



Original Research Article

Onychomycosis: Prevalence and Its Etiology in a Tertiary Care Hospital, South India

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ABSTRACT

Onychomycosis is the most common of all diseases of the nails in adults. It is a fungal infection of the finger and toe nails usually caused by dermatophytes, yeast and non-dermatophytic moulds. It represents up to 20% of all nail disorders.

Aim: This study was done to know the isolation rate and etiological agents of onychomycosis.

Material and Methods: Over a period of 3 years, samples from 95 patients with clinically suspected fungal infection of nail attending Dermatology Outpatient Department of M. S. Ramaiah Medical College and Hospital, Bangalore, were obtained.

Results: The isolation rate was found to be 38/95 (40%) in our hospital. Dermatophytes were isolated in 20 (52.6%) cases, while 18 (47.4%) had non-dermatophytes as fungal agents. *Trichophyton mentagrophytes* (*T.mentagrophytes*) was the most common species (spp) isolated among the dermatophytes, where as *Aspergillus spp* and *Fusarium spp* were among the non-dermatophytes.

Conclusion: This study demonstrated that dermatophytes were the main agents causing onychomycosis and the importance of performing direct examination and fungal culture.

Key Words: Onychomycosis, dermatophytes, *Trichophyton mentagrophytes*, non-dermatophytes, *Aspergillus*, *Fusarium*.

INTRODUCTION

Onychomycosis refers to fungal infection of the nails with various etiological agents, involving dermatophytes, yeasts and non-dermatophytic moulds. Onychomycosis is traditionally referred to as non-dermatophyte infection of nail but now used as a general term to denote all fungal infection of nail. The term onychomycosis is derived from Greek word 'onyx' (nail) and 'mykes' (fungus). Toe nails are more often

affected than fingernails in a ratio of 4:1. Onychomycosis is a common infection in adults and accounts for 20% of all nail diseases. Onychomycosis is classified into four types:

- Distal and lateral subungual onychomycosis (DLSO).
- Proximal subungual onychomycosis (PSO).
- White superficial onychomycosis (WSO).

d. Total dystrophic onychomycosis (TDO).

DLSO is the most common type with predominance of dermatophytes. The commonest infecting species is *T.rubrum*, followed by *T.mentagrophytes*, *T.tonsurans* and *E.floccosum*.^[1]

The incidence and clinical significance of non-dermatophytic fungi or moulds causing onychomycosis is unknown because they may be colonizing organisms rather than pathogens. Though non-dermatophytic moulds are rare, but a number of species, such as *Fusarium spp*, *Scytalidium spp* and *Acremonium spp* have also been described as etiological agents of onychomycosis.^[2]The etiology of onychomycosis is multifactorial. The risk factors for this condition include increase in age, male sex, and underlying condition such as diabetes, immunodeficiency, and peripheral arterial disease, environmental and behavioral factors such as sporting and religious practices. Genetics i.e. genetic defects that cause alterations in immune function has also been identified as a factor responsible for the epidemiology of onychomycosis.^[3,4]

The present study was done to determine the epidemiology, prevalence and fungal causes of onychomycosis.

MATERIALS AND METHODS

A cross sectional study was conducted over a period of 3 years (July 2009 - June 2012). Samples from 95 clinically suspected cases of onychomycosis, attending Dermatology Department of M. S. Ramaiah Medical College, Bangalore, were obtained.

After cleaning the affected area with 70% ethanol, nail clippings or subungual scrapings were collected and the samples were sent in folded paper to microbiology laboratory.^[1] The nail clippings were subjected to direct microscopy in 20% KOH

and culture on plain Sabouraud Dextrose Agar (SDA), Sabouraud dextrose chloramphenicol agar with and without actidione. Cultures were incubated at 25⁰ C and 37⁰C and examined daily for a week and twice a week for 6 weeks. Fungal growth was identified based on culture character, pigment production, microscopic examination in lactophenol cotton blue mount, slide culture, growth in dermatophyte test media and urease test.^[5]

In case of growth of non-dermatophyte mould, its etiologic significance was confirmed by the following criteria, direct positive KOH showing hyphal elements, growth of pure culture in all the tubes of SDA, repeat sample yielding the same growth.^[6,7] Yeast was identified using germ tube test and growth on CHROM agar. Negative culture report was given only after 6 weeks of incubation.

RESULTS

A total of 95 samples were collected and examined (42 males and 53 females). The age group of the patients varied from 5 to 80 years. Maximum numbers of patients were found in the age group 21-40 years (44%). From 95 patients with clinical lesions in the nails, 38 (40%) had onychomycosis by culture and/or direct microscopy. Amongst the 38 patients, 28 (73.68%) were positive by KOH mount. The remaining 10 (26.3%) were KOH negative, but positive only on culture; 30 (78.94%) of samples were positive by both microscopy (KOH) and culture. Infective fungal agents were predominantly dermatophytes (Table 1).

Table 1: Fungal isolates causing Onychomycosis.

