

Study of Clinical, Onychoscopic, Koh Mount and Histopathological Findings in a Patient of Onychomycosis

Dr. Nidhi Pugalia¹, Dr. A. L. Singh²

¹Junior Resident, Department of Dermatology, Venereology and Leprosy, Jawaharlal Nehru Medical College (JNMC), Datta Meghe Institute of Medical Sciences (DMIMS) Sawangi (Meghe), Wardha.

²Professor, Department of Dermatology, Venereology and Leprosy, Jawaharlal Nehru Medical College (JNMC), Datta Meghe Institute of Medical Sciences (DMIMS), Sawangi (Meghe), Wardha.

Corresponding Author:

Dr. NidhiPugalia, Junior Resident, Department of Dermatology, Venereology and Leprosy, Jawaharlal Nehru Medical College (JNMC), Datta Meghe Institute of Medical Sciences (DMIMS)

Sawangi (Meghe), Wardha.

E-mail: nidhipugalia28@gmail.com

Type of Article- Research Protocol

Conflict of Interest: None

Funding :Intramural Grant

Abstract:

BACKGROUND:

The fungal infection of the nail unit caused by dermatophytes, nondermatophytes, yeasts is onychomycosis. prevalence is 0.5%- 5% in India. The type of causative organism largely depends upon factors like geographical distribution, climate, co-morbidities. Therefore, it is important to correctly classify the infective agent in order to provide a proper management and treatment.

OBJECTIVES:

1. To study clinical features of onychomycosis.
2. To study the onychoscopic (nail dermoscopy) features of onychomycosis.
3. To study features of onychomycosis on KOH mount.
4. To study histopathological features of onychomycosis
5. Correlation of clinical findings of onychomycosis with onychoscopy, KOH mount, histopathological findings.

METHODOLOGY: A detailed clinical examination will be done of patients with of fungal infection of nail. A single representative nail will be chosen for onychoscopy and nail

changes will be observed under a dermatoscope. With the help of a nipper, a fragment of the affected nail will be cut and will be placed in a dry container. Specimen will be collected in two different dry containers- one for PAS staining for histopathological examination and other for preparation of KOH mount to look for fungal elements.

RESULTS: Clinical findings of fungal infection of nail are correlated with onychoscopy, KOH mount, histopathological findings.

CONCLUSION: Diagnostic and therapeutic steps can be taken towards patient in management of onychomycosis, which can facilitate the correct treatment and prevent A misdiagnosis that can endanger patients to the wrong treatment

INTRODUCTION:

'Onychomycosis' is a fungal infection of the nail unit caused by dermatophyte, non-dermatophytic moulds, yeast. *Trichophyton rubrum* and *Trichophyton interdigitale*¹ is associated with approximately 90% of toenail and at least 50% of fingernail. Worldwide prevalence of OM is 5% and 0.5%-5% in India.² In the aged males, it is more commonly observed.³ There are five major clinical presentations of primary OM⁴:

- Distal and lateral subungual (DLSO)
- Proximal subungual (PSO)
- Superficial (SO)
- Endonyx
- Total dystrophic (TDO).

It is denoted as mixed OM when fungal infection of nail occurs in combination. Nail dystrophy accounts for 50 percent of clinical manifestations due to fungal infections, so correct diagnosis is important in the management of fungal infection of nail to prevent misdiagnosis and delay in treatment.⁵ Onychoscopy serves as an important and quick adjunct to diagnose fungal infection of nail until other time-consuming investigations, such as culture and PAS become available and the fact the onychoscopic features are highly specific for different variants of fungal infection of nail cannot be overlooked. Laboratory testing and identification of the infecting organism⁶ is of significance because clinical manifestations of fungal infection of nail caused by multiple species of fungi are sometimes indistinguishable. This study of ours, we propose that the clinical and mycological characteristics of fungal infection of nail patients should be determined. In the surrounding environment, the etiological spectrum of any superficial mycosis is certainly dependent on the microbial flora. Geographic, climatic and occupation are impacting factors. OM is spread worldwide and there are diverse genera of causative agents, indicating different causative agents with a variation in temperature, environment and location. Various levels of incidence can occur in various regions of the same country with different environmental conditions.⁷ Because of nondermatophyte filamentous fungi, it is necessary to recognize, classify and confirm fungal infection of nail as some of them may need a prolonged therapy time compared to dermatophytes and many may not be responsive to even novel antifungal agents.

