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Original Article

Dermatoscopic study in dermatophytosis involving skin, hair and nail

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Abstract

Objective This study aimed to investigate the dermoscopic features of dermatophytic infections in the context of skin, hair, and nails. Additionally, the demographic profile of dermatophytosis cases in Karnataka Institute Of Medical Sciences, Hubballi, a tertiary care centre was explored.

Methods A cross-sectional study enrolled 350 patients with clinically diagnosed dermatophytosis attending the Dermatology Department at Karnataka Institute Of Medical Sciences, Hubballi. A purposive sampling of 323 patients was included. Demographic data and clinical history were collected using a pre-tested, semi-structured questionnaire. Dermoscopic examinations were conducted under aseptic conditions using a 10X magnification Digital Dermatoscope. Nail, hair, and clinically uncertain cases underwent KOH examinations.

Results Among 210 tinea corporis cases, scales (100%) were prominent, with peripherally distributed scales subclassified into Biett's collaret-like scaling (45.7%) and "moth-eaten appearance" (54.3%). A red background (93.3%) and grey background (31.4%) were noted. Tinea cruris primarily featured scaling (100%) and red background (91.1%). In tinea faciei, erythema (100%) and scales (93.5%) were prevalent, while tinea capitis exhibited perifollicular scales (100%) and broken hair (83.3%). Tinea pedis and manuum displayed white scales (100%) in skin creases, with erythema noted in 75% of cases. Dermoscopic features of tinea unguium included longitudinal ridges, white patches, and color changes.

Conclusion Dermoscopy revealed consistent patterns across age, sex, and affected site in dermatophytosis cases. Dermoscopy can complement clinical diagnosis, aiding in early initiation of treatment, reducing tinea prevalence, and minimizing unnecessary investigations. It holds potential significance, especially in the Indian dermatophytosis pandemic. These findings can be incorporated into treatment monitoring, with the disappearance of dermoscopic patterns suggesting therapy completion.

Key words
Dermoscopy; Dematophytosis; Tinea carporis; Tinea cruris.

Introduction

Dermatophytosis, commonly known as tinea, represents a superficial fungal infection affecting keratinized tissues encompassing the skin, hair, and nails. The global prevalence of superficial fungal infections impacting these elements reaches a staggering one billion cases,[1] with the World Health Organization (WHO) estimating a worldwide prevalence rate of 20-25%.[2] In specific regions such as North India, the prevalence of dermatophytosis ranges between

5% and 10%.[3]

The manifestation of dermatophytic infections exhibits a broad spectrum, influenced by factors including the fungal strain, the anatomical site of infection, and the patient's immunological status. Typically, clinical diagnosis is sufficient; however, in cases of uncertainty, confirmation is sought through diverse diagnostic approaches, including direct microscopic examination employing potassium hydroxide, fungal cultures, Wood's lamp assessment, and, on rare occasions, skin biopsy.[4] Nonetheless, these conventional mycological examinations are intricate, time-consuming, resource-intensive, and demand extensive expertise, as well as laboratory resources. Recently, the inclusion of dermoscopy has enriched the diagnostic arsenal, offering a noninvasive tool for enhancing the diagnosis of dermatophytosis.[5]

Dermoscopy, known variably as dermatoscopy, epiluminescence microscopy, or surface microscopy, introduces a noninvasive technique enabling rapid and magnified in vivo visualization of the skin. Through this approach, morphological features, often imperceptible to the unaided eye, become discernible. Utilizing a handheld device, dermoscopy facilitates real-time, high-resolution observation at varying magnifications. Additionally, it empowers clinicians to capture and archive images with ease.[6] As a consequential addition to the diagnostic toolkit, dermoscopy significantly augments our capacity to unravel dermatophytic infections and other dermatological conditions, ensuring more accurate and timely diagnosis and potentially revolutionizing our approach to managing these conditions.

