

Prevalence of Onychomycosis and its Etiological Agents in a Tertiary Care Hospital in India: A Five Years Study

Dr. Shalini Malhotra^{1*}, Dr. Shweta Sharma², Dr. Nirmaljit Kaur³, Dr. Ketki Jangid² and Dr. Charoo Hans⁴

¹Assistant Professor, Department of Microbiology, Dr. Ram Manohar Lohia Hospital & PGIMER, Baba Kharak Singh Marg, New Delhi, India

²Senior Resident, Department of Microbiology, Dr. Ram Manohar Lohia Hospital & PGIMER, Baba Kharak Singh Marg, New Delhi, India

³Associate Professor, Department of Microbiology, Dr. Ram Manohar Lohia Hospital & PGIMER, Baba Kharak Singh Marg, New Delhi, India

⁴Professor and Head, Department of Microbiology, Dr. Ram Manohar Lohia Hospital & PGIMER, Baba Kharak Singh Marg, New Delhi, India

*Corresponding Author: Dr. Shalini Malhotra, Department of Microbiology, PGIMER & Dr. RML Hospital, New Delhi-110001, India, E-mail: drshalinimalhotra@yahoo.com

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Abstract

Onychomycosis refers to fungal infection of nails and caused by dermatophytes, yeast and non dermatophytic mould. It is not a life threatening condition, however its high incidence and prevalence and associated morbidity makes it an important public health problem. This study was aimed to determine the isolation of common fungal agents responsible for onychomycosis in a tertiary care hospital in Delhi. Six hundred and twenty five samples were collected from patients with suspected onychomycosis attending Skin O.P.D during five years period from January 2010 to December 2014. Males (65.4%) were more commonly involved than females, and most common age group affected was between 21-40 years (46.2%). Two hundred and twenty (35.2%) samples were positive for fungal elements and/or grown in culture, direct microscopy (KOH mount) was positive in 213 cases (96.8%) and culture was positive in 168 cases (76.4%). Dermatophytes were isolated in 51.2% followed by non-dermatophytic moulds (26.8%) and *candida* spp. (22%). *Trichophyton mentagrophytes* was the most common dermatophyte isolated followed by *Trichophyton rubrum*. Hence accurate diagnosis of onychomycosis by direct microscopy and fungal culture is an essential requirement for appropriate management of such cases.

Keywords: Onychomycosis; Dermatophytes; Anti-fungals.

Introduction

Onychomycosis is defined as the fungal infection of nails caused by dermatophytes, yeasts and non-dermatophytic fungi. It accounts for 50% of all nail disorders and 30% of all superficial fungal infections of the nails [1]. Recently there has been a worldwide increase in the incidence of onychomycosis due to increase in immunocompromised patients, diabetes, and use of occlusive footwear's, nail trauma and improper nail hygiene [2]. It is not a life-threatening infection however it may have complications like secondary bacterial infection, chronicity, disfigurement in the form of discoloration, hyperkeratosis and brittle nails and therapeutic difficulties [3]. Onychomycosis can also mimic with certain skin conditions such as psoriasis, lichen planus, nail trauma etc. therefore laboratory diagnosis is needed to differentiate between various fungal infections before starting antifungal agent. The diagnosis of onychomycosis is done by direct microscopy of potassium hydroxide (KOH) preparation and fungal culture to identify the specific genus and species of pathogens. Clinical outcome of antifungal agents depends on the etiological agent like dermatophyte, yeast or non-dermatophytic mould thereby necessitating fungal culture. In a country like India, where fungal infections are endemic, very few studies are available hence such studies are required to improve our current knowledge regarding mycological agents in onychomycosis. Also there is increase in the isolation of yeasts and non-dermatophytic moulds (NDM) in nail infections, further necessitating studies on onychomycosis. The present study was aimed to determine the prevalence of onychomycosis in various age groups and the isolation and identification of common fungal agents in a tertiary care hospital in Delhi.

Materials and Methods

All clinically suspected cases of onychomycosis presenting to the skin OPD (out-patient department) in a tertiary care hospital, New Delhi over a period of five years from January 2010 to December 2014 were included in the study. The suspected nails were cleaned with 70% alcohol and nail scrapings were collected with a sterile scalpel blade

and collected in a sterile paper. Microscopic examination of all the samples was performed after dissolution with 10% potassium hydroxide (KOH) for the presence of fungal elements. All samples were inoculated on (1) Sabouraud dextrose agar (SDA, HiMedia Laboratories) (2) SDA with 5% chloramphenicol and cycloheximide. Cultures were incubated at 25°C and 37°C and examined daily for first week and twice a week for 4 weeks. Different fungi were identified based on microscopic and culture characteristics as per standard techniques /procedures [4]. Yeast or yeast-like organisms were characterized using germ tube test, urease test, Hi Chrome agar, Sugar assimilation and cornmeal agar. Moulds were identified in Lacto-phenol cotton blue (LPCB) stain and subjected to testing using slide culture on potato dextrose agar. Pathogens are classified as yeast and yeast-like organisms, dermatophytes and non-dermatophytic moulds (NDM). Non-dermatophyte mould is considered pathogenic only when direct microscopy is positive for fungal hyphae, arthrospore or yeast cells, isolation of NDM in the absence of dermatophytes and isolation of the same fungal species of NDM in a second sample from the same nail [5, 6].