RATIONALE/NEED FOR STUDY:

It is necessary to diagnose a fungal infection positively before administering an antifungal treatment for a suspected fungal infection. When assessing nail disorders, onychoscopy can be used as an effective diagnostic method as it not only helps to identify different nail disorders, but also helps prevent unnecessary, tedious and time-consuming investigations. The confirmed diagnosis of fungal infection of nail, precise recognition of the causative agent is of importance not only because the treatment can be long term and cost, but also because an incorrect diagnosis can reveal patients to the wrong therapy, affect the understanding of therapeutic efficacy of the patient. Therefore, carrying out confirmatory tests prior to the start of treatment results in significant savings relative to the higher costs involved in observational treatment. In addition, the course of action for care would be properly driven by having a correct diagnosis and mycological identification of the causative agent. For example, nondermatophyte moulds have been shown to be immune to the standard prescription antifungal therapies, and therefore a confirmatory diagnosis of a nondermatophyte pathogen such as *Fusarium* or *Candida albicans* will be necessary for alternative therapy.^{8,9} Patients who have completed a treatment plan to treat a specific causative pathogen are often found to be more likely to experience a better end result. Because of infection resolution, this includes a higher quality of life than patients who have undergone untargeted care.

RESEARCH QUESTION:

Are clinical, onychoscopic, KOH mount, histopathological findings co-relatable with each other in a patient of onychomycosis?

AIMS AND OBJECTIVES

AIM:

To determine the presence of onychomycosis clinically, on onychoscopy, on KOH mount and histopathologically.

OBJECTIVES:

1. To study clinical features of onychomycosis.
2. To study the onychoscopic (nail dermoscopy) features of onychomycosis.
3. To study features of onychomycosis on KOH mount.
4. To study histopathological features of onychomycosis Correlation of clinical findings of onychomycosis with onychoscopy, KOH mount, histopathological findings.

MATERIALS AND METHODS

Place of study: Out Patient Department of Dermatology, Venereology and Leprosy, AVBRH, Sawangi, Wardha, Maharashtra

Study design: Cross Sectional study

Period of Study: October 2020 to August 2022

Period required for data collection: 2 years

Study setting: All patients, irrespective of gender, suffering from fungal infection of nail, coming to the department of Dermatology, Venereology and Leprosy in AVBRH, Sawangi, Wardha, Maharashtra.

Sample size:

$$n = [Z_{\alpha/2}]^2 * P*(1-P)/ d^2$$

$$n = (1.96)^2 * 0.02(1-0.02) / (0.05)^2$$

$$n = 30.11$$

where,

n = sample size

$Z_{\alpha/2}$ is the level of significance at 5%, that is, 95% confidence interval = 1.96

P = Prevalence of onychomycosis = 2% = 0.02

D = desired error of margin = 5% = 0.05

Sample size for the present study will be 30 cases

- **Cases** will be defined as any patient, irrespective of gender, coming to the Dermatology Department and having onychomycosis.

INCLUSION CRITERIA:

- Patients of both genders of any age group.
- Patients willing to participate in the study with their informed consent
- Patients with presumptive clinical diagnosis of onychomycosis will be included.

EXCLUSION CRITERIA:

- Patients on prior antifungal therapy (Systemic antifungal therapy for the last three months or topical antifungal therapy for the last 1 month)
- Patients with co-existing dermatosis that can cause nail disease (lichen planus, psoriasis, allergic dermatitis)
- Patients with other severe systemic comorbidities and pregnant and lactating women

METHODOLOGY

Patients having fungal infection of nail who will be coming to the Dermatology department, AVBRH, Sawangi, will be enrolled after considering the various inclusion and exclusion criteria. Institutional Ethical Committee (IEC) clearance will be obtained. Written informed consent in their vernacular language will be taken from all the participants for voluntary participation.

