

Onychomycosis: Prevalence and Its Etiology in a Tertiary Care Hospital, North-East IndiaDebajit Das¹, Shromona Kar^{2*}, Shreeni Chatterjee³¹Department of Dermatology, Venereology & Leprosy, Tinsukia Medical College and Hospital, Tinsukia²Department of Dermatology, Venereology & Leprosy, Fakhruddin Ali Ahmed Medical College and Hospital (FAAMC, Barpeta), Barpeta³Department of Dermatology, Venereology & Leprosy, Silchar Medical College and Hospital, Silchar

Received: 25-09-2023 / Revised: 28-10-2023 / Accepted: 30-11-2023

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Conflict of interest: Nil

Abstract:**Background:** Onychomycosis is the most common of all diseases of the nails in adults. It is a fungal infection of the finger and toe nails, usually caused by dermatophytes, yeast and non-dermatophytic moulds. It represents upto 20% of all nail disorders.**Objective:** This study was done to know the isolation rate and etiological agents of onychomycosis.**Methods:** This study has been conducted in the Department of Dermatology, Venereology and Leprosy, Silchar Medical College and Hospital, Silchar, Assam over a period of one year extending from 1st June 2021 to 31st May 2022, on 120 patients, with clinically suspected fungal infection of the nail, from those attending the Dermatology OPD.**Results:** Out of 120 clinically suspected cases of onychomycoses, 50 (41.7%) cases showed fungal growth in culture and 70 (58.3%) cases showed no fungal element on culture. Among the isolates, dermatophytes were the commonest group of isolates accounting for 24(48%) cases, followed by yeasts 14(28%) cases, and lastly non-dermatophyte moulds, 9(18%) cases. Among 50 cases of isolated fungus, Trichophyton rubrum (DM) was the commonest isolate -11(22%) cases, followed Candida species (yeasts) 9(18%) cases, followed by Aspergillus niger (NDM) 8(16%) fungi. Thereafter we obtained Trichophyton mentagrophyte, 7 (14%) cases, other unidentifiable species of Trichophyton, 6 (12%) cases, 5 (10%) cases of Candida albicans and lastly 4 (8%) Aspergillus flavus isolates.**Conclusion:** This study demonstrated that dermatophytes were the main agents in causing onychomycosis and the importance of performing fungal culture.**Keywords:** Onychomycosis, Prevalence, Etiology, Fungal infection, Nail disorders.

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Introduction

Onychomycosis is fungal nail infection that affects one or more components of the nail unit like nail matrix, nail plate, cuticle, mesenchymal tissue and nail folds. The name onychomycosis comes from the Greek words "Onychos" (nail) and "Mycosis" (fungal illness). The first description of mycotic nail infection was published in 1829 by the Parisian empiric Mahon on his work on scalp ringworm. [1] Age, sex, occupation, lifestyle, and comorbid disorders all influence the frequency of onychomycosis. [2]

Distal lateral subungual onychomycosis, superficial white onychomycosis, proximal subungual onychomycosis, and complete dystrophic onychomycosis are the different types of onychomycosis.

The most prevalent kind of onychomycosis is distal and lateral subungual onychomycosis among the ones stated above. Human immunodeficiency virus infection is associated with the proximal subungual type of onychomycosis. [2]

Dermatophytes, yeasts and moulds all cause onychomycosis. Trichophyton rubrum and Trichophyton mentagrophyte are the most predominant dermatophytes. The diverse clinical presentations of onychomycosis are caused by different species. Candida albicans is primarily linked to paronychia of fingernails, among yeast like fungi. Scopulariopsis spp., Fusarium spp., Aspergillus spp., and Scytalidium hyalinum are non-dermatophyte moulds that cause onychomycosis.

The present study was done to determine the epidemiology, prevalence and fungal causes of onychomycosis.

Materials and Methods

A cross sectional study was conducted over a period of 1 year (June 2021 – May 2022). Samples from 120 clinically suspected cases of onychomycosis, attending Dermatology Department of Silchar medical College, Silchar, were obtained. After cleaning the affected area with 70% ethanol, nail clippings were collected and the samples were sent in folded paper to microbiology laboratory.[1] The nail clippings were subjected to direct microscopy in 20% -40% KOH and culture on plain Sabouraud Dextrose Agar (SDA), Sabouraud dextrose chloramphenicol agar with or without cycloheximide. Cultures were incubated at 25 degree C and 37 degree Celsius incubated for 1-6 weeks. Negative culture report was given only after 6 weeks of incubation.

