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Diagnostic Evaluation of Superficial Mycoses: A Clinico-Pathological and Mycological Study Using KOH Microscopy and Fungal Culture.

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Abstract

Background: Superficial mycoses are among the most prevalent dermatological diseases worldwide. In routine clinical diagnosis, mycological confirmation by potassium hydroxide (KOH) microscopy and fungal culture is essential for correct identification and specific management, especially with the increasing prevalence of non-dermatophyte molds and the changing epidemiology of dermatophytes. ***Methods***: A cross-sectional observational study conducted at ESIC Medical College and Hospital Kalaburagi, Karnataka, India from January 2024 to December 2024. We enrolled a total of 128 patients with clinically suspected superficial fungal infections. Skin scrapings, nail clippings or hair roots were subjected to 10-20% KOH direct microscopy and were cultured on Sabouraud Dextrose Agar (SDA). ***Results***: The incidence was more common in males (62.5%) than females (37.5%) with maximum incidence in the 41-50 years age group (25.8%). The most common clinical presentation was tinea corporis (n=54) followed by onychomycosis (n=32). Culture positivity was seen overall in 73 cases (57%). In 74 cases (57.8%) KOH microscopy was positive. The combination of both modalities provided the maximum diagnostic yield. The most commonly isolated dermatophyte was Trichophyton mentagrophytes (n=21) followed by Trichophyton rubrum (n=13) . Interestingly, a large proportion of isolates were non-dermatophyte molds (NDMs), mainly Aspergillus species (n=18). ***Conclusion***: Tinea corporis is the commonest superficial mycosis. T. mentagrophytes is the predominant isolate. KOH mount and fungal culture are both essential and complementary tools to reach a definitive mycological diagnosis.

Keywords: Superficial mycoses, Tinea corporis, Dermatophytes, KOH microscopy, Trichophyton mentagrophytes.

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INTRODUCTION

Mycoses that are superficial, such as those that affect the skin, hair, and nails, are a significant public health issue that affects the entire world [1-3]. Dermatophytes are the most common cause of these infections; however, yeasts and non-dermatophyte molds (NDMs) are increasingly being implicated in the development of these infections, particularly in highly complicated nail infections [4,5].

In recent years, dermatophytosis in tropical and subtropical regions has been increasingly considered to be a chronic, relapsing, and atypical presentation. As a result, a pure clinical diagnosis is no longer sufficient for modern clinical practice [6-8].Empirical therapy is a common practice; however, accurate laboratory diagnosis is required due to the increasing antifungal resistance and the rapidly changing epidemiology of fungal pathogens in the Indian subcontinent [9-11]. Despite the fact that KOH direct microscopy is capable of providing rapid presumptive evidence of fungal elements, it is not able to identify the specific genus, species, or sensitivity profiles that are responsible for the infection [12].

Therefore, fungal culture continues to be the gold standard for accurate species identification as well as for epidemiological monitoring over an extended period of time [13,14].The current study was conducted with the purpose of examining the clinico-mycological profile of patients who were attending a tertiary care center in Kalaburagi and who were diagnosed with superficial mycoses. Additionally, the study aimed to correlate clinical types with laboratory findings obtained through KOH microscopy and fungal culture.

MATERIALS AND METHODS

Study Design and Setting:
This cross-sectional, observational study was conducted in the Department of Dermatology and Microbiology at ESIC Medical College and Hospital Kalaburagi, Karnataka, India.

Study Period:
The study was conducted over a period of one year, from January 2024 to December 2024.

Study Population:
The study included a total of 128 patients presenting with clinically suspected superficial mycoses (including various types of tineae and onychomycosis) during the specified study period.

Specimen Collection and Processing:
After cleansing the affected area with 70% ethanol, clinical specimens (skin scrapings, nail clippings, and hair stumps) were collected using sterile blunt scalpels.

Each specimen was divided into two portions:
Direct Microscopy: The first portion was subjected to KOH preparation (10% for skin/hair, 20% for nails) and examined under a light microscope for the presence of fungal hyphae, spores, or yeast cells.

Fungal Culture: The second portion was inoculated onto Sabouraud Dextrose Agar (SDA) with and without cycloheximide and chloramphenicol. Cultures were incubated at 25°C and 37°C for up to four weeks.

Variables Analyzed:
Patient demographics (age, sex, urban/rural residence), clinical presentation (e.g., Tinea corporis, Tinea cruris, Onychomycosis), KOH status, and specific fungal isolates were recorded and analyzed.

RESULTS

A total of 128 clinically suspected cases of superficial mycosis were evaluated. The demographic distribution is presented in Tables 1, 2, and 3. The peak incidence was observed in the 31–50 age range, comprising 65 out of 128 patients (50.8%). Males (62.5%) were more predominantly affected than females (37.5%). Most patients belonged to an urban demographic (64.8%).

