

ONYCHOMYCOSIS - A CLINICAL AND MYCOLOGICAL STUDY OF 75 CASES**GRZYBICA PAZNOKCI - KLINICZNE I MIKOLOGICZNE BADANIE NA 75 PRZYPADKACH**

Tejinder Kaur, Neerja Puri

*Department of Dermatology and Venereology, G.G.S. Medical College & Hospital, Faridkot. 151203. Punjab, India***Corresponding author:** Dr. Neerja Purineerjaashu@rediffmail.com

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Abstract

Onychomycosis or fungal infection of the nails is a common disease, especially in older persons. A mycological study of onychomycosis was undertaken in 75 patients. The nails were judged to be infected by their clinical appearance. There were a total of 75 suspected cases of onychomycosis. Of these 75 cases 22.6% were positive by direct microscopy and 33.3% were culture positive. Of these 75 cases, 18 were males (24%) and 57 (76 %) were females, male to female ratio being. The commonest age group was 31-40 years followed by 21-30 years. The finger nails were more frequently involved. i.e. 45 (60 %), followed by toe nails 30 (40 %) and both in 18 (24%) cases. Ratio of finger nail to toe nail infection was 1.5:1. Distal and lateral subungual onychomycosis (DLSO) was the commonest clinical pattern (76%) followed by total dystrophic onychomycosis (18.66%) and then superficial white onychomycosis (4%) and proximal subungual onychomycosis (1.33%). The most common fungal isolates were dermatophytes of which 44% were *Trytophyton rubrum*, 4% were *Trytophyton mentagrophytes*. Non dermatophyte moulds constituted 16% of the fungus isolates. Onychomycosis was found to be the commonest in housewives (52%), followed by serviceman / businessman (32%) followed by farmers (8%) and labourer and student 4% each.

Streszczenie

Grzybica paznokci lub zakażenie grzybicze paznokci jest częstą chorobą, zwłaszcza u osób starszych. Mykologiczne badanie paznokci zostało przeprowadzone u 75 pacjentów. Paznokcie uznano za zakażone na podstawie ich objawów klinicznych. Było w sumie 75 podejrzanych przypadków grzybicy paznokci. Z tych 75 przypadków 22,6% były pozytywne w badaniu bezpośredniej mikroskopii, a u 33,3% była pozytywna hodowla. Z 75 przypadków, 18 stanowili mężczyźni (24%), a 57 (76%) stanowiły kobiety. Stosunek mężczyzn do kobiet jest istotny. Najczęstsza grupa wiekowa to pacjenci w wieku 31-40 lat, następnie 21-30 lat. Paznokcie palców rąk były częściej objęte procesem zapalnym, tj. 45 (60%), następnie paznokcie palców stóp 30 (40%) i zarówno palców rąk jak i stóp w 18 (24%) przypadkach. Stosunek zainfekowanych paznokci rąk do paznokci stóp wynosił 1.5:1. Dystalna i boczna podpaznokciowa onychomykoza (DLSO) była najczęstszym klinicznym wzorem (76%), a następnie całkowitej dystroficzna onychomykoza (18,66%), powierzchowna biała onychomykoza (4%) i proksymalna pozpaznokciowa onychomykoza (1,33%). Najczęstszą izolowaną infekcją grzybiczą były dermatofity z których 44% stanowili *Trytophyton rubrum*, 4% stanowił *Trytophyton mentagrophytes*. Formy niedermatofitów stanowiły 16% izolatów grzybiczych. Grzybica paznokci została uznana za najczęstszą wśród gospodyń domowych (52%), u żołnierzy / biznesmenów (32%), a następnie u rolników (8%) oraz robotników i studentów po 4%.