Based upon the colony morphology the fungus was broadly identified as dermatophytes, yeast and mould. Yeasts were further identified by Gram’s staining, germ tube test and chlamyospore formation. Moulds were further identified as dermatophytes and non-dermatophytes based on lactophenol cotton blue mount. Slide culture test

was performed to study the detail morphology of fungi.

Results

A total of 120 samples were collected and examined (66 males and 44 females). Out of 120 cases, the maximum number of patients belonged to the age group of 21-30 years and was found to be 26 in number (24.2%), Table 1 and 2. Out of 120 clinically suspected cases of onychomycosis, 62(51.7%) showed fungal elements in KOH mount and 58(48.3%) cases tested negative.

Out of 120 clinically suspected cases of onychomycosis, 50(41.7%) cases showed fungal growth in culture and 70 (58.3%) cases showed no fungal element on culture. Among the isolates, dermatophytes were the commonest group of isolates accounting for 24(48%) cases, followed by yeasts 14(28%) cases, and lastly non-dermatophyte moulds 9(18%) cases. Among 50 cases of isolated fungus, *T. rubrum* (DM) was the commonest isolate -11(22%) cases, followed *Candida* species (yeasts) 9(18%) cases, followed by *A. niger* (NDM) 8(16%) fungi. Thereafter we obtained *T. mentagrophyte* 7 (14%) cases, other unidentifiable species of trichophyton 6 (12%) cases, 5 (10%) cases of *C. albicans* and lastly 4 (8%) *A. flavus* isolates, Figure 1 to 4.

Table 1: Distribution of Organisms

| Distribution of organisms | Frequency | Percentage |
|---------------------------|-----------|------------|
| Dermatophytes | 24 | 48.0 |
| Non-dermatophyte moulds | 12 | 24.0 |
| Yeasts | 14 | 28.0 |
| Total | 50 | 100.0 |

Table 2: Organisms isolated

| Organism Type | Organisms isolated | Frequency | percent |
|-------------------------|--------------------------|-----------|---------|
| Dermatophytes | <i>T. rubrum</i> | 11 | 22.0 |
| | <i>T. mentagrophytes</i> | 7 | 14.0 |
| | <i>Trichophyton</i> spp. | 6 | 12.0 |
| Non-dermatophyte moulds | <i>A. niger</i> | 8 | 16.0 |
| | <i>A. flavus</i> | 4 | 8.0 |
| Yeasts | <i>C.albicans</i> | 5 | 10.0 |
| | <i>Candida</i> spp | 9 | 18.0 |
| | Total | 50 | 100.0 |



Figure 1: Distal & lateral subungual onychomycosis (DLSO): Clinical photograph showing subungual hyperkeratosis.



Figure 2: Proximal subungual onychomycosis (PSO): Clinical photograph showing proximal subungual involvement.

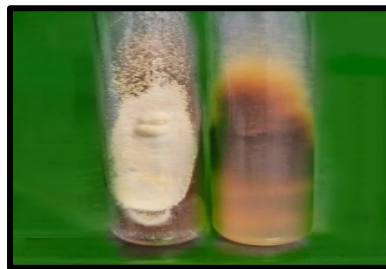


Figure 3: Clinical picture showing T. mentagrophyte colonies in DTM agar

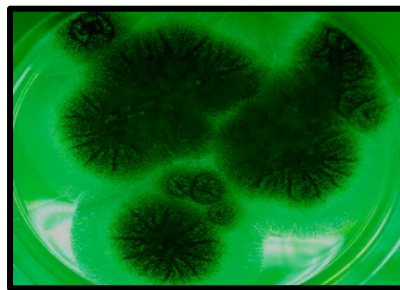


Figure 4: Black colony of Aspergillus Niger on SDA agar

Discussion

Onychomycosis is a common nail disorder. It is a chronic infection of finger and toe nails. Far more than a cosmetic problem, infected nail serves as a chronic reservoir, which can give rise to repeated mycotic infection, secondary bacterial infection, chronicity, therapeutic failures and disfigurements. There is an increase in the incidence and spectrum of causative pathogens causing infections.[3]