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Study Objectives

The present study is driven by the following key objectives:

1. Exploration of Dermoscopic Patterns: The primary goal of this research is to comprehensively investigate and elucidate the dermoscopic features that characterize dermatophytic infections affecting the skin, hair, and nails. By delving into these distinctive patterns, we aim to enhance diagnostic accuracy and refine therapeutic approaches for dermatophytosis management.

2. Analysis of Demographic Composition: A fundamental aspect of this study involves an in-depth examination of the demographic profile pertaining to dermatophytosis cases within the Karnataka Institute of Medical Sciences Hubballi context. Through this inquiry, our aim is to gain comprehensive insights into the prevalence, distribution dynamics, and demographic heterogeneity of this condition, thereby enriching our understanding of its epidemiological impact.

Materials and Methods

The study was conducted at the Skin & STD Outpatient Department of Karnataka Institute Of Medical Sciences Hospital in Hubli, spanning a period of one and a half years from December 2018 to May 2020. It aimed to investigate cases of dermatophytosis among patients seeking medical care for such conditions, including those affecting hair and nails. The inclusion criteria comprised all patients with dermatophytic infections who attended the skin OPD and provided written consent for participation. Patients declining to take part in the study were excluded. Employing a hospital-based cross-sectional approach, the research involved consecutively enrolling individuals with clinically suspected dermatophytic infections as per the sampling procedure.

Patients diagnosed with dermatophytic infections visiting the OPD were enrolled after obtaining informed written consent from the patients or their guardians if minors were involved.

A pre-structured proforma was utilized to collect baseline data.

Detailed medical histories were taken, and thorough clinical examinations were conducted for all participants.

Dermatoscopic evaluation of all dermatophytosis lesions was performed using a DermLite 4th Generation device with 10x magnification.

Prior to examination, the area of interest was sanitized with spirit, and the dermoscope's contact plate was disinfected.

Normal skin, lesion borders, and lesion centers were visualized under non-polarized and polarized light, respectively. Photographic documentation was employed to record these observations.

The contact plate was disinfected after each use.

In cases of clinical doubt, specifically in instances of tinea incognito and dermatophytic involvement of hair and nails, direct microscopic examination for fungal elements was conducted. Clinical materials for this purpose were collected using sterile tools such as nail clippers, scissors, forceps for epilation, sterile scalpel blades, and curettes, along with sterile gauze squares.

Skin scrapings, crusts, nail clippings, or easily extractable hairs were collected on glass slides after cleansing the affected area with 70% ethyl alcohol.

Skin specimens were collected by gently scraping the advancing lesion border with a glass slide.

Nail specimens were procured through nail clippings of the infected region, preferably as proximal as possible, or by scraping the subungual area beneath trimmed nails to gather subungual debris.

Hair specimens were gathered by plucking hair with epilating forceps, including the root end, or by gently scraping the infected patch using the blunt side of a scalpel blade.

Collected specimens underwent potassium-hydroxide (KOH) wet preparation for fungal element identification. Skin and hair specimens were treated with 10% KOH, while nail specimens were treated with 40% KOH. The specimens were mounted on glass slides, a few drops of KOH were added, and a cover slip was placed. After incubating for 20 minutes for skin scrapings and overnight for nail and hair specimens, the fungal elements became discernible as highly refractive, hyaline, septate branching filaments.

Sample size was calculated to estimate the proportion of T corporis/ cruris among total new tinea cases. Based on previous records, data indicate that the about 70% of the total new tinea cases attending our OPD are T Corporis/ cruris, to estimate the true proportion within 5% points with 95% confidence we require a minimum of 323cases.

