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Utilization and Educational Impact of Basic Diagnostic Tools in Infectious Dermatoses in Southern Jordan

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ABSTRACT: Background: Infectious dermatoses are common in dermatology practice and often mimic other skin disorders, posing diagnostic challenges. In resource-limited settings, reliance on cost-effective bedside tools—such as Wood's lamp, potassium hydroxide (KOH) preparation, and dermoscopy—remains crucial for enhancing diagnostic accuracy and facilitating timely management.

Objectives: To evaluate the real-world utilization and diagnostic yield of bedside diagnostic methods in the assessment of common infectious skin conditions in Jordan.

Methods: This retrospective descriptive study analyzed medical records of 2,900 patients who underwent at least one diagnostic procedure at Al-Karak Teaching Hospital between July 2024 and July 2025. Data on the frequency, indications, and diagnostic outcomes of Wood's lamp, KOH preparation, dermoscopy, bacterial cultures, and skin biopsy were extracted and summarized using descriptive statistics.

Results: Wood's lamp was employed in 1,200 patients (41.3%), primarily for tinea capitis (50%) and pityriasis versicolor (16.7%). KOH microscopy was performed in 800 cases (27.6%), confirming fungal elements in 90% of clinically suspected cases. Dermoscopy was used in approximately 750 patients (25.8%) to aid in the diagnosis of fungal infections, scabies, and viral warts. In contrast, bacterial cultures (3%) and skin biopsies (rarely) were reserved for recurrent or diagnostically complex cases. Biopsy confirmed cutaneous leishmaniasis in two patients.

Conclusions: Integrating low-cost diagnostic tools with clinical evaluation significantly improves accuracy and reduces reliance on invasive or empirical treatments. These findings support the adoption of a structured, multimodal diagnostic approach in dermatology clinics, especially in resource-constrained environments, to optimize patient outcomes and minimize misdiagnosis.

INTRODUCTION

Infectious dermatoses, including fungal, bacterial, viral, and parasitic skin disorders, represent a significant proportion of dermatology consultations worldwide and remain an important public health concern across all age groups and healthcare settings (1–3). While many of these conditions are benign, delayed or inaccurate diagnosis can lead to chronicity, complications, unnecessary treatments, and substantial psychosocial and economic burden (4,5). Furthermore, clinical presentations often overlap with non-infectious dermatoses such as eczema, psoriasis, and cutaneous lymphoma, increasing the risk of misdiagnosis (6).

Accurate and timely diagnosis is essential for appropriate management. In resource-constrained environments, where advanced laboratory techniques are not always available, reliance on simple, cost-effective bedside tools—such as Wood's lamp examination, potassium hydroxide (KOH) microscopy, and dermoscopy—becomes critical (7–10). These methods enhance

diagnostic confidence, guide treatment decisions, and reduce reliance on empirical therapy. Additionally, their integration into routine clinical practice plays an educational role, particularly in teaching hospitals where medical students and residents gain hands-on experience in diagnostic dermatology.

Despite their clinical value, the utilization of these tools remains inconsistent globally and regionally. A study from Saudi Arabia reported that fewer than half of dermatologists routinely used KOH preparation, citing barriers such as time constraints and lack of training (11). In Jordan, published data on the real-world application of these diagnostic techniques in dermatology practice are scarce, and their contribution to both clinical accuracy and educational outcomes has not been systematically evaluated.

This study aims to address this gap by retrospectively analyzing the use and diagnostic yield of basic dermatologic diagnostic tools—Wood's lamp, KOH preparation, dermoscopy, bacterial smears, and skin biopsy—in a teaching hospital setting in southern Jordan. The findings are expected to inform practical guidelines for resource-limited environments and enhance dermatology education.

OBJECTIVES

This study aimed to:

- Assess the utilization and diagnostic yield of bedside tools—Wood's lamp, potassium hydroxide (KOH) microscopy, dermoscopy, bacterial smears, and skin biopsy—in the evaluation of common infectious dermatoses in an outpatient dermatology setting.

- Determine the concordance between clinical diagnosis and confirmatory findings obtained through these diagnostic methods.

- Highlight the educational value of these tools in a teaching hospital environment and propose a practical diagnostic framework for resource-limited settings.

METHODOLOGY

This retrospective descriptive study was conducted over 12 months, from July 2024 to July 2025, at the dermatology outpatient clinics of Al-Karak Teaching Hospital, a Ministry of Health–affiliated tertiary care center in southern Jordan. The hospital serves as a training site for undergraduate medical students and dermatology residents.

The study population consisted of all patients who attended the dermatology outpatient clinics during the study period and underwent at least one bedside diagnostic procedure in addition to a clinical evaluation.

The inclusion criteria were patients with suspected or confirmed infectious dermatoses (fungal, bacterial, viral, or parasitic) and complete clinical and diagnostic data available in the patient's record.

Exclusion criteria: Patients with non-infectious skin conditions who did not undergo any diagnostic procedure, and cases with incomplete or missing diagnostic documentation.

A total of approximately 3,900 patients were evaluated in the dermatology outpatient clinic during the study period. Of these, 2,900 patients (approximately 75%) met the inclusion criteria and were enrolled in the analysis.

The diagnostic procedures included:

Clinical Diagnosis: Clinical diagnosis was primarily based on lesion morphology, distribution, progression, and associated symptoms. A wide range of superficial infections, including dermatophytosis, candidiasis, pityriasis versicolor, erythrasma, impetigo, scabies, molluscum contagiosum, orf, and viral warts, were initially assessed through clinical evaluation. While many cases exhibited classical features sufficient for diagnosis, further diagnostic tools (such as KOH preparation, Wood's lamp, dermoscopy, skin smears, or, in rare cases, skin biopsies) were selectively employed when clinical uncertainty existed, when lesions were atypical or treatment-resistant, or when differentiation from other dermatoses was necessary. This pragmatic approach reflected real-world decision-making in a busy outpatient setting.

Wood's Lamp Examination: As part of the diagnostic protocol, a handheld Wood's lamp (UV wavelength 365 nm) will be utilized in a darkened examination room to assist in the evaluation of selected dermatologic conditions. This tool will be applied to cases suspected of tinea capitis, erythrasma, Pseudomonas infections, and pityriasis versicolor, based on their characteristic

fluorescence patterns—namely, blue-green, coral-red, bluish-green, and golden-yellow, respectively. The Wood's lamp will also be employed in some instances to differentiate between acne vulgaris and Pityrosporum (Malassezia) folliculitis on the upper back or face. In addition, Wood's light will be used to aid in the detection of scabies burrows, which may become more visible as whitish or bluish linear or curvilinear streaks, especially in areas with overlying scale or crust.

Potassium Hydroxide (KOH) Microscopy: Specimens were collected based on the anatomical site of suspected fungal involvement. For skin lesions, superficial scrapings were obtained from the active, scaling edge using a sterile scalpel blade. Scalp samples included plucked hairs from the affected area along with associated scale, while nail specimens comprised clippings from the dystrophic nail region and subungual debris. All specimens were placed on clean glass slides, to which 1–2 drops of 20% potassium hydroxide (KOH) solution were applied. Slides were then left at room temperature for a minimum of two hours to allow for keratin softening. In cases involving thick nail samples, preparations were often left overnight to enhance clearing and improve visualization. Microscopic examination was conducted using a standard light microscope (Olympus CX23, Tokyo, Japan) at magnifications of ×10 and ×40. The evaluation was initially performed after the incubation period and, when necessary, repeated later the same day or the following morning to improve diagnostic sensitivity.

