



Original Research Article

Clinico-Mycological Updates on Onychomycosis

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ABSTRACT

Keywords

Trichophyton violaceum,
Trichophyton interdigitale,
Trichophyton tonsurans

Onychomycosis is a common infection of the nail plate or bed due to dermatophytes, yeasts and non-dermatophyte moulds. Tinea unguium is the infection of nail by a dermatophyte species. Aim of the study is to find out the causative fungal species responsible for the various clinical types of onychomycosis. *Trichophyton violaceum* was found to be the predominant species, being the causative organism responsible for endonyx type of onychomycosis. *T. violaceum* was found to be the most common species responsible for tinea unguium and the commonest clinical type was endonyx.

Introduction

One of the main functions of the nails is to protect fingertip from trauma (Samman, 1986). It was observed by Gonzalez-Serva that social status can be silently judged by the condition of the nails, as in the case of Chinese noblemen who grew long nails to demonstrate their avoidance of manual labour (Gonzalez-Serva, 1990).

In most of the societies, nails are thought to be just of cosmetic value. But, in fact it may be representing just the tip of the iceberg. As the number of immunosuppressed individual increases either due to HIV/AIDS or due to any other reason, the number of people suffering from onychomycosis will increase.

Onychomycosis is a fungal infection of nails by dermatophytes, non-dermatophyte

moulds (NDM) and *Candida*. When nail infection is due to dermatophyte, the term tinea unguium is used, and when due to non-dermatophyte fungus and *Candida*, it is called onychomycosis. Onychomycosis is responsible for 50% nail problems (Faergemann and Baran, 2003). So, only clinical diagnosis is not sufficient and can be wrong.

Moreover, studies by Denning *et al.* (1995), Weinberg *et al.* (2003) and Moreno-Coutño *et al.* (2011) have observed higher risk of onychomycosis in immunosuppressed individuals, particularly those living with HIV infection and also noted increased severity of infection when compared to the same age group.

Material and methods

A total of 110 patients were referred to the lab with the clinical diagnosis of onychomycosis. Patients presented with different clinical forms as mentioned in the table (Samman, 1986) and others came with deformed, discolored nails with subungual debris. Nail samples were collected after

thorough cleaning with 70% isopropyl alcohol. Nail clippings were collected with a sterile nail clipper and subungual debris was collected with the help of No.15 surgical blade in sterile petridishes and labeled. Potassium hydroxide (KOH) mounts were prepared in 20% KOH to look for the fungal elements.



Figure.1 *T. violaceum*



Figure.2 *T. interdigitale*



Figure.3 Tinea unguium of left hand affecting little, ring & middle finger. Endonyx type of nail invasion in a 10 yr old boy



Figure.4 Tinea unguium of all 10 ring fingers. *T. violaceum* was isolated. Endonyx type of nail invasion (HIV positive 22year old female).



Figure.5 Total dystrophy onychomycosis. KOH & culture negative

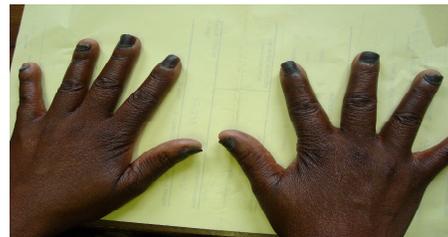


Figure.6 Melanonychia of all fingernails & Tinea unguium due to *T. violaceum*. HIV positive and on AZT

Samples from each patient were inoculated on two plates of Sabouraud's dextrose agar with chloramphenicol and Derm agar. One plate of Sabouraud's dextrose agar was

incubated at 37°C and one at 25°C along with the Derm agar plate. Differentiation of *Candida* species was done on CHROM™ agar.

For dermatophytes, KOH and culture positive or culture positive samples were considered positive. For NDM, both KOH and culture positive samples were considered positive. Also, a second sample was taken and if both KOH and culture were positive, it was considered positive. Patients with positive direct microscopy and with a negative culture were excluded.

Results and Discussion

Nail samples were collected from 110 patients:

KOH positive 35 (31.82%)
 Culture positive 40 (36.33%)

There were four cases of total dystrophic onychomycosis, all were KOH and culture negative. These patients were females in the age group of 20–40years (Figure 5). Patients presented with thickened nails and yellow discoloration and various clinical patterns were mentioned in table 1 and the classification given below is according to Baran *et al.* (1998).

Different species of dermatophytes, NDM

and *Candida* species isolated is as given in table 2. Maximum cases of onychomycosis were seen in the age group >41years 16(40%) (Table 3).

