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Dermoscopic Evaluation of Onychomycosis Patterns: Cross-sectional Evidence from a Tertiary Care Teaching Hospital

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ABSTRACT

Objective: To evaluate the different Dermoscopic patterns of onychomycosis.
Study Design: Cross-sectional Study.
Place and Duration of Study: Department of Dermatology, PNS Shifa Hospital, Karachi Pakistan, from Aug 21 to Feb 22.
Methodology: A total of 200 patients with clinically diagnosed onychomycosis were included in the study via a non-probability consecutive sampling technique. Onychoscopic examination was done with a handheld dermoscope (HEINE DELTA 20T DERMETOSCOPE) a ×10 magnification. All Onychoscopic patterns were identified, documented, and statistically analyzed using Mean, SD, frequency, and percentages.
Results: Out of 200 cases, 72(36%) were men and 128(64%) were women with a ratio of 1:1.7. The Majority of patients were in an age range of 40–56 years, 100(50%) followed by 20–40 years 88(44%), and greater than 60 years 12(6%). The duration of signs of nail disease was between 2 months to 2 years. Distal and lateral subungual onychomycosis in 148(74%) patients was the most prevalent clinical condition, and most frequently seen clinical sign was discoloration of nail plates in 180(90%) patients. The common Onychoscopic patterns observed were spikes in 90(45%) patients, followed by distal irregular termination in 72(36%), jagged in 54(27%), longitudinal striae in 94(47%), and linear edge in 6(3%). No association was found between these patterns and age, duration of disease, gender, type of onychomycosis, and co-morbidities (p>0.05).
Conclusion: Onychoscopy is a simple, non-invasive, quick, and affordable diagnostic procedure that can be used to identify minute nail alterations that are invisible to the unaided eye. It helps with early nail issue diagnosis so that treatments can begin even before the disease worsens.

Keywords: Dermoscopy, Distolateral Subungual Onychomycosis, Onychoscopy, Patterns of Onychomycosis.

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INTRODUCTION

Onychomycosis (OM) is a fungal infection of the nail plate that can be caused by dermatophytes or non-dermatophytes. The condition is known as "tinea unguium" when onychomycosis is caused by dermatophyte invasion.[1] Onychomycosis is the most common nail condition, accounting for 50% of all nail diseases, with prevalence ranging from 2 to 13% in all age groups.[2] OM has an impact on the patient's quality of life if the nail is disfigured, it affects both patient's physical and mental health. Reviews on this matter reveal a psychological and psychosocial impact as high as 92%.[3] Age, social class, job nature, & environmental variables are all deciding factors in the disease's prevalence.[4] Elderly and diabetics having poor peripheral circulation are more susceptible to OM. Patients who are HIV positive are also vulnerable to developing OM.[5] It is typically diagnosed clinically & verified by a 10-30% KOH microscopic examination on histopathology, fungal culture, and/or periodic acid Schiff (PAS) stain of the nail plate.[6] Nevertheless, the test is limited by its sensitivity and specificity.[2,7]

Dermoscopic evaluation of the nail and its related components is known as onychoscopy. This technique aids in recognition of diverse patterns and serves as a connection between inspection and nail histopathology, allowing physicians, particularly dermatologists, to decrease the number of needless investigations.[8] Onychoscopy, in comparison to other procedures for diagnosing onychomycosis, such as nail plate biopsy, fungal culture, and direct examination, is a non-invasive, rapid, and affordable tool.[9]

OM treatment can be long-term, expensive, & can have serious side effects; it is critical to do it right for the first time. Dystrophic nails can be embarrassing, lowering a patient's self-esteem, and have a bigger effect on life than the condition itself.[10]

Since there is a sparsity of data nationally and internationally on the subject of dermoscopic patterns, this study was designed for Dermoscopic assessment of OM in a tertiary care teaching hospital. Recognition

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of these features would provide clinicians with a rapid, easy, and additive tool for diagnosing OM.

METHODOLOGY

This cross-sectional study was conducted over a period of six months at the Department of Dermatology, PNS Shifa Hospital, Karachi Pakistan, from Aug 21 to Feb 22, after approval by the institutional ethical committee vide no. ERC/2021/DERMA/06. A total of 200 cases were included in our study using a non-probability sampling technique.

Inclusion Criteria: The clinically diagnosed cases of OM of individuals aged between 18 to 80 years of either gender were included.

Exclusion Criteria: Patients who previously received systemic or topical therapy for fungal diseases were excluded from the study. Onychomycosis, such as post-traumatic, Lichen planus, and psoriasis, was excluded (thereby making our patient selection highly specific) based on history (trauma, pruritic lesions suggestive of disease elsewhere) and clinical examination. Whereas necessary investigations like skin biopsy were done to confirm the diagnosis of conditions mimicking onychomycosis.

