

## **Etiological Agents of Onychomycosis from a Tertiary Care Hospital in Central Delhi, India**

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### **ABSTRACT**

Onychomycosis, which is a common fungal infection of nail is caused by dermatophytes, yeast and mould. It constitutes an important public health problem because of its rising prevalence and under-diagnosis especially in developing countries. This study discusses the isolation rate and etiological agents associated with this infection. To determine the isolation and etiological agents of onychomycosis in New Delhi (India). Two hundred and seventy-six samples were collected from patients with suspected onychomycosis attending Skin O.P.D of Dr R.M.L and P.G.I.M.E.R Hospital, New Delhi during a two year period between October 2008 to September 2010.

The isolation rate of onychomycosis was found to be 39.5% from our hospital. Dermatophytes were isolated in 48.75% cases while 51.25% had non-dermatophytes as fungal agents. *Trichophyton mentagrophytes* was the most common species isolated in 28 (35%) cases of onychomycosis. This study demonstrated that dermatophytes were main agents causing onychomycosis in our region and accurate diagnosis of onychomycosis requires direct microscopy and fungal culture.

**Key Words:** Onychomycosis, Dermatophytes, *Trichophyton mentagrophytes*.

### **INTRODUCTION**

“Onychomycosis” traditionally referred to as nondermatophytic infection of the nail is now used as a general term to denote any fungal nail infection (Elewski 1998). It accounts for upto 50% of nail disorders and 30% of all superficial fungal infections of the nails. This may occur as a primary event or a secondary infection of a previously diseased or traumatized nail (Gupta *et al.*, 2008)

The disease is more frequent among men than women and it increases with age. Several factors have been implicated to the increase in disease such as reduced peripheral circulation, diabetes, nail trauma and difficulty to maintain proper nail hygiene (Veer *et al.*, 2007) Although not life threatening, onychomycosis may have significant clinical consequences such as secondary bacterial infection, chronicity, therapeutic difficulties and disfigurement in addition to serving as reservoir of infection. The symptomatic disease can be a source of embarrassment and potential cause of morbidity. Common clinical features include discoloration of the nail plate, hyperkeratosis and brittle nails (Malik *et al.*, 2009)

This infection can be caused by dermatophytes, yeast and nondermatophyte moulds (Yenisehirli *et al.*, 2009) Certain skin conditions such as psoriasis, lichen planus, onychogryphosis and nail trauma can mimic onychomycosis. (Malik *et al.*, 2009). Hence laboratory

investigations are needed to differentiate accurately between fungal infections and the above mentioned skin diseases and also before starting treatment of onychomycosis for better results. Fungal cultures are of paramount importance because the clinical outcome of antifungal agents varies as to whether the aetiological agent is a dermatophyte, yeast or mould. The antifungal agents with appropriate spectrum of activity can only be used if the underlying fungal pathogen is identified correctly. The epidemiology of onychomycosis has been well studied in some countries, but studies are lacking in tropical countries like India. This study therefore seeks to improve the current knowledge of the mycological aetiologies of onychomycosis.

### **MATERIALS AND METHODS**

All clinically suspected case of onychomycosis presenting to skin department of Dr R.M.L and P.G.I.M.E.R. Hospital, New Delhi over a period of two years (October 2008 to September 2010) were included in the study. Nail or subungal scrapings from all these subjects were collected with a surgical blade after cleaning the affected area with 70% ethanol. Microscopic examination of the samples was performed following clarification with 10% potassium hydroxide (KOH). All samples were inoculated on (1) Sabouraud dextrose agar (SDA, HiMedia Laboratories) (2) SDA with 5%

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chloramphenicol and cycloheximide. Cultures were incubated at 25°C and 37°C and examined daily for first week and twice a week for 6 weeks. Different fungi were identified based on microscopic and culture characteristics as per standard techniques /procedures (Milne 1996). The following criteria were taken into consideration to consider non-dermatophyte mould as pathogen, a direct positive mycological examination presenting large and irregular septate hyphae, the growth of the same agent in pure culture in at least three tubes of SDA, no development of dermatophytes and repetition of these criteria after an interval of 2weeks (Martinez et al., 2009).

### RESULTS

A total of 276 patients (190 male and 86 females) were examined during the study period. Amongst these 276 patients with clinical manifestation in the nails, 109(39.5%) had onychomycosis by direct microscopy and fungal cultures were positive in 80 specimens. The age of the patients varied from 4-95 years, majority (44.93%) i.e. 124 out of 276 patients were between 21-40 years of age and the ratio of male to female was approximately 2.2 (Table1). The most frequently isolated fungus was dermatophytes in 39 (48.75%) patients followed by *Candida* spp in 18 (22.5%) patients and *Aspergillus* spp in 16 (20%) patients. Of the 39 dermatophytes isolated, *Trichophyton mentagrophytes* was the most commonly involved, being responsible for 28 (35%) cases of onychomycosis. Other dermatophytes strains identified were *Trichophyton rubrum* in 7 (8.75%) samples, *Epidermophyton floccosum* in 4 (5%) samples. Regarding filamentous non dermatophytic fungi, *Aspergillus* spp in 16 (20%) was the most frequently isolated mould. Occasionally *Curvularia*, *Alternaria*, *Fusarium* and *Penicillium* spp were isolated (Table 2).