In this study, there were 25 (62.5%) females and 15 (37.5%) males with onychomycosis. Fingernail involvement was more common 32(80%) and toenail involvement was 8(20% all males). Involvement of 10 fingernails with culture positive for *T. violaceum* was seen in two female patients and they were HIV positive. Onychomycosis of the fingernails due to *Candida* was seen in 2 females and of toenail in one male patient. Onychomycosis of the toenails due to *T. interdigitale* 2 (5%) (Figure 2) and *T. tonsurans* 1 (2.5%) was seen in three male patients. NDM fungus was isolated from the toenails of 4(10%) male patients and *Candida* from one male patient. Out of a total 40 patients 23(57.5%) females and 07(17.5%) males had onychomycosis of the fingernails due to *T. violaceum* (Figure 1). In only 10 patients, HIV positive status was known. One HIV positive female patient was on AZT and had melanonychia along with tinea unguium of fingernails due to *T. violaceum* (Figure 6).

Table.1 Clinical pattern of onychomycosis

	Clinical types	No &%
1	Distal Subungual Onychomycosis (DSO)	4 (10%)
2	White Superficial Onychomycosis (WSO)	3 (7.5%)
3	Proximal Subungual Onychomycosis (PSO)	0(0%)
4	Endonyx Onychomycosis (EO)	30(75%)
5	Total Dystrophic Onychomycosis (TDO) (KOH & culture) negative	4(10%) Not included
6	<i>Candida</i> paronychia	3(7.5%)
	Total	40(100%)

Table 2.Fungal isolates obtained from 40 cases

Species	Number of isolates	Male: Female	Percentage
<i>T. violaceum</i>	30	7:23	75
<i>T. interdigitale</i>	02	2:0	05
<i>T. tonsurans</i>	01	1:0	2.5
<i>Aspergillus sp</i>	02	2:0	05
<i>Fusarium sp</i>	01	1:0	2.5
<i>Alternaria sp</i>	01	1:0	2.5
<i>Candida albicans</i>	02	0:2	05
<i>Candida parpsilosis</i>	01	1:0	2.5
Total	40	15:25	100

Table.3 Association between age groups, fungal species & site

Age-group (in years)	<i>T. violaceum</i>		<i>T. interdigitale</i>		<i>T. tonsurans</i>		NDM		<i>Candida</i> species	
	Finger nails	Toe nails	Finger nails	Toe nails	Finger nails	Toe nails	Finger nails	Toe nails	Finger nails	Toe nails
≤20	07	-	-	-	-	-	-	-	02	-
21-40	10	-	-	02	-	01	-	02	-	-
≥41	13	-	-	-	-	-	-	02	01	-

There are no prior studies of the prevalence of dermatophytes before HIV/AIDS epidemic. The scenario of onychomycosis differs from other regions in the world. *T. violaceum* dominates in this region, and is responsible for most of the clinical forms. Tinea unguium of the toenails due to *Trichophyton rubrum* is predominant in most of the geographical locations, but here in Botswana, more than 90% cases of tinea unguium are due to *T. violaceum* and in majority of the cases, there was involvement of fingernails. In end stage dystrophy, it is difficult to isolate the fungus. In a recent article published by the author, she has mentioned that tinea unguium is the commonest dermatophyte infection in Botswana (Thakur, 2015).

In one of the case report by Mapelli *et al.*

(2012), onychomycosis of the toenail due to *T. violaceum* was reported for the first time. But, soon after this, two studies have reported onychomycosis of fingernails and toenails (Mapelli *et al.*, 2012). The study from Bulgaria by Zisova *et al.* (2015) has mentioned about onychomycosis due to *T. violaceum* in children below 18 years (Zisova *et al.*, 2015). The other study from Cameroon by Minkoumou *et al.* (2012), has reported onychomycosis due to *T. violaceum* of both of fingernails and toenails.

In the present study didn't isolate *Trichophyton rubrum* from any of the cases during our study period. So, we can conclude that *T. rubrum* is rare in this region of Africa. This is the predominant species of onychomycosis from most of the geographical areas of the world.

Scenario of onychomycosis is quite different from other parts of the world. It is partly linked to tinea capitis and to a great extent due to the high prevalence of HIV/AIDS.

The commonest clinical form of onychomycosis was endonyx type (Fig. 4 & 5). This type of infection is due to nail invasion of both superficial surface and also deeper penetration of the nail plate. It leads to the formation of a very typical pattern of the disease. The pattern of nail invasion is usually produced by the dermatophytes responsible for endothrix type of hair invasion (Baran *et al.*, 1996; Martin Dunitz, 1996; Kalter and Hay, 1988).

Some of the nail conditions may appear so trivial, but in fact, they could be the expression of some serious hidden condition. So, the team of clinicians and microbiologist/mycologist should read the expression of the nails carefully. Since 50% cases of nail dystrophy are of fungal origin, it must be diagnosed and treated. Where multiple fingernails or toenails are involved, HIV status of the patient should be advised since the disease progression is pretty fast in them and moreover, they can be potential source of infection for themselves/others. Patients also suffer social embarrassment, and low self esteem.

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