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Original Research Article

A Clinico-Mycological Study of Onychomycosis in Patients Attending a Tertiary Care Centre in South Rajasthan

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Abstract

Background: Onychomycosis is a common fungal nail infection causing cosmetic and functional impairment, with increasing prevalence in India.

Objective: To study the clinical and mycological profile of onychomycosis and associated risk factors in patients attending a dermatology OPD in South Rajasthan.

Materials and Methods: A prospective observational study was conducted on 80 clinically suspected cases of onychomycosis for 1.5years. Clinical evaluation, risk factor assessment, 40% KOH microscopy, and fungal culture were performed.

Results: Middle-aged males, particularly those aged 31–40 years, were most commonly affected. Farmers and housewives represented major occupational groups. DLSO was the predominant clinical type, with the right great toenail most frequently involved. KOH positivity was 75%, culture positivity 60%, and combined positivity 85%. Trichophyton mentagrophytes was the most common isolate, followed by T. rubrum and Candida species. Diabetes mellitus, family history, addiction, and associated dermatoses such as Tinea cruris and Tinea corporis were important risk factors.

Conclusion: Onychomycosis predominantly affects middle-aged males and high-risk occupational groups in South Rajasthan. Combined KOH microscopy and fungal culture improve diagnostic accuracy, highlighting the importance of early diagnosis and targeted management.

Keywords: Onychomycosis, Dermatophytes, Trichophyton Mentagrophytes, KOH Microscopy, Fungal Culture, DLSO, Risk Factors.

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Introduction

Onychomycosis is a common fungal infection of nails caused mainly by dermatophytes, especially Trichophyton rubrum and Trichophyton mentagrophytes [1]. It causes nail discoloration, thickening, brittleness, discomfort, functional impairment, and cosmetic concerns, while also serving as a potential source of fungal spread [2]. Its prevalence is increasing in India due to climatic, immunological, hygienic, and socioeconomic factors [3].

South Rajasthan presents unique challenges because of its hot climate, agricultural occupations, communal bathing, prolonged occlusive footwear use, and limited healthcare access, which increase susceptibility to fungal infections [4]. Globally, onychomycosis accounts for 20–40% of nail disorders, with higher prevalence in tropical and subtropical regions [5]. In India, prevalence ranges from 6–13% [6]. Common dermatophytes from Trichophyton, Microsporum, and Epidermophyton invade keratinized tissues through keratinase production [7]. Infection usually begins distally or laterally and progresses proximally, causing thickened, discoloured, dystrophic nails [8]. Clinically, onychomycosis is classified into distal subungual, proximal subungual, white superficial, and total dystrophic forms [9]. Diagnosis relies on

clinical examination, KOH microscopy, fungal culture, and molecular methods, each with limitations related to specificity, time, cost, and accessibility [10]. Accurate diagnosis is necessary because treatment response varies by fungal species, and delayed therapy increases chronicity and transmission risk [11].

Management includes topical and systemic antifungals depending on disease severity and patient factors. Topical agents are useful in superficial disease, while systemic drugs such as terbinafine and itraconazole are preferred for extensive involvement but require monitoring for adverse effects [12]. Given its growing prevalence and quality-of-life impact, studying the clinical and mycological profile of onychomycosis in South Rajasthan is important for improving regional management strategies and treatment outcomes [13].

Objective

Our study focuses on the clinical and mycological profile of dermatophytes in patients with onychomycosis attending the Skin OPD, along with their associated risk factors.

Material and Method

This is a prospective observational study conducted in the Department of Dermatology OPD in tertiary care center catering to a mixed urban-rural population. This study was a duration-based study, a total of 80 patients aged between 18 to 60 years presenting to the Dermatology OPD for 1.5years. Patients aged 18–60 years, including both males and females, with clinically suspected onychomycosis were included in the study. Patients receiving topical or systemic antifungal treatment within the previous 4 weeks, those with onychodystrophy due to trauma or systemic diseases such as psoriasis, and those unwilling to participate were excluded.

Each patient was assessed using a standardized proforma documenting demographic detail, medical history, and clinical findings, including type and site of nail involvement, subungual hyperkeratosis, onycholysis, and associated skin infections. Nail scrapings were collected aseptically from the nail bed, undersurface of the nail plate, and hyponychium after cleansing with 70% alcohol. Samples were subjected to 40% KOH microscopy for direct fungal detection and fungal culture on Sabouraud Dextrose Agar with chloramphenicol and cycloheximide, incubated at 25–28°C for up to 4 weeks. Fungal isolates were identified based on colony morphology and Lactophenol Cotton Blue mount and classified as dermatophytes, non-dermatophyte moulds, or yeasts. Relevant risk factors including diabetes, immunosuppression, trauma, occlusive footwear, and family history were recorded.