Dermoscopy: Dermoscopy was employed as a non-invasive diagnostic adjunct in patients presenting with ambiguous or atypical skin lesions. Examinations were conducted using the DermLite DL3 handheld dermoscope (3Gen, USA), which features both polarized and non-polarized illumination.

Bacterial Smears and Culture: As part of the diagnostic work-up, bacterial cultures and smear examinations will be performed in patients presenting with suspected bacterial skin infections, particularly in cases of recurrent impetigo, furunculosis, or chronic eczematous lesions complicated by secondary infection. In these cases, sterile cotton swabs will be used to collect specimens either from the lesion itself (e.g., a pustule, erosion, or crusted area) or from the anterior nares in patients being evaluated as potential carriers of Staphylococcus aureus. Collected samples will be promptly transported to the microbiology laboratory for Gram staining, which enables rapid microscopic assessment of the presence and morphology of bacteria (e.g., Gram-positive cocci in clusters), and for bacterial culture on appropriate media (such as blood agar or MacConkey agar).

Skin Biopsy: Skin biopsies were reserved for diagnostically challenging cases, notably when clinical examination and non-invasive diagnostic tools—such as KOH preparation, Wood's lamp, dermoscopy, or smears—failed to provide sufficient diagnostic clarity. Biopsies were primarily performed in patients with suspected cutaneous leishmaniasis, chronic granulomatous dermatoses, atypical inflammatory conditions, or non-resolving nodular or ulcerative lesions. The procedure was conducted under local anesthesia (typically 2% lidocaine with epinephrine) following standard aseptic precautions. Depending on the clinical presentation and lesion type, either a 4 mm punch biopsy or a shave/incisional biopsy was performed. The specimens were immediately fixed in 10% neutral buffered formalin and submitted to the histopathology laboratory for routine hematoxylin and eosin (H&E) staining. In select cases, special stains such as Giemsa, Periodic acid–Schiff (PAS), or Fite-Faraco were requested to highlight organisms or specific tissue components (e.g., Leishmania amastigotes, fungal elements, or mycobacteria). The results were reviewed in conjunction with the clinical findings to reach a definitive diagnosis.

Outcome Measures

Cases in which multiple diagnostic tools were applied were recorded individually for each method used. Diagnostic concordance was assessed by comparing the initial clinical impression with confirmatory findings from these adjunctive tests. The primary outcome was the frequency and diagnostic yield of each bedside tool in confirming or revising clinical diagnoses.

Secondary outcomes included the Identification of commonly misdiagnosed conditions and the tools used to correct them—estimation of diagnostic concordance between clinical and confirmatory methods.

Data Analysis

Data were extracted from patient records and entered into a secure database. Descriptive statistics were applied using Microsoft Excel. Frequencies and percentages were calculated for each diagnostic modality and indication. Concordance between clinical and confirmatory diagnoses was expressed as a percentage agreement. No inferential statistical tests were performed due to the descriptive nature of the study.

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Data Management and Analysis

All diagnostic data were extracted from patient records and logged into a secure spreadsheet. Descriptive statistics were used to analyze the frequency and distribution of each diagnostic method, categorized by clinical indication. Percentages and absolute numbers were calculated for each modality. No inferential statistical tests were applied, as the study was descriptive in nature.

Ethical Considerations:

This study was approved by the Institutional Review Board (IRB) at Al-Karak Teaching Hospital-Mutah University. All patient data were anonymized to maintain confidentiality. As this was a retrospective chart review with no direct patient contact or intervention, the requirement for informed consent was waived.

RESULTS

Over the 12-month study period, a total of 2,900 patients underwent at least one diagnostic procedure in the dermatology outpatient clinics of Al-Karak Teaching Hospital. The selection of diagnostic tools was guided by clinical suspicion and varied depending on the nature of the presenting condition. This section summarizes the distribution and outcomes of each diagnostic method used in the study. The tools evaluated included Wood's lamp examination, KOH microscopy, dermoscopy, direct skin smears, bacterial cultures, and skin biopsies. In several cases, more than one diagnostic modality was employed to enhance diagnostic accuracy, particularly in complex or treatment-resistant presentations.

Clinical Diagnosis as the Initial Tool in Dermatologic Assessment

In dermatology, clinical diagnosis remains the cornerstone of patient evaluation and management. At Al-Karak Teaching Hospital, the initial assessment of most patients relied on detailed clinical examination, including inspection of lesion morphology, distribution, configuration, and associated symptoms such as itching, pain, or scaling. This method was applied universally across all age groups and disease types. During the one-year study period, an estimated 3,500 to 4,000 patients were examined in the dermatology outpatient clinic. Clinical judgment alone was often sufficient for diagnosing common conditions such as acne vulgaris, common warts, and molluscum contagiosum. However, in diagnostically challenging cases—especially those involving atypical fungal infections, unusual pigmentation, or lesions modified by prior treatment—clinical suspicion served as the guiding step to selecting the appropriate confirmatory test, such as KOH preparation, Wood's light, or dermoscopy. The integration of clinical evaluation with additional diagnostic tools ensured higher accuracy, reduced the likelihood of misdiagnosis, and prevented unnecessary treatments. While adjunctive techniques were essential in complex cases, clinical assessment remained the primary filter for triaging patients and identifying the most likely diagnosis in real-world outpatient dermatology settings.

Wood's Light Examination Findings

Over one year, Wood's light examination was employed in approximately 1,200 patients at the dermatology clinic of Al-Karak Teaching Hospital. It served as a rapid, non-invasive tool for screening and diagnostic support in various cutaneous infections and pigmentary disorders. The distribution of diagnostic indications was as follows:

- Tinea capitis: ~600 cases. This condition was the most common reason for Wood's light examination. Characteristic blue-green fluorescence (Fig.1), suggestive of Microsporum species, was observed in approximately 90% of cases, particularly in pediatric patients. This finding helped guide further testing and the selection of appropriate antifungal therapy. However, it is essential to note that not all causative organisms fluoresce under Wood's light. Infections caused by Trichophyton species—especially T. tonsurans—typically do not exhibit fluorescence, which may lead to false-negative results if relied upon as the sole diagnostic method (Fig.2).
- Tinea versicolor: ~200 cases. Yellowish-golden fluorescence under Wood's light helped confirm Malassezia infection, especially in cases with subtle, poorly defined, or atypically located lesions. In several patients, lesions were not visible under normal lighting, particularly on non-seborrheic areas such as the dorsal hands or forearms. Wood's light examination enhanced diagnostic confidence and facilitated earlier initiation of antifungal treatment in these otherwise clinically ambiguous (Fig 3).
- Differentiating Acne Vulgaris and Pityrosporum Folliculitis Using Wood's Light: Acne and/or Pityrosporum Folliculitis: 160