Key words: fungi; onychomycosis; nails; culture; infection; dermatophytes**Słowa kluczowe:** grzyby; grzybica paznokci; paznokcie; kultura; zakażenie; dermatofity**Introduction**

Onychomycosis refers to the invasion of the nail plate by a fungus [1]. The infection may be due to a dermatophyte, yeast or non dermatophyte mould [2,3]. Predisposing factors of this disease includes presence of positive history of onychomycosis, increasing age, trauma to the nail, diabetes, immunosuppression, poor peripheral circulation and tinea pedis [4]. Perhaps 50% of all nail diseases are caused by fungi that invade the nail unit through the nail bed or nail plate. Often, more than one type of organism is

involved. Most cases of onychomycosis in the United States are caused by dermatophytes, but nondermatophyte fungi (molds or yeasts) may also serve as causative agents [5].

Onychomycosis can be classified into 4 types according to the pattern of infection [6,7]. Distal subungual onychomycosis, the most common type, affects the distal portion of the nail bed and the underside of the nail. In proximal white subungual onychomycosis, the fungus enters through the cuticle to invade the proximal portion of the nail bed. The nail plate turns white proximally near the cuticle.

This type is common in immunosuppressed patients, especially those with human immunodeficiency virus infection. In both subungual types, *Trichophyton rubrum* is the most common causative organism. In white superficial onychomycosis, found mostly in the toenails of otherwise healthy individuals, direct fungal invasion of the nail plate surface, usually by *Trichophyton mentagrophytes*, produces a white, crumbly appearance. The fourth type, Candida & onychomycosis, is usually caused by *Candida albicans* and has three subtypes. Candida paronychia, the most common of the three, is marked by swelling and erythema of the proximal and lateral nail folds. In Candida onychomycosis, the nail plate separates from the nail bed. It is characterized by direct invasion and thickening of the nail plate and associated paronychia. This type of yeast infection occurs mostly in immunocompromised patients. Progression of any of the four types so that the entire nail unit becomes involved is known as total dystrophic onychomycosis [7,8].

Aims And Objectives

The aim of our study was:

1. To determine incidence of various types of onychomycosis
2. To find out the occupational consequences related to onychomycosis
3. To find out the fungal infection positivity in nail clippings.
4. To isolate the causative fungal pathogen using fungal nail cultures.

Materials and Methods

The study population comprised of 75 suspected cases of onychomycosis attending the dermatology, outpatient department. Nail scrapings / clippings were obtained according to standard procedures. Detailed history of trauma, infection, occupation, diabetes, personal habits (smoking etc.) were taken. Different clinical patterns (DLSO - Distal and lateral subungual onychomycosis, PSO - Proximal subungual onychomycosis, SWO - White superficial onychomycosis, TDO - Total dystrophic onychomycosis) were recorded separately. All specimens were subjected to direct microscopy in 20% KOH solution for the presence of fungal mycelia and spores. Direct microscopy was used to diagnose whether the fungi were present or absent. Nail scrapings and clippings were inoculated on antibiotic containing Sabourand dextrose agar with and without cycloheximide at 27°C and at 37°C. For culture, 1 of the 2 media contained cycloheximide, which inhibits the growth of many nondermatophytes.

Growth on both media suggests a dermatophyte; growth on only the medium without cycloheximide may suggested a nondermatophyte. Treatment was initiated on the results of direct microscopy but was adjusted once the laboratory results were available. The fungal growth was identified by standard procedures. At least three samples from each patient were processed.

Those who grew dermatophytes were classified as dermatophytosis patient. Those who grew a particular mould other than dermatophyte consistently on two or more successive occasions with consistent filaments by direct microscopy at least once and continued to grow the same mould consistently thereafter from the same nail and without growing a dermatophyte on any occasion were classified as opportunistic onychomycosis patient. Those who grew a dermatophyte on one or more occasions and also grew a mould with the same consistency, site specificity and direct microscopic variability as indicated for opportunistic onychomycosis, were classified as mixed infection patients. Because of difficulty in discerning pathogens from contaminants, the guidelines followed were: 1). If a dermatophyte was isolated on culture, it was a pathogen, 2) if a nondermatophyte mould (NDM) or yeast was cultured, it was significant only if direct microscopy was positive and 3) NDM required repeated isolation.