Data were analysed using MS Excel 2010, SPSS v20, and OpenEpi, with categorical variables expressed as frequencies and percentages and continuous variables as mean ± SD. Outcome measures included KOH/culture positivity, clinical patterns of onychomycosis, fungal isolates, and their association with clinical findings and comorbidities.

Results

This study included 80 clinically suspected onychomycosis cases attending the dermatology OPD in South Rajasthan. Demographic details, clinical patterns, site involvement, and risk factors were analysed. Mycological evaluation using KOH mount (Fig 1) and fungal culture (Fig 2) identified causative organisms, and correlations between clinical types and laboratory findings were assessed. Data are presented in tables and percentages for clarity and comparison.

Table 1 Among 80 study participants, 58 were males and 22 females, indicating male predominance. The 31– 40-year age group showed the highest frequency (n=34), followed by 41–50 years (n=29). The mean age was 40.10 ± 7.61 years, with no statistically significant gender difference in mean age (p = 0.8564).

Table 2 among 80 cases, 42 (52.5%) had no addiction history, while 38 (47.5%) reported addictions including alcohol (25%), smoking (15%), and tobacco chewing (7.5%). Nearly half of the patients had some form of addiction, suggesting a possible contributory risk factor for onychomycosis.

Table 3 Farmers constituted the highest proportion of onychomycosis cases (32.5%), followed by housewives (20%) and private employees (17.5%). Factory workers, shopkeepers, and teachers accounted for 15%, 10%, and 5% of cases, respectively, suggesting a possible association between occupational exposure and onychomycosis risk.

Table 4 the distribution of presenting symptoms in patients with onychomycosis. Itching in the surrounding area or associated lesion was the most frequently reported symptom (46 cases, 57.50 %). A significant number of patients (21 cases, 26.25%) were asymptomatic and noticed only nail changes. Pain was reported by 11 patients (13.75%) and discoloration was found in 2 patients (2.50%).

Subungual hyperkeratosis was the most commonly observed nail abnormality, seen in 58 cases (72.5%), followed by colour change in 44 cases (55%) and distal onycholysis in 18 cases (22.5%). Other findings included lateral onycholysis (12.5%), nail dystrophy (10%), and nail splitting (10%). Less frequent findings were brittle nails (3.75%), proximal onycholysis (2.5%),

onychorhexis (2.5%), nail plate thickening, and longitudinal ridging (1.25% each). This indicates that discoloration and onycholytic changes were the most dominant features among the cases.

In this study, the right great toenail was the most commonly involved site (16 cases), followed by the left great toenail (11 cases). Right and left fingernails, and right toenails were each involved in 12–15 cases. Left toenails were affected in 9 cases. The thumbs were less commonly involved, with 3 right and 5 left thumb cases. Overall, toenail involvement was more frequent than fingernail involvement.

Table 5 most cases presented within 1–5 months, indicating subacute presentation is common. The majority of patients presented within 1 to 5 months of symptom onset, indicating a subacute pattern. Specifically, 22 cases (27.5%) reported symptoms for 1 month, followed by 18 cases

(22.5%) for 2 months, and 16 cases (20%) for 5 months. Fewer cases had longer durations, with only 6 cases (7.5%) each at 3 and 6 months, and 2 cases (2.5%) reporting a 7-month history. The mean duration of disease in females was 2.63 ± 1.91 years, while in males it was

3.24 ± 1.78 years. The overall mean duration was 3.08 ± 1.83 years. The difference between the groups was not statistically significant ($p = 0.183$).

Table 6 Out of 80, 68 cases were either KOH or culture positive. 60 cases were KOH positive, while 48 were culture positive. Concordance (both positive) was seen in 40 cases (50 %).

Table 8 illustrates the diagnostic findings based on KOH mount and fungal culture. Out of 80 total cases, 60 (75%) were KOH positive, and 48 (60%) showed culture positivity. Concordant positivity for both KOH and culture was observed in 40 cases (50%). Among 20 KOH-negative cases, 8 (10%) were culture positive. Thus, a combined 68 cases (85%) were either KOH or culture positive, highlighting the utility of using both methods for mycological confirmation.

Out of the total cases, 42 males and 18 females tested positive for KOH or fungal culture, while 16 males and 4 females were negative. This indicates a higher positivity rate among males, consistent with the overall male predominance in the study population. Table 7 Distal Lateral Subungual Onychomycosis (DLSO) was the most common clinical type, with 50 cases KOH positive and 37 culture positive, reinforcing its predominance. Total Dystrophic Onychomycosis (TDO) showed 6 KOH-positive and 7 culture-positive cases. Both Proximal Subungual (PSO) and Superficial White Onychomycosis (SWO) were entirely KOH and culture positive, though fewer in number. These results indicate that DLSO not only is the most prevalent form but also shows strong mycological confirmation, while less common types like PSO and SWO also demonstrate 100% diagnostic concordance.

