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Original Research Paper

CLINICAL AND MICROBIAL PROFILE OF ONYCHOMYCOSIS IN ELDERLY PATIENTS

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ABSTRACT:
Background: Onychomycosis is one of common age-associated in elderly, primarily caused by dermatophytes, however, there are few clinical studies describing the clinical and microbial profile of Onychomycosis in elderly. **Aim**: To describe the clinical and microbial profile of onychomycosis in elderly patients attending a specialized geriatric centre. **Methods**: A total of 30 elderly cases of onychomycosis attending the Outpatient department of a Geriatric facility were enrolled in the study. Their demographic profile, exposure to risk factors and medical history was noted. Clinical examination was done and clinical pattern of disease was recognized. Nail/skin scrapings were obtained and were subjected to KOH mounting and culture assessment. Identification upto species level was performed. The data so obtained was tabulated and represented in numbers, percentages, mean and standard deviation. Results: Age of patients ranged from 62 to 83 years (Mean age 70.70±6.21 years). Majority were males (53.3%), Nail plate discoloration (96.7%) and subungual hyperkeratosis (93.3%) were the most common clinical features. DLSO (66.7%) was most common pattern. All the patients had comorbidities. A total of 27 (90%) cases that were found to be KOH mount positive. On culture, all the KOH mount positive cases were identified to have only single pathogen. Dermatophytes (66.7%) were most common, followed by yeast/yeast-like isolates (18.5%) and non-dermatophytes (14.8%) respectively. Among dermatophytes, *T. rubrum* (n=14) was the most dominant whereas *C. albicans* (n=5) was most common yeast. *Fusarium spp.* (n=2) was the most common non-dermatophyte mold isolated. **Conclusion**: The clinicopathological spectrum of onychomycosis was quite diverse. The study emphasized on the need for comprehensive diagnostic work-up of these patients in view of diverse etiology and clinical spectrum.

Key Words: Geriatric, Onychomycosis, KOH mount, Dermatophytes, Trichophyton rubrum

INTRODUCTION:

Oncyhomycosis is a common problem in elderly. It affects nearly one-fifth of the population aged >60 years[1]. It comprises nearly half the total nail diseases[2]. It is an infectious disorder with dermatophytes being the most common underlying pathogens, however, non-dermatophyte molds and yeast can also contribute to a sizeable proportion of affected patients[3]. Despite being a common clinical condition in elderly, it often remains ignored. Most of the patients initially consider it as a cosmetic problem only, however, apart from being a cosmetic issue it is also associated with impairment of tactile function and is cause of pain and discomfort for the patient. One of the most disabling conditions associated with it is toenail dystrophy which affects the walking, exercise, or shoe wearing ability of the patient[4]. A number of demographic, clinical and environmental factors, *viz.*, age, sex, occupation, presence of chronic illnesses, immunity, footwear, use of community bathrooms, swimming pools, nail trimming practices, climatic conditions, frequency of travel, *etc*.[5,6] Moreover, the underlying pathogens may also show variation from region to region. Although, there are a number of studies describing the prevalence, clinical profile and underlying etiology in general population or derma clinics[7-9], however, despite having an association with ageing, there are limited studies describing the clinical profile, risk factors and underlying etiologies in an exclusive elderly population. Hence, the present study was planned to describe the clinical and microbial profile of onychomycosis in elderly patients attending a specialized geriatric centre.

MATERIAL AND METHOD:

This descriptive study was carried out among 30 consecutive OPD patients at a speciality geriatric facility in Lucknow, India after obtaining approval for the study from the appropriate institutional authority vide letter No. dated Informed consent from the patients was also collected. The current study was carried out as a pilot study with a targeted probability

of having non-dermatophyte etiologies to be 10% at 95% confidence level. The sample size was calculated using the formula $n=[\{\ln(1-\gamma)\}/\{\ln(1-\pi)\}]$[10]. At the given considerations, $\gamma = 0.95$ and $\pi=0.10$, and the calculated sample size was 28.4 which after rounding off to nearest ten came out to be 30. A total of 30 elderly patients aged >60 years, presenting with newly diagnosed onychomycosis, without a history of any oral/topical antifungal treatment during last six months were enrolled in the study. Patients with a known history of psoriasis, lichen planus, autoimmune connective tissue disorders and yellow nail syndrome were excluded from the study. Patients having any history of local tumors and nail abnormalities were also excluded from the study. At enrolment demographic details were noted and clinical evaluation was carried out. All the patients underwent a though clinical evaluation. The clinical evaluation and diagnosis was made as described by Hay and Ashbee[11].