- A total of 160 patients presented with papular eruptions on the face or trunk that were clinically assessed for acne vulgaris and/or pityrosporum folliculitis. In some cases, the diagnosis was clear, while in others, overlapping features made it difficult to separate. A subset of patients exhibited red-orange fluorescence under Wood's light, suggestive of Cutibacterium acnes, whereas others showed yellowish follicular fluorescence, consistent with Malassezia involvement. Mixed presentations were also observed. Given this variability, the two conditions were grouped for analysis, with Wood's light serving as a supportive diagnostic tool to guide further management and treatment selection. The findings helped guide further diagnostic steps, including KOH examination or empiric antifungal therapy. Figure 4 demonstrates this contrast: the left image shows acne with red fluorescence, while the right image reveals yellow fluorescence consistent with pityrosporum folliculitis.
- Erythrasma: ~60 cases. Approximately four cases of erythrasma were identified monthly. The majority involved intertriginous areas, particularly the axillae, groin, and toe web spaces. Several of these cases presented with non-specific maceration and erythema and were initially misdiagnosed as tinea pedis or candidal intertrigo. However, Wood's light examination revealed a characteristic coral-red fluorescence, confirming infection with Corynebacterium minutissimum. This finding was especially valuable in cases with atypical locations or overlapping clinical features. For example, as illustrated in Figure 5, a patient presenting with whitish maceration between the toes was clinically presumed to have a fungal infection. Still, Wood's light revealed an intense coral-red glow, leading to a definitive diagnosis of erythrasma. These observations underscore the utility of Wood's light in distinguishing between bacterial and fungal intertrigo, particularly in resource-limited settings where laboratory confirmation may be delayed.

- Pseudomonas intertrigo: 10 cases: Bluish-green fluorescence in toe webs or moist skin folds helped detect Pseudomonas infections. Though less common, this diagnosis was clinically crucial due to the need for targeted antibacterial therapy.

Wood's light significantly enhanced diagnostic confidence, especially in differentiating fungal and bacterial conditions with overlapping clinical features. Its ease of use, low cost, and diagnostic value justified its routine incorporation into daily dermatologic practice in this resource-limited setting. A total of approximately 1200 patients underwent Wood's light examination during the study period. The most common indications were tinea capitis and tinea versicolor, followed by pityrosporum folliculitis and erythrasma. A detailed breakdown of diagnostic indications and findings is presented in Table 1.

KOH Preparation Findings

During the one-year study period, potassium hydroxide (KOH) preparation was performed in approximately 800 patients at Al-Karak Teaching Hospital's dermatology outpatient clinic. The test served as a frontline diagnostic tool for superficial fungal infections, providing rapid microscopic confirmation of fungal elements. The anatomical and diagnostic distribution of KOH tests is summarized below:

- Tinea capitis: ~500 cases: Most commonly seen in children, especially with patchy alopecia and subtle scaling. All clinically suspected cases yielded positive KOH findings, showing endothrix or ectothrix hyphae within hair shafts (Fig 6).
- Tinea corporis: ~200 cases: The most frequent indication for KOH use. While typical annular lesions often confirmed the diagnosis, in atypical cases (e.g., tinea incognito) (Figure 7), KOH helped avoid unnecessary biopsies by revealing septate hyphae. Approximately 15–20% of these cases were classified as tinea incognito.
- Tinea cruris: ~30 cases: Diagnosis was confirmed in nearly all tested cases, despite occasional sampling challenges due to moisture and friction in the groin area.
- Interdigital infections (tinea pedis/candidiasis/mixed): ~30 cases: KOH testing differentiated between dermatophytes, Candida, and mixed infections. Results showed: Candidiasis: ~70%, Tinea pedis: ~5%, Mixed fungal/bacterial: ~10%, Other causes (e.g., erythrasma, Pseudomonas): ~15% (confirmed via Wood's light or culture).
- Pityriaisis versicolor: 30 cases, KOH reliably demonstrated the classic "spaghetti and meatballs" appearance of Malassezia species, especially in patients with equivocal Wood's light results.
- Onychomycosis: ~20 cases: KOH yield was low despite careful sampling. Most cases were later confirmed via fungal culture, revealing Aspergillus or non-dermatophyte molds.
- Mucosal candidiasis: ~10 cases: Confirmed by KOH in cases of angular cheilitis or chronic candidiasis. In contrast, KOH was negative in immune-mediated erosive conditions, such as Behçet's disease or pemphigus.

These findings underscore KOH's high sensitivity in diagnosing scalp, skin, and mucosal fungal infections, particularly in straightforward cases. Its limitations were most apparent in nail infections and deeply inflamed or masked lesions. Nonetheless, the technique remains indispensable in outpatient dermatologic care due to its speed, affordability, and ability to guide management without delay. The results of the KOH test were summarized in Table 2.

Dermoscopy Findings

Dermoscopy was utilized in a wide range of dermatological conditions throughout the one-year study period, serving both as a diagnostic and monitoring tool in the dermatology clinic at Al-Karak Teaching Hospital. Approximately 750 to 800 patients underwent dermoscopic evaluation, either at the time of initial presentation or during follow-up visits. The indications for dermoscopy included fungal, viral, parasitic, and other uncertain lesions:

- Tinea capitis: Dermoscopy was performed in all diagnosed cases, regardless of Wood's light findings. The tool was essential for: Identifying active infection features (e.g., comma hairs, corkscrew hairs, black dots) (Fig. 8), monitoring treatment response or residual activity at follow-up, and detecting subclinical signs even in partially treated patients.
- Scabies (Sarcoptic infestation): Dermoscopy was used selectively in ~50% of scabies cases, especially when the clinical picture was unclear. Approximately one scabies case was seen weekly, but dermoscopy was reserved for diagnostically challenging lesions. The characteristic "delta-wing jet" sign (burrows with mite body) was rarely observed but considered highly specific (Fig 9).
- Warts (verruca vulgaris): While dermoscopy was not used for all wart cases (due to high daily prevalence), it was conducive in: Distinguishing warts from other hyperkeratotic lesions, Identifying thrombosed capillaries, which aided in assessing response to cryotherapy or topical agents (Fig 10).

- Molluscum contagiosum: Dermoscopy was employed in 2–3 cases monthly, especially for atypical lesions or those mimicking genital warts or keratoacanthoma. The classic central umbilication and polylobular white-to-yellow amorphous structures were often observed.
- Orf Infection: 14 Cases. During the study period, 14 cases of orf infection were diagnosed, predominantly in patients with a history of contact with sheep or goats, reflecting its zoonotic nature. Clinically, the lesions presented as solitary or multiple erythematous nodules with a central ulcerative or crusted area, most commonly on the hands and fingers. These cases were initially misdiagnosed as pyogenic granuloma, bacterial infections, or keratoacanthoma, leading to unnecessary antibiotic use in some instances. Dermoscopy proved highly useful in confirming the diagnosis, revealing orange-yellow, structureless areas with central ulceration and a peripheral white halo, features typical of orf infection. These findings enabled clinicians to avoid invasive diagnostic procedures, such as biopsies, and prevent mismanagement. All cases were managed conservatively, with spontaneous resolution occurring within 4 to 6 weeks. Figure 11 illustrates the clinical and dermoscopic appearance of a representative Orf lesion.

Uncertain or atypical lesions: Dermoscopy supported clinical diagnosis in cases with diagnostic ambiguity, helping avoid unnecessary biopsies.

These findings demonstrate the expanding utility of dermoscopy in routine dermatologic evaluation, beyond pigmented lesions. In the context of this study, dermoscopy complemented traditional tools (such as KOH, Wood's light, and clinical judgment). It enhanced diagnostic confidence, particularly in pediatric scalp disorders, viral skin infections, and parasitic infestations. Table 3 summarizes all of the dermoscopic results.