Table 1: Age Distribution of Total and Culture-Positive Cases

Age Group	Total Cases (n=128)	Percentage (%)	Culture Positive (n=73)	Percentage (%)
11-20	6	4.7%	4	5.5%
21-30	29	22.7%	11	15.1%
31-40	32	25.0%	19	26.0%
41-50	33	25.8%	13	17.8%
51-60	21	16.4%	15	20.5%
61-70	6	4.7%	10	13.7%
>70	1	0.8%	1	1.4%

Table 2: Sex Distribution

Sex	Total Cases	Percentage	Culture Positive Cases	Percentage
Male	80	62.5%	40	63.0%
Female	48	37.5%	33	37.0%
Total	**128**	**100%**	**73**	**100%**

Table 3: Distribution by Residence

Residence	Total Cases (n=128)	Total %	Culture Positive (n=73)	Culture Positivity %
Urban	83	64.8%	38	64.8%
Rural	45	36.2%	35	36.2%
Total	**128**	**100%**	**73**	**100%**

Tinea corporis was the most common clinical presentation, accounting for 42.2% (n=54) of the cases, followed by Onychomycosis (25.0%, n=32).

Table 4: Clinical Types of Superficial Mycoses

Clinical Types	Number of cases (n=128)
Tinea capitis	9
Tinea corporis	54
Tinea cruris	5
Tinea pedis	13
Tinea manuum	10
Tinea incognito	5
Onychomycosis	32

Comparing the two diagnostic modalities, 74 cases were KOH positive, and 73 were culture positive. 58 cases were positive by both methods. KOH microscopy demonstrated a higher diagnostic yield in culture-negative cases (n=16) compared to culture detecting fungus in KOH-negative cases (n=15).

Table 5: Correlation of KOH Microscopy and Fungal Culture

	Culture Positive	Culture Negative	Total
KOH Positive	58	16	74
KOH Negative	15	39	54
Total	**73**	**55**	**128**

Among the 73 culture-positive cases, dermatophytes were the predominant pathogens, but non-dermatophyte molds also formed a substantial cohort. Trichophyton mentagrophytes was the single most common isolate (n=21).

Table 6: Profile of Fungal Isolates (n=73)

Fungal Species	Number of cases
Trichophyton mentagrophytes	21
Aspergillus species	18
Trichophyton rubrum	13
Trichophyton tonsurans	9
Candida species	4
Penicillium species	3
Bipolaris species	2
Fusarium species	1
Cladosporium species	1
Scopulariopsis species	1

DISCUSSION

The correct diagnosis of superficial mycoses is of great importance because of its high prevalence and the ever-increasing problem of recalcitrant infections [15]. In our study in ESIC Medical College and Hospital Kalaburagi maximum number of cases were in third to fifth decades of life (31-50 years). This is in agreement with the results obtained by Singh et al. and other Indian cohorts [16,17] who found that active age group is highly susceptible to fungal infections due to physical exertion, occupational sweating and outdoor activities. We also noted a marked male preponderance (62.5%) which was in agreement with the demographic findings of Bhatia et al. and other regional epidemiological surveys [18,19]. This is generally attributed to increased outdoor labour and use of occlusive footwear or close-fitting clothes.Clinically the most frequent presentation was Tinea corporis (n=54, 42.2%) followed by onychomycosis (n=32, 25.0%). Similar clinical distributions have been previously reported by Kaur et al. and contemporary reports [20,21] in tropical tertiary care settings with high rates of T. corporis attributed to hot, humid climates that promote fungal colonization on glabrous skin.As for diagnostic modalities, KOH was positive in 57.8% of cases and culture in 57%.

Interestingly, 16 cases were KOH positive but culture negative, which can occur secondary to non-viable fungal elements, often because of prior empirical antifungal therapy [22]. Conversely, 15 cases were culture positive with a negative KOH smear which points out that direct microscopy alone may miss low fungal burdens [23].This study describes a major epidemiological shift in the mycological profile. Historically, T. rubrum was reported as the most frequent dermatophyte across India [20]. But our data showed that T. mentagrophytes (n=21) was the predominant species than T. rubrum (n=13).

This switch is well supported by recent literature. Dogra et al. and regional studies [8,24] have also reported a similar changing epidemiological trend, with T. mentagrophytes being heavily implicated in the rise of chronic, steroid-modified dermatophytosis (including Tinea incognito cases, of which we recorded 5).

The isolation of non-dermatophyte molds (NDMs) was also very high, especially Aspergillus species (n=18). The high percentage of onychomycosis cases (n=32) in our cohort is in good agreement with the high rate of NDMs. Aspergillus and Scopulariopsis are now increasingly recognized as the primary pathogens of nail infections and not laboratory contaminants and require specific culture identification to direct appropriate systemic therapy [5,25]. This has been comprehensively established by Gupta et al. and subsequent mycological studies.

CONCLUSION

Our study reveals that Tinea corporis remains the most prevalent clinical form of superficial mycoses, mainly affecting active adult males. The dominance of Trichophyton mentagrophytes and the high isolation rate of Aspergillus species suggest a continuing shift in the fungal epidemiological scenario in India. Both modalities were successful in identifying cases that were missed by the other and the combined use of KOH microscopy and fungal culture continues to be the gold standard for accurate and reliable diagnosis and targeted therapeutic intervention.

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