

Spectrum of Fungi causing Onychomycosis in a Tertiary care Hospital in North East Karnataka

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Abstract

Onychomycosis, the commonest presentation of deformed nails is caused by dermatophytes, non-dermatophyte moulds (NDM) or yeast. Clinical presentation varies from onychodystrophy, subungual hyperkeratosis, onycholysis or discolouration of nail plate.

Objectives: Identification of the causative fungal organisms and to compare the clinical diagnosis with positivity of KOH examination and fungal culture.

Materials and Methods: 78 clinically suspected cases of onychomycosis were taken. After disinfecting the nails with 70% alcohol, KOH mount and fungal culture was done followed by LPCB mount.

Results: 44 patients had onychomycosis with 31-40 yrs (40.9%) as common age group and male preponderance (63.63%). Male:Female ratio 1.75:1. Toe nails (61.36%) were predominantly involved with Distal and lateral subungual onychomycosis (56.8%) as the most common presentation. KOH positivity (63.1%) was more than culture positivity (57.8%). Dermatophytes (54.54%) were the commonest group isolated followed by NDM (25%) and yeasts (20.45%). Trichophyton *rubrum* (31.81%) was the commonest among dermatophytes while among NDM, *Fusarium spp* (9.09%) was most common. *Candida albicans* (11.36%) was most common among yeasts.

Conclusion: Clinical diagnosis of onychomycosis should be confirmed both by KOH and fungal culture to prescribe species specific antifungal drugs for optimal outcome.

Keywords: Onychomycosis, Dermatophytes, Non-dermatophyte moulds, Yeasts.

Introduction

Fungi are ubiquitous in nature. The term onychomycosis is derived from Greek word 'onyx', nail and 'mykes' fungus.⁽¹⁾ It is a denomination used to describe fungal infection of one or more of nail units and can be caused by dermatophytes, yeasts or non-dermatophyte moulds (NDM).⁽²⁾ It affects 3-5% of the population worldwide and represents 20-40% of onychopathies and about 30% of mycotic cutaneous infection.⁽³⁾ Prevalence in HIV patients is higher as compared to others⁽⁴⁾ Different clinical types by a recent classification scheme includes Distal and Lateral Subungual Onychomycosis (DLSO), Superficial White Onychomycosis (SWO), Proximal Subungual Onychomycosis (PSO), Endonyx Onychomycosis (EO) and Total Dystrophic Onychomycosis (TDO).⁽⁵⁾

The aim of our study was to determine the prevalence of various causative agents of onychomycosis, to identify the clinical pattern of the disease and to analyze the potential risk factors.

Materials and Methods

Study population and period: This study was conducted over a period of 6 months from November 2015 to April 2016, on samples from 78 patients with clinically suspected onychomycosis who attended the Dermatology department of Basaweshwara Teaching and General Hospital, Kalaburagi, Karnataka.

Inclusion criteria: All cases of clinically suspected onychomycosis presenting with onychodystrophy,

onycholysis, subungual hyperkeratosis, melanonychia, leuconychia and thickening of nail plate were selected for the study.

Exclusion criteria:

- 1) Patients already receiving topical or systemic antifungal therapy for onychomycosis or some other fungal infection.
- 2) Patients with nail changes due to psoriasis, lichen planus, contact dermatitis or other systemic diseases.

Prior consent was taken and all the data was entered in the respective proforma which included age, sex, occupation, habits, longer drug intake, any predisposing factors like diabetes, peripheral vascular disease, immunosuppression, history of contact with animals or soil was also elicited. The patients were classified according to the sites of involvement.

Nail clippings or subungual scrapping from all the cases were collected with a surgical blade after cleaning the affected area with 70% alcohol from the involved nail bed and from the undersurface of the nail.⁽³⁾ The specimens were processed by direct microscopic examination using 20% KOH. Culture was done on Sabourauds dextrose agar (SDA) supplemented with cycloheximide and chloramphenicol and SDA without cycloheximide, incubated at 23°C for 4 weeks.⁽⁶⁾

The pathogenic organisms were identified macroscopically by colony morphology, pigmentation on reverse and obverse and microscopic examination of

Lactophenol Cotton Blue mount (LPCB). Trichophyton *rubrum* was differentiated from other Trichophyton *spp* by Urease test. *Candida albicans* was identified by Gram's staining and Germ tube test. Nondermatophyte moulds were isolated by subcultures.⁽⁶⁾

Results

Out of 78 suspected cases, 44 patients had onychomycosis. Out of 44 cases, 31-40 yrs, 18 cases (40.9%) were the commonest age group involved followed by 41-50 yrs, 9 cases (20.43%) (Table 1) with males 28 cases (63.63%) and females 16 cases (36.36%)(Table 2). Male to female ratio was approximately 1.75:1. It was more common in people with low socio-economic status (50%) followed by middle class (31.81%) and high class (18.18%). Manual labourers (31.81%) were the predominant group followed by farmers (25%) and house wives (20.45%). Contact with soil and animals was found to be more associated with the infection.

