

ORIGINAL RESEARCH

Onychoscopic assessment of onychomycosis: A cross-sectional study from tertiary care center of north India

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ABSTRACT

Background: Onychomycosis is a fungal infection in the nail region that accounts for 18-40% of all nail problems. Traditionally KOH, culture or PASS is used for the diagnosis of onychomycosis. Onychoscopy is a noninvasive technique that enables the visualisation of the nail plate as well as the nail folds, nail bed, nail matrix, and the vessels and fine structure of the free margin of nail. **Objective:** Present study aims to analyse onychoscopic patterns in clinically proven onychomycosis. **Methodology:** Out of 15 clinically suspected cases, 11 patients (150 nails) were with confirmed onychomycosis were studied by onychoscopy. Videodermatoscope was used in both polarized and non-polarized mode to study the various patterns in onychomycosis. The most frequent onychoscopic patterns were identified. **Results:** The mean duration of onset of disease was 11.67 ± 7.63 years and mean duration of disease progression was 5.33 ± 4.50 years. PSOM was observed in 50 nails, DLSOM found in 50 nails, WSO reported in 30 nails and Endonyx found in 20 nails. Among 150 nails, special patterns of onychomycosis in patients revealed ruin appearance in 78 (52%) nails, longitudinal striae in 57 (38%) nails, and spike pattern 15 (10%) nails. **Conclusion:** According to the findings of our study, nail plate dermoscopy can be used as an easy, rapid, and affordable method to improve onychomycosis diagnostic accuracy in situations where mycological investigations are not easily accessible.

Keywords: Onychomycosis, dermoscopy, onychoscopy, PSOM, DLSOM.

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INTRODUCTION

Onychomycosis is a slow-growing nail fungal infection, that if left untreated, may result in the total loss of the nail plate. Onychomycosis accounts for 18-40% of all nail problems and roughly 30 percent of all dermatophyte infections. Onychomycosis affects 0.5-12% of Indian population and around 5% global population and is thought to affect some groups more frequently, including those with diabetes, people who are immunosuppressed, and the elderly(1). Onychomycosis infection is dermatophytic in 99% cases or could be nondermatophytic in only 1% of cases. The most prevalent causative pathogens are the dermatophytes, *Trichophyton rubrum* and *Trichophyton mentagrophytes*. Various clinical types of onychomycoses include the distal lateral subungual, proximal subungual, white superficial, endonyx, total dystrophic. The yeast *Candida albicans*, *Candida tropicalis*, *Aspergillus*, and other

moulds may be to blame among the nondermatophytes(2).

Compared to fingernails, toenails are far more likely to be affected. At first, just one nail is affected; subsequently, numerous nails may get infected, although frequently one or more might remain healthy. Deformed nails become unappealing to others, which can lower the self-esteem of patients and impart a feeling of depression(3). Onychomycosis is a critical medical condition that can lead to other fungal infections in neighbouring tissues. Additionally, especially in high-risk populations like diabetics, it can enhance risk of further bacterial infections (4). In the diagnosis of onychomycosis, the sensitivity of KOH is found to be 81.82% whereas sensitivity of PAS found to be 84.56%, and sensitivity of culture found to be 57%. KOH exhibit a specificity of 92.86%, culture specificity was 92.86%, and PAS specificity was 57.14% (5). Dermoscopy of nail or

onychoscopy is a noninvasive, quick, reproducible and lab-based procedure. Onychoscopy can help improve the diagnostic sensitivity because it enables the visibility of the nail plate as well as the nail folds, nail matrix, nail bed, and the vessels and fine structure of the free margin of nail (6). The entire nail can be seen at 10 × magnification; however, accuracy is enhanced when magnification is increased from 20 × to 70 × (7). A dermoscope without a medium can be used to directly view lesions on the nail plate surface; however, gel must be used as an interface in order to assess the distal nail margin, nail separation, and nail colour (8). A jagged proximal edge with spikes, longitudinal striae, a ruin-like look, and longitudinal ridges in the nail bed are the four dermoscopic features unique to onychomycosis (9). The proximal nail jagged edge is referred to as the spiked characteristic. The longitudinal striae characteristic denotes the invasive growth of dermatophytes along the nail plate toward the nail lunula. A lesion with a smooth linear edge is described as the linear edged characteristic. The distal irregular characteristic displays the comminution of the thickened nail plate (8, 9). Present study was conducted to study the onychoscopic patterns in clinically proven onychomycosis patients. We also determine the correlation of onychoscopic patterns with the severity of onychomycosis.

METHODOLOGY

Study Design: Present study was a prospective, observational, descriptive, hospital-based study conducted over a duration of six months. The study involved examining consecutive individuals who presented to the dermatology outpatient department of our tertiary care teaching hospital in North India and were clinically diagnosed as onychomycosis relating to their nails and nail folds. After receiving the necessary consent from the institutional ethics committee, the study was carried out.