Proper specimen collection is essential to accurate diagnosis. First, the nail area was cleansed with alcohol. Then, for distal subungual onychomycosis, the abnormal nail was clipped proximally and the nail bed and underside of the nail plate are scraped with a 1-mm curette; the outermost debris was discarded. For proximal subungual onychomycosis, the normal surface of the nail plate was pared down at the lunula and the white debris was collected from the deeper portion of the plate. For white superficial onychomycosis, the white spots on the nail were scraped and the outermost surface was discarded; the white debris directly underneath was then collected. For Candida infection, the material closest to the proximal and lateral nail edges was obtained. In suspected candidal onycholysis, after lifting the nail bed, the undersurface of the nail plate was scrapped. For distal dystrophic onychomycosis, any abnormal area of the nail plate or bed was used as a specimen.

Results (Tabl. I-IX)

The data was collected, analysed and the following results were obtained.

Age group	Number of cases		Total	% Age
	Male	Female		
<20	0	3	3	4%
21-30	4	16	20	26.6%
31-40	9	19	28	37.2 %
41-50	3	12	15	20%
51-60	0	8	8	10.6%
> 60	1	0	1	1.3%

Table I. Age distribution in patients of onychomycosis

Sex	Number of cases	% Age
Male	18	24%
Female	57	76%
Total	75	100

Table II. Sex distribution in onychomycosis
Male: Female ratio = 1: 3.15

Sr No	Type	Number of cases	% Age
1	Distal lateral subungual onychomycosis	57	76%
2	Superficial white onychomycosis	3	4%
3	Proximal subungual onychomycosis	1	1.33%
4	Total dystrophic onychomycosis	14	18.66%

Table III. Types of onychomycosis

Nail changes	Distal lateral subungual onychomycosis N=57	Superficial white onychomycosis N=3	Proximal subungual onychomycosis N=1	Total dystrophic onychomycosis N=14	Total	% Age
Subungual hyperkeratosis	39	2	-	6	50	2.6%
Oncholysis	29	2	1	8	40	53.3%
Discoloration	57	3	1	14	75	100%
Long striature	31	2	-	6	40	53.3%
Transverse grooves	6	1	-	1	8	10.6%
Paronychia	14	2	1	3	20	26.6%
Rough nails	26	2	-	8	38	50.6%
Pitting	2	-	-	1	3	4%

Table IV. Nail changes in different types of onychomycosis (n= 75)

Sites	Number of cases	% Age
Toe nail infections	30	40%
Finger nail infections	45	60%
Both Finger and Nail infections	18	24%

Table V. Incidence of toe and finger nail infections (n= 75)
Finger Nail : Toe nail infections = 1.5: 1

	Before treatment		After treatment	
	Number of cases	% Age	Number of cases	% Age
Nail for Fungus positivity	17	22.6%	3	4%
Fungal nail culture positivity	25	33.3%	5	6.6%

Table VI. Nail fungus and fungal nail culture positivity before and after treatment

Sr No	Occupational status	Number of cases	% Age
1	Housewife	39	52%
2	Farmer	6	8%
3	Labourer	3	4%
4	Student	3	4%
5	Service/ Businessman	24	32%

Table VII. Association of onychomycosis with different occupations

Number of nails	Number of cases	% Age
1-5	18	24%
6-10	32	40.24%
11-15	11	14.6%
16-20	14	18.6%
Total	75	100

Table VIII. Number of nails involved in onychomycosis

Fungal species	Number of cases	% Age
Trichophyton rubrum	1	44%
Candida albicans	5	20%
Other trichophyton species (Trichophyton mentagrophytes)	1	4%
Mixed infections	4	16%
Non Dermatophyte mould (Penicillium)	4	16%
Total	25	100