Bacterial Infections and Laboratory Support

Although direct bacterial microscopy or culture was not routinely performed in the dermatology clinic itself, specimens were regularly referred to the microbiology laboratory for further evaluation, particularly in cases suggestive of bacterial skin infections. The most commonly requested investigation was the nasal swab culture, primarily used to assess Staphylococcus aureus colonization in patients with Recurrent furunculosis (Fig.12), Recurrent impetigo, and Treatment-Resistant pyoderma. On average, eight patients per month underwent nasal swab testing, especially those with frequent relapses or poor response to topical and systemic antibiotics. The results were essential for identifying persistent carriers, guiding antibiotic selection, and implementing decolonization strategies when needed. This highlights the importance of integrating microbiological testing into

dermatologic care, even when not directly performed in the clinic, to enhance diagnostic accuracy and optimize patient outcomes.

Skin Biopsy

Skin biopsies were rarely required during the study period, as most dermatologic conditions were diagnosed clinically or confirmed using non-invasive tools, such as KOH examination, Wood's light, or dermoscopy. However, in select cases where the clinical diagnosis remained uncertain or where parasitic infections were suspected, biopsy was utilized as a definitive diagnostic measure. Specifically, two patients underwent skin biopsy for lesions suspicious of cutaneous leishmaniasis (Fig.13). In both cases, histopathological examination confirmed the diagnosis by identifying Leishmania amastigotes within macrophages. These biopsies were essential due to the atypical clinical presentation and negative results from less invasive methods. This underscores the role of skin biopsy as a valuable last-resort tool when non-invasive diagnostics are inconclusive, especially in endemic areas where parasitic or granulomatous diseases may mimic more common dermatoses.

Summary of Findings

During the 12-month study period, 2,900 patients underwent at least one diagnostic procedure in addition to clinical examination. Wood's light examination was the most frequently employed tool, performed in approximately 1,200 cases (41.3%), primarily for suspected fungal infections such as tinea capitis and tinea versicolor, and for bacterial conditions like erythrasma and Pseudomonas intertrigo. Potassium hydroxide (KOH) microscopy was performed in about 800 cases (27.6%), serving as the primary confirmatory test for superficial fungal infections, particularly tinea capitis and tinea corporis. Dermoscopy was used in approximately 750 cases (25.8%), aiding in diagnosis and monitoring a broad range of conditions, including tinea capitis, scabies, warts, molluscum contagiosum, and zoonotic infections such as orf. Bacterial cultures and nasal swabs were ordered for an average of eight cases per month (approximately 3% of patients), primarily in recurrent furunculosis or impetigo, to identify carriers and guide antibiotic therapy. Skin biopsy was reserved for diagnostically challenging cases, confirming cutaneous leishmaniasis in two patients where non-invasive methods were inconclusive.

The application of these diagnostic tools had a substantial impact on clinical decision-making. Wood's light facilitated the rapid identification of characteristic fluorescence patterns in infections such as Microsporum tinea capitis, erythrasma, and Pityrosporum folliculitis, thereby reducing misdiagnosis and unnecessary treatments. KOH preparation demonstrated high sensitivity in scalp and skin fungal infections, while its limitations in nail disease underscored the importance of culture for definitive diagnosis. Dermoscopy provided critical visual markers—such as comma hairs in tinea capitis, the delta-wing jet sign in scabies, and thrombosed vessels in warts—supporting accurate diagnosis and monitoring therapeutic response. Microbiological investigations allowed targeted antibiotic selection for recurrent bacterial infections, and biopsy, though rarely required, remained essential for confirming rare parasitic and granulomatous diseases. Collectively, these findings underscore the complementary roles of traditional bedside techniques and laboratory-based methods in enhancing diagnostic accuracy, optimizing patient care, and serving as valuable teaching tools in dermatology training settings.

DISCUSSION

This study highlights the crucial role of bedside diagnostic tools—Wood's lamp, potassium hydroxide (KOH) microscopy, and dermoscopy—in enhancing the accuracy of diagnosing infectious dermatoses in a resource-limited, real-world teaching hospital setting. Among 2,900 patients, these methods significantly enhanced clinical confidence and reduced unnecessary invasive procedures, underscoring their dual importance in both patient care and dermatology education (12). These tools are not limited to basic setups; in fact, advanced techniques such as dermoscopy and mycological microscopy (dermomycology) are increasingly utilized and supported by recent research conducted locally, including the work of Al-Refu and colleagues, which emphasizes the role of dermoscopic features in diagnosing various cutaneous infections (13-15). Importantly, these diagnostic modalities require specific skillsets and clinical judgment, especially among residents and general practitioners. Their effective use can significantly reduce misdiagnosis, avoid unnecessary treatments or biopsies, and improve overall patient care. Therefore, the primary objective of the current study was not only to assess the diagnostic yield but also to highlight the clinical scenarios in which each technique proved most beneficial and how these tools can be better integrated into routine dermatologic practice. The present study highlights the crucial role of Wood's light examination as a simple, rapid, and cost-effective diagnostic adjunct in dermatology, particularly in resource-limited settings. Over one year, this technique was applied to 1,200 patients, primarily for diagnosing tinea capitis, which accounted for approximately 50% of all Wood's light examinations. This aligns with findings

from previous research indicating that blue-green fluorescence under Wood's light is highly characteristic of Microsporum infections, thus enabling quick bedside confirmation and reducing reliance on more time-consuming tests (7). However, our study also confirms a well-recognized limitation: infections caused by Trichophyton species, especially T. tonsurans, do not fluoresce, emphasizing that Wood's light should not be used as a sole diagnostic tool. For tinea versicolor, the detection of yellowish-golden fluorescence significantly improved diagnostic accuracy in patients with atypical or faint lesions, consistent with observations in earlier studies. An interesting finding was the utility of Wood's light in differentiating acne vulgaris from Pityrosporum folliculitis. Our results show that red-orange fluorescence, attributed to porphyrins produced by Cutibacterium acnes, contrasts with the yellow follicular fluorescence associated with Malassezia species. Similar patterns have been reported in the literature (16).

Furthermore, the technique proved particularly valuable for diagnosing erythrasma, as the classic coral-red fluorescence due to Corynebacterium minutissimum enabled rapid confirmation and differentiation from tinea pedis or candidal intertrigo, reducing unnecessary antifungal use (17, 18). Although less frequent, the detection of bluish-green fluorescence in Pseudomonas intertrigo also facilitated appropriate antibacterial treatment, underscoring the method's versatility in identifying mixed or overlapping infections. Its role is particularly significant in teaching hospitals, where it enhances diagnostic accuracy and provides a valuable hands-on learning experience for residents. While newer diagnostic modalities such as dermoscopy and molecular techniques are gaining popularity, Wood's light remains indispensable due to its low cost, non-invasiveness, and immediate results.

KOH preparation demonstrated a 90% positivity rate among clinically suspected fungal infections, particularly tinea capitis and tinea corporis. This performance corroborates previous studies reporting high sensitivity of KOH for scalp dermatophytosis (6,19). Its effectiveness in diagnosing tinea incognito was noteworthy, preventing unnecessary biopsies—a finding in line with Nowowiejska et al. (20). For interdigital and candidal infections, KOH also served as a rapid discriminator between dermatophytes and yeast, consistent with the work of Gupta et al. (21). However, its diagnostic yield in onychomycosis was suboptimal compared to fungal culture, echoing prior evidence that culture or histopathology remains essential for nail disease (22,23). Thus, while KOH is indispensable for routine care, clinicians should recognize its limitations and consider confirmatory methods when necessary.

