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**Research Article**

# Candida onychomycosis: Indian scenario

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## ABSTRACT

**Background:** Onychomycosis, a fungal infection of nails, may be caused by dermatophytes, nondermatophytes and yeast. Its incidence is progressively increasing, and now it is no more considered merely a cosmetic problem and the figures represent only the tip of the iceberg.
**Methods:** The retrospective study was carried out from January, 2000 to March, 2014 at Allahabad. KOH examination and culture were carried out in 3321 cases and species identification of *Candida* was done by Vitek-2 system.
**Results:** Out of 3321 cases, 2906 cases were culture positive. *Candida onychomycosis* was found in 284 (10.1%) cases. When data was further analyzed *Candida albicans* were isolated in 96 (33.81%) cases while *non albicans Candida species* were identified in 188 (66.19%) cases.
**Conclusions:** The result suggests that *non albicans Candida species* of Candida predominates in comparison to *Candida albicans*.

**Keywords:** Onychomycosis, *Candida albicans*, *non albicans Candida species*, Causative agent

## INTRODUCTION

Onychomycosis is a fungal infection of nails caused by dermatophytes, yeasts and moulds, accounting for about 50% of onychopathies.[1] Its incidence is progressively increasing, and now it is no more considered merely a cosmetic problem and the figures represent only the tip of the iceberg.[2]

In 1998, a study presented a new classification of onychomycosis dividing the pattern of nail plate involvement by mode and site of invasion into five clinical types: distal lateral subungual onychomycosis (DLSO), white superficial onychomycosis (WSO), proximal subungual onychomycosis (PSO), endonyx onychomycosis (EO), and candidal onychomycosis. Patients may have a combination of these subtypes. Total dystrophic onychomycosis refers to the most advanced form of any subtype. Therefore, *candida* onychomycosis is now a separate category in the new classification.[3] *Candida albicans* predominates in most yeast-caused onychomycosis cases.[4-9] However, other *Candida* species including *C. tropicalis*, *C. parapsilosis*, *C. glabrata*, *C. guilliermondi*, *C. krusei* and *C. famata*, have also been isolated in infected nails.[4,8-14]

*Candida albicans* and *C. parapsilosis* are most commonly isolated yeasts from abnormal toe nails but *C parapsilosis* is the most prevalent of the two.[15] The role of the *Candida* species in the pathogenesis of nail disease is complex.

Onychomycosis due to *Candida* species is thought to be restricted to patient with chronic mucocutaneous candidosis (CMC) or as secondary invaders in chronic paronychia.[16] The significance of *Candida* in the pathogenesis of nail dystrophy ought to be reconsidered as some patients with some forms of nail dystrophy not

associated with either mucocutaneous candidosis or chronic paronychia from which this yeast was isolated and patients were cured by an oral antifungal drug alone.[17] Therefore, this retrospective study is carried out to assess the frequency of *Candida* and its species as a single pathogen in cases of onychomycosis.

## METHODS

The study included 3321 clinically diagnosed cases of onychomycosis received from the skin clinics of Allahabad, India. In all the cases data related to the age, sex, duration of the lesions, occupation, personal, habits etc were noted. After a detailed clinical examination, the physical features of the nails were recorded. Care was particularly taken to record the presence of superficial mycotic infections on other parts of the body.

Before obtaining a specimen, nails were cleansed by swabbing them liberally with alcohol to eliminate as many bacteria as possible, because they can overgrow and inhibit the growth of dermatophytes. Scrapings, clippings were collected from the deepest part of the nail (junction of the healthy and diseased portion of the nail). When both toe and finger nails were affected, specimens were collected from both the sites.

In patients with presumptive diagnosis of DSO and CO, a nail clipper was used to cut away the nail plate; then a curette was used to scrape the debris from the nail bed at a site as proximal to the cuticle as possible. A No 15 blade scalpel was used to scrape debris from the nail surface in the cases of WSO. In the cases of PSO healthy nail was pared back with a no 15 blade scalpel and a curette was used to remove the material from the proximal nail bed.

Each specimen was divided into two parts, one was taken for direct microscopic examination after 10% KOH solution treatment and second was inoculated on Sabouraud Dextrose agar (M286) and Sabouraud Cycloheximide Chloramphenicol agar (M664). Two successive nail cultures were performed to establish the colonization of the pathogen because successive sampling rarely demonstrates the same contaminant.

Cultures were routinely incubated at $25^0$-$30^0$ c and examined daily for up to 4 weeks. The identification of individual fungi was based on standard methods such as microscopy, morphology, colonial characterization and pigment production, rate of growth and biochemical test while yeast identification was done by Vitek-2 (Biomeurix, France).[17-18]

## RESULTS

Out of 3321 clinically diagnosed cases of onychomycosis, 2906 cases were found culture positive. Their base line data are summarized (Table 1). Out of 2906 culture positive cases, 44.97% dermatophytes, 41.61% non dermatophytes, 9.77% *Candida* and its species and 3.65% mixed infections were isolated (Table 2).

