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Onycomycoses in Tripoli/Libya

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Review Article

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Abstract

Background: This is study was conducted to determine the chief agents of Onycomycoses in Tripoli/Libya. Specimens were collected over a one-year period for mycological investigations carried out on all nail specimens sent to the Mycology Laboratory, department of medical microbiology, college of medicine.

Methods: In the period between Januarys 2021and December 2021, a total of 100 specimens from nails were collected from 100 clinically suspected cases with fungal infections. Direct microscopic examination using 40% potassium hydroxide and culture on both Sabouraud dextrose agar supplemented with chloramphenicol, with or without cycloheximide.

Results: The fungi isolated included dermatophytes (n=18), yeasts (n=33), and Nondermatophyte filamentous fungi (n=5). *Trichophyton mentagrophytes* (n=7) was the most Prevalent, followed by *Trichophyton rubrum* (n=6). Candida species were also isolated, with *Candida parapsilosis* (n=17) being the most common, followed by *Candida albicans* (n=12). Other candida species, non dermatophytes mold and mixed fungal and bacterial involvement were less frequently associated with nail infections. Finger nail was most involved site (n=57) and toe nail (n=45).

Conclusions: In this study, Onycomycoses infections were reported more commonly in female (n=68) than in male (n=32) patients. Candida species was the chief agent of finger nail infection in female than in male patients and tinea unguium was more prevalent in male with dermatophytes most causing agents.

Keywords: Nail; Dermatophytes; Candida; KOH; Libya

Introduction

Onycomycoses refers to fungal infection of the nails with various etiological agents, involving dermatophytes, yeasts and non-dermatophytes Moulds (NDM). It represents 18.4% of the onychopathies and about 30% of the mycotic cutaneous infections [1]. Yeasts are now increasingly recognized as pathogens in finger nail infections, as are some moulds [2].

Onycomycoses as a common nail disorder that has a substantial impact on the patient's quality of life. Diagnosis is made through clinical presentation, potassium hydroxide preparations and culture of tissue/nail samples [3]. Onychomycosis (fungal infections of nail plates) are among the most frequent of nail diseases and represent 5.8–30% of diagnosed superficial mycoses [1]. Fungi has specific characteristics in their geographical distribution as well as in their predilection for different body sites [4], the reported frequency of recovery of fungi from infected nails varies according to the geographical area and whether toenails or fingernails are being considered independently [5]. In temperate zones a higher prevalence of dermatophytes has been reported from both toenails and fingernails [3]. However, in tropical and subtropical countries, moulds such as Aspergillus species and *Fusarium oxysporum* have been reported as a major cause of nail diseases [6]. In fingernails, Candida species can be isolated as frequently as dermatophytes [1].

The purpose of the present study was to establish the nature of the agents responsible for onychomycosis in a sample of the Libyan population presenting with suspected cases of disease.

Materials and Methods

Patients with suspected fungal nail infections, attending the dermatology Clinic in Tripoli district region, were directly referred to the Mycology Laboratory at department of medical microbiology, college of medicine were enrolled in the study. Nail scrapings and clipping fragments of suspected infected nails were collected and processed as recommended [7,8].

Direct microscopic examination was performed using 40% (w/v) potassium hydroxide (KOH). A portion of specimen was placed on a microscopic slide and 50 µL of KOH was added. After 2 hours, the wet preparation was examined for the presence of any fungal elements and their diagnostic morphology such as arthrocondia, hyphae, yeast cells or combinations of these [3].

Plates were inoculated with finely divided pieces of each sample on both Sabouraud dextrose agar supplemented with chloramphenicol (0.05g/L), with or without cycloheximide (0.5g/L), and incubated at 25-30C for recovery of dermatophytes or moulds. Plates for the recovery of Candida species were incubated at 37C. Plates examined twice weekly for evidence of growth and maintained for up to 4 weeks before being discarded as negative.