A detailed clinical examination will be done of patients with of fungal infection of nail . A single representative nail will be chosen from each subject for onychoscopy and nail changes will be observed under a dermatoscope. The clipping technique is simple and painless. With the help of a nipper, a fragment of the affected nail is cut. The extracted specimen may be placed in a formaldehyde solutions or a dry container. Specimen are collected in two different dry containers- one for PAS staining for histopathological examination and other for preparation of KOH mount to look for fungal elements.

OUTCOME MEASURE:

With this study, diagnostic and therapeutic steps can be taken towards patient in management of fungal infection of nail. Further, this can facilitate the correct treatment and prevent misdiagnosis that can reveal patients to the erroneous treatment or affect the patient's understanding about its clinical efficacy.

STATISTICS:

All standard parametric and non-parametric data will be assessed by standard statistical methods.

A '*p*' value of <0.05 will be considered significant

SCOPE:

This study will help in the diagnosing fungal infection of nail in patients. It can later be used to correctly target the treatment in patients of fungal infection of nail.

LIMITATIONS

This is a hospital-based study, not a population based study.

IMPLICATIONS:

With this study, therapeutic steps can be taken towards patient in management of fungal infection of nail. Further, this can facilitate the correct treatment and prevent a misdiagnosis that can expose patients to the wrong treatment or affect the patient's understanding of its clinical efficacy.

DISCUSSION:

A study conducted in 2019 by Manasa N. Kayarkatte et al¹⁰ to recognise the patients appearing at tertiary care hospital in Delhi with OM . For OM, a hundred patients were

enrolled. 88 patients amidst them, with PAS stain tested positive for OM on direct KOH, culture and/or histopathology microscopy, were enrolled in study. Fungal infection of nail was tested for clinicomycological features and risk factors associated with OM and was more common in males (M:F = 2.5:1). In 35 (39.77 percent) patients, concurrent dermatophytosis of the skin was present. The most frequent clinical variant was Distal and Lateral Subungual OM (DLSO)(81.8 percent. Dermatophytes were mainly isolated, followed by non-dermatophytic moulds in 30 (63.82 percent) patients. followed by non-dermatophytic moulds (NDM) in 7 (14.8%) and *Candida* spp. in left over 10 (21.27%) patients. There were 17 (19.3%) OM patients who had diabetes mellitus at the same time, with 12 (13.64%) male patients being male. Similar results were testified through previously done studies where diabetes was present in 6.6 percent of Papini et al¹³ 22.9 percent (Yadav et al)¹² in 11.2 percent. Onycholysis is a frequent finding on clinical examination of OM supported by studies conducted by Yadav et al (97.4%)¹¹. and Kaur et al¹². In 77 (87.5 per cent), SUH in 72 (81.81 per cent) and dystrophy in 15 (17.1 per cent) patients, nail plate thickening was observed. In 47 (53.4 percent) patients, fungal culture isolation was seen; in 30/47 percent, the most frequent pathogen was a dermatophyte (63.8 percent). In 18 (38.2 percent), *T. rubrum* was the most prevalent isolate, followed in 10 by *T. mentagrophytes* (21.27 percent). This finding indicates similar patterns with previous studies worldwide and across India, but this outcome is not in accordance with recent research from North India. where *T. mentagrophytes* have been more commonly isolated. Clayton et al¹² conducted a study in which 11 percent of 2113 toenails were positive for KOH, but truly negative for fungal culture. This may be misleading, as nearly half of all onychomycosis samples have been documented to fail to produce a positive culture.¹⁸ Additionally, false positive KOH test results have not confirmed that the fungi observed are viable and may have accurately represented the state of the infection. For instance, in a clinical trial assessing tavaborole, a 5% topical solution. The positive KOH test results were found to be substantially higher than positive culture outcomes (68.8-62.9 percent vs. 14.6-13.0 percent, respectively), probably as the residual nail sample detected dead fungal elements. Shrijana Gurung et al¹³ conducted a study in two geographically distinct regions of India – Sikkim (hilly temperate region) and Karnataka (coastal tropical region) To indicate whether there was a difference in temperature, atmosphere and locale between the causative agents. The most common pathogen causing onychomycosis was found to be the nondermatophyte mould followed by dermatophytes and *Candida* spp. \in Manipal (Karnataka). Contrasting to earlier studies conducted in India, the findings were that Dermatophyte was the most common etiological agent. At STNM Hospital, Sikkim, *Trichophyton rubrum* turned out to be the most prevailing isolate, which is reinforced findings of previous studies *Trichophyton rubrum*'s increased prevalence may be attributable to its improved adaptation to the nails' hard keratin. Manipal and Gangtok were isolated from two separate fungal genera. The lifestyle and daily activities of the population are influenced by a disparity in geography, climate and temperature. Due to the hot and damp environment baring the nails to trauma, the rest opted to wear open sandals in Manipal 5 individuals regularly wearing closed footwear. The region around Manipal is an agricultural area that may have encouraged the population's interaction with a geophilic fungus, *Fusarium*. 14 people in Gangtok wore closed footwear for a long period of time. It is acknowledged that