Dermoscopy, traditionally associated with the evaluation of pigmented lesions, is increasingly recognized for its role in diagnosing infectious and inflammatory dermatoses. In our study, dermoscopy was performed in nearly 800 patients, highlighting its expanding utility in routine dermatology practice. For tinea capitis, dermoscopy provided distinct and reproducible features—such as comma hairs, corkscrew hairs, and black dots—that aided both early diagnosis and treatment monitoring. These findings are consistent with previous reports emphasizing trichoscopy as a valuable adjunct to confirm dermatophytosis and track therapeutic response (15,24). Beyond fungal infections, dermoscopy demonstrated considerable value in diagnosing parasitic infestations. The identification of the "delta-wing jet" sign in scabies cases was highly specific and helped avoid invasive scraping techniques. In viral infections, dermoscopy revealed thrombosed capillaries in warts, facilitating differentiation from callosities and assisting in evaluating treatment response (25,26). For molluscum contagiosum, characteristic central umbilication and lobular structures enhanced diagnostic confidence, particularly in early or atypical presentations (27). Notably, dermoscopy also played a role in zoonotic conditions (28), such as orf infection, where it demonstrated orange-yellow, structureless areas with central ulceration and a peripheral white halo. These features prevented unnecessary biopsies and allowed for accurate bedside diagnosis. The tool was further employed in differentiating acneiform conditions (29), evaluating inflammatory dermatoses, reinforcing its versatility as a non-invasive, real-time diagnostic aid.These benefits underscore the need to incorporate dermoscopy into standard dermatology curricula and clinical protocols worldwide (30).

Although dermatology practice primarily focuses on diagnosing fungal and viral infections, bacterial colonization and recurrent infections remain clinically significant, especially in chronic or relapsing dermatoses. In this study, nasal and lesion-site swabs were performed in patients with recurrent furunculosis, impetigo, and treatment-resistant pyoderma. The primary objective of these investigations was to identify Staphylococcus aureus carriage, which is a well-documented contributor to recurrent bacterial skin infections and treatment failure (31). Cultures and Gram staining helped differentiate between primary infection and secondary colonization, guiding targeted antibiotic therapy and implementing decolonization protocols when necessary (32). This approach is consistent with international recommendations that emphasize screening for nasal carriage in recurrent

furunculosis to reduce recurrence rates (33). In addition, bacterial cultures were particularly valuable in avoiding unnecessary empirical antibiotic use and in selecting appropriate antimicrobial agents in cases where resistance was suspected. These findings highlight the essential role of integrating microbiological testing into routine dermatology workflows, even in outpatient settings, to optimize treatment outcomes and reduce antibiotic misuse.

Although bacterial cultures and nasal swabs were used in only 3% of cases, they were crucial for managing recurrent furunculosis and impetigo, guiding targeted antibiotic therapy and reducing unnecessary empirical treatments (31–33). Skin biopsy, performed in two cases, confirmed cutaneous leishmaniasis, reflecting its role as a diagnostic gold standard when less invasive methods fail (34–36). These findings align with global recommendations emphasizing biopsy in chronic, atypical, or granulomatous lesions where differential diagnoses include infectious and inflammatory disorders (37,38).

The integration of these diagnostic tools into clinical practice also serves an educational purpose. Training residents to perform Wood's lamp examination, KOH preparation, and dermoscopy equips them with critical skills for accurate bedside diagnosis, fostering competency-based dermatology education. This hands-on experience is especially vital in resource-limited regions, where reliance on advanced molecular diagnostics is impractical.

Key strengths of this study include its large sample size and comprehensive assessment of multiple diagnostic modalities within a single teaching hospital setting. However, limitations include its retrospective design, lack of comparative analysis with molecular techniques, and single-center scope, which may restrict generalizability.

This study reinforces the clinical and educational value of simple, low-cost diagnostic techniques in dermatology. Incorporating these tools into structured diagnostic protocols can enhance accuracy, optimize patient outcomes, and strengthen dermatology training programs, particularly in low-resource environments.

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Legends of Figures

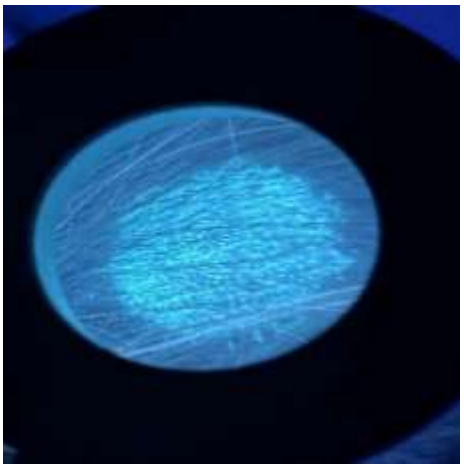

Figure 1. Wood's light examination showed bright blue-green fluorescence in a case of tinea capitis, consistent with infection caused by Microsporum species. This fluorescence pattern is characteristic and aids in rapid bedside diagnosis.

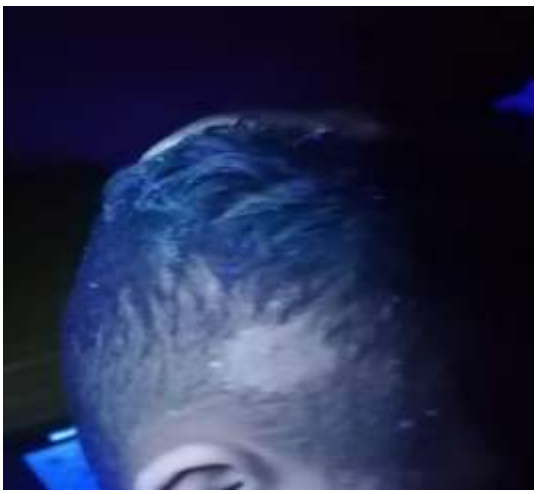

Figure 2. Wood's light examination of a child with clinically suspected tinea capitis. No fluorescence is observed, which is consistent with infection caused by Trichophyton species—particularly T. tonsurans—that typically do not emit fluorescence under ultraviolet (UV) light.

Natural Resources for Human Health
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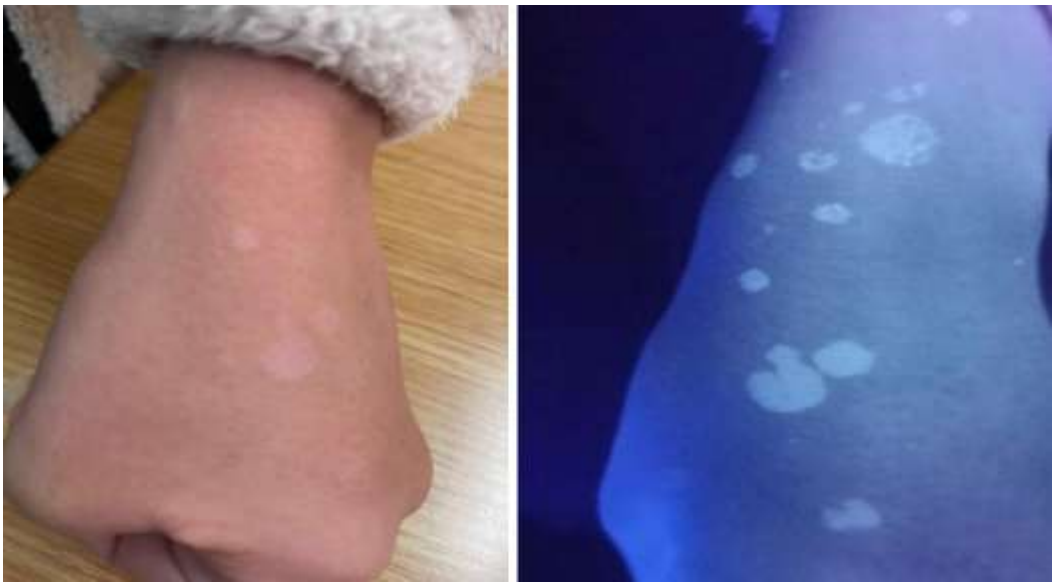

- **Figure 3.** Pityriasis versicolor presenting in an unusual location on the dorsal hand. The clinical appearance showed faint hypopigmented macules that were difficult to define under normal lighting. Wood's light examination revealed characteristic yellow-white fluorescence, confirming the diagnosis and guiding appropriate management.

