# Onychomycosis: clinical pattern and prevailing fungi in Kathmandu

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## ABSTRACT

Onychomycosis is a chronic mycotic infection of finger and toe nails that affects the quality of life in a significant proportion. The study was aimed to identify the clinical patterns and etiological agents of onychomycosis. The study population comprised of the suspected cases of onychomycosis, attending the outpatients department of Dermatology of Tribhuvan University Teaching Hospital, Kathmandu, during November 2006 to March 2008. Detailed history was taken and clinical pattern was noted. Nail sample was obtained from patients with suspected onychomycosis and was subjected for direct microscopy and fungal culture. After first inoculation, the culture tubes were examined every day for one week and thereafter weekly and the fungus was identified. A total of 218 patients were included in the study. The age of the patients ranged from 4 to 88 years with mean of 32.8 ± 15.4. Maximum of the patients were in the age group of 21-30 years. M: F ratio was 1.05:1. Duration of the disease varied from 1 month to 15 years. Direct microscopy was positive in 64.22% and culture was positive in 41.7%. Dermatophytes were isolated in 54.9%, yeasts in 39.6% and non-dermatophyte molds in 5.5%. As a whole, *Trichophyton rubrum* was the most common fungal isolate (82%). Yeast infection was more common in females. Yeast was significantly more commonly implicated as a pathogen in finger nail onychomycosis. Dermatophytes were more frequently isolated from toe nail onychomycosis. In conclusion, *T. rubrum* was the most common fungal isolate.

**Keywords:** Nepal, onychomycosis, yeast, mold, trichophyton.

## INTRODUCTION

Onychomycosis is a chronic mycotic infection of finger and toe nails that affects the quality of life in a significant proportion. It is responsible for up to 50 percentages of dystrophic nails. Laboratory diagnostic confirmation is often helpful prior to treatment with oral antifungals. KOH examination, nail biopsy and fungal culture on Sabouraud dextrose agar (with and without antimicrobials) are most useful.[1]

Onychomycosis is also frequently encountered in Nepal. In Nepal, higher priorities in socioeconomic concerns and health issues for other diseases have resulted in low awareness of onychomycosis by physicians and the general public alike. In view of the paucity of the study from Nepal, this study was aimed to identify the clinical patterns and etiological agents of onychomycosis in this region.

This study will highlight the prevalent fungi responsible for onychomycosis in our region, which in turn will modify the treatment modality to be offered to the patient.

## MATERIALS AND METHODS

The study population comprised of 218 suspected cases of onychomycosis, attending the department of Dermatology of Tribhuvan University Teaching Hospital, Kathmandu, during November 2006 to March 2008. Detailed history of infection, occupation, diabetes was taken. Disease was recorded into one of the four major clinical presentations: Distal and lateral subungual onychomycosis (DLSO), Proximal subungual onychomycosis (PSO), White superficial onychomycosis (WSO) and Candidial onychomycosis (CO).

After taking informed consent nail samples was obtained from patients with suspected onychomycosis. The affected nails was first thoroughly washed with 70% alcohol and then either scraped with a sterile blade or clipped into small pieces with a clean nail cutter. Nail samples was collected onto a clean and dry paper.

The collected sample was taken to the microbiology laboratory not later than half an hour. The samples was first subjected to direct microscopy using 20% potassium hydroxide and kept for one hour at room temperature after which it was examined under microscope and result noted. The remaining portion of the specimen was incubated into 2 tubes of *Sabouraud's Dextrose agar*, one at 37 degree centigrade and another at 25 degree centigrade to see their dimorphism. The cultured agar was incubated for 4 weeks before declaring the culture results as negative.

After first inoculation, these tubes were examined every day for one week and thereafter weekly. The tubes showing growth of any fungus was transferred to potato dextrose agar plate to see the colony morphology and to induce sporulation. The fungus was then examined under lactophenol cotton blue preparation either using tease

**Table-1:** Comparison of direct microscopy with culture

| Direct microscopy | Culture report | | Total |
|---|---|---|---|
| | Growth | No growth | |
| Positive | 48 (52.74%) | 92 (65.7%) | 140(64.22%) |
| Negative | 43 (47.26%) | 35 (43.9%) | 78(35.78%) |
| Total | 91 | 127 | 218 |

mount preparation or cellotape scotch preparation to see their intact morphology in case of filamentous type of fungi. The morphology was compared and identified based on morphology in reference text books. In case of non-filamentous fungi such as yeast was subjected for wet mount preparation, gram's staining and germ tube test for *Candida albicans*.