Results

Six hundred and twenty five samples were collected from patients with suspected onychomycosis attending Skin O.P.D. Males (65.4%) were more commonly involved than females, and most common age group affected was between 21-40 years (46.2%) followed by 41-60 years (29.8%) as shown in Table 1. 220 (35.2%) samples were positive for fungal elements and/or grown in culture. Among 220 positive samples, direct microscopy (KOH mount) was positive in 213 cases (96.8%) and culture was positive in 168 cases (76.4%). Correlation of direct microscopy with culture is shown in Table 2. Dermatophytes were isolated in 86 cases (51.2%) while non-dermatophytic moulds were isolated in 45 cases (26.8%) and *candida* spp. in 37 cases (22%) as shown in Table 3. Among dermatophytes isolated, *Trichophyton mentagrophytes* was the most common followed by *Trichophyton rubrum*, *Trichophyton* spp. and *Epidermophyton* spp. as shown in Table 3.

Table 1: Age and sex-wise distribution of samples received with suspected onychomycosis:

Age	Male	Female	Total
0-20 yrs	51	30	81 (12.9%)
21-40 yrs	187	102	289 (46.2%)
41-60 yrs	122	64	186 (29.8%)
>60 yrs	49	20	69 (11%)
Total	409 (65.4%)	216 (34.6%)	625

Table 2: Correlation of direct microscopy with culture (Total samples- 625):

Test Procedure	Number	Percentage
KOH positive	213	34.1%
Culture positive	168	26.9%
Both KOH and culture positive	161	25.7%
KOH positive, culture negative	52	8.3%
KOH negative, culture positive	7	1.1%
Both KOH and culture negative	405	64.8%

Table 3: Spectrum of fungal isolates from cases of onychomycosis:

Fungal Isolates	Species	Number	Percentage
Dermatophytes n= 86 cases (51.2%)	<i>Trichophyton mentagrophytes</i>	56	33.3%
	<i>Trichophyton rubrum</i>	13	7.7%
	<i>Trichophyton</i> spp.	9	5.3%
	<i>Epidermophyton</i> spp.	8	4.8%
Non-dermatophytic moulds n= 45 cases (26.8%)	<i>Aspergillus</i> spp.	23	13.7%
	<i>Curvularia</i> spp.	11	6.5%
	<i>Alternaria</i> spp.	6	3.6%
	<i>Fusarium</i> spp.	4	2.4%
	<i>Penicillium</i> spp.	1	0.6%
Candida n= 37 cases (22%)	<i>Candida albicans</i>	17	10.1%
	<i>Candida krusei</i>	9	5.3%
	<i>Candida tropicalis</i>	7	4.2%
	<i>Candida parapsilosis</i>	4	2.4%
Total culture positive		168	

Discussion

Onychomycosis is a chronic fungal infection of nails that affect the quality of life in a significant proportion. There has been a recent increase in the incidence and also the spectrum of causative pathogens is also changing in onychomycosis. It occurs worldwide, however its presentation and the etiological agents varies from place to place and time to time. Among patients attending skin OPD for onychomycosis, males (65.4%) were more commonly involved than females, which is in concordance with other studies [2, 3, 7, 8]. However there are other studies where females were more commonly involved than males [9, 10].

Males are more prone for nail infections as they are more exposed to trauma due to increased physical activity and outdoor movement. Also smoking, drinking alcohol and poor personal hygiene are other contributing factors responsible for increased incidence in males. In our study, the most common age group affected was between 21-40 years (46.2%) followed by 41-60 years (29.8%). A similar high prevalence among 21-40 years age group was reported in other studies [10 - 12]. Adults are more active and more involved in physical activity, exposed to wet work and wear shoes or occlusive footwear's thereby more prone for fungal infections.

In the present study, mycologically confirmed onychomycosis was found to be 35.2%. Other studies from India showed isolation rate of 37.6% from Himachal Pradesh [13], 39% from New Delhi [7, 11] while studies from Kuwait [3] and Quetta [8] reported a lower isolation rate of 29% and 20%. The difference in the prevalence worldwide is due to the fact that all patients suffering from onychomycosis do not seek medical attention and many patients were started on anti-fungals before taking samples for microscopy and culture. Out of confirmed cases, direct microscopy (KOH mount) was positive in 96.8% while culture positivity was 76.4%. This suggests that direct microscopy is more sensitive for diagnosis of fungal infections. However culture is gold standard and it also helps in the identification of genus and species of different fungi. In our study, dermatophytes were the most common pathogen accounting for 51.2% and most common species being *T. mentagrophytes* (33.3%) followed by *T. rubrum* (7.7%). Dermatophytes have also been reported as the commonest cause of onychomycosis, however *T. rubrum* is considered as the commonest dermatophyte causing nail infection followed by *T. mentagrophytes* in many studies from India [2, 14]. But there are studies where *T. mentagrophytes* is more common than *T. rubrum* as seen in our study [7, 11]. This can be attributed to the fact that epidemiology of onychomycosis varies from one geographical region to other.

Non-dermatophytic moulds (NDM) and yeasts are gradually emerging as an important etiological agent in onychomycosis. In our study NDM were isolated in 26.8%, which is similar to other studies. *Aspergillus*, *Curvularia*, *Alternaria* and *Fusarium* were the NDM isolated in our study. Other studies also report these moulds as the cause of onychomycosis [2, 7, 15]. The present study shows the presence of candida in 22% and out of them *Candida albicans* was the commonest which is similar to other studies [7, 11]. Trauma to nail and humid climate expose nails to these contaminant fungi thereby contributing to its increased prevalence in onychomycosis.

Conclusion

Onychomycosis is a common problem in India and although it is not life-threatening it can cause significant pain and discomfort to the patient, thereby impairing quality of life. Hence it is recommended that people should be made more aware about onychomycosis so that they can maintain personal hygiene and report early to the hospital to prevent morbidity. Also all nail samples from such cases should be sent for fungal culture before initiating treatment because the antifungal agent with appropriate spectrum of activity can only be used if the underlying fungal pathogen is identified correctly.

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