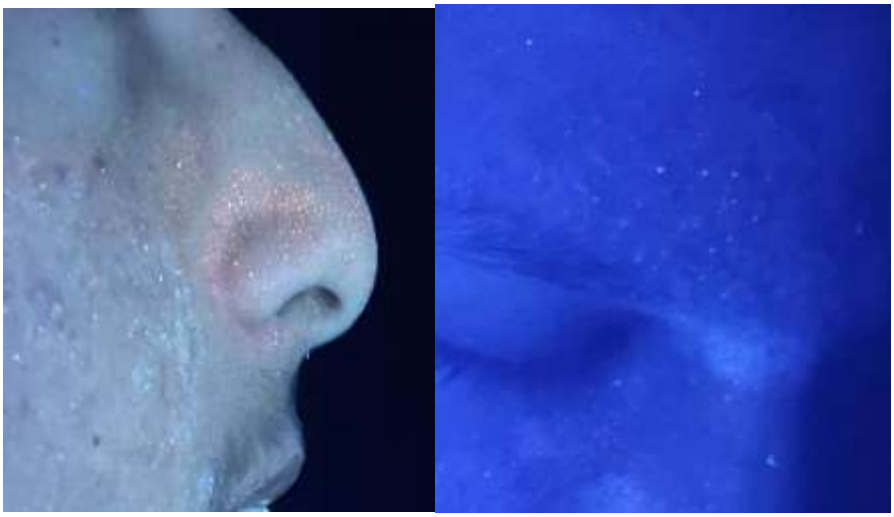

Figure 4. Wood's light examination differentiates acne vulgaris and pityrosporum folliculitis.

The left image shows multiple inflammatory papules and comedones consistent with acne vulgaris, displaying red-orange fluorescence under Wood's light—attributed to porphyrins produced by Cutibacterium acnes. In contrast, the right image reveals yellowish fluorescence along follicular units, suggestive of pityrosporum folliculitis caused by Malassezia species. This distinction under UV light aided in differentiating between bacterial and fungal follicular conditions.

Natural Resources for Human Health
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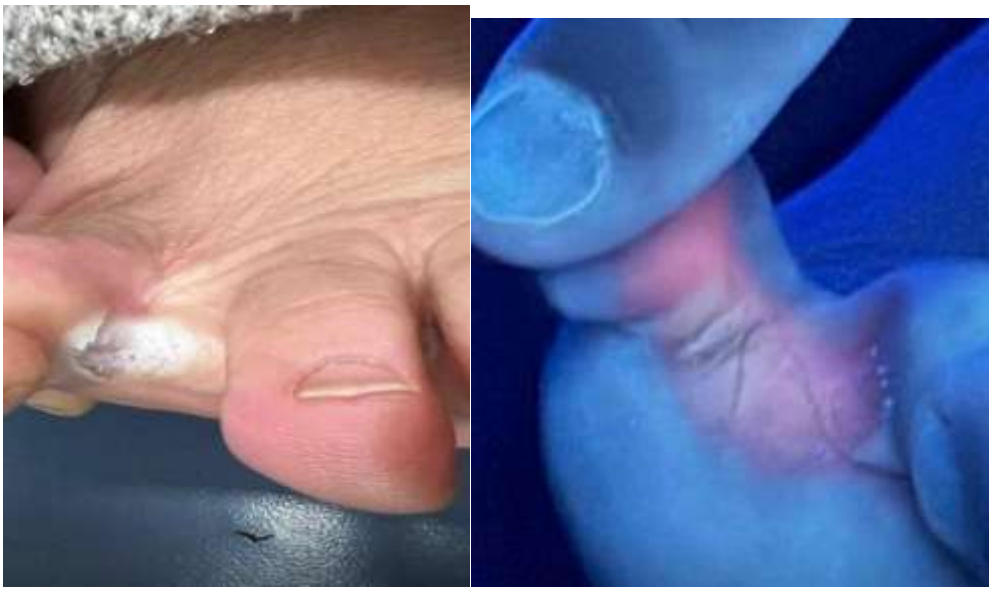

Figure 5. Clinical and Wood's light examination of a patient with erythrasma involving the toe web space. The left image shows maceration and mild erythema between the toes, which could be mistaken for tinea pedis or candidal intertrigo. Under Wood's light (right image), the affected area exhibits coral-red fluorescence, characteristic of infection with Corynebacterium minutissimum. This distinctive finding confirmed the diagnosis and helped differentiate erythrasma from other interdigital dermatoses.

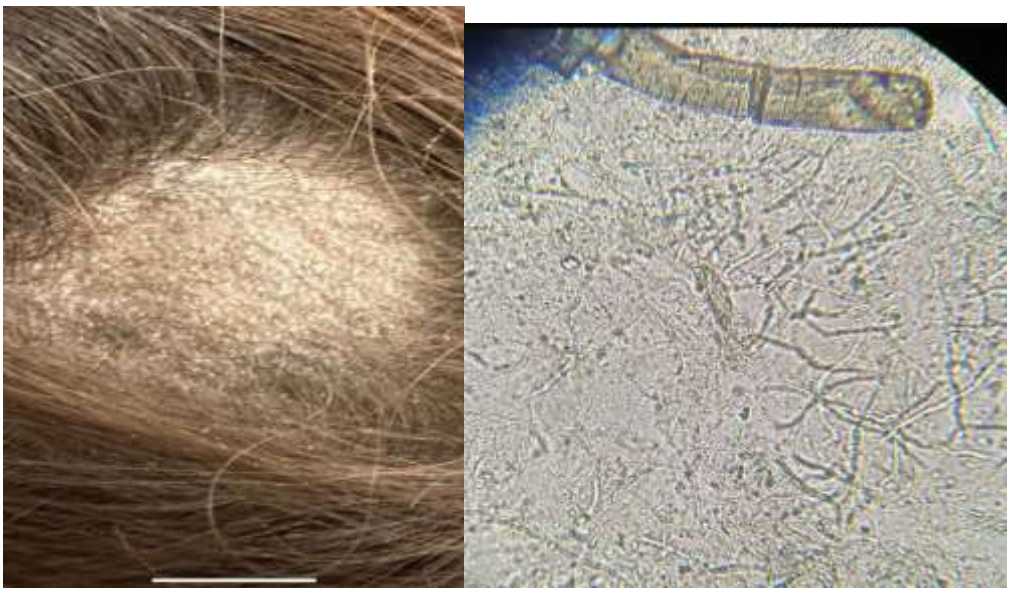

Figure 6. Clinical and microscopic findings in a case of tinea capitis. The left image shows an area of alopecia with subtle scaling on the scalp, a common clinical presentation of dermatophytic infection in children. The right image demonstrates a KOH preparation of plucked hairs viewed under light microscopy, revealing endothrix and ectothrix hyphae within hair shafts, confirming the diagnosis of tinea capitis.

