

Clinicomycological study of Onychomycosis

M. BESRA¹, S. SARKAR¹, J. DAS¹, D. N. GANGULY¹, A. DAS¹, M. MAJUMDAR², A. CHAKRABORTY²
AND S. BASAK².

¹Department of Dermatology, School of Tropical Medicine, Kolkata

²Department of Microbiology, Mycology Division, School of Tropical Medicine, Kolkata

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Onychomycosis is defined as fungal infections of the nail apparatus. Mostly onychomycosis are caused by dermatophytes, non-dermatophyte molds and candida. Non-dermatophytes and yeasts are responsible for 1.5% to 6% and 5% of onychomycoses respectively. Clinical types of onychomycosis are distal lateral subungual onychomycosis (DLSO), proximal subungual onychomycosis (PSO), white Superficial Onychomycosis (WSO), endonyx onychomycosis and total dystrophic onychomycosis (TDO). Relative lack of study regarding clinicomycological pattern of onychomycosis in eastern India prompted us to undertake this study. This study aimed to find out different clinical types of onychomycosis and to ascertain the causative agents.

Consecutive 101 clinically suspected cases of onychomycosis were studied regarding their clinical types, KOH mount and fungal culture in Sabouraud's Dextrose Agar (SDA), Sabouraud's Dextrose Chloramphenicol Cycloheximide Agar (SDCCA) media and in Dermatophyte Test Media (DTM). Out of total 101 patients, 56 were male and 45 were female and 51 patients had history of occupational exposure to wet work. Amongst those patients 84.15% had DLSO, 2.97% had PSO, 5.94% had WSO, 6.93% had total dystrophic onychomycosis and none showed endonyx onychomycosis. KOH positivity was found in 71 cases out of which 59 (83.09%) were DLSO, 3(4.22%) were PSO, 4(5.63%) were WSO, and 5(7.04%) were TDO. Twelve cases showed fungal growth of which, 11 were *Trichophyton rubrum* and one was *Trichophyton mentagrophytes*. Out of 11 cases of *Trichophyton rubrum*, 9 had DLSO and one each had PSO and WSO. In this study DLSO was found to be the most common type of onychomycosis. KOH positivity was obtained in two third cases and culture showed fungal growth in twelve cases. *Trichophyton rubrum* was found to be the most common offender.

Key words: Onychomycosis, KOH, culture, *Trichophyton rubrum*

INTRODUCTION

Onychomycosis refers to any infection of the nail apparatus caused by dermatophytes and non-dermatophytic fungi including yeasts (Hailey and Daniel, 1990). Onychomycosis is differentiated from the Tinea unguium by that the latter is only a dermatophytic infection of the nail plate (Kanwar and De, 2008).

Onychomycosis occurs worldwide and it is a common nail infection accounting for up to 50% of all nail disorders (Van der Straten *et al.*, 2003). Various Indian studies have reported the incidence of onychomycosis which varies from 0.5-5% in the general population (Van der Straten *et al.*, 2003).

Dermatophytes are the most frequently implicated causative agents and account for 90% in toe nails and 50% in finger nail infection. (Elewski, 1998). The most commonly implicated dermatophytes are – *Trichophyton rubrum*, *Trichophyton mentagro-*

¹Email: mrinal.besra@gmail.com

phytes var. *interdigitale* and *Epidermophyton floccosum* (English and Atkinson, 1973; Walshe and English, 1996; Zais *et al*, 1996). Other less common dermatophytes are *Trichophyton tonsurans*, *Trichophyton violaceum* and *Trichophyton Soudanensei*. Non-dermatophytes are responsible for 1.5% to 6% of onychomycoses (Garcia-Martos *et al*, 2000) and include *Fusarium* sp, *Scopulariopsis brevicaulis*, *Aspergillus* sp, *Acremonium* sp, *Alternaria* sp, *Botryodiplodia theobromae*, *Onychocola canadensis*, *Scytalidium dimidiatum* (*Hendersonula toruloidea*), *Scytalidium hyalinum*, *Geotrichum candidum* and *Cladosporium carrionii* (Greer, 1995). Yeasts are the source of approximately 5% of onychomycosis, the majority of which caused by *Candida albicans* and others include *Candida parapsilosis*, *Candida tropicalis*, *Candida krusei* (Singal *et al.*, 2011).