A total sample size of 350 new cases were included.

$$\text{Sample size } n \geq \frac{(Z_{1-\frac{\alpha}{2}})^2 P(100-P)}{(d)^2}$$

$Z_{1-\alpha/2}$ - table value for confidence level of 95%= 1.96

P = Proportion of T Corporis/cruris =0.70(70%)

1-P = 1-0.911= 0.3 (30%)

d = Error = 0.05 (5%)

$$n = \frac{1.96^2 \text{ X } 0.7 \text{ X } 0.3}{0.05^2} = 323$$

Results

A total of 350 patients were enrolled for the dermatoscopic study conducted between December 2018 and May 2020. The mean duration of the disease among the participants was 3.1 months. The age spectrum varied significantly, with the youngest patient being only 1 year old and the oldest patient aged 74 years. The study population predominantly consisted of individuals in the age bracket of 21-30 years (31.1%), followed by those in the age ranges of 31-40 years (27.1%) and 41-50 years (16.3%). Of the 350 cases, 189 (54%) were males and 161 (46%) were females, yielding a male-to-female ratio of 1.17:1. It was notable that males outnumbered females in all age groups, with the age group of 21-30 years being the most affected.

Of the 350 patients, 295 (84%) hailed from urban areas, whereas 55 (16%) were from rural areas. The occupation-based distribution highlighted that the majority of participants were homemakers (33.1%), followed by shopkeepers (23.7%).

A significant 29.4% of cases had a family history of dermatophytosis. Treatment patterns revealed that a substantial proportion of patients resorted to over-the-counter drugs (37.1%), followed by antifungals (13.1%) and steroid combinations (12.9%).

The groin region was the most commonly affected site, observed in 61.7% of cases, followed by the abdomen (27.1%). Notably, multiple site involvement was observed in 51.1% of cases, with tinea corporis accounting for 25.7% of cases, and tinea cruris and tinea faciei contributing 15.7% and 4% respectively. Tinea capitis, tinea pedis, and tinea manuum were relatively less frequent, with 1.4%, 0.6%, and 0.9% of cases respectively. Among the mixed clinical types, tinea corporis and tinea cruris coexistence was the most prevalent (84%).

Dermoscopic examination of 210 tinea corporis cases revealed scales as the most common feature (100%), characterized by distinct types. Peripherally distributed scales, including Biett's collaret-like scaling (45.7%) and "moth-eaten appearance" (54.3%), were prominent **(Table 1)**. Other features included perifollicular scales (23.8%), scales along skin creases (25.2%), erythema (93.3%), and grey background (31.4%). Notably, non-follicular pustules (10.4%), yellow globules (5.2%), red globules (11.4%), black globules (12.4%), and hair changes (7.1%) were also observed. Scaling (100%) and a red background (91.1%) were the predominant dermoscopic features in tinea cruris cases **(Table 2)**.

Table 1 Dermoscopic features in tinea corporis.

Dermoscopic features of tinea corporis	*Frequency (%)*
Red background	196 (93.3%)
Grey background	66 (31.4%)
Biett's collaret-like scaling	96 (45.7%)
Moth-eaten appearance	114 (54.3%)
Perifollicular scale	50 (23.8%)
Scales along the skin creases	53 (25.2%)
Pustules	22 (10.4%)
Yellow globules	11 (5.2%)
Red globules	24 (11.4%)
Black globules	26 (12.4%)
Hair changes	15 (7.1%)
Hypopigmented terminal hairs	10 (4.8%)
Morse code hair	2 (1%)
Broken hair	1 (0.5%)
Break in the medulla	1 (0.5%)

Table 2 Dermoscopic features in tinea cruris.

Dermoscopic features	*Frequency (%)*
Red background	51 (91.1%)
Grey background	13 (23.2%)
Biett's collaret-like scaling	18 (32.1%)
Moth-eaten appearance	38 (67.9%)
Perifollicular scale	6 (10.7%)
Scales along the skin creases	15 (28.6%)
Non-follicular Pustules	14 (25%)
Yellow globules	3 (5.4%)
Red globules	18 (32.1%)
Black globules	7 (26.8%)
white structureless areas	1 (1.8%)
Hypopigmented terminal hairs	10 (17.9%)
Morse code hair	2 (3.6%)
Broken hair	2 (3.6%)
Bent hair	2 (3.6%)

Table 3 Dermoscopic features in tinea faciei.