Natural Resources for Human Health
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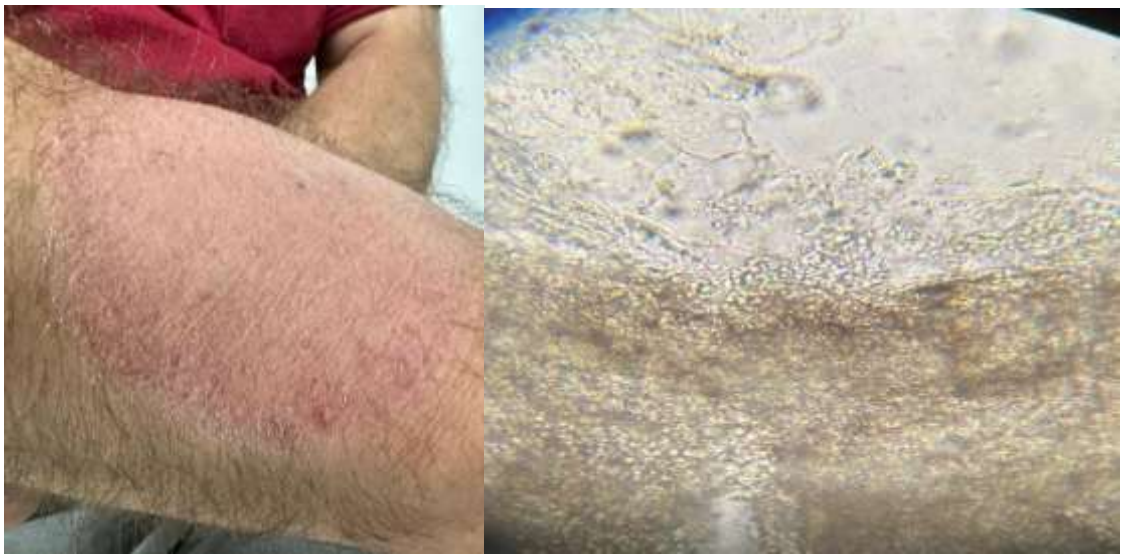

Figure 7. Clinical and microscopic findings in tinea corporis involving a hairy area.

The left image shows an erythematous, scaly plaque with broken hairs and localized hair loss, a clue suggesting fungal invasion of hair follicles. The right image illustrates a KOH mount of skin scrapings and hair fragments under light microscopy, revealing septate hyphae and fungal spores invading the hair shaft and follicular structures, confirming the diagnosis of dermatophytic infection.

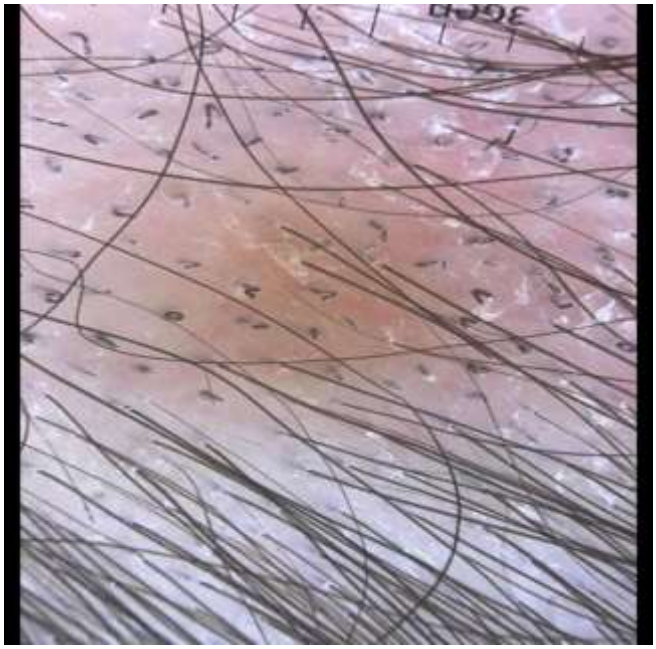

Figure 8. Dermoscopy of tinea capitis showing characteristic features, including comma hairs, corkscrew hairs, broken hairs, and black dots, which are indicative of fungal invasion of hair shafts. These findings are valuable for early diagnosis, monitoring treatment response, and detecting subclinical disease activity during follow-up.

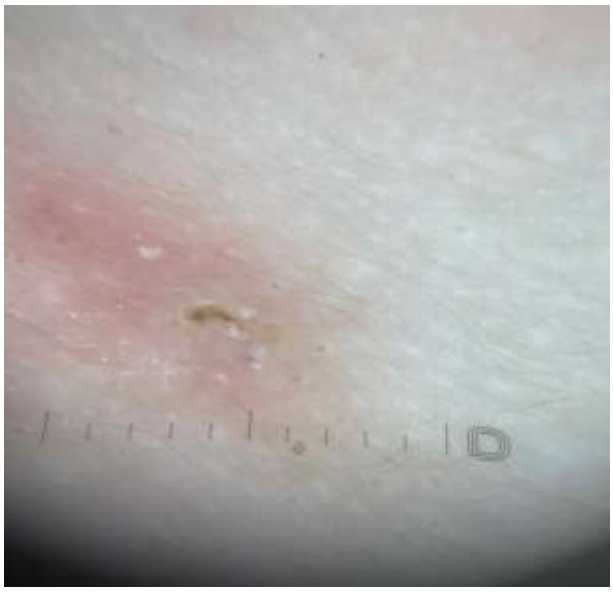

Figure 9. Dermoscopy of scabies (sarcoptic infestation) showing the classic "delta-wing jet" sign, which represents the anterior part of the mite at the end of its burrow. This finding is particular for scabies and allows rapid, non-invasive bedside diagnosis, reducing the need for skin scrapings in clinically typical cases.

Figure 10. Dermoscopy of verruca vulgaris (common wart) reveals characteristic features, including thrombosed capillaries appearing as black or red dots and globules, surrounded by a yellowish keratotic surface. These findings help differentiate warts from calluses or corns, guiding therapeutic decisions such as cryotherapy or the use of topical keratolytic agents.