Table IX. Organisms involved in fungal nail culture

Discussion

There were a total of 75 suspected cases of onychomycosis. Of these 75 cases 22.6% were positive by direct microscopy and 33.3% were culture positive. Of these 75 cases, 18 were males (24%) and 57 (76 %) were females, male to female ratio being. The commonest age group was 31-40 years followed by 21-30 years. The finger nails were more frequently involved. i.e. 45 (60 %), followed by toe nails 30 (40 %) and both in 18 (24%) cases. Ratio of finger nail to toe nail infection was 1.5:1. Distal and lateral subungual (Fig. 1) onychomycosis (DLSO) was the commonest clinical pattern (76%) followed by total dystrophic (Fig. 3) onychomycosis (18.66%) and then superficial white (Fig. 2) onychomycosis (4%) and proximal subungual (Fig. 4) onychomycosis (1.33%). The most common fungal isolates were dermatophytes of which 44% were *Trichophyton rubrum*, 4% were *Trichophyton mentagrophyte*. Non dermatophyte moulds constituted 16% of the fungus isolates. Onychomycosis was found to be the commonest in housewives (52%), followed by serviceman/ businessman (32%) followed by farmers (8%) and labourer and student (4% each).

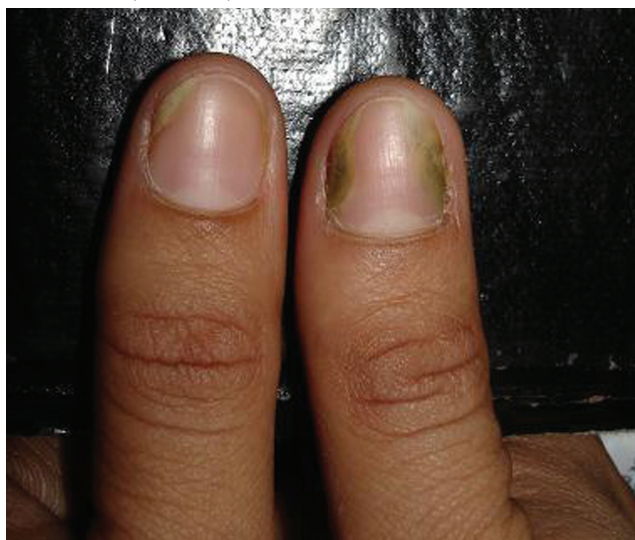


Figure 1. Distal lateral subungual onychomycosis

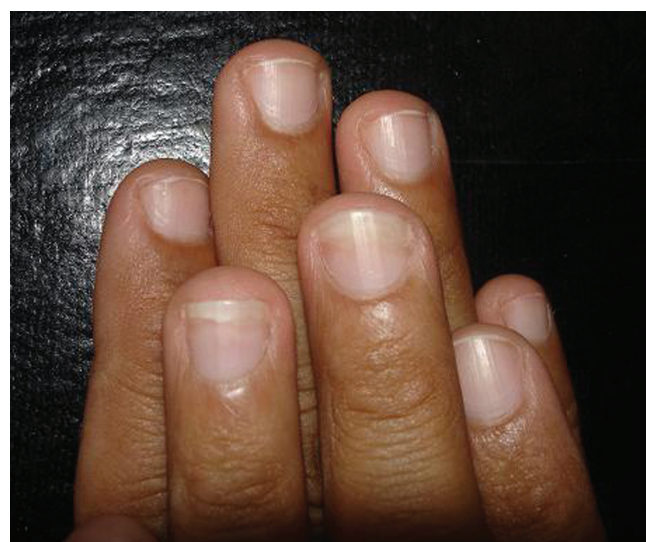


Figure 2. Superficial white onychomycosis



Figure 3. Total dystrophic onychomycosis

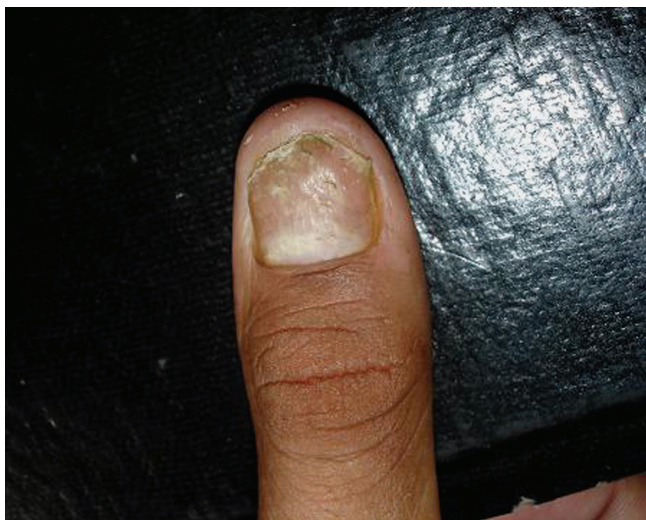


Figure 4. Proximal subungual onychomycosis

Onychomycosis, defined as fungal infection of nail affects approximately 5% of the population worldwide [9-12] and represents around 30% of all superficial mycotic infection and 500.10 of nail disorders. The infection has profound social consequences for the affected patients, who often have diminished confidence or self esteem and experience embarrassment in social and work situations. Onychomycosis in immunocompromised patients, such as those infected with human immunodeficiency virus (HIV), can pose a more serious health problem [13]. Over the recent years, an upsurge in cases of onychomycosis due to nondermatophytes has been documented. Of the nondermatophytic filamentous agents implicated in onychomycosis include members of *Scopulariopsis* and *Scytalidium* (the two most common genera), which are both thought to digest keratin in vivo, as well as members of the genera *Alternaria*, *Aspergillus*, *Acremonium* and *Fusarium*. The most common yeast that is involved in onychomycosis is *Candida albicans*. The fact that the infection is difficult to treat and treatment consists of prolonged courses of potentially toxic drugs makes it imperative to make an early and accurate diagnosis [14,15]. Diagnosis of onychomycosis depends on direct microscopy, supplemented