Clinically five types of Onychomycosis have been described (Zais, 1970). Distal lateral Subungual Onychomycosis (DLSO), Proximal Subungual Onychomycosis (PSO), White Superficial Onychomycosis (WSO), Endonyx Onychomycosis and Total Dystrophic Onychomycosis (TDO).

Many dermatoses mimic onychomycoses like psoriasis, lichen planus, chronic hand dermatitis, chronic paronychia, haemorrhage or trauma etc (Gupta and Ricci, 2006). Mycological examination by direct microscopy (KOH mount) combined with culture remains the gold standard technique and it is also cost effective and least inconvenience to the patients (Feuilhade de Chauvin, 2005). On this background we have carried out the study to find out various clinical types and identification of their causative agents with available laboratory procedures so that it can further clarify the clinico-etiological correlations as well as justify the utility of present diagnostic methods as far as diagnosis of Onychomycosis is concerned.

MATERIALS AND METHODS

The study was conducted at the Department of Dermatology and Department of Medical Mycology, School of Tropical Medicine, Kolkata from December 2009 to November 2010. Consecutive 101 patients of clinically diagnosed onychomycosis, attending the outpatient department were included in the study.

Patients of all age groups and both sexes with clinically suspected onychomycosis were included while

those on topical or systemic antifungal treatment and nail changes due to other dermatoses were excluded from the study. Nail scrapings were taken after an alcoholic swab over the nail and KOH mount was done. The scrapings were also put into SDA and SDCCA media for fungal culture. Culture results were observed after 4 weeks. The data were collected in a pre-structured case data sheet and was analysed by using Medcalc R version 10.2.0.0.

RESULTS AND ANALYSIS

In this present study total 114 patients with onychomycosis were evaluated. Among those, 5 patients did not give consent for the study, 3 patients were taking antifungal medications and nail psoriasis could not be excluded in 5 patients. Hundred and one patients who fulfilled the study criteria were included in the study.

Analysis of age distribution of onychomycosis patients showed that their age ranged from 8 to 71 years with a mean of 36.24 years and a median of 36 years with a standard deviation of 12.99 years. Decade wise analysis showed that largest number of patients belonged to 2nd 3rd and 4th decades (25.74%, 26.73% and 24.75% respectively). The lowest proportion was seen in the 7th decade (1 patient, 0.99%).

Out of 101 patients, 56 patients (55.44%) were males and 45 patients (44.55%) were female with a male to female ratio of 1.24:1. Fifty one patients had history of occupational exposure to wet work of them most were house wives (Table 1)

In this study out of total 101 cases, 85 patients (84.15%) had DLSO, 7 patients (6.93%) had total

Table 1: Different occupations (n= 101)

Occupations	Number of patients	Percentage
Housewives	32	31.68
Students	13	12.87
Office workers	12	11.88
Mechanical workers	7	6.93
Trades and business	6	5.94
Field workers	5	4.95
Teachers	4	3.96
Others	22	21.78

dystrophic onychomycosis, 6 patients (5.94%) had WSO, 3 patients (2.97%) had PSO but no patient were found to have endonyx onychomycosis.

Amongst 101 cases, KOH positivity was found in 71(70.29%) cases out of which 59(83.09%) were DLSO, 3(4.22%) were PSO, 4(5.63%) were WSO, and 5(7.04%) were TD type of onychomycosis. Fungal growth was obtained only in 12 cases out of which 11 were *Trichophyton rubrum* and one was *Trichophyton mentagrophytes*. Out of these 11 cases of *Trichophyton rubrum*, 9 had DLSO and one each had PSO and WSO. *Trichophyton mentagrophytes* was found only in one case of DLSO.

or left hand was found (Chi square, $p=0.22$). Among the toe nails both side affection was almost similar with mild higher involvement of right side. In both sides great toe involvement was found in 20 cases each. Regarding other nails of right foot second toe affection was present in 5 cases, third toe among 3 cases, both fourth and fifth toe was affected in two cases. On the left side rest of the toe nails except great toe affection was found among two cases each.