### DISCUSSION

Onychomycosis is a chronic mycotic infection of finger nails and toe nails that affect the quality of life in a significant proportion. There has been a recent increase in the incidence as well as the spectrum of causative pathogens associated with onychomycosis. This increase in the incidence can be attributed to various factors like aging population, an ever expanding number of immunocompromised patients and life style practices.

Onychomycosis occurs worldwide and appears to be a variable entity presenting in different forms in different parts of the world with every country and every region of country having its own characteristics of presentation

(Jesudanam et al., 2002). In this study the isolation rate of onychomycosis was found to be 39.5%. Our study was in concordance with a study from Himachal Pradesh in India which showed an isolation rate of 37.6% while studies from Kuwait and Quetta reported a lower isolation rate of 29% and 20% (Gupta et al., 2008; Malik et al., 2009; Yehia et al., 2010). Studies from different parts of India showed a higher prevalence rate of 48.8% from Maharashtra, 41.6% from Western Rajasthan, 60% and 40% from Karnatka, 82.35% from Sikkim and 45% from New Delhi (Veer et al., 2007; Karmaskar et al., 1995; Sujatha et al., 2000; Adhikari et al., 2009; Kaur et al., 2007; Vijaya et al., 2004). Even studies from Brazil and Turkey showed a higher prevalence rate of 42% and 86.9% (Yenisehirli et al., 2009; Martinez et al., 2009). The fact that not all patients affected by onychomycosis seek medical attention can also explain the difference in prevalence of onychomycosis observed worldwide. The commonest age group affected in our study was 21-30 (25, 24.6%) years followed by 31-40 (35, 20.2%) years. A similar high prevalence among 21-30 years age group was reported in other studies. (Jesudanam et al., 2002; Reddy et al., 1982) In contrast two other studies reported a higher isolation rate among adults over the age of 50 years. (Mercantini et al., et al. 1996; Velez et al., 1997). Increased participation in physical activity, increased exposure to wet work and shoe wearing habit among this age group could be some of the contributing factors for the increased prevalence in the 21-30 years age group (Jesudanam et al., 2002).

Higher isolation rate was noted among males (68.8%) than females, the ratio being 2.2:1, which was in concordance with most of the studies (Gupta et al., 2008; Veer et al., 2007; Malik et al., 2009; Yenisehirli et al., 2009; Yehia et al., 2010 Karmaskar et al., 1995; Sujatha et al., 2000). Higher isolation rate in males may be contributed to the fact that they are more exposed to outdoors with greater physical activity and are more prone to trauma (Veer et al., 2007).

Though yeasts have been quoted in literature as being responsible for many cases of onychomycosis worldwide (Gupta et al., 2000; Koursidou et al., 2002), dermatophytes, especially *Trichophyton mentagrophytes*, were the etiological agents most widely found in our study population being responsible for 35% of cases evaluated. This can be attributed to the fact that epidemiology of onychomycosis varies from one geographical region to other. Although not usually life threatening, onychomycosis can be a source of significant pain and discomfort. It can also pose significant risk for patients, their family

**Table 1. Age and Sex wise distribution of suspected cases of onychomycosis.**

Age group (years)	Male	Female	Total
1-10	5	1	6
11-20	25	13	38
21-30		25	68
	43		
31-40		15	56
	41		
41-50		9	43
	34		
51-60		12	29
	17		
61-70		9	24
	15		
71-80		2	10
	8		
>80		0	2
	2		
<b>Total</b>	<b>190</b>	<b>86</b>	<b>276</b>

**Table 2. Spectrum of fungal isolates from cases of onychomycosis**

Organism	Male	Female	Total	%
Trichophyton spp	31	4	35	43.75
Epidermophyton spp	4	0	4	5
Candida spp	13	5	18	22.5
Aspergillus spp	14	2	16	20
Curvularia spp	2	2	4	5
Alternaria spp	1	0	1	1.25
Fusarium spp		0	1	1.25
Pencillium spp	1	0	1	1.25
<b>TOTAL</b>	<b>57</b>	<b>13</b>	<b>80</b>	<b>100</b>

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and others in contact with them. Onychomycosis can no longer be considered a simple cosmetic nuisance confined to the nails. It is a significant and important disease which can generate many physical, physiological and occupational problems, considerably impairing patient quality of life. So, fungal cultures are of paramount importance in all suspected cases of onychomycosis because the antifungal agent with appropriate spectrum of activity can only be used if the underlying fungal pathogen is identified correctly.

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