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Isolation, Identification And Comparative Analysis Of Dermatophytes With Sabouraud's Dextrose Agar (Sda) And Dermatophyte Test Medium (Dtm) In A Tertiary Care Teaching Hospital

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Abstract

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Introduction

Dermatophytosis is one of the most prevalent superficial fungal infections worldwide and constitutes a major public health concern, particularly in tropical and subtropical countries such as India. These infections are caused by a specialized group of keratinophilic fungi known as dermatophytes, which invade and utilize keratinized tissues including the skin, hair, and nails. The three principal genera responsible for human infections are *Trichophyton*, *Microsporum*, and *Epidermophyton* [1]. Dermatophyte infections are commonly referred to as tinea or ringworm infections and are classified according to the site involved, such as tinea corporis, tinea cruris, tinea capitis, tinea pedis, and tinea unguium [2].

India has experienced a significant rise in the incidence, recurrence, and chronicity of dermatophytosis during the past decade. Favorable climatic conditions characterized by high humidity and temperature, overcrowding, poor personal hygiene, increased urbanization, and widespread misuse of topical corticosteroid-containing combinations have contributed to this growing burden [3]. The disease affects individuals of all age groups and socioeconomic backgrounds and is associated with considerable morbidity, discomfort, social stigma, and reduced quality of life. Moreover, recurrent and treatment-resistant dermatophytosis has emerged as a major challenge for dermatologists and microbiologists across the country [4].

Although dermatophytosis can often be suspected clinically based on characteristic annular, erythematous, scaly lesions with central clearing, clinical diagnosis alone is insufficient because several dermatological disorders such as eczema, psoriasis, candidiasis, and pityriasis versicolor may mimic fungal infections [5]. Therefore, laboratory confirmation is essential for accurate diagnosis and appropriate treatment. Conventional laboratory methods include direct microscopic examination using potassium hydroxide (KOH) mount and fungal culture. KOH microscopy is a rapid, inexpensive, and widely used screening technique that demonstrates fungal hyphae in clinical specimens; however, it does not allow species identification and may occasionally yield false-negative results due to inadequate sample collection or low fungal load [6].

Fungal culture remains the gold standard for definitive diagnosis and identification of dermatophytes because it confirms the presence of viable organisms and

enables characterization based on colony morphology, pigmentation, growth rate, and microscopic features. Species identification is important from both epidemiological and therapeutic perspectives, as different dermatophyte species vary in their pathogenicity, transmission dynamics, and susceptibility to antifungal agents [7]. In addition, culture facilitates surveillance of changing species distribution and emerging trends in dermatophytic infections.

Sabouraud's Dextrose Agar (SDA) is the most commonly employed culture medium for isolation of dermatophytes in clinical microbiology laboratories. SDA contains peptones and dextrose that support fungal growth and is often supplemented with chloramphenicol and cycloheximide to suppress bacterial contaminants and saprophytic fungi [8]. The medium allows dermatophytes to develop characteristic colony morphology and pigmentation, which are crucial for species identification. However, dermatophytes are generally slow-growing fungi, requiring incubation periods ranging from one to four weeks before visible colonies become evident. This prolonged turnaround time may delay diagnosis and initiation of treatment.

To overcome the slow growth of dermatophytes on conventional media, Dermatophyte Test Medium (DTM) was developed as a selective and differential medium for rapid isolation and presumptive identification. It contains phenol red, which changes from yellow to red when dermatophytes produce alkaline metabolites, enabling earlier detection than conventional culture media [9]. DTM also helps reduce contamination and supports recovery of dermatophytes from mixed specimens. Comparative studies have shown that SDA is superior for definitive species identification, whereas DTM provides rapid presumptive diagnosis through its characteristic color change. Due to occasional false-positive reactions on DTM, confirmation on SDA is often required. Therefore, the combined use of both media improves diagnostic accuracy and recovery of dermatophytes [8,9].

Recent studies conducted in tertiary care hospitals across India have reported *Trichophyton mentagrophytes* complex and *Trichophyton rubrum* as the predominant dermatophyte species isolated from patients with dermatophytosis [10]. Continuous monitoring of species distribution and evaluation of diagnostic methods are therefore necessary to support effective clinical management and epidemiological surveillance. In resource-limited settings, where advanced molecular techniques such as polymerase chain reaction (PCR) may not be routinely available, conventional culture methods continue to play a pivotal role in the diagnosis of dermatophytic infections.

Therefore, the present study entitled "Isolation, Identification and Comparative Analysis of Dermatophytes with Sabouraud's Dextrose Agar (SDA) and Dermatophyte Test Medium (DTM) in a Tertiary Care Teaching Hospital" aims to evaluate the effectiveness of these two-culture media in the recovery and identification of dermatophytes. The study seeks to compare their diagnostic utility, growth characteristics, and efficiency in facilitating early detection of dermatophytic infections, thereby contributing to improved laboratory diagnosis and patient care.