Dermoscopic features	*Frequency (%)*
Red background	28 (96.6%)
Grey background	1 (3.4%)
Biett's collaret-like scaling	3 (10.3%)
Moth-eaten appearance	26 (89.7%)
Perifollicular scale	7 (24.1%)
Scales along the skin creases	3 (10.3%)
Pustules	2 (6.9%)
Yellow globules	1 (3.4%)
Red globules	6 (20.7%)
Black globules	1 (3.4%)
Hypopigmented terminal hairs	3 (10.3%)
Morse code hair	2 (6.9%)
Broken hair	1 (3.4%)

In tinea faciei, erythema (100%) and scaling (93.5%) were the most common findings, followed by crust (32.3%) **(Table 3)**.

Perifollicular scales (100%), broken hair (83.3%), and cigarette sheath (66.7%) were the prominent dermoscopic features of tinea capitis. Among these cases, 50% yielded fungal elements on KOH examination **(Table 4)**.

Erythema and scales were observed in all tinea manuum cases. Scales were particularly prominent at the border, with 87.5% showing scales along creases.

Dermoscopic evaluation of tinea incognito highlighted erythematous (red) background (74.4%) and grey background (15.4%) **(Table 5)**. Biett's collaret-like scaling (28.2%), moth-eaten appearance (48.7%), perifollicular scaling (5.1%), and scales along skin creases (10.3%) were observed. Additional findings included yellow globules (5.1%), red globules (20.5%), black globules (7.6%), and hair changes, such as barcode hair (5.1%) and light-colored hair (23.1%). Dotted vessels and telangiectasias were noted in 17.9% of cases, and non-follicular pustules were seen in 12.8% of cases.

In comparing dermoscopic features between tinea of non-glabrous skin with and without steroid abuse, it was observed that erythema, scaling, hyperpigmentation, and crust were more prevalent in patients without a history of steroid use. Conversely, striae and telangiectasias were more commonly seen in patients with a history of steroid use.

Table 4 Dermoscopic features in tinea capitis.

Dermoscopic features	*Frequency (%)*
Diffuse scale	1 (16.7%)
Perifollicular scales	6 (100%)
Cigarette sheath	4.0 (66.7%)
Brokenhair	5 (83.3%)
Corkscrewhair	2 (33.3%)
Zigzaghair	3 (50.0%)
Morsecodehair	2 (33.3%)
Yellow crust	2 (33.3%)
Velloushair	2 (33.3%)
Haemorrhage/redcrust	1 (16.7%)

Table 5 Dermoscopic features in tinea incognito.

Dermoscopic features	*Frequency (%)*
Red background	29 (74.4%)
Grey background	6 (15.4%)
Biett's collaret-like scaling	11 (28.2%)
Moth-eaten appearance	19 (48.7%)
Perifollicular scale	2 (5.1%)
Scales along the skin creases	4 (10.3%)
Non-follicular Pustules	5 (12.8%)
Yellow globules	2 (5.1%)
Red globules	8 (20.5%)
Black globules	3 (7.6%)
Hypopigmented terminal hairs	9 (23.1%)
Morse code hair	1 (2.6%)
Broken hair	1 (2.6%)
Break in the medulla	0 (0%)
Telengectesia	7 (17.9%)

Discussion

In this study, we delved into the clinical and dermoscopic aspects of dermatophytosis, focusing on various clinical types, demographic characteristics, and dermoscopic features. Our findings are corroborated with existing literature, providing valuable insights into the epidemiology and diagnostic tools for this prevalent skin condition.