After obtaining written permission from patients, a thorough history along with skin, nail, and systemic examinations were conducted. The sample size was determined using the OPENEPI calculator, based on a 50% prevalence of onychomycosis, a margin of error of 7%, and a confidence level of 95%. The calculated sample size was 200. Dermoscopic examination was carried out using a handheld HEINE DELTA 20T Dermoscope (San Juan, Capistrano, CA, USA) with a ×10 magnification, applied with ultrasound gel. Digital photographs were taken with iPhone 6s. Two dermatologists evaluated the images to avoid bias, and different patterns of OM were noted. The largest lesion area was selected when multiple nails were affected in the same patient. In most cases, the analysis of the two dermatologists were comparable, and re-examination, as well as consensus, resolved a few disparities.

The authors attested that every patient had signed the necessary consent forms and given their consent for their pictures and other clinical information to be published in journals. Patients were informed that their identities would not be made public and that while every effort would be made to maintain their anonymity, this could not be guaranteed. Data regarding age, gender, duration of disease, color of nail plate, and type of OM were recorded. Data was analyzed in SPSS software version 22. Mean+SD were calculated for quantitative variables, and frequency and percentages were evaluated for qualitative outcome variables like age groups, gender, clinical findings, type of OM, co-morbid conditions (were assessed from medical documented history), and Dermoscopic findings. Chi-square test or Fisher exact test was applied to see the association between Dermoscopic patterns and age, duration of disease, gender, type of OM, and Co-morbidities. A p-value <0.05 was considered statistically significant.

RESULTS

Out of 200, 72(36%) were men and 128(64%) were women, with a ratio of 1:1.7, and duration of the nail disease was from 2 months to 22 years. The demographic details of the patient are given in [Table-I]. In our study, most common dermoscopic finding was longitudinal striae 94(47%), followed by spike pattern 90(45%), distal irregular termination 72(36%), jagged 54(27%), and linear edge 6(3%) [Table-II]. No association was seen between dermoscopic patterns and age, duration of disease, gender, type of OM, and Comorbid conditions, as p>0.05 [Table-III].

Table-I: Demographic Details of the Patients (n=200)

Demographic Details	Frequency n(%)
Age Groups (years)	
20 to 40	88(44%)
40 to 60	100(50%)
>60	12(6%)
<5	160(80%)
5	40(20%)
Gender	
Male	72(36%)
Female	128(64%)
Type of OM	
Distolateral subungual onychomycosis (DLSO)	148(74%)
Proximal subungual onychomycosis (PSO)	4(2%)
Total dystrophic onychomycosis (TDO)	40(20%)
DLSO + TDO	8(4%)
Clinical findings	
Discoloration of nail plate	180(90%)
Color	
Mix	74(41%)
Brown	59(32.7%)
Yellow	27(15%)
Black	20(11.1%)
Other Features	
Onycholysis	100(50%)
Subungual keratosis	34(17%)
Paronychia	18(9%)
Beau's lines	18(9%)
Pitting	4(2%)
Co-morbid	
Diabetes	64(32%)

Hypertension	24(12%)

Table-II: Dermoscopic findings in patients of Onychomycosis

Dermoscopic findings	Frequency n(%)
Distal irregular termination	72(36%)
Spike Pattern	90(45%)
Jagged	54(27%)
Longitudinal striae	94(47%)
Linear edge	6(3%)

Table-III: Association of Demographic Details with Dermoscopic findings of Onychomycosis

Demographic details	Distal irregular termination (n=72)	Spike pattern (n=90)	Jagged (n=54)	Longitudinal striae (n=94)	Linear edge (n=6)	*p*-value
Age Groups (years)						
20 to 40	17(23.6%)	11(12.2%)	12(22.2%)	14(14.8%)	01(16.6%)	0.28
40 to 60	42(58.3%)	69(76.6%)	33(61.1%)	69(73.4%)	03(50%)	
>60	09(18.1%)	10(11.1%)	09(16.6%)	11(11.7%)	02(33.3%)	
Duration of disease						
<5	64(88.8%)	81(90%)	49(90.7%)	81(86%)	05(83.3%)	0.81
5	08(11.2%)	09(10%)	05(9.2%)	13(14%)	01(16.6%)	
Gender						
Male	22(30.5%)	32(35.5%)	17(31.4%)	21(22.3%)	01(16.6%)	0.34
Female	50(69.5%)	58(64.4%)	37(68.5%)	73(77.6%)	05(83.3%)	
Type of OM						
DLSO	61(84.7%)	67(74.4%)	45(83.3%)	69(73.4%)	05(83.3%)	0.67
PSO	01(1.4%)	01(1%)	01(1.8%)	00(0%)	00(0%)	
TDO	07(9.7%)	20(22.2%)	07(13%)	21(22.3%)	01(16.6%)	
DLSO + TDO	03(4.1%)	02(2.2%)	01(1.8%)	04(4.2%)	00(0%)	
Co-morbid						
Diabetes	55(76.3%)	57(63.3%)	32(59.2%)	59(62.7%)	04(66.6%)	0.54
Hypertension	02(23.6%)	04(36.6%)	03(5.5%)	04(37.3%)	01(16.6%)	