Tinea infections were the most frequently associated dermatological conditions, with Tinea cruris (25%) and Tinea corporis (12.5%) being the most common 28.75% of patients had no associated dermatological condition. Trauma in 5 (6.25%) and other fungal infections like Tinea pedis in 8 (10%), Tinea manuum in 4 (5%), and Paronychia in 4 (5%) were also noted but less frequent. DM was present in 32.50 % of patients, showing a strong correlation with fungal nail infections. Out of the 80 patients, 38 cases (47.5%) had no comorbidities. Diabetes Mellitus (DM) was the most frequently associated comorbidity, seen in 26 cases (32.5%), either alone or in combination with hypertension (4 cases). Other comorbidities included hypothyroidism (6 cases), hypertension alone (4 cases), and hyperthyroidism (2 cases). The significant prevalence of DM highlights its potential role as a predisposing factor in the development of onychomycosis.

Table 1: Age- and sex-wise distribution of patients with clinically suspected onychomycosis (n = 80)

Age Group	Female (N=22)	Male (N=58)	Total	p-value
18-30 Years	3 (14%)	6 (10%)	9 (11%)	
31-40 Years	8 (36%)	26 (45%)	34 (43%)	
41-50 Years	5 (23%)	24 (41%)	29 (36%)	
51-60 Years	6 (27%)	2 (4%)	8 (10%)	
Total Years	22 (100%)	58 (100%)	80 (100%)	
Age (Mean ± SD)	39.70 ± 8.37	39.30 ± 8.95	40.10 ± 7.61	0.8564

Table 2: Distribution of patients according to addiction history (n = 80)

Addiction	Number of Cases	Percentage
Alcohol	20	25 %
Smoking	12	15 %
tobacco chewing	6	7.5 %
No	42	52.50 %

Table 3: Occupational distribution of patients with onychomycosis (n = 80)

Occupation	Number of Cases	Percentage (%)
Farmer	26	32.50 %
Housewife	16	20 %
private job	14	17.50 %
factory worker	12	15.0 %
Shopkeeper	8	10.0 %
Teacher	4	5.0 %

Table 4: Distribution of patients according to presenting symptoms of onychomycosis (n = 80)

Symptoms	Number of Cases	Percentage (%)
Itching	46	57.50 %
No	21	26.25 %
Pain	11	13.75 %
discoloration	02	2.5 %

Table 5: Distribution of patients according to the duration of onychomycosis (n = 80)

Duration	Number of Cases	Percentage (%)	P value
1month	22	27.50 %	
5months	16	20.0 %	
2months	18	22.50 %	
4months	10	12.50 %	
3months	6	7.5 %	
6months	6	7.5 %	
7months	2	2.5 %	
Mean Duration of disease (Mean ± SD)	\multicolumn{2}{c}	{3.075 ± 1.833}	0.183

Table 6: Comparison of potassium hydroxide mount and fungal culture findings in clinically suspected cases of onychomycosis (n = 80)

KOH Mount test	Culture Negative	Culture Positive	Total
KOH Negative	12 (15%)	8 (10%)	20 (25 %)
KOH Positive	20 (25%)	40 (50%)	60 (75%)
Total	32 (40%)	48 (60 %)	80 (100 %)

Table 7: Association of clinical types of onychomycosis with potassium hydroxide mount and fungal culture findings (n = 80)

Type of Onychomycosis	KOH Positive	KOH negative	Culture (Positive)	Culture (Negative)
DLSO	50 (62.50%)	06 (7.5%)	37 (46.25%)	19 (23.75%)
PSO	02 (2.5 %)	00	02 (2.5%)	00
SWO	02 (2.5%)	00	02 (2.5%)	00
TDO	06 (7.5%)	02 (2.5%)	07 (8.75%)	01 (1.25%)

Figure 1: KOH: Septate branched hyphae

Figure 2: Culture: Cream/peach colored powdery colonies

Discussion

In the present study involving 80 clinically diagnosed cases of onychomycosis, a clear male predominance was observed, with 72.5% males (n=58) and 27.5% females (n=22). This gender distribution is consistent with several earlier studies conducted across India and globally. Choudhary et al. [14] from Southern Rajasthan also reported male predominance in dermatophytic infections, attributing it to greater physical activity, trauma exposure, and prolonged occlusive footwear use favoring fungal growth.

The absence of a significant gender-based age difference suggests a similar age distribution across genders, possibly reflecting shared lifestyle and environmental risk factors. The present findings support the role of age and gender in dermatophytic infection epidemiology, aiding prevention, early diagnosis, and targeted management in high-risk groups.