Age is a pivotal factor in the epidemiology of dermatophytosis, with the age group of 21-30 years exhibiting the highest prevalence at 31.1%. This finding aligns with studies by Hanumanthappa *et al;*[7] Noronha TM *et al;*[8] Yasmeen Jabeen Bhat *et al;*[5] and Surendran *et al*.[9] The increased incidence in this age group could be attributed to their heightened activity levels, engaging in various tasks such as household work, agriculture, and manual labor, which exposes them to environmental sources of infection. While some studies, like Bindu V *et al;*[10] reported a higher prevalence among the 11-20 years age group, our mean age group affected (32.597±12.5748) was similar to Asma Arif Hussain *et al.*[11] mean age of 38±8.7 years.

Gender-wise distribution revealed that males (54%) were more commonly affected than females (46%), with a male-to-female ratio of 1.17:1. This male predominance was consistent with studies by Poria *et al;*[12] Hanumanthappa H *et al;*[7] Yasmeen Jabeen Bhat *et al;*[5] Surendran *et al;*[9] and Asma Arif Hussain *et al.*[11] This discrepancy could be attributed to increased exposure to the contamination source in workplaces and lower health-seeking behavior among females. Similar observations were made, even when considering cases concomitant with HIV infection.[13]

Residence-wise, urban areas had a higher case representation, in line with Noronha *et al;*[8] while studies by B Janardhan *et al.*[14] and Sumana *et al.*[15] reported higher cases from rural regions. This disparity is likely influenced by disease prevalence, local healthcare infrastructure, and accessibility.

Occupationally, housewives (33.1%) topped the list of affected individuals, followed by shopkeepers (23.7%). The continuous exposure to water during household activities and traditional Indian garments like saris or salwar kameez (known for their tight waistlines) might contribute to the increased prevalence among housewives. Kaviarasan *et al;*[13] on the other hand, identified laborers (43.9%) and drivers (29.3%) as the most affected groups in their study.

Tinea corporis emerged as the most common clinical type in our study, accounting for 25.7% of cases. Similar findings were observed in studies by Rao BR *et al;*[16] Siddappa K *et al;*[17] Bindu V *et al;*[10] Kaviarasan PK *et al;*[13] Singh S *et al;*[18] and Yasmeen Jabeen Bhat *et al*.[5] However, Sardari L *et al.*[19] and Verma *et al.*[20] reported tinea cruris as the primary subtype. Tinea corporis predominantly affected the age group of 21-30 years (29.30%), consistent with Poria *et al.*[12] and Noronha *et al*.[8] While we observed a female preponderance, Siddappa K *et al.*[17] and Sumana V *et al.*[15] reported male preponderance in their studies.

Tinea cruris had a prevalence of 15.7%, in line with Bindu V *et al;*[10] while Karmakar S *et al.*[21] reported a higher prevalence of 34.5%. We noted a higher prevalence in the age groups of 21-30 and 31-40 years, similar to Janardhan *et al*.[14] Our study indicated a male predominance of 65.5%, consistent with Janardhan *et al*.[14]

Tinea capitis **(Figure 1)** was observed in 1.7% of cases, with a higher incidence among the 1-10 years age group (50%). This aligns with studies by Janardhan *et al*.[14] and Bindu *et al*.[10] Notably, this condition was equally distributed between

Figure 1 Clinical picture showing tinea capitis.

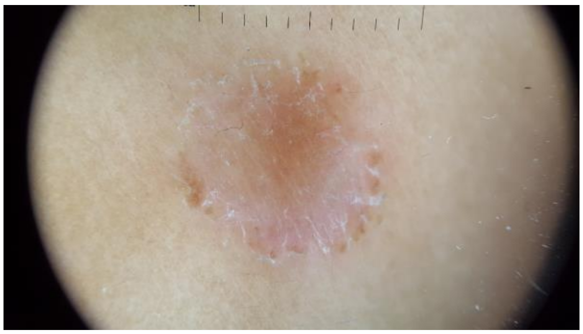

Figure 2 Dermoscopic picture showing Biett's collaret-like scaling.

males and females, but studies by Janardhan *et al.*[14] reported male predominance in the 1-10 years age group.