DISCUSSION

Similar to some previous studies, the present study showed that the third, fourth and fifth decade are

Table 2: Demography and laboratory profile of different types of Onychomycosis

Types	DLSO	PSO	WSO	TDO	Endonyx	Total
Mean age \pm SD (years)	36.67 \pm 12.56	38.43 \pm 12.97	40 \pm 12.90	29.57 \pm 16.49	00 \pm 00	36.27 \pm 13.05
Sex (male: female)	49 : 36	1 : 2	3 : 3	3 : 4	0 : 0	56 : 45
Duration (month)	35.84 \pm 29.58	27.47 \pm 25.07	34.5 \pm 18.57	32.85 \pm 42.93	00 \pm 00	34.62 \pm 30.22
Occupation (wet: non- wet work)	41 : 44	1 : 2	3 : 3	2 : 5	0 : 0	47 : 54
Culture (positive : negative)	10 : 75	1 : 2	1 : 5	0 : 7	0 :	12 : 89
KOH (positive : negative)	59 : 26	3 : 0	4 : 2	5 : 2	0 : 0	71 : 30
<i>T. rubrum</i>	9	1	1	0	0	11
<i>T. mentagrophytes</i>	1	0	0	0	0	1

Regarding affection of the fingers right hand finger was most commonly affected with first finger affection was found in 29 cases, Second finger in 27 cases, Third finger among 20 patients, fourth finger in 11 patients and fifth finger in 8 patients. Statistically significant lower affection of fourth and fifth finger compare to other fingers were found (Chi square $p=0.001$). Among the left hand fingers first finger was affected in 23 cases, second finger in 16, third finger in 17, fourth finger in 13, and fifth finger in 2 patients. Significant lower affection of fifth finger was found compare to other fingers ($p=0.002$). However, no statistically significant difference of affection between affection of right hand

more commonly affected age groups. In our study we got slight male preponderance than female with a male to female ratio of 1.24: 1. Most of the previous studies suggested that the patients had a long duration of presentation as in our study most of the patients showed the duration of their disease in the range of 13-24 months. This may explain that the patients were ignorant about their nail problems at the initiation of the disease.

Our study revealed that fingernails are involved most commonly in onychomycosis similar to other Indian studies. But western studies showed more toenail involvement which could be explained by widespread use of occlusive shoes in western country

while in our study population there was much lower level of cosmetic consciousness resulting in lower reporting of toe nail infections. In our study the occupational group involved (housewives, housemaids, farmer etc.) used to handle water, detergents, mud etc. with their hands. That is why we got maximum number of onychomycosis in fingernails.

Our study showed DLSO as the commonest type, followed by TDO, WSO and PSO. Maximum occurrence of DLSO is most probably due to the fact that dermatophytes mainly infect the lateral nail fold and proceeds distally.

Previous studies regarding direct microscopy of nail in KOH mount revealed fungal positivity in 70.29% cases and culture positivity in 11.88% cases. Kaur *et al*, (2008) documented that dermatophytes were the most common fungi isolated followed by yeasts and non-dermatophytes. Among the dermatophytes, *Trichophyton rubrum* was the commonest species isolated followed by *Trichophyton mentagrophytes*, *Trichophyton tonsurans*, *Epidermophyton floccosum*, *Trichophyton violaceum* in decreasing order of frequency. Among the yeasts, *Candida albicans* were commonly isolated. Another study documented *Trichophyton tonsurans* as the commonest isolation followed by *Trichophyton rubrum*, *Trichophyton mentagrophytes*. In the present study KOH mount positivity was obtained in 70.29% of cases. On contrary to the previous studies, our study identified *Trichophyton rubrum* as the commonest species followed by *Trichophyton mentagrophytes*. But no other species were identified. The prevalence of onychomycosis caused by the non-dermatophytes molds varied from 1.5-22% (Clayton, 1992). But our study demonstrates no non-dermatophyte molds.

DLSO was the most common type of onychomycosis in this study. KOH mount was positive in more

than two third cases. Culture was negative in most of the cases. Dermatophytes were the most common cultured organism with *Trichophyton rubrum* being the commonest.

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