using SPSS version 25. Qualitative variables were summarized as frequencies and percentages, whereas quantitative variables were expressed as mean ± standard deviation (SD). Dermoscopic findings were descriptively analyzed and correlated with clinical and histopathological features. Disease-wise prevalence was calculated using percentages. The results were presented in the form of tables, graphs, and charts. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 78 patients with clinically and laboratory-confirmed cutaneous neglected tropical diseases (CNTDs) were included in the present study. The mean age of the study population was 29.43 ± 15.95 years (range: 13–75 years). The majority of participants belonged to the 12–20 years age group (39.7%), followed by the 21–30 years age group (25.6%). Males constituted 56.4% of the study population, while females accounted for 43.6%. Students represented the largest occupational group (55.1%), followed by housewives (17.9%) and farmers (12.8%). More than half of the patients (53.8%) presented within 1–4 weeks of symptom onset [Table 1, Figure 1]. The etiological distribution demonstrated that parasitic infections were the predominant cause of cutaneous neglected tropical diseases, accounting for 89.7% of all cases, whereas bacterial and fungal infections contributed 9.0% and 1.3%, respectively. Among individual diseases, scabies was the most frequently encountered condition (71.8%), followed by pediculosis (11.5%), Hansen's disease (7.7%), and cutaneous leishmaniasis (6.4%). Only one case each of actinomycetoma and eumycetoma was identified during the study period [Table 2, Figure 2]. Dermoscopic evaluation revealed disease-specific characteristic features across different cutaneous neglected tropical diseases. Among patients with scabies (n=56), burrows were observed in 52 cases, followed by the delta-wing (jet with contrail) sign in 45 cases, erythematous background in 40 cases, scybala in 38 cases, and excoriation in 34 cases. In pediculosis, visible nits were identified in 7 of 9 patients, whereas an adult louse was visualized in 4 patients. All patients with cutaneous leishmaniasis demonstrated a diffuse erythematous background and yellow tears/crust, while central ulceration and polymorphous vessels were observed in four patients each. In Hansen's disease, yellowish erythematous background, decreased hair follicles, and absence of pigment network were consistently observed in all six cases, whereas linear vessels were present in five cases and a shiny white surface was noted in one patient with histoid leprosy. The single cases of actinomycetoma and eumycetoma demonstrated characteristic yellow dots and black dots, respectively [Table 3]. Gender-wise analysis showed an overall male predominance in the study population. Scabies affected 31 males and 25 females, whereas pediculosis was relatively more common among females (6 females vs. 3 males).

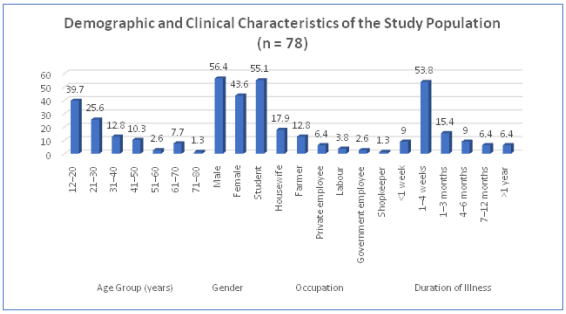
Hansen's disease, cutaneous leishmaniasis, actinomycetoma, and eumycetoma were observed predominantly in male patients. Overall, 45 males and 33 females were diagnosed with cutaneous neglected tropical diseases during the study period [Table 4].

Table 1: Demographic and Clinical Characteristics of the Study Population (n = 78)