The following five clinical diagnoses were made:

1. Distal lateral subungual Onychomycosis(DLSO)
2. Superficial Onychomycosis(SO)
3. Endonyx Onychomycosis(EO)
4. Proximal subungual Onychomycosis(PSO)
5. Mixed pattern Onychomycosis(MPO)
6. Total Dystrophic Onychomycosis(TDO)

Site of involvement and side of involvement was also noted, total number of nails involved and involvement of skin was also noted. All the patients were enquired about their shoe-wearing practices, exposure to predisposing factors such as wet work, travel, trauma or sports was also noted. Medical history of the patients was also noted. Following history taking and clinical examination, the specimen were obtained from the patients under aseptic conditions. Sample of scraping, or clippings from the nail plate, or a moistened swab rubbed in the nail fold were obtained for mycological study using a nail clipper[11]. In case of involvement of finger as well as toe nails and skin, separate samples were obtained from each of them. In case of presence of more than one clinical patterns of OM, samples were obtained for all the different patterns. The obtained specimen were subjected to KOH mounting and culture. For KOH mount, a portion of the obtained specimen was placed on a glass slide and then a drop of 40% KOH was poured. The slide was then warmed for some time on a spirit lamp. The wet mount was viewed under optical microscope using magnification 10X and 40X. Visualization of branching septate, hyphae or budding yeast was considered as KOH positivity. Fungal culture was performed using Sabouraud's dextrose agar. The portion of remaining specimen after KOH mount was placed in both Sabouraud Dextrose Agar (SDA) and SDA with cycloheximide (0.5 g/l) in sterile culture tubes. The culture tubes incubated at 25°C under biological oxygen conditions for 6 weeks. In case of absence of growth during this period, the culture was declared as negative. In case of presence of a growth, it was isolated from the culture tube and subjected to slide cultures on Corn Meal Agar for detailed morphological analysis in order to recognize the specific species. The colony character, surface color, color on reverse, and presence of any diffusible pigment were also noted from the primary culture tubes. Urease test and hair perforation test were also done for the identification of dermatophytes. For confirmation of yeast to species level germ tube test and color production on Chromagar candida media were also used. Nondermatophytic fungus as the causative agent were identified through direct microscopy.

Data Analysis:

The collected data was tabulated and represented as frequency (number) and proportions (percentages). Mean and standard deviation was used to describe the age of the patients.

RESULTS:

A total of 30 patients aged between 62 and 83 were assessed. Majority (n=16; 53.3%) were aged between 61 and 70 years and only 3 (10%) were aged above 80 years. Mean age of patients was 70.70±6.21 years. Majority of patients were males (53.3%). Nail plate discoloration (n=29; 96.7%) was the most common clinical feature followed by subungual hyperkeratosis (93.3%), nail plate crumbling (50%) oncyholysis (40%), proximal nail fold thickening (20%) and onychomadesis (6.7%) respectively. Majority of patients had involvement of fingers (n=18; 60%). There were 6 (20%) patients having involvement of toes. A total of 6 (20%) patients had involvement of both fingers and toes. Majority (n=16; 53.3%) had unilateral involvement, there were 14 (46.7%) patients having involvement of both sides. Majority of patients had involvement of 2 to 5 nails (56.7%) followed by one nail only (n=8; 26.7%), >10 (10%) and 6-10 nails (6.7%) respectively. There were 5 (16.7%) patients showing skin involvement too. A total of 7 (23.3%) patients reported the habit of wearing shoes. In most of the cases (90%) predisposing factor could not be established. There were two (6.7%) patients in whom wet work was identified as the predisposing factor whereas in one (3.3%) patient travel was identified as the predisposing factor. All the patients had one or more comorbid conditions. There were 13 (43.3%) patients having history of diabetes and/or hypertension, 6 (20%) each had history of renal disease with or without diabetes/hypertension and heart disease with or without diabetes/hypertension. A total of 5 (16.7%) patients had history of respiratory disorder with other comorbidities (Table 1).

Clinically, majority (n=20; 66.7%) were identified as distal lateral subungual onychomycosis (DLSO) and 5 (16.7%) each were diagnosed as Mixed pattern onychomycosis (MPO) and Total dystrophic onychomycosis (TDO) (Table 2).