Statistical analysis was done using SPSS software (version 17). P value of < 0.05 was taken as statistically significant.

## RESULTS

A total of 218 patients suspected of onychomycosis were included in the study. Mean age was 32.8 ± 15.4 years. The age of the patients ranged from 4 to 88 years. Maximum of the patients were in the age group of 21-30 years (37.2 %). Most of them were males with M: F ratio of 1.05:1. Duration of the disease varied from 1 month to 15 years. Majority of them had the disease between 6 and 12 months duration (34.9 %). Finger nail involvement was more common than toe nail involvement (Fig. 1).

DLSO was the most common clinical type seen in 80.7 % of the cases followed by CO (13.8 %), WSO (5%) and PSO (0.5 %). DLSO was most commonly observed in male patients whereas CO among females (Fig. 2). Out of 218 clinically suspected cases of onychomycosis, 140

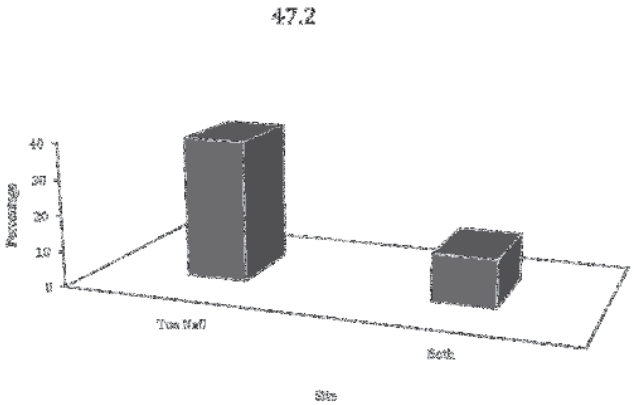


**Fig. 1.** Site of involvement

(64.22%) cases were positive on direct microscopy (KOH mount) and culture was positive in 91 cases (41.7 %). Positive KOH examination with positive culture was seen in 48 (52.74%) patients. Positive KOH with negative culture was seen in 92 (65.7%) patients (Table-1).

Out of the culture positive 91 cases, dermatophytes accounted for more than half of the cases (54.9 %), yeasts accounted for 39.6% of cases and 5.5% were non-dermatophyte molds (NDM). *Trichophyton rubrum* was the most common among the dermatophytes isolated, accounting for 82% of the dermatophytes (Table-2). As a whole, *Trichophyton rubrum* was the most common fungal isolate, both in males as well as females (Fig. 3, 4). It was isolated in 45%, Yeast infection was more common in females. Non-dermatophyte molds were isolated more often in males than females (Table-3).

Among the finger nail onychomycosis (n=43), 24(55.8%) were yeast infections, 18 (41.9%) were dermatophytic infections and one (2.3%) was due to non-dermatophyte mold. Yeast was significantly more commonly implicated as a pathogen in finger nail onychomycosis (p value – 0.0011).

**Table-2:** Pathogens of onychomycosis

| Fungus group | Fungal isolate | Frequency | (%) |
|---|---|---|---|
| Dermatophytes(54.9%) | *T. rubrum* | 41 | 82.0 |
| | *T.mentagrophytes* | 3 | 6.0 |
| | *T.tonsurans* | 3 | 6.0 |
| | *T.violaceum* | 3 | 6.0 |
| | Total | 50 | 100.0 |
| Yeast (39.6 %) | *C. albicans* | 19 | 52.78 |
| | *Candida spp, other than C. albicans C.albicans* | 17 | 47.22 |
| | Total | 36 | 100.0 |
| NDM(5.5%) | *Alternaria spp.* | 2 | 40.0 |
| | *Fusarium spp.* | 2 | 40.0 |
| | *Scopulariopsis spp.* | 1 | 20.0 |
| | Total | 5 | 100.0 |

Among the fungus isolated from toenail onychomycosis (n=33), 25(75.8%) were dermatophytes, 4(12.1%) were yeasts and 4(12.1%) were non-dermatophyte molds. Among the concurrent finger and toe nail onychomycosis, 9 (69.2%) were dermatophyte and 4 (30.8%) were yeast infections (Table-4).

