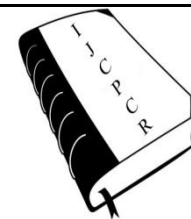




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### PREVALENCE OF ONYCHOMYCOSIS IN A TERTIARY CARE TEACHING HOSPITAL

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#### ABSTRACT

Onychomycosis is the fungal infection of the nails. It is the commonest nail disorder encountered in clinical practice constituting 20-40% of all diseases of the nails. This study was done to know the different causative agents of onychomycosis. A more reliable method of detection would improve the diagnosis and facilitate appropriate therapy. The prevalence of onychomycosis seems to vary across the world because of various socioeconomic and cultural factors. However, all the nail diseases are not fungal in origin. Hence laboratory investigations are needed to differentiate accurately between fungal infections and other conditions. One hundred and five clinically suspected cases of onychomycosis sent to microbiological evaluation at Department of Microbiology Govt. Medical College & Hospital over a period of Six months (May to October 2016) were included in present study. The nail clipping and scrapping were collected from patients and subjected to direct microscopy by using 20% KOH and culture on Sabaroud's Dextrose agar. Among clinically suspected patients, 85% (89/105) were mycologically confirmed to have onychomycosis. *Aspergillus* species was most commonly isolated  $n = 63$  (70.71%) followed by dermatophytes, yeasts and other fungi  $n = 26$  (29.22%). In men, *Aspergillus* onychomycosis was seen in 68.57%. Among patients who had *Aspergillus* nail infection, 40(63%) had diabetes for a period of >15 years. Among patients who were engaged in agricultural activities, 74.14% were confirmed to have infected nails due to *Aspergillus* species. *Aspergillus niger* was the most common pathogen isolated from toenail infection. *Aspergillus* species should be considered as an important pathogen in toenail onychomycosis in diabetic patients. For proper management of onychomycosis, diagnosis and accurate treatment play a key role in better outcome.

**Key words:** Onychomycosis, *Aspergillus*, Diabetes, Agriculture.

#### INTRODUCTION

Onychomycosis is a fungal infection of nail more commonly involves the toenails [1]. It is caused by a variety of fungi including dermatophytes, non-dermatophyte molds and *Candida* [2,3]. It affects approximately 5% of the population worldwide and represents around 30% of all superficial mycotic infection and 50% of nail disorders [4]. This 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

[5]. There is a long list of fungi which have a tendency to damage the nail, like dermatophytes (50%), yeasts (27%) and molds (23%) [6]. Recently, *Aspergillus* species were considered as emerging pathogens of toenail infections [7, 8]. The proportion of *Aspergillus* infection in onychomycosis has been reported as 50–60% [9].

However, all the nail diseases are not fungal in origin they are also caused by other clinical conditions like trauma, wet work (with the hand submerged in soap & water), HIV-AIDS, immunodeficiency which is due to organ or bone marrow transplantation, old age, psoriasis,

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atopic dermatitis, diabetes. Hence laboratory investigations are needed to differentiate accurately between fungal infections and the above-mentioned skin diseases for proper management of onychomycosis.

## MATERIAL AND METHODS

One hundred and five clinically suspected cases of onychomycosis sent to the Department of Microbiology Govt. Medical College & Hospital for microbiological evaluation by Dermatology Department over a period of Six months (May to October 2016) were included in present study. Ethical approval for the study was granted by the Ethical Committee. Nail clippings or subungual 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 by using 20% potassium hydroxide (KOH). All samples were inoculated on Sabouraud's dextrose agar (SDA, Hi Media laboratories) and SDA with 5% 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 which were confirmed by slide culture in case of dermatophytes and other moulds and by germ tube, sugar assimilation test in case of *Candida* spp. The following criteria were taken into consideration for confirming Non-dermatophyte mould as pathogen, on direct microscopic examination large and irregular septate hyphae in KOH mount, the growth of the same agent in pure culture in at least three tubes of SDA and no growth of dermatophytes as well as repetition of these criteria after an interval of 2 weeks [10-12].

## RESULTS

One hundred and five patients with clinically suspected onychomycosis, comprising 80 males (76.19%) and 25 females (23.81 %) aged 10-80 years (mean age 58.3 years) were included in the study. (May to October 2016) Table 1 and 2 Among clinically suspected patients, 85% (89/105) were mycologically confirmed to have onychomycosis. Male to female ratio was 3.7:1 Of the patients with confirmed onychomycosis culture positivity alone was seen in 10 (11.23%) cases, both culture and KOH positivity was seen in 79 (88.77%) cases. *Aspergillus* onychomycosis was confirmed after obtaining positive results from both KOH and culture. Of the fungal pathogens isolated from mycological investigations, *Aspergillus* species were most commonly isolated (70.78%). Among *Aspergillus* species, *Aspergillus niger* (76%) was prominent.

Among the women with onychomycosis, 15 (78.95%) and 4 (21.05%) cases were due to *Aspergillus* species and other fungi species respectively whereas in men 68.57% of onychomycosis was caused by *Aspergillus* species. Table 3 and Table 4

With regard to occupation 65% patients were engaged in agriculture activities including farming and gardening. Among these 74.14% were confirmed to have infected nails due to *Aspergillus* species. 35% of the clinically suspected patients were wearing socks and shoes during work. Among them 64.52% were confirmed to have onychomycosis due to *Aspergillus* species. Table 5

Among patients who had *Aspergillus* nail infection 66% had diabetes for a period of more than 15 years and 34% had diabetes for a period of less than 15 years.

