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Original Research Article

Nail as a carrier in patients with extensive tinea corporis – An observational analytical study

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ABSTRACT

Background: Dermatophytosis is a common infection which until recently used to respond satisfactorily to treatment, however clinical resistance is frequently encountered. The exact cause of treatment failure is not known. Neglecting the management of subclinical onychomycosis might be a possible cause for recurrence. This study was undertaken to detect the fungi in the nail plate and under the nail fold in patients without clinical evidence of onychomycosis.

Aims: To detect the carrier state of nail plate and subungual region in patients with extensive dermatophytoses.

Study design: Observational analytical study.

Materials and Methods: Patients with dermatophytoses of skin without clinical involvement of nail, attending the tertiary care centre in South India were studied. Scrapings from skin lesions and under-surface of the clinically uninvolved nails, nail clipping of clinically uninvolved nail were examined by potassium hydroxide (KOH) preparation for fungus using standard methods.

Results: Of the 150 patients recruited, 147 patients (98%) revealed fungal elements on KOH mount done on skin scrapings, while 90 patients (60%) and 99 patients (66%) had positive KOH findings from nail and subungual samples respectively.

Conclusions: We postulate that the subclinical nail involvement, without clinical evidence of fungal invasion of nail could be one of the reasons for treatment failure. It is recommended when the nail is clinically involved, more prolonged treatment is required to prevent relapse. Thus, subclinical nail involvement should also be treated as onychomycosis. We recommend that KOH mount of the nail and subungual region should be carried out in all patients with recurrent fungal infections.

Key Messages: Tinea corporis is a recalcitrant problem with increased resistance to the treatment. Detecting the carrier state of nail and subungual region carries a significant role, and treating the same may lead to better therapeutic levels.

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1. Introduction

Treatment failure in dermatophytic infections are commonly encountered. Various causes attributed for the failure include topical steroid abuse,¹⁻⁴ increased prevalence of *Trichophyton mentagrophytes*, inconsistent use of topical

and oral antifungal agents, and the presence of fungal infections in fomites.⁵ When nails are involved, more prolonged treatment is required.⁶ And failure to recognize the nail involvement is one of the causes of treatment failure.⁷ It is possible that the fungus may involve the nail without clinical manifestation, or may colonise beneath the nail without involving the nail plate. In these patients, treatment failure could be because of the subclinical nail

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involvement.

2. Aim

To detect the carrier state of nail in patients with extensive dermatophytic infections of skin

3. Objective

To detect the presence of fungi in the clinically uninvolved nail plate and beneath the nail plate in patients having dermatophytic infections of skin.

4. Materials and Methods

4.1. Study design

It is an observational analytical study.

4.2. Inclusion criteria

All patients attending our out-patient department of dermatology with suspected dermatophytic infection of skin, with clinically uninvolved finger nails and toe nails were included in the study.

4.3. Exclusion criteria

Patients with features of dermatophytic infection of nail like pitting, white or yellow discoloration of nail plate, thickened nails, onycholysis and subungual hyperkeratosis were excluded. Also, patients with candidiasis and other form of fungal infections (other than dermatophytoses) of skin were excluded from the study.

4.4. Methodology

An Institutional Ethical Committee approval was taken. Patients with suspected dermatophytic infection of skin without clinical evidence of nail involvement attending our Outpatient Department of Dermatology from January 2018 to April 2018 were studied. Samples were obtained from the skin lesions, clinically uninvolved nails and the subungual region. Potassium hydroxide (KOH) mounts were then performed as follows. Using a pre-flamed blunt scalpel, skin scrapings were collected from the edge of the lesion. In a clean glass slide, to the collected material, 10% KOH was added, covered by a cover slip and then gently preheated before examining the fungus microscopically.

KOH preparation for the nail clipping and scraping from subungual region were performed using standard methods. After disinfecting with 70% alcohol, nail clipping and subungual samples were separately taken from the clinically uninvolved sites, using a sterile no.15 scalpel blade. The specimens were incubated with 20% KOH overnight at room temperature. Using a cover slip, the softened nail specimen was gently crushed to form a thin film over a

clean glass slide, and was then examined microscopically for fungal elements.

4.5. Statistical analysis

Statistical analysis was done using SPSS software version 23 (IBM statistical package for the social sciences IBM SPSS statistics for windows, version 23.0, IBM Corp, Armonk, NY). All analysis was done for nonparametric distribution of data. Association between qualitative data was calculated using Chi-square test.