by culture results [16]. Direct microscopy is often time-consuming, because nail debris is thick and coarse and hyphae are usually only sparsely present. Although direct microscopy can provide clues about the identity of the microorganism, careful matching of microscopic and culture results is necessary for the clinician to be confident of the diagnosis. Onychomycosis is a common infection of nails in adults and accounts for prevalence rate of 2 to 50% worldwide and the incidence increases with age [17,18]. In the present study, onychomycosis was found to be commonest in the age group 31-40 years in accordance with most of the studies. Our study reveals that incidence of onychomycosis is increasing with advancing age. Higher incidence was noted amongst females (76%) than males (24%), the ratio being 3.15 : 1, which compares well with most of the studies. Higher incidence in males may be because they are more exposed to household chores and their hands come in contact with water.

Various authors have reported high incidence of onychomycosis of the toenail. In the present study we have

come across more cases of fingernail onychomycosis, than toenails with a ratio of 1.5:1, which compares well with other studies. Incidence of increased finger nail onychomycosis may be because of the increased chances of occupation related trauma, also fingernail infection is more likely than the toenail infection to arouse the patients concern, driving them to seek medical attention. In various studies, right thumb was the commonest fingernail involved. We observed that, ring finger and index finger were commonly involved. Greater toenail onychomycosis has been reported frequently, this is in agreement with other studies, because of its bigger size predisposing to increased trauma. The high incidence of DLSO pattern has been reported by various studies. Incidence of DLSO pattern was seen in 76% of our cases, which is comparable with most of the studies. In the present study anthropophilic dermatophytes have been isolated from 29.6% of culture positive cases which is comparable with various studies. *Trichophyton rubrum* was the common isolate i.e., 57.6% in accordance with other studies. *Candida albicans* is reported as the commonest cause of paronychia onychomycosis. This is reflected in our study where all the paronychia cases grew *Candida albicans* on culture. Previously regarded as contaminant, yeast is now increasingly recognized as pathogen in fingernail infections. To conclude, DLSO was the commonest clinical presentation in this study. *Trichophyton rubrum* and *Candida* were major pathogens. This study also stresses the role of non dermatophyte moulds associated onychomycosis.

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