Natural Resources for Human Health
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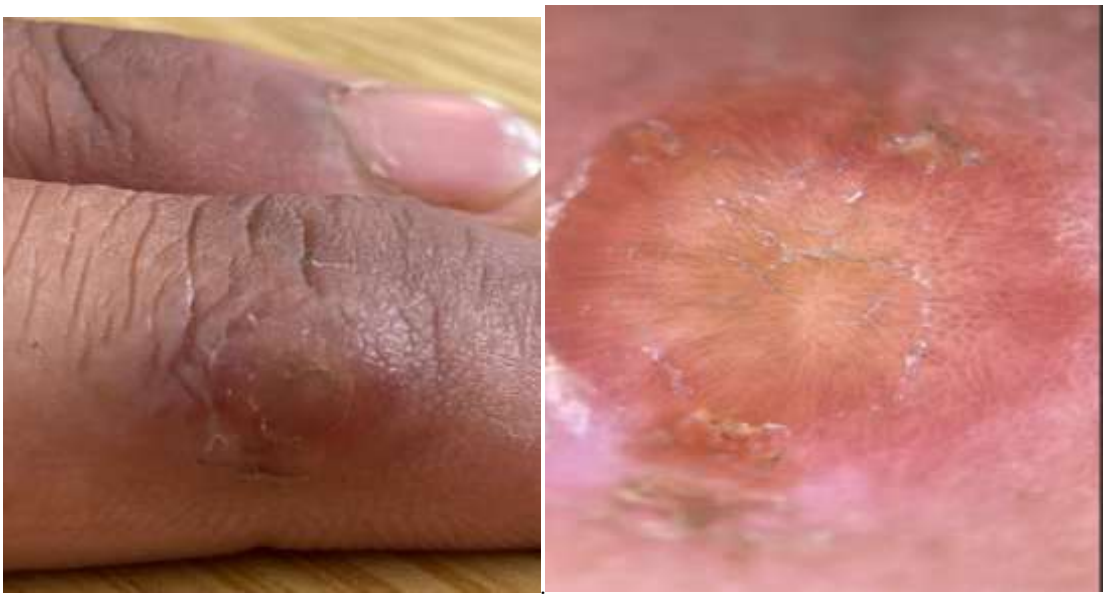

Figure 11. Clinical and dermoscopic features of orf infection. The left image shows a solitary, erythematous, noduloulcerative lesion on the finger, often seen in individuals with animal exposure. The right image demonstrates the dermoscopic view, revealing orange-yellow amorphous areas with central ulceration and a peripheral white halo, features that are highly suggestive of orf.

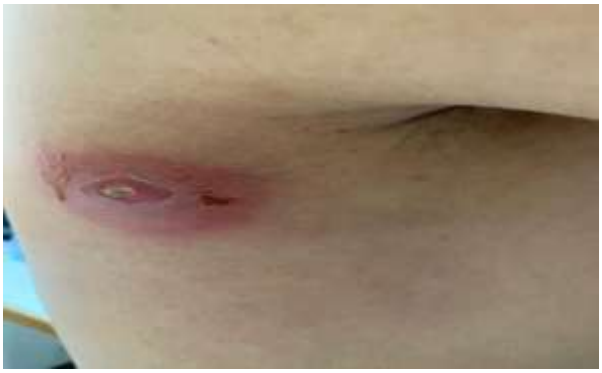

Figure 12. Clinical image showing a case of recurrent furunculosis in the axillary region, characterized by a well-defined, erythematous, indurated plaque with central ulceration and purulent discharge. This presentation highlights the importance of microbiological testing, including nasal and lesion-site swabs for Gram staining and culture, to identify bacterial pathogens (commonly Staphylococcus aureus) and guide appropriate antimicrobial therapy.

Natural Resources for Human Health
eISSN: 2583-1194

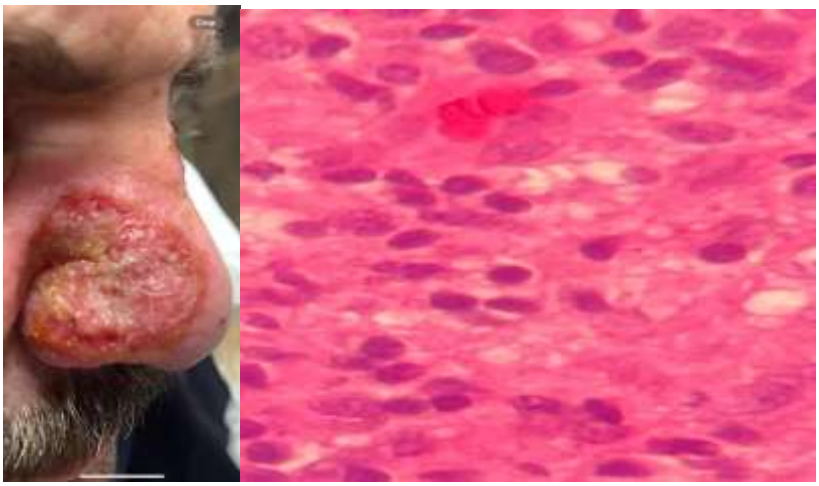

Figure 13: Clinical image of an ulcerated, crusted nodule on the nasal region with significant induration, highly suggestive of chronic cutaneous leishmaniasis. The accompanying histopathology (H&E stain, 400×) demonstrates dense dermal infiltrate with numerous macrophages harboring Leishmania amastigotes.

Legends of tables:

Table 1. Summary of Wood's Light Examination Results

Condition	**Number of Cases**	**Percentage (%)**	**Key Diagnostic Finding**
Tinea capitis	600	50%	Blue-green fluorescence (Microsporum species); in some cases, non-fluorescent (Trichophyton)
Tinea versicolor	200	16.7%	Yellow-golden fluorescence (Malassezia species)
Acne vs Pityrosporum folliculitis	160	13.3%	Red-orange fluorescence (Cutibacterium acnes) vs yellow-white follicular fluorescence (Malassezia)
Erythrasma	60	5%	Coral-red fluorescence (Corynebacterium minutissimum)
Pseudomonas intertrigo	10	0.8%	Bluish-green fluorescence (Pseudomonas species)
Others/Follow-up cases	170	14.2%	Used for lesion monitoring and diagnostic clarification

Table 2. Distribution and Diagnostic Findings of KOH Preparation (n ≈ 800)

Condition	Cases (n)	Percentage (%)	Key Diagnostic Findings
Tinea capitis	~500	62.5%	Positive in all clinically suspected cases; endothrix and ectothrix hyphae in hair shafts
Tinea corporis	~200	25%	Septate hyphae in classic and atypical lesions; 15–20% were tinea incognito
Tinea cruris	~30	3.8%	Positive in nearly all cases; sampling

			challenges due to moisture
Interdigital infections	~30	3.8%	Differentiated fungal vs Candida; 70% candidiasis, 5% tinea pedis, 10% mixed infections
Pityriasis versicolor	~30	3.8%	"Spaghetti and meatballs" pattern of Malassezia species
Onychomycosis	~20	2.5%	Low positivity; confirmed by culture in most cases (Aspergillus, non-dermatophyte molds)
Mucosal candidiasis	~10	1.3%	Positive in chronic candidiasis; negative in Behçet's and pemphigus cases

Table 3. Summary of Dermoscopy Findings

Condition	**Number of Cases / Frequency**	**Key Dermoscopic Findings**
Tinea capitis	~500 cases (all diagnosed cases)	Comma hairs, corkscrew hairs, black dots; useful for early diagnosis and monitoring (Fig. 8)
Scabies (Sarcoptic infestation)	~50% of scabies cases (~1 case/week)	'Delta-wing jet' sign (mite at end of burrow); highly specific for scabies (Fig. 9)
Warts (Verruca vulgaris)	Selected cases (not all wart cases)	Thrombosed capillaries as black/red dots; helps differentiate warts from calluses (Fig. 10)
Molluscum contagiosum	2–3 cases monthly	Central umbilication; polylobular white-yellow amorphous structures
Orf infection	14 cases	Orange-yellow structureless areas, central ulceration, peripheral white halo (Fig. 11)
Uncertain/Atypical lesions	Not specified (diagnostic ambiguity cases)	Provided diagnostic support, avoided unnecessary biopsies