Toe nails were frequent anatomic site involved in 27 cases (61.36%) followed by finger nails in 14 cases (24.51%) and both in 3 cases (6.81%). DLSO was the commonest clinical type in 25 cases (56.8%), followed by PSO, 8 cases (18.18%), TDO 7 cases (15.90%), SWO and paronychia 2 cases each (4.54%). In our study cases of endonyx onychomycosis were not found (Table 3).

Direct microscopy by KOH mount was positive in 48 cases (63.1%) and fungal culture in 44 cases (57.8%) (Table 4). From 44 culture positive samples Dermatophytes were the predominant group isolated from 24 cases (54.54%) followed by NDM in 11 cases (25%) and Yeasts in 9 cases (20.45%).

Among the dermatophytes Trichophyton *rubrum* was the most common species isolated in 14 cases (31.81%) followed by *T.mentagrophytes* in 5 cases (11.36%), Epidermophyton *floccosum* in 4 cases (9.09%) and *T.tonsurans* in 1 case (2.27%). Among the NDM, *Fusarium spp* was the commonest *spp* isolated in

4 cases (9.09%) followed by *Aspergillus niger* in 3 cases (6.81%), *A.flavus* and *A.fumigatus* in 2 cases each (4.54%). Among the yeasts *Candida albicans* was isolated in 5 cases (11.36%) followed by other *Candida spp* in 4 cases (9.09%) (Table 5).

Table 1: Age distribution among cases of onychomycosis

Age Group	No. of Cases	Percentage
11-20 yrs	1	2.27%
21-30 yrs	9	20.45%
31-40 yrs	18	40.9%
41-50 yrs	9	20.45%
51-60 yrs	5	11.36%
61-70 yrs	2	4.54%

Table 2: Sex distribution among cases of onychomycosis

Sex	No. of cases	Percentage
Males	28	63.63%
Females	16	36.36%

Table 3: Clinical patterns among cases of onychomycosis

Clinical pattern	Finger nails	Toe nails	Both	Total
DLSO	9	14	2	25 (56.8%)
PSO	2	5	1	8 (18.18%)
SWO	-	2	-	2 (4.54%)
TDO	1	6	-	7 (15.90%)
Paronychia	2	-	-	2 (4.54%)
Total	14 (31.81%)	27 (61.36%)	3 (6.81%)	44 (100%)

Table 4: Microscopy and culture positivity among cases of onychomycosis

Diagnosti c tests	Culture +ve	Culture -ve	Total
KOH +ve	38 (48.7%)	10 (13.1%)	48 (61.53%)
KOH -ve	6 (7.8%)	24 (31.5%)	30 (38.46%)
Total	44 (57.8%)	34 (43.58%)	78 (100%)

Table 5: Distribution of fungi among cases of onychomycosis

Fungus	No. of isolates	Percentage
Dermatophytes		
<i>Trichophyton rubrum</i>	14	31.81%
<i>Trichophyton mentagrophytes</i>	5	11.36%
<i>Epidermophyton floccosum</i>	4	9.09%
<i>Trichophyton tonsurans</i>	1	2.27%
Total	24	54.54%
Non dermatophyte moulds		
<i>Fusarium spp</i>	4	9.09%
<i>Aspergillus niger</i>	3	6.81%
<i>Aspergillus flavus</i>	2	4.54%
<i>Aspergillus fumigatus</i>	2	4.54%
Total	11	25%
Yeasts		

<i>Candida albicans</i>	5	11.36%
Other <i>Candida</i>	4	9.09%
Total	9	20.45%

Discussion

Onychomycosis is a chronic fungal infection of nails present worldwide. In recent decades there has been an increase in its prevalence. Its presentation and causative fungi show regional variation and according to environment, living style and co-morbid conditions.⁽⁴⁾ The increase in prevalence is because of difficulty in clinical and mycological diagnosis, inappropriate collection of material for analysis as well as ineffective treatment make it hard to ascertain the true profile of such onychopathies.⁽³⁾