**Table 1: Baseline data of patients.**

| Data | Values |
|---|---|
| Gender (M:F) | 33.80: 66.20 |
| Age (Year) | 46.11±8.30 |
| Finger nail | 62.1% |
| Toe nail | 35.8% |
| Both the sites | 02.1% |

**Table 2: Isolation of *dermatophytes, nondermatophytes candida* and its species in cases of *onychomycosis.***

| Culture isolates | n=2906 | Percentage |
|---|---|---|
| *Dermatophytes* | 1307 | 44.97% |
| *Nondermatophytes* | 1209 | 41.61% |
| *Candida and species* | 284 | 9.77% |
| Mixed infections | 106 | 3.65% |

**Table 3: Percentage of *albicans* and *non albicans Candida species.***

| Isolates | n=284 | Percentage |
|---|---|---|
| *Non albicans Candida species* | 188 | 66.19% |
| *Albicans* | 96 | 33.81% |

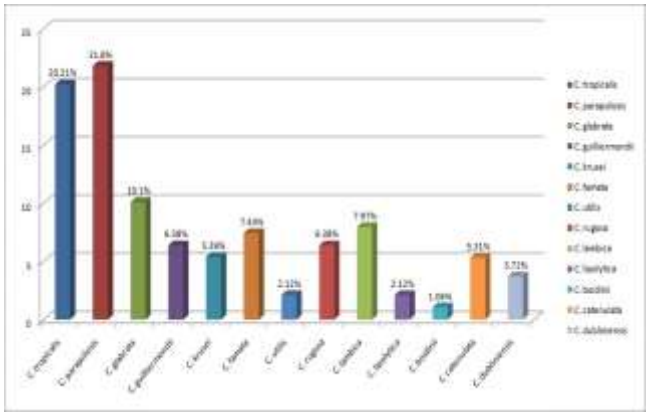

**Figure 1: Percentage of *non albicans Candida species*.**

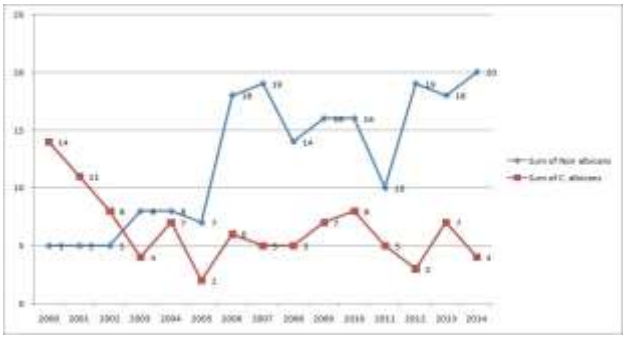

**Figure 2: Strains of *Candida* isolated in 14 years (2000-March 2014).**

When the data was further analyzed 13.4% *Candida albicans* and 86.6% *non albicans Candida species* were found (Table 3). Fourteen species of *Candida* were isolated from the cases of onychomycosis (Figure 1). *Non albicans Candida species* accounted for majority of the isolates and more so in the recent years (Figure 2).

## DISCUSSION

*Candida* nail infections occur in patients with chronic mucocutaneous candidiasis, and are caused by *C. albicans*. *Candida species* may cause other syndromes, including onycholysis and paronychia.[19] These forms occur more commonly in women than in men and often affect the middle finger, which may come into contact with *Candida* organisms that reside in the intestine or vagina.[20]

*Candida* onychomycosis can be divided into three general categories: Infection beginning as a paronychia, the most common type of *Candida* onychomycosis; patients with chronic mucocutaneous candidiasis are at risk for *Candida* granuloma and account for less than 1% of onychomycosis cases.[20-22]

It involves direct invasion of the nail plate; *Candida* onycholysis, which is more common on the hands than the feet.[19,23] *C. albicans* is the only yeast so far reported which is capable of invading the nail plate causing total dystrophy and producing a clinical picture similar to dermatophyte onychomycosis but the invasion of the nail plate is rare.

Female preponderance was observed in our study with a male-to-female ratio of 33.80:66.20. Bokhari et al observed 72% female patients in their study while Elewski and Cohen et al showed a male preponderance and included the male gender as a general risk factor for onychomycosis.[22,24,25]

*Candidal* onychomycosis was the most common type of infection associated with fingernails of females. Possibly chronic exposure to water as seen in the housewives (52.6%) and chefs (10.5%) may be the most common occupational risk factor as reported in previous studies.[26] Further, as females harbor this organism in their intestine or vagina, and have more cosmetic concern, that may be the reason for high number seeking medical attention.[27-29]

In case of involvement of the site, 62.1% fingernails 35.8% toenails and both the sites were affected in 2.1% of cases. However, conflicting reports exists regarding the site of infection involved. Gupta et al., have reported that toenail infection is more common than that of fingernail infection possibly because of the use of occlusive footwear, which are associated with increased perspiration and trauma.[26,30]

Venugopal found exceptionally high incidence of *Candida* onychomycosis of the toenails and it was suggested that this phenomenon might be related to the Muslim religious practice of washing the feet five times a day.[31] However, contrary to these reports fingernails have been shown to be more affected than toenails by other workers.[28,32-35]

The emergence of other species of *Candida* in various sites of the world is pointing towards a change in epidemiological behavior of the disease: *C. krusei*, *C. glabrata*, *C. parapsilosis* and *C. tropicalis* in India and Singapore.[36-37]

*C. tropicalis* and *C. guillermondii* in Malta.[38] *C. parapsilosis*, *C. tropicalis* and *C. guillermondii* in Brazil.[39] *C. parapsilosis*, *C. albicans* and *C. glabrata* in Maxico, *C. guillermondii* and *C. albicans* in Germany, and *C. tropicalis*, *C. albicans*, *C. glabrata* and *C. krusei* in Turkey have been reported.[40-42]

In Sao Paulo nail candidiasis outnumbered nail dermatophytosis, with *C. albicans* and *C. parapsilosis* being found more commonly, in the same order, particularly in fingernail onychomycosis.[43] As mentioned above only a few species of *Candida* causing Onychomyocosis have been reported from different parts of the world till date.

## CONCLUSION

It is hereby stated that isolation of 14 species of *Candida* from nails is being reported for the first time and has not been documented from any other part of the world so far. This has been made possible because of the identification on the isolated colonies done by Vitek-2. Thus the study emphasises that *Candida* play an important role in the development of the nail dystrophy and *non albicans Candida* species appear to be significant pathogens in cases of *Candida* onychomycosis.

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