5. Results

A total of 150 patients were recruited in the age group ranged from seven to 74 years. The mean age of the patients was 58.01 years. Most of the patients in the study population were ≥ 61 years old (54.0%). (Table 1) Of the 150, 92 (61%) were females and 58 (39%) were males. In our study, farmers were majorly affected (48%), followed by housewives (23.3%) and retired patients (19.3%). (Table 2)

Of the 150 patients, 147 patients (98%) revealed fungal elements on the KOH mount done on the skin scrapings, while 90 patients (60%) and 99 patients (66%) had positive KOH findings from nail and subungual samples respectively. (Table 3) (Figure 1) In the present study, 88 patients (58.7%) had positive KOH findings from both nail and skin samples, and 96 patients (64%) had positive KOH findings from both subungual and skin samples. (Table 3) While 42 patients (28%) showed positive findings from both nail and subungual samples. (Table 3) (Figure 2) A total of 40 patients (26.7%) showed positive KOH findings in all the three samples taken from skin, nail and subungual region. (Table 3)

In our study, the presence of fungal infections in all the three sites including skin, nail and subungual regions, were majorly seen in patients ≥ 61 years of age, followed by age group of 41 to 60 years.

Similarly, fungal elements in the nail and subungual region were predominantly detected in patients with ≥ 61 years of age, with a significant “P” value of 0.022. (Table 4)

Patients with occupation based on agriculture had increased presence of fungal infections in the nail and subungual region followed by housewives and retired persons.

Table 1: Age distribution

Age	Frequency	Percent %
≤ 20	1	0.7
21-40	17	11.3
41-60	51	34.0
≥ 61	81	54.0
Total	150	100.0

Table 2: Occupation distribution

Occupation	Frequency	Percent %
Agriculture	72	48.0
Barber	1	0.7
Business	5	3.3
Housewife	35	23.3
Mason	1	0.7
Retired person	29	19.3
Student	2	1.3
Tailor	5	3.3
Total	150	100.0

Table 3: KOH findings of the study population

	Yes		No	
	Frequency	Percent %	Frequency	Percent %
Nail	90	60.0	60	40.0
Subungual	99	66.0	51	34.0
Skin	147	98.0	3	2.0
Nail and Skin	88	58.7	62	41.3
Subungual and skin	96	64.0	54	36.0
Nail and subungual	42	28.0	108	72.0
All three	40	26.7	110	73.3

Table 4: KOH findings of nail and skin,subungual and skin, nail and subungual, and all three

	Age	Yes	No	Total	P value (Fisher's exact test)
Nail and Skin	≤20	1	0	1	0.515
	21-40	12	5	17	
	41-60	29	22	51	
	≥61	46	35	81	
	Total	88	62	150	
Subungual and skin	≤20	0	1	1	0.361
	21-40	12	5	17	
	41-60	30	21	51	
	≥61	54	27	81	
	Total	96	54	150	
Nail and subungual	≤20	0	1	1	0.022
	21-40	10	7	17	
	41-60	10	41	51	
	≥61	22	59	81	
	Total	42	108	150	
All three	≤20	0	1	1	0.064
	21-40	9	8	17	
	41-60	10	41	51	
	≥61	21	60	81	
	Total	40	110	150	

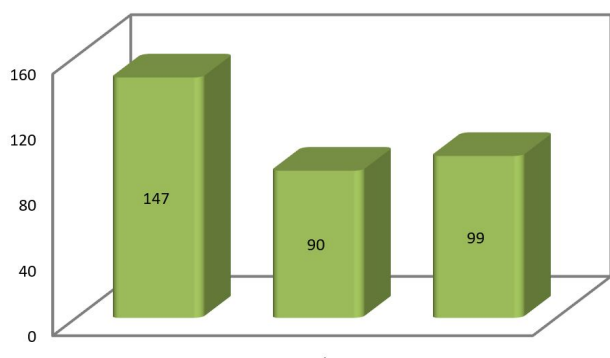


Fig. 1: KOH findings of the skin, nail and subungual samples.