The prevalence is higher than currently thought as the difficulty in clinic-mycological diagnosis, improper sample collection or ineffective treatment makes it difficult to know the true profile of onychomycosis.[2] Also conditions like psoriasis, lichen planus, onychogryphosis and nail trauma can mimic onychomycosis, hence making laboratory investigations necessary to differentiate between fungal and nonfungal causes.[3] In the present study, out of 120 cases, the highest incidence of onychomycosis was seen in age group of 21-30 years (24.2%) which was similar the research of Asifa N.et al.[4] , where they found incidence of onychomycosis in age group 21-30 years to be

26.50 %. This age group has a higher incidence of onychomycosis because they are more energetic and engaged in occupations that put them at risk for repetitive mild trauma, making them more prone to infection. In the present study, males were 66 (55%) in number and females were 54 (45%) in number with male-female ratio being 1.22:1 showing male predominance. The ratio is in accordance with other studies conducted by Kaur R et al. [5], Adhikari L et al. [6], Veer P et al. [7], C-C Chi et al. [8] and Grover S et al. [9] which found OM to be more common in males than females. The greater exposure to outdoor physical activity, which renders the nail more vulnerable to trauma, may be the cause of the higher frequency of OM in men. Out of 120 clinically suspected cases of onychomycosis, 62(51.7%) showed fungal elements in KOH mount. The observed results were similar to those of Gupta M et al.[10] , Adhekandi S et al. [11] and Ashokan C et al. [12] Out of 120 cases, 50 (41.7%) cases were culture positive. This is in accordance with the research done by Presanambika H R et al.[13] , Gupta M et al. [10]and Veer P et al. [7] In the present study,

dermatophytes made up the majority of the isolates, accounting for 24 (48%) of the cases, followed by yeasts with 14 (28%) and non-dermatophytes (NDM) with 9 (18%) cases.

Results of the present study are in accordance with the results by Ahuja et al.[14] and Das NK et al.[15] Gupta M et al. [10] found slightly higher percentage of yeasts (40.8%).

Among 50 cases of isolated fungus, the only group of dermatophytes isolated throughout our research belonged to the Trichophyton species. A total of 24 Trichophyton species were identified, but only 18 of them could be speciated. Of the ones we identified, Trichophyton rubrum accounted for the majority of the cases 11(22%), which was in accordance with studies by Garg A et al. [16] , (23.07%) and Das NK et al. [15] (29.54%), who found dermatophytes to be the most common isolate and among dermatophytes, T. rubrum to be the most common isolated organism. T. rubrum was also the commonest isolate in the study by Golia S et al.[17] (43.84%) and Venkatesh VN et al.[18] (30.25%) similar to our study, with slightly higher incidence due to geographical variations. However, Samaddar D et.al. [19]] found T. mentagrophyte (21.2%) as the commonest isolate which is the second most common isolate among the dermatophyte group in our study (14%).

Yeasts and non-dermatophyte moulds are rapidly becoming recognized as significant etiological factors in onychomycosis. Yeast was the second most frequent group isolation in our investigation. Yeast was listed as the second most typical group in other studies by Golia S et al. [17], Venkatesh et al. [18] and Adekhandi S et al. Among yeasts, Candida species, which were isolated in 9 instances (18%), were the most prevalent yeast, although speciation was not possible in those cases, followed by Candida albicans 5 (10%) cases. Similar to the present study, research by Reddy NK et al. 106 & Kayarkatte MN et al. 120, found candida species to be 20% & 21.27% respectively.

Presanambika HR et al. (29.3%) and Adekhandi S et al. [11] (29.3%) found slightly higher percentage of candida species. Das NK et al.[15] (11.78%), and Ahmad M et al.[20] (14%), found similar results comparable to the present study in terms of isolation of candida albicans. (10%) 12 (24%) cases of onychomycosis resulted in the isolation of nondermatophyte moulds. Aspergillus niger was the most common NDM in the present study. Aspergillus niger was identified as the most prevalent NDM causing onychomycosis also by Adhikari L et al. [6](21.43%).

Conclusion

Onychomycosis is more difficult to treat than most dermatophytosis because of the inherent slow

growth of the nail. Nothing can predict change in microbiological environment, and the therapy is directed mainly by the type of the organisms. Therefore, it becomes imperative that this kind of studies should be performed at regular intervals to find out any change in the causative organisms.

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