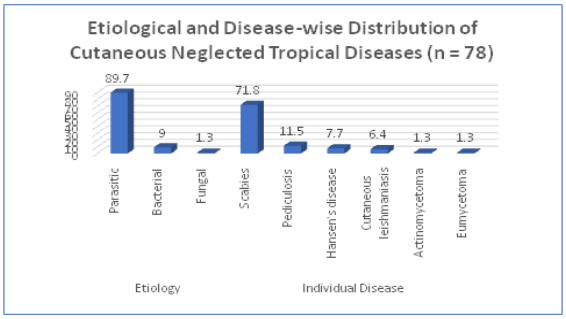
Variable	Category	Number (n)	Percentage (%)
Age Group (years)	12–20	31	39.7
	21–30	20	25.6
	31–40	10	12.8
	41–50	8	10.3
	51–60	2	2.6
	61–70	6	7.7
	71–80	1	1.3
Gender	Male	45	56.4
	Female	33	43.6
Occupation	Student	43	55.1
	Housewife	14	17.9
	Farmer	10	12.8
	Private employee	5	6.4
	Labour	3	3.8
	Government employee	2	2.6
	Shopkeeper	1	1.3
Duration of Illness	<1 week	7	9.0
	1–4 weeks	42	53.8
	1–3 months	12	15.4
	4–6 months	7	9.0
	7–12 months	5	6.4
	>1 year	5	6.4

Table 2: Etiological and Disease-wise Distribution of Cutaneous Neglected Tropical Diseases (n = 78)

Variable	Number (n)	Percentage (%)
Etiology		
Parasitic	70	89.7
Bacterial	7	9.0
Fungal	1	1.3
Individual Disease		
Scabies	56	71.8
Pediculosis	9	11.5
Hansen's disease	6	7.7
Cutaneous leishmaniasis	5	6.4
Actinomycetoma	1	1.3
Eumycetoma	1	1.3



Graph 1: Demographic and Clinical Characteristics of the Study Population (n = 78)



Graph 2: Etiological and Disease-wise Distribution of Cutaneous Neglected Tropical Diseases (n = 78)

Table 3: Frequency of Major Dermoscopic Features in Individual Cutaneous Neglected Tropical Diseases

Disease	Major Dermoscopic Feature	Frequency
Scabies (n=56)	Burrows	52
	Delta-wing sign	45
	Erythematous background	40
	Scybala	38
	Excoriation	34
	Nodules	4
	Scaling/crusting	2
Pediculosis (n=9)	Visible nits	7
	Adult louse	4
Cutaneous Leishmaniasis (n=5)	Diffuse erythematous background	5

	Yellow tears/crust	5
	Central ulceration	4
	Polymorphous vessels	4
	White starburst structures	3
Hansen's Disease (n=6)	Yellow/erythematous background	6
	Reduced hair follicles	6
	Absence of pigment network	6
	Linear vessels	5
	Shiny white surface	1
Actinomycetoma (n=1)	Yellow dots	1
Eumycetoma (n=1)	Black dots	1

Table 4: Distribution of Cutaneous Neglected Tropical Diseases According to Gender

Disease	Male	Female	Total
Scabies	31	25	56
Pediculosis	3	6	9
Hansen's disease	5	1	6
Cutaneous leishmaniasis	4	1	5
Actinomycetoma	1	0	1
Eumycetoma	1	0	1
Total	45	33	78

Figure 1: Cutaneous leishmaniasis.

Polarized entomodermoscopic image (DermLite DL5) of cutaneous leishmaniasis showing central ulceration with an adherent yellowish-brown crust, peripheral whitish starburst-like structures (radial white lines), and a polymorphous peripheral vascular pattern, consistent with the characteristic dermoscopic features of cutaneous leishmaniasis.

Figure 2: Pediculosis capitis.

Entomodermoscopic image (DermLite DL5) demonstrating an adult head louse (Pediculus humanus capitis). The parasite exhibits a dorso-ventrally flattened body, three pairs of legs with well-developed terminal claws adapted for grasping hair shafts, and a segmented abdomen, confirming the diagnosis of pediculosis capitis.

