

NON-DERMATOPHYTIC ONYCHOMYCOSIS: MYCOLOGICAL OVERVIEW FROM A TERTIARY CARE CENTRE.

Microbiology

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ABSTRACT

INTRODUCTION: Onychomycosis accounts to almost 50% of all the nail disorders. Dermatophytes are implicated to be their most common etiological agents as they have the ability to survive on the human keratin layers. Non-dermatophytes are generally considered as either contaminants or commensals, however, their significance in causing onychomycosis have been increasingly reported. The etiological agents of onychomycosis changes with respect to geographical area. This study was conducted to understand the mycological spectrum of onychomycosis and the role of non-dermatophytes in causing the disease.

METHODOLOGY: All the specimens obtained were subjected to microscopy, after treatment with 40% KOH. The specimens were also inoculated onto Sabouraud's dextrose agar with and without cycloheximide and incubated at 25°C and 37°C upto 4 weeks. The tubes were examined twice weekly and fungal growths were identified according to standard procedures.

RESULTS: During the study period 37 cases were reported. There was a male preponderance (67.6%) over female (32.4%). Finger nails (26/37, 70.3%) were more affected than toe nails (11/37, 29.7%). Direct microscopy of nail clippings in 40% KOH was positive in 20/37 (54%) cases and fungal culture was positive in 26/37 (70%) of cases. *Aspergillus* was the most common isolate (n=12), followed by *Cladosporium* species (n=4). Trichophyton species were identified in only n=3 cases.

CONCLUSION: Being aware of the spectrum of agents causing onychomycosis in a particular region becomes important to keep a broad-minded approach for the possible pathogens. This will help in providing early and appropriate treatment to the patient thereby reducing the patient's morbidity and mortality in the long run. Our study reported an increase in trend of onychomycosis caused due to non-dermatophytic moulds, hence these agents should also be considered as pathogens instead of mere contaminants or secondary colonisers.

KEYWORDS

onychomycosis, non-dermatophytes, dermatophytes, nails

INTRODUCTION

The term "onychomycosis" is broadly used to denote any fungal nail infections caused by dermatophytes, non-dermatophytes (ND) and yeasts.¹ This condition accounts to almost 50% of all the nail disorders.^{2,3} Dermatophytes (*Trichophyton*, *Epidermophyton* and *Microsporum*) are implicated to be the most common etiological agents of onychomycosis as they have the ability to produce keratinase, allowing them to survive on the human keratin layers.⁵ On the other hand, non-dermatophytes (*Scopulariopsis brevicaulis*, *Aspergillus* species, *Fusarium* species, *Sytridium* species and *Onychocolanandiensis*) have been associated with onychomycosis to only about 1.45 to 17.6% as they are not keratinolytic but they are able to live on the non-keratinized intercellular cement or take advantage of previous keratin degradation by dermatophytes, trauma, or a pre-existing nail pathology.^{1,5} Non dermatophytes are generally considered as either contaminants or commensals and their role in causing onychomycosis is controversial till date.² However, their significance in causing onychomycosis have been increasingly reported.⁶

Though onychomycosis is not associated with fatality, it is characterised by clearly visible disfigurement and can have significant impact on patients' emotional and social wellbeing. Affected individuals often experience embarrassment in social and work environment. The therapeutic options available are prolonged and are often associated with adverse effects.⁷ Added to this, the non-dermatophytic moulds or yeasts may not respond to the usually prescribed systemic antifungals like itraconazole, fluconazole and griseofulvin.⁸ Identifying the correct etiological agent is essential in delivering the appropriate treatment and to reduce the morbidity surrounding it.

The etiological agents of onychomycosis changes with respect to geographical area.⁴ This study was conducted to understand the mycological spectrum of onychomycosis and the role of non-dermatophytes in causing the disease.

MATERIALS AND METHODS

The study included patients with clinically diagnosed onychomycosis received from the department of Dermatology in ESIC MC & PGIMS during the study period Nov 2016 to Nov 2017. The demographic details of the patients like age, sex, etc were noted down. Before collecting the nail clippings, the site of lesion was thoroughly

examined and cleaned with alcohol to avoid bacterial contamination. Nail clipper and NO 15 blade were used to collect the sample and the debris from the nail bed was accessed using a curette.

All the specimens obtained were subjected to microscopy, after treatment with 40% KOH to detect the presence of any fungal elements. The specimens were also inoculated onto Sabouraud's dextrose agar with and without cycloheximide and incubated at 25°C and 37°C upto 4 weeks. The tubes were examined twice weekly and fungal growths were identified according to standard procedures such as colony characteristics, pigment production, microscopy, rate of growth, germ tube test and biochemical reactions. The fungal isolates were grouped into dermatophytes, non-dermatophytes and yeasts for analysis.

RESULTS

During the one-year study period, 37 cases were received to the department of Microbiology suspected with onychomycosis. The age of the study population ranged from 1yr to 60 yrs with maximum number of cases between 19-60 years (70.3%). There was a male preponderance (67.6%) over female (32.4%) (M:F=2:1) in this study. Finger nails (26/37, 70.3%) were more affected than toe nails (11/37, 29.7%) (**Figure 1**). Direct microscopy of nail clippings in 40% KOH was positive in 20/37 (54%) cases and fungal culture was positive in 26/37 (70%) of cases. No fungal growth was seen in 11/37 (30%) cases. All the 20 (54%) patients with positive fungal elements on KOH mount were also culture positive (**Table 1**).