Fungal isolates	No. of isolates	Percentage
Dermatophytes	20	52.6%
Non-dermatophytes	18	47.4%

Among the dermatophytes, *T.mentagrophytes* was the commonest

(Table 2) and among the non-dermatophytes, *Aspergillus* and *Fusarium* species were the predominant fungi (Table 3).

Table 2: Distribution of Dermatophytes causing Onychomycosis.

Fungal isolates	No. of isolates	Percentage
<i>Trichophyton mentagrophytes</i>	16	42.10%
<i>Trichophyton rubrum</i>	2	5.26%
<i>Epidermophyton floccosum</i>	2	5.26%

Table 3: Distribution of Non-dermatophytes causing Onychomycosis.

Fungal isolates	No. of isolates	Percentage
<i>Fusarium spp</i>	5	13.15%
<i>Aspergillus niger</i>	4	10.52%
<i>Pencillium spp</i>	3	7.89%
<i>Aspergillus terreus</i>	1	2.63%
<i>Aureobasidium spp</i>	1	2.63%
<i>Mycelia sterilia</i>	1	2.63%
<i>Alternaria spp</i>	1	2.63%
<i>Candida albicans</i>	1	2.63%
<i>Unidentified dematiaceous fungi</i>	1	2.63%

DISCUSSION

Onychomycosis is a common nail disorder. It is a chronic infection of finger and toe nails. Far more than a cosmetic problem, infected nail serves as a chronic reservoir, which can give rise to repeated mycotic infection, secondary bacterial infection, chronicity, therapeutic failures and disfigurements. There is an increase in the incidence and spectrum of causative pathogens causing infections.^[5] The prevalence is higher than currently thought as the difficulty in clinicomycological diagnosis, improper sample collection or ineffective treatment makes it difficult to know the true profile of onychomycosis.^[2] Also conditions like psoriasis, lichen planus, onychogryphosis and nail trauma can mimic onychomycosis, hence making laboratory investigations necessary to differentiate between fungal and nonfungal causes.^[5]

Though onychomycosis occurs worldwide, its prevalence varies. In this study, the prevalence of onychomycosis was seen in 40% of patients examined. This data

was in concordance with some studies conducted in India which showed a prevalence of 40%, 41.6% and 39.5% (Vijaya et al, Karnataka, Karmaskar et al, Rajasthan and Ahuja Sanjiv et al, Delhi, respectively).^[8,9,5] Some other studies from India have shown a higher prevalence rate of 82.35% and 48% (Adhikari et al, Sikkim and Veer P et al, Maharashtra).^[10,11] Studies from Brazil and Turkey showed a prevalence rate of 42% and 86.9% respectively.^[12,13] This varying difference of prevalence worldwide could be because the affected patients usually do not seek medical care unless the severity increases.

The commonest age group affected in our study was 21-40 years (42, 44%). The increased prevalence in this age group can be justified due to increased physical activity, use of occlusive footwear and nail trauma.^[2,14] Females (53, 56%) showed higher infection rate than males in this study which is similar to other studies.^[15,16] The greater prevalence in females may be due to domestic chores and hands remaining wet for most of the day. Most often the fingernails were affected.

Though literature has quoted that yeasts such as *Candida* are the commonest cause of onychomycosis worldwide followed by *T. rubrum*,^[8] in our study, *T. mentagrophytes* was the commonest etiological agent (42.1%) which is similar to Ravinder Kaur et al.

Nail invasion by non-dermatophytic mould is considered uncommon with prevalence rates ranging from 1.45% to 17.6%. In India, the frequency is quoted as 22%. This variation could be due to difference in the geographical mould distribution and difference in the criteria used for diagnosing onychomycosis.^[2,7,17] Onychomycosis usually affects elderly people, probably due to more incidence of trauma, very slow growth of nails, and higher incidence of impaired blood supply to

extremities and chronic diseases like diabetes.^[18,19]

Aspergillus niger is gradually emerging as an important etiological agent. A study conducted by Nilay et al in Eastern India showed *Aspergillus niger* and *Fusarium spp* to be the predominant isolates which is a similar observation in our study.^[20] With the continued increase in the prevalence of onychomycosis, it is important to keep in mind that all isolated filamentous or pseudohyphal elements should be evaluated as potential pathogens when diagnosing fungal infections. Positive results were found more with fungal culture than KOH mount.^[8,20] Only direct microscopy can lead to missing out on cases leading to false negatives; therefore, it should be coupled with fungal culture for accurate diagnosis and species identification.^[20,21] The main drawback of dermatophytosis is that many individuals are not aware of harboring a dermatophyte, others may notice lesions but fail to consult their doctors. Therefore, a sensitive Immunochromatography test (ICT) has been developed recently. This test has been described by Yuko Higashi et al wherein they have concluded that it is easy to use ICT which yields quicker results in patients with dermatophytosis.^[22]

CONCLUSION

Onychomycosis is more difficult to treat than most dermatophytosis because of the inherent slow growth of the nail. Nothing can predict change in microbiological environment, and the therapy is directed mainly by the type of the organisms. Therefore, it becomes imperative that this kind of studies should be performed at regular intervals to find out any change in the causative organisms.

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