Yeast species were first identified using the API 20C AUX commercial system (BioMe´rieux). All *C. albicans* isolates were tested for germ tube production in human serum as well as for chlamydospore formation on corn meal agar plus Tween 80 (Sigma Chemical Co., Poole, U.K). Fungal isolates were subculture onto Savoured and potato dextrose agar (Oxoid, Basingstoke U.K). Isolates were examined macroscopically and microscopically in lactophenol-cotton blue. The dermatophytes species were identified by gross and microscopic morphology and by in vitro tests if required based on criteria enumerated previously [3]. Identification of moulds as pathogens was based on an examination of morphology and microscopic structures following growth on Czapek's agar medium according to the scheme detailed by Raper KB, et al. [9].

Statistical analysis was carried out using the chi-squared test with Yates correction.

Results

The total number of patients included in this study was 100, 32% (n = 32) of whom were males and 68% (n = 68) were females. 48% (n=48) were less than 40 year old and 50% (n=50) were 41 to 81 years old. Direct microscopic examination was positive in 49% (n=49) and culture Positive were obtained from 52 specimens (52%) collected of patients. 42 of specimens was both KOH and culture negative, 6 specimens were KOH positive and culture negative and 9 specimens were culture positive and KOH negative respectively (Table 1) show sensitivity, specificity and of . Nail fungal infections was more predominant in female than male and yeast involvement represented by Candida parapsilosis and *Candida albicans* were the leading agent. Dermatophytes were more common in male and Trichophyton mentagrophytes and T. rubrum are more frequency isolated. Other fungi were also isolated from both sex (Table 1) show fungi isolated from patients with positive culture with clinical nail suspected infection.

Species	Women	Male	Total no. of Isolates
Candida parapsilosis	11	3	14
Candida albicans	4	3	7
Trichophyton mentagrophytes	2	5	7
Trichophyton rubrum	4	1	5
Candida glabrata	3	0	3
Aspergillus terreus	1	1	2
Candida krusei	1	0	1
Trichophyton verrucosum	0	1	1
Candida guilliermondii	1	0	1
Candida albicans and Candida parapsillosis	1	0	1
Candida albicans and Trichophyton mentagrophytes	1	2	3
Candida albicans and Geotrichum candidum	1	0	1
Fusarium solani	1	0	1
pacillomyces spp	0	1	1
Candida parapsillosis and Peudomonas aeruginosa	1	0	1
Candida parapsillosis, Trichophyton vioaceum	1	0	1
Fusarium solani and Geothricum candidum	1	0	1
Trichophyton rubrum and Rhodotorula mucilaginosa	1	0	1
Total Isolates	**35**	17	52

Table 1: Summarizes Distribution of fungi responsible for onychomycosis according to gender (numbers represent all patients culture-positive for fungi).

Microscopic examination of KOH-treated samples revealed yeast, hyphae, yeasts and hyphae or hyphae and arthrocondia. In the majority of cases KOH and culture positive show that yeast, yeast and hyphae or hyphae can be seen (Table 2) show results of microscopic examination of nail infected samples that were microscopy and culture positive.

Infected Nail	No. of Patients	Y	Y+ H	H	H and Arth
Rth and Lth Big toe	11	1	1	5	4
Lft foot Middle toe	1	0	1	0	0
Rth foot Little toe	1	1	0	0	0
Rth foot big toe and little toe	2	0	0	0	2
Lth hand middle finger nail	1	1	0	0	0
Lth hand Thumb	2	0	0	1	1
Rth hand Thumb	9	4	5	0	0
Lth hand ring finger nail	1	0	0	1	0
Rth hand index finger nail	3	3	0	0	0
Rth hand Middle finger nail	4	1		3	0
Rth hand middle, index finger nail and thumb	1	0	1	0	0
Rth hand Middle, ring and little nail finger nail	1	1	0	0	0
Rth hand ring finger nail	1	0	1	0	0
Twenty nail	1	0	1	0	0
Ten foot toe	3	0	0	2	1
Ten finger nails	1	0	1	0	0
Total Specimens	43	12	11	12	8

Table2: Results of microscopic examination of samples that were microscopy and culture positive
Y, Yeast; H, Hyphae; Arth, arthrocondia, Rth; Rigth, Lth; left.