## DISCUSSION

Onychomycosis is the commonest nail disease, responsible for up to 50% of diseases of the nails. The disease is known to occur at any age, but is more common between 40 and 60 years of age and is unusual prior to puberty.[2]

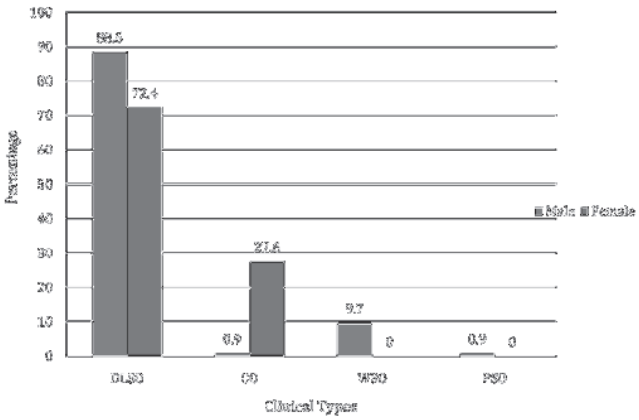


**Fig. 2.** Clinical types of onychomycosis according to gender

Various studies have shown no sex differences in the prevalence of onychomycosis.[3] We have also found no sex differences in the occurrence of onychomycosis.

Onychomycosis appears to be a variable entity presenting in different forms in different parts of the world with every country and every region of the same country having its own characteristics of presentation.[4] The disease is mainly caused by dermatophytes, but yeasts and non-dermatophyte molds also play a major role in its etiology.[2,5]

DLSO was the predominant type observed in the present study which is comparable to the findings of several other authors.[6-12] Our incidence of candidial onychomycosis is higher than that observed by Sujatha *et al*[12] and Veer *et al*[8] but lower than that recorded by Jesudanam *et al*.[13] Various other authors have reported prevalence of WSO ranging from 1 to 3%,[6,7,8,10,12,13,14] which is lower than our report. PSO, while rare, is the most common type in persons infected with human immunodeficiency virus (HIV).[15] While Ching *et al*[11] and Jesudanam *et al*[13] in their study had observed PSO as the least common type with a prevalence of 0.3% and 0.98% respectively, Wang and colleagues[6] in their study had no cases of PSO. PSO was also the least common clinical type in our study accounting for only 0.5% of all cases and the patient was tested positive for HIV-I antibody.

About 64% cases were positive on direct microscopy (KOH mount) and culture was positive in 41.7%. Our culture positivity rate was similar to Kam *et al* (48.2%)[16] but lower than that of Grover (62.8%)[7] and Sujatha *et al* (60%).[12]

**Table-3:** Fungal isolates according to gender

| Gender | Fungus group | | | Total |
|---|---|---|---|---|
| | NDM | Dermatophyte | Yeast | |
| Female | 0 | 21 | 20 | 41 |
| Male | 5 | 29 | 16 | 50 |
| Total | 5 | 50 | 36 | 91 |

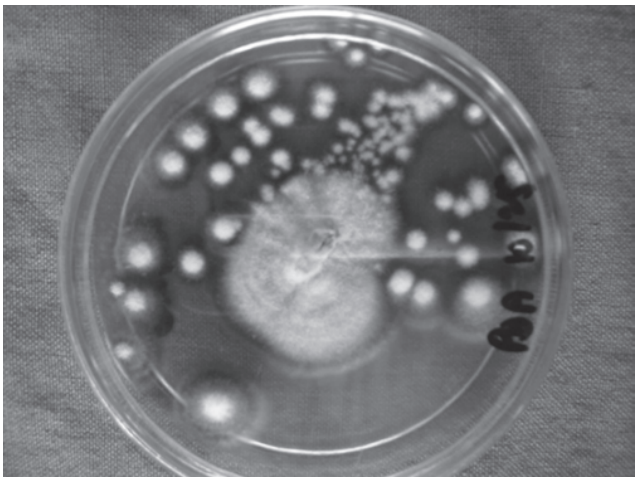

**Fig. 3.** Colony of T. rubrum in Potato dextrose agar

In our study, dermatophytes were the main fungi to be isolated accounting for 54.9% of culture positive cases. Wang and colleague[6] had isolated dermatophytes in 55.5% of patients, Veer *et al*,[8] Ilkit[17] and Sayed *et al*[18] had obtained similar results. On the other hand, by Rigopoulos *et al*[15] it was found *Candida* to be the most frequently isolated fungus (52.44%) followed by dermatophytes (41.04%). In our study, 39.6% of onychomycosis was caused by yeasts which is similar to that observed by other author.[16] Higher prevalence of *C. albicans* was observed by Bokhari *et al*.[10] This discrepancy in the pathogen could result from varying climatic conditions in different regions.