anthropophilic dermatophytes thrive at 37°C and the hot and humid atmosphere produced by the shoe may have favoured its development.

A clinicomycological study on fungal infection of nail was conducted by Attal RO et al.¹⁴ in hospital in Central India in which they deduced most ordinary pattern of onychomycosis noted was DLSO, but it was not unusual for TDO & WSO. Compared to fingernails, the toenails were affected most commonly. . Among 38.6 percent of patients, fungal culture findings were favourable. The most common species isolated were nondermatophytic moulds, stressing the role of nondermatophytic moulds in causing onychomycosis. The other pathogens noted to cause onychomycosis were Dermatophytes & Candida. The dermatophytes contain *T. Rubrum* was the pathogen that was the most widespread. The combined sensitivity of direct microscopy and culture in their research was higher than that of direct microscopy and culture alone. This highlights the need for all tests to be done to validate the diagnosis. Of the 44 clinically suspected OM patients in their sample, 19 were men (43.2 percent) and 25 were women (56.8 percent) with a 1.32:1 male to female ratio.

Cross-sectional study was conducted by **Kayarkatteet al**¹⁵ on nail dermoscopy (onychoscopia) findings in the diagnosis of primary onychomycosis and it was found that onychoscopic features like spiked pattern, distal irregular termination and ruins appearance had a significant association with OM and its variants. They identified few newer features, like white fluffy shadows, transverse striate pattern, homogenous opacity and lamellar micro-splitting in the diagnosed cases of onychomycosis

An observational study was conducted by **Yasmeen Bhat et al**¹⁶ on nail dermoscopy on 237 patients from Kashmir. Their study showed various nail disorders in decreasing order of frequency Onychomycosis (81), psoriasis (63), lichen planus (27), connective tissue disorders (24), nail tics (5), subungal verrucae (3). They concluded that onychoscopy is an easier, non-invasive and cost-effective form of diagnosis that can allow the unaided eye to detect subtle changes in the nails. It can not only aid us ascertain nail diseases early so that disease advances can be managed, but also help to tell benign lesions apart from malignant lesions and thereby serve as a guiding light to prevent needless biopsies. Few of the related studies were reviewed¹⁷⁻²⁰.

REFERENCES

- [1] Kaur R, Kashyap B, Bhalla P. Onychomycosis- epidemiology, diagnosis and management. *Indian J Med Microbiol.* 2008;26:108-116.
- [2] Sobhanadri C, Rao DT, Babu KS. Clinical and mycological study of superficial fungal infections at Government General Hospital: Guntur and their response to treatment with Hamycin, Dermostatin and Dermamycin. *Indian J Dermatol Venereol Leprol.* 1970;36:209-214.
- [3] Piraccini BM, Alessandrini A. Onychomycosis: A Review. *J. Fungi.* 2015;1:30-43.
- [4] Hay RJ, Baran R. Onychomycosis: A proposed revision of the clinical classification. *J Am Acad Dermatol.* 2011;65:1219-1227.
- [5] Scher RK, Baran R. Onychomycosis in clinical practice: factors contributing to recurrence. *Br J Dermatol* 2003; 149(suppl 65): 5–9.
- [6] Elewski BE, Hay RJ. Update on the management of onychomycosis: highlights of the Third Annual International Summit on Cutaneous Antifungal Therapy. *Clin Infect Dis* 1996; 23: 305–313.
- [7] Rogopoulos D, Katsiboulas V, Koumantaki E, Emmanouil P, Papanicolaou A, et al. (1998) Epidemiology of Onychomycosis in Southern Greece. *Int J Dermatol* 37:925-928.