147: Number of patients with KOH positive from skin 90: Number of patients with KOH positive from nail clipping only
99: Number of patients with KOH positive from subungual scrapings only

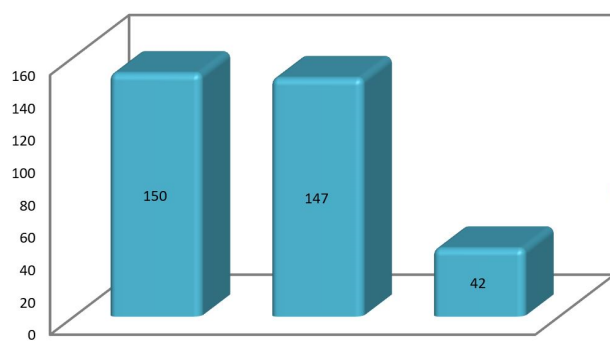


Fig. 2: KOH findings of the study population.

150: Number of patients. 147: Number of patients with KOH positive from skin.
42: Number of patients with KOH positive from nail and subungual samples.

6. Discussion

Dermatophytic infection of the skin and nail is a major health problem affecting the patients' quality of life. In our study, maximum number of patients (54.0%) belong to the elderly age group (≥ 61 years), in contrast to the findings in the study conducted by Singh et al., where majority of the study population were in third decade (27.8%).⁸ Also, onychomycosis was predominantly seen among the elderly population (≥ 61 years), with 22 patients (52.38%) showing KOH positive findings in both the nail and subungual region with a significant "P" value of 0.022. Onychomycosis is highly prevalent with increasing age, reaching almost 20% in patients over 60.^{9,10} This is because elderly patients are predisposed to the intrinsic factors like poor blood circulation, immunosuppression, trauma, altered biochemics and diabetes mellitus.¹¹

This is an observational analytical study, and the study population had 68 females (45.3%) and 82 males (54.7%). Similar to previous literature, ours also showed a male preponderance of dermatophytosis of skin.^{12–15} However, onychomycosis were more commonly seen among the females which is in accordance with other studies.^{16–18} Wet work among the females is a major contributing factor for the marked female preponderance in the present study.

The most common occupation found in our study group was farming where 41 patients (45.56%) and 47 patients (47.47%) had fungal elements present in the nail and subungual samples respectively. This finding corresponds to the pronounced wet work among the farmers. Following farmers, housewives majorly found to have fungal positivity in the nail and subungual regions. These are consistent with the findings described in other studies.^{18,19}

In the present study, 147 patients (98%) had positive and three patients (2%) had negative KOH findings from the skin. Of the 150, three patients had negative KOH findings from skin samples possibly because of prior application of steroids. In patients, who are currently applying steroid cream, it is difficult to obtain scrapings, which yields very less fungal elements.²⁰ Also, of the three patients, one patient had positive KOH finding from nail clipping inspite of negative KOH finding from the skin. This further highlights the need for routine examination of nail clipping in patients with extensive dermatophytic infection.

Epidemic of dermatophytic infections has become a major problem concerning both the dermatologists and the patients. The frequent use of steroids or combination of steroids with antifungals is a common cause for failure of treatment apart from the unwanted side effects following prolonged use of steroids.^{1–4} The other causes of treatment failure include inadequate dosage or duration of treatment.^{5,7} The shorter duration of treatment might be due to the discontinuation of drugs by patients when they find significant clinical improvement or due to financial burden.^{5,7} In addition, using the clothing with fungi associated with the changing fashion trends with increased use of skin bound leggings and denims could be one of the causes for treatment failure.⁵ Not examining and treating other family members affected by the fungus can also result in reinfection and may be interpreted as treatment failure.⁵ Although fungal resistance is broadly classified as microbiological and clinical resistance, they have not been proved.^{21–24}

To the above list of causes which may lead to the failure, we suggest that the failure of treatment may also be due to the presence of fungi in the nail plate without clinical involvement. When nail plate involvement is detected, the patient should be treated as onychomycosis with higher dose of drug for more prolonged duration.⁶ When the fungus is present only in the subungual region and when fungus is not detected in the nail plate, local care such as clipping of

nail and hygiene may prevent the infection. We recommend that nails of all patients with chronic fungal infection should be tested for the presence of fungus irrespective of clinical involvement.

7. Limitations

The limitation of the study is that the culture was not performed. This is because the purpose of the study was to identify the relationship between the dermatophytic infections of the skin with clinically uninvolved nail. Also, the culture was not done since the study was not aimed at identifying the specific species but was to detect the presence of the dermatophyte. While, the sensitivity of culture is only 57% compared to the sensitivity of KOH which is 81.82%, we performed KOH mount for the patients.²⁵

8. Conflict of Interest

The authors declare no relevant conflicts of interest.

9. Source of Funding

None.

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