Study Population: A total of 150 nails showing clinical features of onychomycosis were assessed dermoscopically and were included in the study. KOH examination was also done for all patients. The study excluded patients who had received systemic or topical antifungal medication during the previous three months.

Onychoscopy: All patients underwent onychoscopy. Videodermatoscope was used in both polarized and non-polarized mode to study the various patterns in onychomycosis. The most frequent onychoscopic patterns were identified.

Statistical analysis: The data was tabulated in excel sheet and then analyzed using the SPSS software. Quantitative data was expressed as mean and standard deviation. Qualitative data was represented as numbers and percentages. Relevant graphs and charts are used for pictorial representation of the data. All statistical test was performed by taking a p value of <0.05 as significant.

RESULTS

The mean age of the patients was 62.67 ± 6.80 years with 6 (54.5%) male and 5 (45.5%) female patients. 5 (45.5%) patients were farmer whereas 3 (27.3%) patients were labourer and 3 (27.3%) patients were housewife. The chief complaint among 7 (63.3%) patients was the thickening of nail plate whereas 4 (36.4%) patients come with the complaint of yellowish discoloration of nails. The mean duration of onset of disease was 11.67 ± 7.63 years and mean duration of disease progression was 5.33 ± 4.50 years. The onychomycosis was diagnosed in B/L hands in 4 (36.4%) patients, in B/L feet in 3 (27.3%) patients, whereas B/L hands and feet in 4 (36.4%) patients. Diabetes as aggravating factor was identified in 5 (45.5%) patients (Table 1).

Variable	Subdomain	Mean ± SD or N (%)
Mean age		62.67 ± 6.80 years
Gender	Male	6 (54.5%)
	Female	5 (45.5%)
Occupation	Farmer	5 (45.5%)
	Labourer	3 (27.3%)
	Housewife	3 (27.3%)
Chief complaint	thickening of nail plate	7 (63.3%)
	yellowish discoloration	4 (36.4%)
Mean duration of onset of disease		11.67 ± 7.63 years
Mean duration of disease progression		5.33 ± 4.50 years
Infected area	B/L hands	4 (36.4%)
	B/L feet	3 (27.3%)
	B/L hands & feet	4 (36.4%)
Aggravating factors	Diabetes	5 (45.5%)

Table 1: Sociodemographic and clinical examination details of patients.

The assessment of clinical type of onychomycosis revealed distal and lateral subungual onychomycosis (DLSOM) in 50 nails, proximal subungual onychomycosis (PSOM) in 50 nails, White superficial onychomycosis (WSO) in 30 nails and Endonyx onychomycosis in 20 nails (Table 2).

Area	DLSO	PSOM	WSO	Endonyx	Total
Hand	30 (60%)	20 (40%)	20 (66.7%)	0	70 (46.7%)
Feet	20 (40%)	30 (60%)	10 (33.3%)	20 (100%)	80 (53.3%)
Total	50 (100%)	50 (100%)	30 (100%)	20 (100%)	150 (100%)

Table 2: Clinical type of onychomycosis in area of hand and feet.

The mean OSI score of nails of hands area was 28.17 ± 8.92 and mean OSI score of nails of feet area was 34.01 ± 3.09 . Mean OSI score of all nails was 30.90 ± 7.43 (Table 3).

Area	Mean OSI
Hand	28.17 ± 8.92
Feet	34.01 ± 3.09
Total	30.90 ± 7.43

Table 3: Mean OSI score of hands and feet area.

The mean OSI score of DLSO was 32.46 ± 6.03 , PSOM was 29.64 ± 8.53 and WSO was 34.33 ± 0.47 and Endonyx was 25.00 ± 9.23 (Table 4).

Onychomycosis type	Mean OSI
DLSO	32.46 ± 6.03
PSOM	29.64 ± 8.53
WSO	34.33 ± 0.47
Endonyx	25.00 ± 9.23
Total	30.90 ± 7.43

Table 4: Mean OSI score of various type of onychomycosis.

Among 150 nails, special patterns of onychomycosis in patients revealed ruin appearance in 78 (52%) nails, longitudinal striae in 57 (38%) nails, and spike pattern 15 (10%) nails (Figure 1).



Figure 1: Special patterns of onychomycosis: (A) ruin appearance (B) longitudinal striae and (C) spike pattern.

Previous systemic review, which included 2048 patients with onychomycosis performed the clinical classification of onychomycosis and it divided into 6 patterns based on the point of fungal entry into the nail unit. The DLSO patterns was observed in 1514 (71.7%) cases, Superficial onychomycosis (SO) observed in 31 (1.6%) patients, PSOM was observed in 21 (1.1%) cases, Total dystrophic onychomycosis (TDO) observed in 266 (14.1%) cases, Mixed pattern (MO) observed in 51 (2.7%) cases and Endonyx onychomycosis found in 2 cases (10).