Fungal responsible either for finger nail or toe nail infection are shown in (Table 3), dermatophytes intended to be more associated with toe nail than yeast infections and opposite is true for finger nail were yeast was the common isolates.

Isolated fungi	Finger Nail	Toe Nail	Total Isolates
Aspergillus terreus	1	1	2
Candida albicans	6	1	7
Candida albicans and Candida parapsilosis	1	0	1
Candida albicans and Geotrichum candidum	1	0	1
candida albicans and Trichophyton mentagrophytes	0	2	2
Candida albicans and Trichophyton mentagrophytes	1	0	1
Candida glabrata	3	0	3
candida guilliermondii	0	1	1
Candida krusei	1	0	1
Candida parapsillosis	12	2	14
Candida parapsillosis and Peudomonas aeruginosa	1	0	1
candida parapsillosis, T. vioaceum	0	1	1
Fusarium solani	0	1	1
Fusarium solani and geothricum candidum	0	1	1
pacillomyces spp	1	0	1
Trichophyton mentagrophytes	3	4	7
Trichophyton rubrum	0	5	5
Trichophyton rubrum and Rhodotorula mucilaginosa	0	1	1
Trichophyton verrucosum	0	1	1
Total Isolates	**31**	**21**	**52**

Table 3: Fungi responsible for onychomycosis in Finger and Toe nail samples that were culture positive.

Discussion

Fungal infections of fingernails accounted for 17% of all superficial mycoses among patients attending the Outpatient Dermatology Clinic at Tripoli Medical Center [10]. In this study and early study [3] a higher frequency of fingernail infections was demonstrated in women than in men. Several studies have found similar results, especially in temperate zones [5,9]. However, others have reported no notable difference [8] while, some investigators found fungal infection of fingernails to be more common in men than women [11]. The reason for the greater frequency of fungal nail infection particular of fingernails among women is probably due to the frequent immersion of the hands in water or exposure to chemicals and trauma [12]. In addition, women are more concerned about the appearance of their fingernails than men. Onychia and paronychia due to Candida species, particularly C. *parapsilosis*, were the most common clinical forms observed in this study and replaced *Candida albicans* in our early study [3] accounted for 38.7% (n=12) of culture-positive cases from finger nail, most of which were women. Previous reports have indicated that dermatophytes are the dominant cause of onychomycosis [3], but the findings of this survey indicate that in women, yeasts of the genus Candida are the principal etiological agents of this condition and were isolated from both fingers and toe nails. Our findings agree with other surveys which found that Candida Onychia is usually seen more often in women than me [3,5]. Other Candida species, particularly *C. albicans*, *C. glabrata* and *C. guilliermondii*, were isolated more frequently from women who presented with chronic paronychia or onycholysis. Onychomycosis of the fingernails and toe nails due to dermatophytes was higher among men (14 cases) than women (4 cases). The anthropophilic fungi *T. rubrum* and *T. mentagrophytes* were isolated more frequently from men than women. Previous epidemiological surveys have found that *T. rubrum* and *T. mentagrophytes* are responsible for most cases of dermatophytes-induced onychomycosis of the fingernails [13,14].

Onychomycosis due to nondermatophyte fungi was isolated on few occasions only of both toe nails and fingernail infections: Similar studies have found that non-dermatophytes-induced onychomycosis, particularly in temperate regions, accounts for less than 3% of isolates, even in large surveys [15]. In conclusion, this study has demonstrated that yeasts of the genus candida are still the dominant cause of onychomycosis associated with finger nail infection in Libyan women and that dermatophytes are the principal cause of this condition associated toe nail infections particular in men. The reason for this may lie in the different types of trauma between women and men and different factors such as immersion in water, exposure to chemicals experienced by the fingernails of men and women and also whether the patients suffer from a concurrent dermatophytes infection such as tinea pedis. There also appears to be a greater tendency among women to present with this condition in comparison with men. The data presented here indicate that in women the condition is caused by yeasts of the genus Candida and that thumb nail more frequently involved and one or two fingernails on one or both hands tend to be infected, while in men the condition is caused almost exclusively by dermatophytes and that big toe nail is the most infected one.

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