Original Article

Prevalence of Candida species in onychomycosis at a Tertiary Care Hospital Karachi

Shahida Kashif[1], Muhammad Irfan Khan[2], Mukesh Kumar[3], Fakhur Uddin[4], Farhina Nasir[5], Suresh Kumar[6]

[1] Assistant Professor, Department of Pathology, Liaquat College of Medicine & Dentistry, Karachi.
[2,5] Assistant Professor, Department of Pathology, Karachi Medical and Dental College, Karachi.
[3] Assistant Professor, Department of Pathology, SMBB Medical College, Karachi.
[4] Medical Technologist, Department of Microbiology, BMSI, Jinnah Postgraduate Medical Center, Karachi.
[6] Assistant Professor, Department of Pathology, Jinnah Sindh Medical University, Karachi.

Author's Contribution
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Corresponding Author
Dr. Fakhur Uddin,
Medical Technologist,
Department of Microbiology,
BMSI, Jinnah Postgraduate Medical Center, Karachi
Email: fakharindhar@hotmail.com

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Abstract

Objective: This study was designed to determine the frequency of Candida in clinically diagnosed cases of onychomycosis.

Materials and Methods: This cross-sectional study was conducted in the Department of Microbiology, BMSI, JPMC, Karachi A total of 328 clinical samples have been collected. The fungal isolates were identified according to standard microbiological procedures. Samples were processed for primary screening microscopic test by KOH 20% (potassium hydroxide solution) wet mount. Processing for mycological culture was done by using Sabouraud's dextrose agar (cycloheximide and chloramphenicol), without antibiotics and Dermatophytes test medium**Results:** Prevalence of fungal species that isolated from the 328 samples, 14.33% were dermatophytes, 6.40% were non-dermatophytes mould, 23.70% were Candida, 4.87% were mixed growth and 50.30% were negative for growth. Among the 16 mixed isolates, 15 were Candida species, accounting for a total of 28.4% Candida isolates. **Conclusion:** A significant number of onychomycosis cases result from the Candida spp. and Candida albicans were the main species. However, Candida non-albicans species are emerging in onychomycosis. In this manner, a legitimate conclusion of the pathogens of onychomycosis is vital for focused treatment.

Keywords: Candida, C. tropicalis, Dermatophytes, Non-albicans, Onychomycosis, Potassium hydroxide

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Introduction

Onychomycoses are the infections of a nail; it is a global dermatological problem with different frequencies and relapses are increasing in the young population in the past few decades.[1] It could be a critical open wellbeing issue since of its high recurrence of the event, related morbidity, and long-lasting treatment.[2] It is frequently persistent, troublesome to abolish, contains a propensity to reappear, and needs systemic antifungal treatment.[3] Onychomycosis may lead to nail deformation which causes job and cosmetic-related issues.[4,5] Moreover, untreated patients can be a foundation of disease for family members and presumably debases public regions as it is contagious and transmitted by direct contact or contaminated utensils.[6]

Formerly, only dermatophytes were considered the most frequent pathogen of onychomycosis, and Trichophyton species were the most common[7] whereas non-dermatophyte moulds were infrequent.[8] Scenario is shifting from dermatophytes to Candida[9] and it is established that Candida species are causing onychomycosis.[5,8,10] Over the years, candidal onychomycosis was only considered with hand paronychia but now it is recognized that Candida species cause nail disorders identical to dermatophytes.[8,11,12] Candidal onychomycosis (CO) influences fingernails in individuals who work in a muggy and wet environment or regularly douse their hands in water. The CO may represent in one of four ways: candidal paronychia, chronic mucocutaneous candidiasis, secondary candidiasis, total dystrophic onychomycosis.[8] Candidal paronychia is the most predominant form of CO.[8]

In *Candida* >200 species are included, *Candida albicans* is mostly associated with onychomycosis[12] followed by *C. parapsilosis.*[13] Despite it other species are rising such as *C. utilis* and *C. lipolytica.*[14] The prevalence of *Candida* species is ranging between 3.5% to 58.5% [11,15] and in some literature, it is reported up to 71.4%, in onychomycosis.[16] The epidemiology of *Candida* species varies in the geographic region and some species are intrinsically resistant to some antifungal agents. This will result in failure of treatment and recurrence of the onychomycosis. This needs the continuous monitoring of *Candida* species spectrum in the local region. In Pakistan, most of the laboratories only perform direct microscopy and the culture facilities are limited. Therefore the present research was designed for the assessment of the prevalence of *Candida* species in the local population.

Materials and Methods

A cross-sectional study was conducted in the Department of Microbiology, Basic Medical Sciences Institute (BMSI), Jinnah Postgraduate Medical Centre (JPMC), Karachi with the collaboration of the Dermatology Department, JPMC, Karachi. The duration of this research was one year.

Sample size:

A total of 328 nail specimens were collected. The sample size was calculated by Open Epi online software using reference study [4].

Inclusion criteria:

All the clinically suspected cases of onychomycosis were included irrespective of age and gender.

Exclusion criteria:

Exclusion criteria were **p**atients having lesions other than onychomycosis, and antifungal drugs were excluded.

Ethical Consideration:

The ethical approval was obtained from the Institutional Review Board (IRB) of JPMC, Karachi (Reference No: F.2-81/2018-GENL/2928/JPMC), and informed consent was obtained from all participants.