DISCUSSION

Onychomycosis is comprised of four distinct types, each of which requires a different technique to obtain a nail specimen. A potassium hydroxide (KOH) preparation may be used to confirm the presence of

fungi. It involves retrieving the specimen from the nail bed and underneath the nail plate then dissolving it in KOH. KOH dissolves the keratin, allowing microscopic visualization of the fungal septate hyphae. Specimens can be further treated with stains such as Calcofluor White, Evans Blue, Gram, Giemsa, and India ink. KOH testing has 61% sensitivity and 95% specificity. It is cost-effective and can determine the presence of fungal organisms within an hour. However, a fungal culture is required to identify the specific genus and species of the pathogen (11). For the identification of nail problems in an outpatient setting, a clinical dermatologist can use onychoscopy as a rapid, easy, and noninvasive investigative technique at the bedside. Only a few researchers have examined the validity and reliability of onychoscopy in the diagnosis of onychomycosis in the Indian

population. The mean age at presentation in our study was 62.67 ± 6.80 years in our study which is similar to the study by Sangeetha et al. which reported the age at presentation as 59 years(12). In our study a male dominance was observed whereas females slightly outnumbered men by being 27% of the total study group in the study by Sangeetha et al. (12). However, a male preponderance has been noted by others like Sen et al in their study which support the findings of this study(13). It is thought that fungal nail infections are preceded by inflammation of the nail folds and cuticle loss. Long-term contact to water is known to increase the risk of chronic paronychia and inflammation of the nail folds, which in turn cause the cuticle to separate from the nail plate. As a result, the nail plate no longer has its watertight characteristic. Given that three of our patients are farmers, it is likely that their exposure to moist conditions and work environments had a role in the development of onychomycosis. Sen et al studied the association of onychomycosis with other risk factors like occupation, presence of concomitant diabetes and history of dermatophytosis(13). In present study also two patients were diabetic which probably contributed to the occurrence of onychomycosis. In the study by Sangeetha et al. 48.3% of cases were diabetic (12). Therefore, in addition to the treatment of onychomycosis, it is important that the treating dermatologist also identifies these associated risk factors and addresses them so that the risk of relapse of onychomycosis is minimized. Ruin appearance refers to the distal part of the thickened nail plate showing ventral indentations caused by dermal debris. It corresponds to the fungal presence in the nail plate. The frequency of ruin appearance varied between 13% and 100%(9). In present study, ruin appearance (52%) is the most common patterns of onychomycosis. According to the metanalysis performed by Litaïem et al. the main dermoscopic signs of onychomycosis are "ruin appearance", "longitudinal striae" and "spikes" which supports the results of present study (9). Previous study by Chetana et al. revealed the similar results mentioning longitudinal striae (49.1%) as one of the most common dermoscopic patterns in onychomycosis(14). In the study by Kayarkatte et al. ruin pattern was observed in 52 (59.1%) cases (15). Fungal invasion of the nail plate causes longitudinal striae, which show up as streaks inside the nail plate. They were reported in 64.9% cases (9). In present study, longitudinal striae seen in 57 (38%) nails. In the study by Kayarkatte et al. longitudinal striae was observed in 22 (25%) cases(15). Longitudinal striae were observed in 81.1% subjects in the study by Sangeetha et al. (12). "Spiked pattern", "intermittent spiked pattern" and "Jagged edge with spikes" share the same definition. It is characterized as indentations at the proximal edge of the onycholytic area. The frequency of jagged edges with spikes varied between 39% and 100% (9). Spike pattern in present study was observed in 15

(10%) nails. In the study by Chetana et al. spiked pattern was observed in 52.5% cases (14). In the study by Kayarkatte et al. spiked pattern was observed in 76 (86.4%) cases (15). Sangeetha et al. reported 'spiked pattern' in 80.3% subjects(12). Currently, onychoscopy is a method used to assist in the diagnosis. This approach cannot determine details such as the kind of pathogenic fungus, which is crucial in determining the course of therapy. Age and sex-matched controls were not used to compare the dermoscopic findings in our research sample. There were no uniform groupings of various clinical subtypes of onychomycosis in the research population. The onychoscopic patterns that were examined were mostly restricted to PSOM and DLSOM. KOH, culture, and biopsy positive cases were included in our investigation. Due to practical and economical concerns, nail plate biopsy, which is regarded as the gold standard in the diagnosis of onychomycosis, was not possible in every case.

CONCLUSION

According to the findings of our study, nail plate dermoscopy can be used as an easy, rapid, and affordable method to improve onychomycosis diagnosis accuracy in situations where mycological investigations are not easily accessible. Due to their similar morphological characteristics, traumatic onycholysis and Tinea unguium may also be distinguished using this screening method. Larger sample size investigations are required to determine the importance of the new patterns that our study revealed.

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