In the present study, 37.5% of participants (n=30) reported a positive family history of onychomycosis, while the remaining 62.5% (n=50) had no such history. This finding suggests that familial predisposition may be an important factor in the development of onychomycosis. Familial clustering may result from shared genetic factors, immunological susceptibility, or common environmental exposures such as communal footwear, shared bathing areas, or inadequate nail hygiene. These findings are consistent with existing literature and highlight the importance of screening and preventive counselling for family members to reduce recurrence and transmission.

The most frequently reported symptom was itching in the surrounding area or associated skin lesion (57.5%), followed by asymptomatic nail changes (26.25%), pain (13.75%), and discoloration alone (2.5%). The predominance of itching indicates the co-existence of dermatophytosis of the surrounding skin, such as tinea pedis or tinea manuum, which is often associated with nail involvement. [15] Additionally, Housley at al [16] reported a high incidence of asymptomatic onychomycosis in diabetic individuals, leading to delayed clinical recognition and thereby extended disease duration. This further explains the chronicity noted in a subset of patients in our cohort who presented after 6-7 months.

Mycological evaluation showed 68/80 cases (85%) positive by either KOH or culture. KOH positivity was seen in 75%, culture positivity in 60%, and concordant positivity in 50%, highlighting the added diagnostic value of culture in KOH-negative cases.

KOH mount is a rapid and cost-effective test but lacks species identification, which can be achieved through culture. On the other hand, fungal culture, though time-consuming and sometimes yielding false negatives due to improper sampling or nonviable organisms, remains the gold standard for identifying the etiological agent. [17]

KOH positivity was highest among farmers (22 cases) and housewives (15 cases), indicating greater exposure to fungal risk factors in these groups. Culture positivity was also most frequent in farmers (19 cases), followed by housewives (12 cases) and those in private jobs (8 cases). Factory workers had 8 KOH-positive cases but only 4 culture- positive, suggesting some discordance. The findings highlight that occupational exposure, particularly in agriculture and domestic environments, may significantly influence fungal nail infection rates.

In our study, Distal Lateral Subungual Onychomycosis (DLSO) emerged as the most prevalent clinical variant, with 50 KOH-positive and 37 culture-positive cases, reaffirming its

dominance. This pattern aligns with earlier reports by Grover [18] and Chadeganipour et al [19], who also found DLSO to be the most common subtype due to its characteristic progression from the hyponychium and lateral nail fold, areas highly susceptible to trauma and fungal invasion. The high concordance of KOH and culture positivity in PSO and SWO, albeit in fewer cases, suggests these variants are easily identifiable when present. However, DLSO's high incidence and positivity across both diagnostic modalities make it an essential focus for both clinical diagnosis and epidemiological surveillance of onychomycosis.

Among the 48 culture-positive cases in our study, Trichophyton mentagrophytes was the most frequently isolated organism (19 cases, 39.58%), followed by Trichophyton rubrum (15 cases, 31.25%). Candida species were identified in 9 cases (18.75%), and Aspergillus species in 5 cases (10.42%). These findings underscore the predominance of dermatophytes, especially T. mentagrophytes and T. rubrum, as the primary causative agents of onychomycosis in our population.

Among the various clinical types of onychomycosis, Distal Lateral Subungual Onychomycosis (DLSO) was the most common presentation, observed in 56 cases (70%). This was followed by Total Dystrophic Onychomycosis (TDO) in 8 cases (10%), while Proximal Subungual Onychomycosis (PSO) and Superficial White Onychomycosis (SWO) were comparatively rare, with only 2 cases (2.5%) each. These findings reinforce that DLSO remains the most prevalent clinical pattern, consistent with global and Indian epidemiological trends.

The high prevalence of DM among onychomycosis patients supports the hypothesis that diabetes serves as a significant predisposing factor, likely due to impaired peripheral circulation, immune dysfunction, and hyperglycemia, which promote fungal growth and persistence. [20] Similar findings have been reported in studies by Lipsky et al [(21)] where diabetic patients had increased susceptibility to chronic fungal infections, especially onychomycosis.

Conclusion

This study of 80 clinically suspected onychomycosis cases in South Rajasthan highlighted important epidemiological, clinical, and mycological patterns. Middle-aged males, especially those aged 31–40 years, were most commonly affected, with farmers and housewives representing high-risk groups. DLSO was the predominant clinical type, and the right great toenail was the most frequently involved site. Combined KOH mount and fungal culture improved diagnostic yield, showing 85% positivity. Trichophyton mentagrophytes was the most common isolate, followed by T. rubrum and Candida species. Contributory factors included family history, addiction, and associated dermatoses such as Tinea cruris and Tinea corporis. These findings highlight the importance of early diagnosis, diagnostic integration, patient education, and improved hygiene practices for effective management and prevention of recurrence, particularly among high-risk groups.

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