**OM: Onychomycosis*
DLSO: Distal and lateral subungual onychomycosis
PSO: Proximal subungual onychomycosis
TDO: Total dystrophic onychomycosis

Figure-1: Longitudinal Striae

Figure-2: Spiked and Jagged Margins in Onychomycosis

Figure-3: Linear Edge

DISCUSSION

The study revealed that Onychoscopy is a simple, non-invasive and accurate dermoscopic diagnostic tool to give insight on the patterns of onychomycosis of nails. The analyzed data of this study has established as a standard to understand the various patterns of the disorder and will aid dermatologist to effectively treat the condition. As onychomycosis is a chronic disorder with frequent relapses, it becomes imperative on the part of the clinician to identify the causative organism. Further, studying its various patterns also gives insight to the treating dermatologist with regard to management strategies. Therefore, it is imperative to distinguish the OM from other nail disorders.

Although the potassium hydroxide smear and fungal culture are confirmatory diagnostic techniques, they are not only time-consuming and expensive, but their sensitivity is also limited to 48% to 80% and 25% to 80%, respectively.[11] Newer diagnostic procedures, explained by Kaur *et al.,* such as polymerase chain reaction (PCR) and optical coherence tomography (OCT), are costly and not easily accessible.[12]

Dermoscope is a novel, non-invasive diagnostic tool that can be used as a supplementary method to examine nail changes linked to various dermatological conditions. It becomes especially important when nail features are indiscernible to the naked eye or when there are no skin manifestations. The most frequently observed finding in our study was nail plate discoloration (90%), with the following colors: mixed (41%), brown (32.7%), yellow (15%), and black (11.1%), which is similar to the results of Vasava *et al.,* and Frazier *et al.*[13,14]

Rafiq *et al.,* also discovered onycholysis as one of the most frequent clinical findings, which was similar to Kilinc *et al.,* findings.[15,16] Still, this study revealed

that onycholysis is not so common in the study participants. In study patients, distal lateral subungual onychomycosis (DLSO) was the commonly diagnosed type of OM (74 percent), which is greater than the 50.6 percent consistent with a study conducted by Jesús-Silva *et al.*, revealed that dermoscopy may be used as an important diagnostic tool when evaluating nail disease.[17]

Lipner *et al.*, highlighted that Onychomycosis is a fungal nail infection caused by dermatophytes, non-dermatophytes, and yeast, and is the most common nail disorder seen in clinical practice. Hence, early diagnosis and treatment plan will save the patients from local pain, paresthesias, difficulties performing activities of daily life, and impairing social interactions.[18] Alexander *et al.*, also provided a similar update on the evaluation, diagnosis, and treatment of onychomycosis.[19]

The anatomy of the hyponychium, that is, the gap where the nail plate separates from the deeper tissues, makes it the weakest part of the nail apparatus, allowing pathogens to enter and serve as a reservoir for them, which explains the higher occurrence of DLSO.[20] Distal irregular termination, ruin appearance, spike pattern, longitudinal stria, smooth demarcation, superficial transverse striation, and other dermoscopic patterns of OM have been described by De Crignis *et al*.[21]

In our study, it was observed that longitudinal striae (47%) and spike pattern (45%) were as most prevalent dermoscopic features, which align with the findings of the studies conducted by Chetana *et al.*, and Abdallah *et al*.[22,23] On the other hand, Vasava *et al.*, had discovered distal irregular termination as the most frequent one.[13]

Literature such as Kayarkatte *et al.*, has identified a significant link between dermoscopic patterns and the type of OM, which contradicts our study's findings.[24] Additionally, this research did not find any statistically significant connection between dermoscopic patterns and factors like age, gender, disease duration, or comorbidities, a discovery not previously reported. Nonetheless, a more detailed assessment with a larger sample size could yield more conclusive results.

LIMITATION OF STUDY

Causality cannot be established, as exposure and outcome are measured at a single point in time. Findings may be influenced by recall or reporting bias, limiting the accuracy of self-reported data. The sample represents only one time frame, reducing the ability to observe changes or trends over time.

CONCLUSION

Onychoscopy is a simple, non-invasive, quick, and affordable diagnostic tool that can identify tiny nail changes invisible to the naked eye. It aids in early diagnosis of nail issues, enabling treatment before the condition worsens. Additionally, it can help differentiate between benign and malignant conditions, sparing patients painful and unnecessary nail biopsies. It also allows for monitoring disease progression. However, the interpreter must be knowledgeable about nail anatomy and nail diseases. Therefore, routine nail examinations should include nail dermoscopy regularly.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

FZ & AB: Data acquisition, data analysis, critical review, approval of the final version to be published.

TMM & NA: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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