Sample collection and processing:

Nail samples were collected in accordance with the standard method from the affected area of the nail. Aseptically small fragments of nail clippings, scraping of the nail bed and subungual debris were collected on a filter paper and labeled with patient primary data for sample identification. The direct microscopy was performed as KOH (20%) wet mount [17]. For culture specimen was inoculated on Sabouraud's dextrose agar (SDA, [Oxoid UK]) with and without antibiotics and Dermatophytes test medium (DTM, [Oxoid UK]) vials. Inoculated vials were incubated at 25°C and 37°C accordingly. The fungal species were identified by colonial and microscopic characteristics. Microscopic features of isolates were observed by using lactophenol cotton blue stain (LPCB). *Candida* species were identified by the API 20C AUX Candida system (RF: 20210, Biomerieux, SA).

Results

For the data analysis, IBM-SPSS version 23.0 was used for appropriate variables. The prevalence of fungal isolates in 328 nail samples, 47 (14.33%) were dermatophytes, 21 (6.40%) other mold, 78 (23.70%) *Candida,* 16 (4.87%) were mixed growth, and the remaining 166 (50.30%) samples were negative for

growth. The overall 162 (49.33%) samples were positive for fungal isolates.

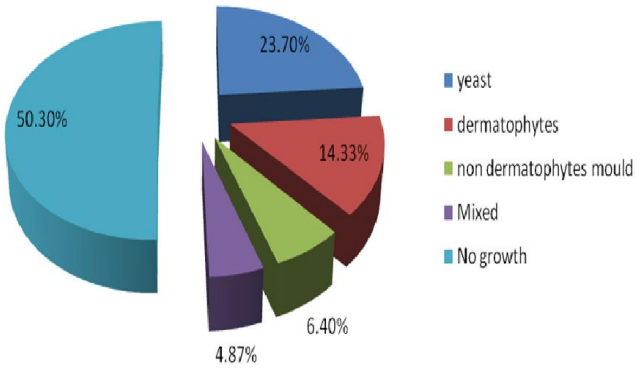

Figure 1: Distribution of fungal isolates in onychomycosis (n=328)

Among the all fungal isolates, 93 (28.3%) were Candida species, out of that 78 (83.87%) were in pure form, as a single pathogen and 15 (18.17) as mixed growth with other fungal pathogens. Among the candidial species, C. albicans was the most prominent 49 (52.68%) and followed by the Candida non-albicans (Table 1).

Table 1: Prevalence of Candida species in onychomycosis (n=93)

Candida species	*Number (%)*
Candida albicans	49(52.68%)
Candida tropicalis	25(26.88%)
Candida parapsilosis	11(11.82%)
Candida glabrata	4(4.30%)
Candida guilliermondii	1(1.07%)
Candida krusei	2(2.15%)
Candida utilis	1(1.07%)
Total	93(100%)

Discussion

Nail infections are reported around the world and onychomycoses account for about 30% of all superficial diseases and 50% of nail infections.[18] It impedes the quality of life, cumbersomeness, and other mental consequences, in addition to torment and misfortune of ability.[10] The predominance of onychomycosis is changing completely different topographical zones. In the present study, the prevalence was 49.39% and the previous studies from different countries reported as 36.9%, 56.8%, 58.41%, and 76% from Chile, India, Iran, and Bangladesh respectively.[9,11,18,19] Previously from Pakistan low prevalence was reported by Ahmed et al.[4] but in 2016, it was increased from 20% to 42% 20 and in the present study, it was 49.39%. This may be due to small sample size, lack of awareness about onychomycosis, and/or there is a gradual increase in prevalence.

The pathogenic spectrum of onychomycosis is changed and dermatophytes are overcome by Candida species.[15] Presently, it has been reported that there is an increase in predominance of candidal onychomycosis due to extend presentation to damp work, different injuries from exposure to physical and chemical work.[10] The similar pattern was observed in the present work, as Candida was the more prevalent in onychomycosis, followed by dermatophytes and other moulds (23.7, 14.3, and 8.5%) respectively. A similar finding is reported in previous studies.[9,16,21] Previously infrequently isolated Candida species are now increasingly reported from the different geographic regions, indicating a change in the epidemiology of Candida species.[11] This epidemiological variation of Candida species is related to a few variables like geological locale, immunosuppression, prematurity, experimental utilize of the wide range of antimycotics.[22] In India and Singapore, the C. krusei, C. glabrata, C. parapsilosis, and C. tropicalis species were most common. This geographic variation is also reported in Malta, Brazil, and Mexico.[11] Therefore the continuous monitoring of onychomycosis pathogens is necessary for the proper treatment.

In this study, the most frequent Candida species were Candida albicans (52.68%) being shown in isolates followed by Candida non-albicans (47.3%). A similar pattern is reported in recent literature.[21,23] Among the Candida non-albicans, C. tropicalis was the predominant species (26.88%) followed by Candida parapsilosis (11.82%). The C. glabrata, C. krusei, and others were infrequent. A similar prevalence was reported in previous studies.[16] However, other studies reported that C. parapsilosis is the second to C. albicans.[5,11] The variation of Candida species isolated from onychomycosis is well reported.[8,24,25] The findings in the present study revealed that surveillance is necessary for the accurate therapy and changing prevalence of Candida species.

Conclusion

This study revealed that Candida species are the main cause of onychomycosis and Candida non-albicans species are also increasing in onychomycosis in this geographic area.

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