Among the dermatophytes, maximum of the fungal isolate was *Trichophyton rubrum*, in 82%. A 70% incidence of dermatophytes especially *T. rubrum* in the culture positive cases has been reported by various other authors.[9,19] Sigurgeirsson *et al*[20] and Rigopoulos *et al*[21] also found that *T. rubrum* was the dominating organism. The high prevalence of *T. rubrum* has been explained by its better adaptation to the hard keratin of nails. However, a study conducted from Eastern part of Nepal revealed *T. mentagrophytes* as the commonest fungus.[22] Sayed *et al*[18] also found *T. mentagrophytes* to be the commonest pathogen which proves the diversity in etiology of onychomycosis even within the same country.

The non-dermatophyte molds are usually considered to be nonpathogenic and unable to infect human's nails. However, they may infect secondarily, particularly in nails that have sustained significant trauma, whether by

**Table-4:** Correlation between site of involvement and fungal isolates

| Site | Fungus group | | | Total |
|---|---|---|---|---|
| | NDM | Dermatophyte | Yeast | |
| Both | 0 | 6(60.0%) | 4 (40.0%) | 10 |
| Finger nail | 1(2.3%) | 16(37.2%) | 26(60.5%) | 43 |
| Toe nail | 4(10.5) | 28(73.7%) | 6(15.8%) | 38 |
| Total | 5 | 50 | 36 | 91 |

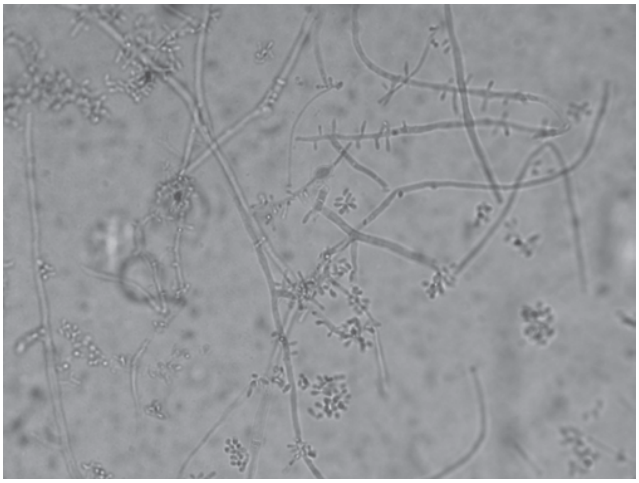

**Fig. 4.** Microscopic photograph of T. rubrum in lactophenol cotton blue preparation

the action of a dermatophyte or from some other cause. In our study, the prevalence of non-dermatophyte molds was 5.5%. This is lower than those found by others.[10,14,23] The lower prevalence of these pathogens observed in our study may be due to the cold climate of Kathmandu, where the study was carried out.

Male patients were infected more commonly with dermatophytes. Similarly, several other authors have also shown dermatophytes as the commonest pathogen in male patients.[6,15,16] Non-dermatophyte molds (NDM) were also isolated more often in males than females. From our study, the predominant fungus infecting women was dermatophyte. But yeast was more commonly isolated from females. This higher prevalence of yeast infection in females may be due to their involvement in wet household work. Other authors have also found yeast as the most common pathogen in female patients.[6,15,16,24] Previously regarded as contaminant, yeast is now increasingly recognized as pathogen in fingernail infections.[12] Yeast isolation was significantly higher in finger nail onychomycosis in the present study. This is in agree-ment with the reports of other studies.[6,11,15,16,18] It is possibly because of exposure of finger nails to wet environment as in housewives which favors yeast infection.

Although there is a wide diversity in the etiologic agents of onychomycosis, dermatophytes still remain as an important cause. Yeast infection was more commonly isolated from finger nail onychomycosis, especially in housewives, which can be prevented by taking protective measures.

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