- [8] Clark AE, Kaleta EJ, Arora A, et al. Matrix-Assisted laser Desorption Ionization-Time of Flight mass spectrometry: a fundamental shift in the routine practice of clinical microbiology. *Clin Microbiol Rev* 2013; 2: 547–603.
- [9] Theel ES, Hall L, Mandrekar J, et al. Dermatophyte identification using matrix-assisted laser desorption ionization– time of flight mass spectrometry. *J Clin Microbiol* 2011; 2011: 4067–4071.
- [10] Kayarkatte MN, Singal A, Pandhi D, Das S. Clinico-mycological study of onychomycosis in a tertiary care hospital-A cross-sectional study. *Mycoses*. 2020 Jan;63(1):113-118. doi: 10.1111/myc.13025. Epub 2019 Nov 13. PMID: 31642133
- [11] Yadav P, Singal A, Pandhi D, Das S. Clinico-mycological study of dermatophyte toenail onychomycosis in New Delhi, India. *Indian J Dermatol*. 2015;60:153-158.
- [12] Clayton YM. Clinical and mycological diagnostic aspects of onychomycoses and dermatomycoses. *Clin Exp Dermatol* 1992; 17(Suppl 1): 37–40.
- [13] Gurung, Shrijana&Prakash, Peralam&Bhutia, Pema& Gupta, Amlan&Bairy, Indira &Pradhan, Jagat&Pradhan, Uttam& Sharma, Dhruva& Peggy, Tshering. (2012). Onychomycosis in two geographically distinct regions in India. *Archives of Clinical Microbiology*. 3. 1-6. 10.3823/264.
- [14] ATTAL, Ruchita& RA, Chaudhary&Deotale, Vijayshri& Jain, Sonia. (2015). Attal RO, Chaudhary RA, Deotale VS, Jain SP, A clinicomycological study of onychomycosis in a rural hospital in Central India *Int J Res Med Sci*. 2015; 3(5): 1131-1137. doi:10.5455/2320-6012.ijrms20150519. IJRMS. 10.5455/2320-6012.ijrms20150519.
- [15] Kayarkatte MN, Singal A, Pandhi D, Das S, Sharma S. Nail dermoscopy (onychoscropy) findings in the diagnosis of primary onychomycosis: A cross-sectional study. *Indian Journal of Dermatology, Venereology and Leprology*. 2020 Jul-Aug;86(4):341-349. DOI: 10.4103/ijdv1.ijdv1_100_19.
- [16] Bhat YJ, Mir MA, Keen A, Hassan I. Onychoscopy: an observational study in 237 patients from the Kashmir Valley of North India. *Dermatol Pract Concept*. 2018;8(4):283-291. Published 2018 Oct 31. doi:10.5826/dpc.0804a06.
- [17] Henry, D., and A. Singh. “A Study of Pattern of Cutaneous Manifestations in Patients with Diabetes Mellitus.” *Journal of Pakistan Association of Dermatologists* 30, no. 1 (2020): 161–66.
- [18] Henry, D., A. Singh, B. Madke, and P. Kedia. “A Case of Altered Clinical Picture of Extensive Tinea Corporis (Tinea as a Great Mimicker).” *Iranian Journal of Dermatology* 22, no. 3 (2019): 107–9.
- [19] Verma, S.B., and B. Madke. “Topical Corticosteroid Induced Ulcerated Striae.” *Anais Brasileiros de Dermatologia*, 2020. <https://doi.org/10.1016/j.abd.2020.07.003>.
- [20] Verma, S.B., B. Madke, R.S. Joshi, and U. Wollina. “Pseudoedematous Striae: An Undescribed Entity.” *Dermatologic Therapy* 33, no. 4 (2020). <https://doi.org/10.1111/dth.13754>.