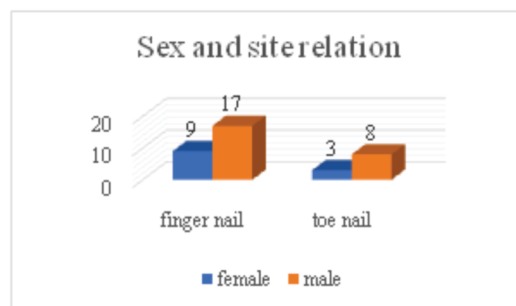
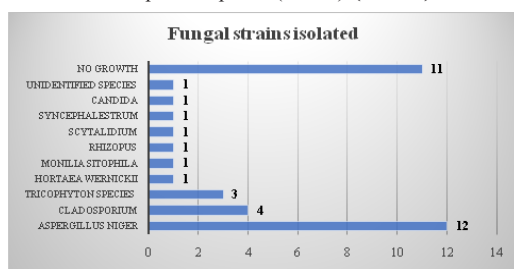


Figure 1: Bar diagram showing sex and site relation.

Table 1: Correlation of KOH findings with culture growth

KOH	CULTURE GOWTH		TOTAL
	Growth	No growth	
Negative	6	11	17
Positive	20	0	20
TOTAL	26	11	37

Aspergillusniger was the most common isolate (n=12), followed by *Cladosporium* species (n=4). *Trichophyton* species were identified in only n=3 cases. The details of the fungal growth are mentioned in the Figure 2. *Aspergillusniger* affected finger nails (34.6%) more commonly than toe nails (27.27%). The other most common fungus to affect toe was *Cladosporium* species (18.2%). (Table 2)

**Figure 2: Fungal strains isolated in the study****Table 2: Sites affected by various fungal strains**

Species	Site		Total
	Finger nail	Toe nail	
<i>Aspergillusniger</i>	9 (34.61%)	3 (27.3%)	12
<i>Cladosporium</i>	2 (7.69%)	2 (18.2%)	4
<i>Trichophyton</i>	3 (11.54%)	0	3
<i>Rhizopus</i>	0	1 (9.1%)	1
<i>Syctalidium</i>	1 (3.85%)	0	1
<i>Syncephalestrum</i>	1 (3.85%)	0	1
<i>Monilialsitophila</i>	0	1 (9.1%)	1
<i>Hortaeawernickii</i>	0	1 (9.1%)	1
<i>Candida</i>	1 (3.85%)	0	1
Unidentified strain	1 (3.85%)	0	1
No growth	8 (30.76%)	3 (27.3%)	11
Total	26	11	37

DISCUSSION

Confirmed cases of onychomycosis should be treated promptly due to various considerations like cosmetic and functional disability, lack of spontaneous remission, impairment of health and wellbeing in elderly patients, and the need to reduce contamination in communal bathing places.⁹ The occurrence of non-dermatophytic onychomycosis varies from one region to another. In European countries like Austria, Estonia, Italy, and Spain, the frequencies of mould onychomycosis were reported as about 5%, 7%, 8%, and 17.2%, respectively. Asia reported as 12% in Singapore and 22% in India.²

In our study the incidence was more common in males as compared to the females. This was in agreement with the study conducted by Lone et al, Sarma et al and Kaur R et al.^{6,10,11} The reason for males being affected more compared to females could be attributed to their increased outdoor activities as well as occupational nail trauma.

The present study showed that finger nails (70.3%) were more involved than toe nails (29.7%). This can be attributed to the fact that finger nails are more prone for trauma and also exposure to the pathogens compared to the toe nails which are protected by footwear most of the time. Similar findings were noted by Lone et al, Sarma et al and Kaur R et al.^{6,10,11}

KOH findings play an important role in case of onychomycosis, as it can help in identification of the pathogen and also direct the clinician to start the treatment without any further delay. However, the results are very subjective. In our study KOH microscopy was positive in 20/37 (54.05%) cases. The culture negative cases were also KOH negative. However, in the present study 70.3% of cases were positive by culture. This is in accordance with the study conducted by Kaur R et al.⁶

Our study noted that only 8% of the cases were caused due to dermatophytes, while *Aspergillusniger* being the most common

organism to be isolated (32.43%). There are various studies which show that dermatophytes are the common cause of onychomycosis.^{11,12,13} This indicates a change in pattern of the causative agents of onychomycosis from dermatophytes to non-dermatophytes.

CONCLUSION

Diagnosing a case of onychomycosis caused due to non-dermatophytic moulds is difficult when compared to dermatophytes and yeast causing nail infections, due to the fact that getting consecutive cultures from repeated nail scrapings for a reliable laboratory results becomes important.¹⁴ Non-dermatophytic onychomycosis should raise an alarm as they could be a portal of entry to a much more dangerous deep-seated/invasive mycosis. This becomes even more important in case of immunocompromised patients, as their treatment becomes difficult.^{15,16}

Being aware of the spectrum of agents causing onychomycosis in a particular region becomes important to keep a broad-minded approach for the possible pathogens. This will help in providing early and appropriate treatment to the patient thereby reducing the patient's morbidity and mortality in the long run. It will also help in preventing the spread of the disease in the community. Overall our study reported an increase in trend of onychomycosis caused due to non-dermatophytic moulds, hence these agents should also be considered as pathogens instead of mere contaminants or secondary colonisers.

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