Dermoscopy emerged as a promising diagnostic tool, particularly in challenging cases and for distinguishing dermatophytosis from other conditions. In tinea corporis, scales and their variations were prominent. Peripherally distributed scales, including Biett's collaret-like scaling **(Figure 2)** and the "moth-eaten appearance," were present, consistent with literature.[11] The background color showed a shift from erythema in early stages to a greyish hue in later stages, a pattern echoed in other studies.[22]

Tinea capitis exhibited characteristic trichoscopic findings, including perifollicular and interfollicular scales **(Figure 3)**, comma hairs, corkscrew hairs **(Figure 4)**, and broken hairs, corroborating findings from studies by Vivek V Nikam *et al.* and Anna Waśkiel-Burnat *et al*.[23,24]

Tinea manuum and pedis were diagnostically challenging due to their similarity to other conditions. Dermoscopy offered insight into whitish scales, perifollicular scaling, and characteristic changes in dermatoglyphics. These findings were supported by literature.[5,11,25]

For onychomycosis, dermoscopy provided valuable insights into distinct features like whitish scales, longitudinal striae, ruin appearance, and changes in the nail plate. These findings aligned with previous studies.[5]

The emergence of tinea incognito due to corticosteroid abuse necessitates accurate diagnosis. Dermoscopy played a crucial role in distinguishing this condition from eczema and psoriasis. Noteworthy dermoscopic changes included background erythema, perifollicular scales, dots, globules, hair changes, and telangiectasias. Dotted vessels and telangiectasias were indicative of steroid use and were not present in typical tinea corporis cases, as reported by Sidharth Sonthalia *et al*.[26]

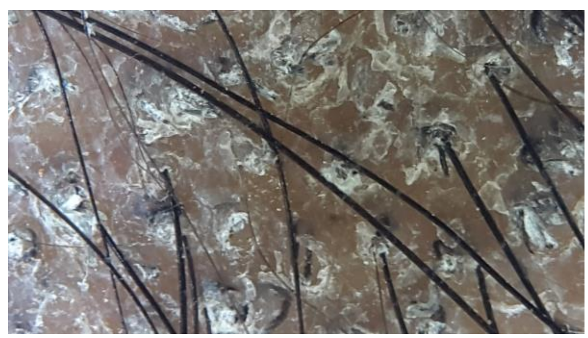

Figure 3 Dermoscopic picture showing perifollicular and interfollicular scales.

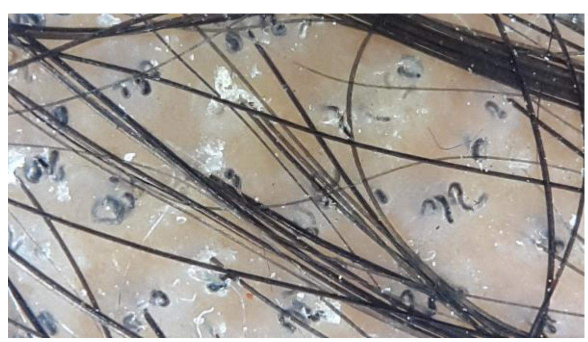

Figure 4 Dermoscopic picture showing comma hairs and corkscrew hairs.

Conclusion

In summary, our study comprehensively explored the clinical and dermoscopic aspects of dermatophytosis. The demographic patterns we observed and the dermoscopic features we documented emphasize the utility of dermoscopy as a diagnostic aid, offering novel insights into the accurate diagnosis and management of dermatophytosis cases. It holds potential significance, especially in the Indian dermatophytosis pandemic. These findings can be incorporated into treatment monitoring, with the disappearance of dermoscopic patterns suggesting therapy completion. Our findings align with existing literature, consolidating the knowledge surrounding this prevalent dermatological concern.

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