In the present study onychomycosis was found to be commonest in the age group of 31-40 yrs in accordance to Veer et al⁸ and Grover et al.⁽¹⁰⁾ There was decreasing prevalence in patients over the age of 50 yrs. Antecedant diseases such as Diabetes, Peripheral vascular disease, personal habits such as chronic smoking, trauma to the nails were noted as predisposing factors in our study.^(1,2)

Higher incidence was noted among males than females with a male to female ratio of 1.75:1, in accordance to Ratna et al,⁽³⁾ Rubeena Lone et al,⁽⁷⁾ Veer et al,⁽⁸⁾ Grover S et al,⁽¹⁰⁾ Adhikari et al⁽¹¹⁾ and S Neupane et al.⁽¹²⁾ Some studies like Arti et al⁽⁴⁾ and Ruchita et al⁽⁶⁾ have shown female preponderance than males. Higher incidence in males may be because they are more exposed to outdoors with greater physical activity and more prone to trauma.

In the present study onychomycosis was more common in people with low socioeconomic status, the reason being higher prevalence of poor hygiene practices and overcrowding. Manual labourers were predominant group followed by farmers, house wives and office personnel. Labourers have increased perspiration, a greater risk of occupation-related trauma and exposure to soil saprophytes, while the use of occlusive footwear by office personnel might predispose them to onychomycosis.

Toe nails are more commonly involved than finger nails in accordance to Ratna et al,⁽³⁾ Ruchita et al,⁽⁶⁾ Adhikari et al.⁽¹¹⁾ Some studies have shown finger nail involvement more than toe nails as in Rubeena lone et al,⁽⁷⁾ Veer et al,⁽⁸⁾ Grover S et al.⁽¹⁰⁾ Prevalence of toe nail involvement is due to 3 times slower growth rate than finger nail. DLSO is the commonest clinical pattern seen in our study followed by PSO comparable to Rubeena Lone et al,⁽⁷⁾ Veer et al⁽⁸⁾ and Grover S et al.⁽¹⁰⁾

The two conventional methods used for identification of fungi were direct microscopy with KOH mount and fungal culture. Our study revealed a greater mycological positivity of direct microscopic examination than culture. This is in accordance to Ratna et al,⁽³⁾ Arti et al,⁽⁴⁾ Ruchita et al,⁽⁶⁾ Rubeena lone et al,⁽⁷⁾ Veer et al,⁽⁸⁾ Adhikari et al,⁽¹¹⁾ whereas Das et al⁽⁵⁾ and

Grover S et al⁽¹⁰⁾ have shown culture positivity more than KOH positivity.

In our study, Dermatophytes were the predominant group isolated followed by NDM and yeasts in accordance to Ratna et al,⁽³⁾ Arti et al,⁽⁴⁾ Rubeena lone et al,⁽⁷⁾ Veer et al,⁽⁸⁾ Grover S et al⁽¹¹⁾ whereas NDM were most commonly isolated in Ruchita et al⁽⁶⁾ and yeasts were more common than NDM in Das et al⁽⁵⁾ and Bassiri-Jahromi et al.⁽⁹⁾ Among the dermatophytes, *T. rubrum* was more common than *T. mentagrophytes* in accordance to Ratna et al,⁽³⁾ Arti et al,⁽⁴⁾ Das et al,⁽⁵⁾ Ruchita et al,⁽⁶⁾ Rubeena lone et al⁽⁷⁾ and Veer et al⁽⁸⁾ whereas *T. tonsurans* were most common in Adhikari et al⁽¹¹⁾ and *E. floccosum* was most common after *T. rubrum* in Grover S et al.⁽¹⁰⁾

Among the NDM, *Fusarium spp* was most commonly isolated followed by *Aspergillus spp* in contrast to Arti et al⁽⁴⁾ Das et al,⁽⁵⁾ Ruchita et al,⁽⁶⁾ Bassiri-Jahromi et al⁽⁹⁾ Grover S et al⁽¹⁰⁾ and Adhikari et al⁽¹¹⁾ who have shown *Aspergillus spp* more common than *Fusarium spp*. Among yeasts *Candida albicans* was most common followed by other *Candida spp* as in Ratna et al⁽³⁾ and Das et al.⁽⁵⁾

Conclusion

Onychomycosis is a frequent cause of nail infection more commonly affecting males. DLSO was most common clinical pattern with toe nails predominantly involved than finger nails. The combined sensitivity of direct microscopy and culture was greater than those of direct microscopy and culture alone, which emphasizes the need of performing both tests. Trichophyton *rubrum* remains the most common etiological agent and there is increase in infections with NDM and yeasts. Hence clinico-epidemiological data is helpful in increasing public awareness and for development of diagnostic, preventive and treatment strategies.

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