DISCUSSION

The present cross-sectional study evaluated the clinical profile, dermoscopic features, and histopathological correlation of Skin Neglected Tropical Diseases (SNTDs) among 78 patients attending a tertiary care hospital in Solan, Himachal Pradesh. Dermoscopy proved to be a valuable, non-invasive diagnostic tool that facilitated rapid bedside identification of characteristic skin lesions and complemented histopathological examination, thereby improving diagnostic accuracy. This approach is particularly useful in resource-limited settings where access to advanced laboratory investigations is limited. The mean age of the study population was 29.43 ± 15.95 years, with the highest proportion of patients belonging to the 12–20 years age group, and males being more frequently affected. Similar findings were reported by Saka et al,[24] who observed that skin NTDs predominantly affected individuals aged ≤18 years in rural Togo, and by Alderton et al,[25] whose systematic review demonstrated a slight male predominance. Students represented the largest occupational group affected, followed by housewives and farmers, consistent with the observations of Almamy et al,[26] who also reported higher disease prevalence among farmers and students due to increased environmental exposure and close interpersonal contact. Most patients presented within 1–4 weeks of symptom onset, although disease duration varied according to the underlying pathogen. Similar observations have been described by Saka et al,[24] Özçelik,[27] and Fróes Jr. et al,[28] who reported acute presentations in parasitic infestations and a relatively chronic course in bacterial and fungal infections. Parasitic

diseases constituted the majority (89.7%) of SNTDs in our study, followed by bacterial (9.0%) and fungal infections (1.3%), comparable to findings by Abdela et al,[29] Scabies was the most common diagnosis (71%), followed by pediculosis (11%), Hansen's disease (7.7%), and cutaneous leishmaniasis (6%), while only one case each of actinomycetoma and eumycetoma was encountered. Similar epidemiological trends have been reported by Feldmeier and Heukelbach,[30] Yotsu et al,[31] and Curtis et al,[32] Upper limbs were the most frequently affected anatomical site, consistent with observations by Curtis et al,[32] and Cardoso et al,[33] reflecting greater exposure of uncovered body areas. Dermoscopy demonstrated characteristic disease-specific patterns. Scabies showed burrows, the "jet with contrail" sign, scybala, and excoriations, findings consistent with Li and Chen.[34]. Cutaneous leishmaniasis demonstrated diffuse erythema, yellow-brown crusts, central ulceration, polymorphous vessels, and white starburst-like structures, correlating with studies by Bhat et al.[35] Dermoscopy effectively differentiated pediculosis capitis from corporis by demonstrating viable and empty nits or adult lice, similar to findings by Martins et al,[36] Hansen's disease showed reduced hair follicles, yellow-orange structureless areas, vascular changes, and shiny white structures in histoid lesions, consistent with Mohta et al,[37] and Agharia et al.[38] Actinomycetoma demonstrated yellow dots and sinus openings, whereas eumycetoma showed characteristic black grains, findings previously described by Ankad et al.[39,40] Histopathological examination confirmed the dermoscopic diagnosis in all suspected cases and significantly enhanced diagnostic confidence, supporting recommendations for integrated clinical, dermoscopic, and histopathological evaluation in SNTDs as advocated by WHO-based strategies . Overall, the present study demonstrates that dermoscopy is a rapid, reliable, and cost-effective adjunct for diagnosing skin NTDs. The observed dermoscopic features closely correspond with published literature while providing valuable regional data from Himachal Pradesh. Integration of dermoscopy with histopathology can facilitate early diagnosis, prompt treatment, disability prevention, and improved surveillance, with future incorporation of artificial intelligence-based image analysis offering additional potential for strengthening SNTD diagnosis in endemic and resource-constrained settings.

CONCLUSION

The present study demonstrated that scabies was the most common skin neglected tropical disease, with parasitic infections accounting for the majority of cases. Dermoscopy proved to be a valuable, rapid, and non-invasive diagnostic tool by identifying characteristic disease-specific patterns that showed good correlation with clinical and histopathological findings. Its use facilitated early recognition of cutaneous neglected tropical diseases, particularly in resource-limited settings where access to advanced laboratory investigations may be limited. Incorporating dermoscopy into routine dermatological practice, along with appropriate laboratory confirmation, may improve diagnostic accuracy, enable timely treatment, and reduce the morbidity associated with skin neglected tropical diseases.

Limitations of the study: The present study was conducted at a single tertiary care center with a relatively small sample size,. Rare cutaneous neglected tropical diseases such as actinomycetoma and eumycetoma were represented by only one case each, precluding meaningful comparative analysis. Additionally, long-term follow-up was not performed to evaluate treatment response or changes in dermoscopic features over time.

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