## DISCUSSION

Onychomycosis is a chronic mycotic infection of finger nails and toe nails that affect the quality of life in a significant proportion [13]. There has been a recent increase in the incidence as well as the spectrum of causative pathogens associated with onychomycosis [10-14] which may be due to increase in awareness among peoples towards health, cosmetic consciousness or due to increase in various risk factors like chronic diseases leading to immunosuppression, other fungal infections of the skin, sport and increased age [15].

Although it is reported that dermatophytes and yeasts are the most common cause for onychomycosis, [7,8] non-dermatophyte moulds (NDM) such as *Aspergillus* spp., *Fusarium* spp., *Acremonium* spp., and *Scopulariopsis* spp., were also found as the most common pathogens for onychomycosis in patients with diabetes. [16]

In our study, *A. niger* was found to be the most common (76%) cause for onychomycosis among the diabetes patients. Our results were also in line with previous investigators [15,16] reporting that *A. niger* as the commonest cause of nail infection in diabetics. [17] Several other studies also have reported *Aspergillus* species as a primary cause of onychomycosis. [7,8] In contrast to our study, Moreno and Arenas, Gupta and Humke, have reported that *Trichophyton* spp., *Microsporum* spp. and *Epidermophyton* spp. were more common pathogens causing nail infections among diabetes patients. [7,8]

In our study the onychomycosis was predominant in men (63.63%) which may be due to more exposure to risk factors, This finding is concurrent to various other studies [10, 13, 14] however study from Gujarat (Prakash Gelotar et al., 2012) show high incidence among females [6].

In present study, age is also found as a determinant factor in acquiring fungal nail infections, In this study, the highest incidence was seen between age groups of 31-45 years (37%) with a mean age of 41.1 years. This is in accordance with reports by Garg et al [15], showing majority of their patients (70%) were between the age of 10 and 40 years [18]. Mohammad and Seyed also reported majority of subjects were under 49 years of age and the age group of 40-49 years contained the highest prevalence of onychomycosis. [19]

Diabetic patients more than 50 years old are more susceptible to fungal infections in toenails due to diminished blood circulation, increased thickness of the nail plate, decreased the growth rate of the nail, and poor foot hygiene [20]. Certain factors such as barefoot walking, using open rubber slippers, low socioeconomic status, late presentation by patients, poor compliance with medical care, inadequate adherence to precautionary measures, and foot inspection contribute to this high prevalence of onychomycosis among diabetic population.

In the present study, 65% patients were agriculturist followed by businessmen, students and housewives (35%). Neupane et al in their study observed that most of the patients were students (31.3%) followed by housewives (28%), occupational involvement in wet

work was seen in 41.8%. [21] In our study population, only 20% were office workers, among them more than half were diagnosed with *Aspergillus* onychomycosis. In other study Thomas et al had reported an association between onychomycosis and the use of footwear [22].

*Aspergillus* is normally considered as a common contaminant. Therefore, it is difficult to discern between the contaminant and the pathogen when *Aspergillus* spp. are identified in onychomycosis. However in our study, all the nail specimens which were confirmed to have *Aspergillus* showed positive direct smear as well as gave a comparable culture result. As the spectrum of disease is based on various etiologies, so the culture will remain gold standard in identifying the species causing the infection.

**Table 1. Incidence of fungal infections among different age groups**

Age group	Male	Female	Total (percentage)
<30	10	3	13(12.38%)
31-45	34	12	46(43.81%)
46-60	27	6	33(31.43%)
>60	9	4	13(12.38%)
Total	80	25	105(100%)

**Table 2. Sex distribution**

Gender	No. of cases	Percentage
Female	25	23.81%
Male	80	76.19%
Total	105	100%

**Table 3. Gender based distribution of various fungi**

Fungus	Male	%	Female	%	Total	%
Aspergillus	48	53.93%	15	16.85%	63	70.78%
Trichophyton	12	13.48%	3	3.38%	15	16.86%
Candida	6	6.74%	1	1.12%	7	7.86%
Fusarium	2	2.25%	0	0	2	2.25%
Alternaria	2	2.25%	0	0	2	2.25%
Total	70	78.65%	19	21.35%	89	100%

**Table 4. Aspergillus species isolated from toenail**

Aspergillus species	No. of isolate (%)
Aspergillus nigar	48(76%)
Aspergillus flavus	8(12%)
Aspergillus terrus	5(8%)
Aspergillus fumigatus	2(4%)
Total	63(100%)

**Table 5. Occupational distribution**

Occupation	Aspergillosis	Other than aspergillosis	Total N= 89 (100%)
Agricultural activities	43(74.14%)	15(25.86%)	58(65%)
Wearing socks and shoes during work (businessmen, students etc)	20(64.52%)	11(35.48%)	31(35%)

## CONCLUSION

Onychomycosis is a frequent cause of nail infection. The mycological study and identification of etiological agents of onychomycosis are needed to confirm the clinical diagnosis and for the choice of therapy. *Aspergillus niger* was the most common pathogen isolated from toenail infection. *Aspergillus* species should be considered as an important pathogen in toenail onychomycosis in diabetic patients. For proper management of onychomycosis, diagnosis and accurate treatment play a key role in better outcome.

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## CONFLICT OF INTEREST

No conflict of interest

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Nil