Fungal pathogens could be isolated in 27 cases. In all the cases, only one pathogen was isolated. Dermatophytes (n=18; 66.7%) were most common followed by yeast/yeast-like isolates (n=5; 18.5%) and non-dermatophyte molds (n=4; 14.8%) respectively (Table 3).

Table 1: General Profile and Clinical Characteristics of Patients (n=30)

SN	Characteristic	No. / %
1.	Age	
	61-70 Years	16 (53.3%)
	71-80 Years	11 (36.7%)
	>80 Years	3 (10.0%)
	Mean Age±SD (Range) in years	70.70±6.21 (62-83)
2.	Sex	
	Male	16 (53.3%)
	Female	14 (46.7%)
3.	Clinical Features	
	Subungual hyperkeratosis	28 (93.3%)
	Nail plate discoloration	29 (96.7%)
	Onycholysis	12 (40.0%)
	Nail plate crumbling	15 (50.0%)
	Proximal nail fold thickening	6 (20.0%)
	Onychomadesis	2 (6.7%)
4.	Sites involved	
	Fingers	18 (60.0%)
	Toes	6 (20.0%)
	Both	6 (20.0%)
5.	Side involved	
	Unilateral	16 (53.3%)
	Bilateral	14 (46.7%)
6.	Total No. of nails involved	
	One only	8 (26.7%)
	2-5	17 (56.7%)
	6-10	2 (6.7%)
	>10	3 (10.0%)
7.	Skin involvement	5 (16.7%)
8.	Habit of wearing shoes	7 (23.3%)
9.	Predisposing factors	
	Unspecific	27 (90.0%)
	Wet work	2 (6.7%)
	Travel	1 (3.3%)
10.	Comorbidities	30
	DM and/or HTN	13 (43.3%)
	Renal disease with/without DM/HTN	6 (20.0%)
	Heart disease with/without DM/HTN	6 (20.0%)
	Respiratory disorder with other comorbidities	5 (16.7%)

Table 2: Distribution of cases according to clinical diagnosis

SN	Clinical Diagnosis	No. / %
1.	Distal lateral subungual onychomycosis (DLSO)	20 (66.7%)
2.	Mixed pattern onychomycosis (MPO)	5 (16.7%)
3.	Total dystrophic onychomycosis (TDO)	5 (16.7%)

Table 3: Fungal Isolates (n=27)

SN	Diagnosis	No. (%)
Dermatophytes (n=18)		
1.	*Trichophyton rubrum*	14 (51.9%)
2.	*Trichophyton verrucosum*	2 (7.4%)
3.	*Trichophyton mentagrophytes*	2 (7.4%)
Yeast/Yeast-like (n=5)		
1.	*Candida albicans*	5 (18.5%)
Non-dermatophyte Molds (n=4)		
1.	*Aspergillus fumigatus*	1 (3.7%)
2.	*Aspergillus flavus*	1 (3.7%)
3.	*Fusarium sp.*	2 (7.4%)

DISCUSSION:

The present study was marked by a rather even gender disposition (M:F=1.14) with majority of patients aged between 61 and 70 years (53.3%). There was dominance of DLSO as the clinical diagnosis (66.7%) followed by MPO and TDO (16.7% each). Culture positivity rate was 90% with dermatophytes contributing for two-third (66.7%) of the fungal pathogens followed by yeast/yeast-like pathogens (25.9%) and non-dermatophyte molds (7.4%), thus total contribution of non-dermatophyte pathogens was 33.3%. Unilateral involvement (53.3%), involvement of 2-5 nails (56.7%), unspecific predisposing factors (90%) and presence of comorbidities (100%) were the distinguishing clinical features of the patients. Almost all the patients presented with classical features like nail plate discoloration (96.7%) and subungual hyperkeratosis (93.3%). Nail-plate crumbling (50%) and onycholysis (40%) were the other common clinical features. Although, some recent studies conducted in general population in India have shown a dominance of those aged 21-40 years[12,13], 31-50 years[9] and no particular gender predominance. However, epidemiological studies in elderly report the prevalence of onychomycosis to be increasing with age with reported prevalence being ≥20% in elderly aged >60 years and ≥50% in those aged ≥70 years[1,14]. There are few clinical studies describing the clinical and fungal profile of onychomycosis in elderly. Compared to the present study in which mean age of elderly onychomycosis patients was 70.7 years and there was a dominance of males (53.3%), Araiza-Santibáñez *et al.*[15] in a study conducted among Mexican elderly population reported the mean age of patients as 67.9 years and a dominance of females (53.8%). In another study conducted in Korean elderly aged ≥65 years, majority of patients were aged between 70 and 79 years (51.3%) and were males (56.2%)[16]. In a recent study conducted among Thai elderly onychomycosis patients[17], majority of patients were aged above 70 years (51.6%) and were males (56.8%). In some other studies, the mean age of elderly (defined as those aged >65 years) onychomycosis patients was reported to be above 80 years and there was a dominance of females[18,19], however, one of these studies[18] differed from the present study as they included institutionalized elderly as compared to community dwelling elderly. A dominance of those aged <70 years in the present study may be attributable to the fact that unlike other studies where sampling frames were not that strict, we followed a strict inclusion and exclusion criteria and ruled out inclusion of a number of patients having antifungal treatment history and a number of other concomitant skin conditions that are common in the elderly. Moreover, the present study included only patients with newly diagnosed onychomycosis. As far as clinical and microbial profile of the patients is concerned, compared to the present study that had DLSO (66.7%) as the most common clinical type, Araiza-Santibáñez *et al.*[15] in their series of 138 elderly onychomycosis patients found a dominance of TDO (63%) as the most dominant clinical type. Incidentally in the present study, TDO comprised only 16.7% of total cases. Dominance of DLSO as the dominant clinical diagnosis has also been reported in some other studies from India conducted in general population[12,13,20-24]. In most of these studies, MPO and TDO have been reported as the other dominant clinical types as also seen in the present study. Climatic and environmental differences between our study and that of Araiza-Santibáñez *et al.*[15] could be helpful to describe the differences in the clinical manifestation of the disease. As far as profile of fungal isolates is concerned, in the present study, culture positivity rate was 90%. Compared to this Araiza-Santibáñez *et al.*[15] found culture positivity rate of only 51.4%. However, Scherer *et al.*[19] in their study reported the culture positivity rate to be above 90%. A higher culture positivity rate in the present study could be owing to inclusion of newly diagnosed cases with no history of antifungal treatment. With respect to profile of fungal pathogens, in the present study it was dominated by dermatophytes (66.7%), particularly *Trichophyton rubrum* (51.9%) followed by yeasts (18.5%) represented by *Candida albicans* and non-dermatophyte filamentous molds comprised only 14.8% of total isolates with 7.4% cases each of *Aspergillus sp.* and *Fusarium sp.* respectively. Compared to our study, Araiza-Santibáñez *et al.*[15] too found maximum fungal isolates to be dermatophytes

(44.4%) particularly *T. rubrum* (27.8%), however, in their study there was a dominance of non-dermatophytes (55.6%) like yeasts (38.9%) and non-dermatophyte molds (16.7%) like *Fusarium sp*, *Aspergillus sp* and *Neoscytalidium sp* (5.56% each) respectively, thus giving a similar picture like ours but with a dominant of non-dermatophytes (55.6%) over dermatophytes (44.4%). In another study, Scherer *et al.*[19], however, 526 organisms were isolated from 346 cultures, thus depicting the average yield per specimen to be 1.5. In their study, however, dermatophytes comprised only 23.6% of total fungal isolates and saprophytes were the most common fungal isolates, predominated by *Aspergillus sp.* (16.2%) alone. In another recent study from Mexico[25], dermatophytes comprised only 24% of the total fungal isolates. However, within dermatophytes they also found *T. rubrum* as the dominant isolate.

One of the characteristic clinical findings of the present study was presence of comorbidities in all the patients. However, comorbidities have not been reported that extensively in other studies on elderly. Yoo *et al.*[16] reported comorbidities in 52% of elderly patients with onychomycosis. In another study, Araiza-Santibáñez *et al.*[15] found comorbidities in 33/138 (23.9%) of elderly onychomycosis patients. In the present study, presence of comorbidities in all the patients could be attributed to the fact that the patients were OPD visitors of a geriatric facility and were not from a specialized derma unit. One of the limitations of the study was its small sample size, owing to which it was considered as a pilot study, however, despite its small sample size it provided some useful in-depth information about geriatric onychomycosis patients in our patients. Unfortunately, there is complete lack of such studies in geriatric population in Indian population, hence, the present study attempts to provide a preliminary spectrum of problem of onychomycosis in elderly patients in our settings. Further studies on a larger sample size are recommended to validate the findings of present study and to provide some newer insights into this rather unexplored problem in elderly.

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