Methodology

1. Study Design

This study was conducted as a hospital-based cross-sectional observational study to isolate and identify dermatophytes from clinically suspected cases of dermatophytosis and to compare the performance of Sabouraud's Dextrose Agar (SDA) and Dermatophyte Test Medium (DTM) for their isolation and identification.

2. Study Setting

The study was carried out in the Department of Microbiology, Sri Atal Bihari Vajpayee Medical College and Research Institute (SABVMCRI), Bengaluru. Clinical specimens were collected from patients attending the Dermatology Outpatient Department of Bowring and Lady Curzon Hospital, a tertiary care teaching hospital.

3. Study Duration

The study was conducted over a period of five months from November 2025 to March 2026. During this period, eligible patients' sample was collected, specimens were processed, and laboratory findings were recorded and analyzed.

4. Participants

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The study included all newly diagnosed clinically suspected cases of dermatophytosis involving skin, hair, or nails, irrespective of age and sex. Patients already receiving antifungal treatment, known cases on follow-up, and those unwilling to participate were excluded from the study.

5. Study Sampling

A consecutive sampling method was adopted, wherein all eligible patients presenting with clinically suspected dermatophytosis during the study period were enrolled until the required sample size was achieved.

6. Study Sample Size

The sample size was calculated using the formula $n = Z^2 \times p \times (1-p) / d^2$. Based on the prevalence reported by Begum S.S. et al [11] and considering a 95% confidence interval with 10% allowable error, the calculated sample size was 45 participants.

7. Study Groups

No separate study groups were formed. Each clinical specimen was inoculated simultaneously onto SDA and DTM, and the culture results obtained from both media were compared to assess their diagnostic utility.

8. Study Parameters

The parameters evaluated included demographic details, clinical presentation, KOH mount findings, culture positivity on SDA and DTM, time required for growth, colony characteristics, colour change in DTM, and species identification of dermatophytes.

9. Study Procedure

After obtaining informed consent, appropriate clinical specimens were collected under aseptic precautions. Samples were subjected to direct microscopic examination using KOH mount and cultured on SDA and DTM. Isolates were identified based on colony morphology and microscopic features using Lactophenol Cotton Blue staining.

10. Study Data Collection

Data regarding patient demographics, clinical findings, laboratory results, and culture characteristics were collected using a structured case record form and entered into a database for analysis.

11. Data Analysis

The collected data were analyzed using SPSS version 2023. Descriptive statistics were used to summarize the data, while Chi-square test or Fisher's exact test was applied to compare qualitative variables. A p-value of ≤ 0.05 was considered statistically significant.

12. Ethical Considerations

Prior approval was obtained from the Institutional Ethics Committee before initiation of the study. Written informed consent was obtained from all participants, and confidentiality of patient information was maintained throughout the study.

Results

1. Age and gender distribution of study participants

The majority of participants belonged to the 21–40 years age group, indicating higher occurrence of dermatophytosis among young adults. Males constituted a greater proportion of cases than females (Table 1).

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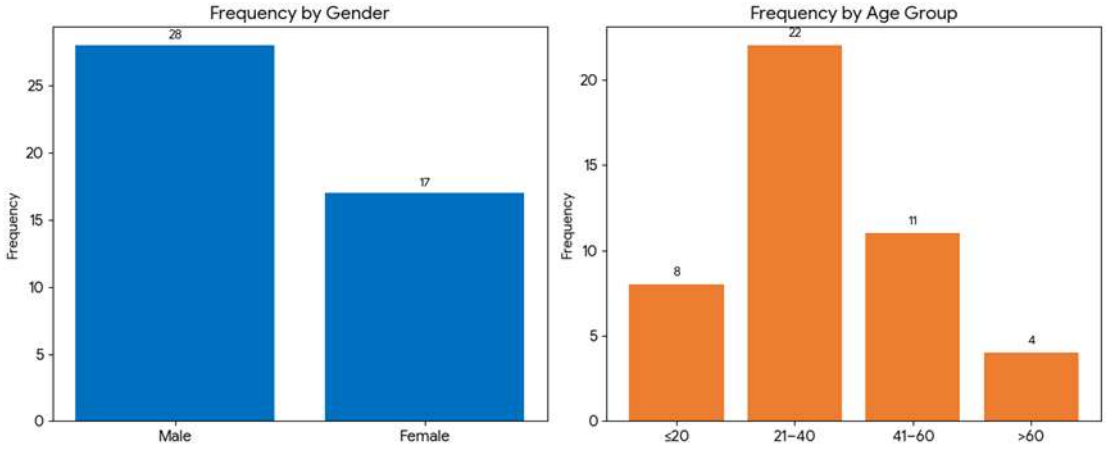
Table 1. Distribution of Study Participants According to Age Group and Gender (n=45)

Variable	Frequency (n)	Percentage (%)
Gender		
Male	28	62.2
Female	17	37.8
Age Group (Years)		
≤20	8	17.8
21–40	22	48.9
41–60	11	24.4
>60	4	8.9

Graph 1: Age and gender distribution of study participants



2. Clinical distribution of dermatophytosis cases

Tinea corporis was the predominant clinical presentation followed by tinea cruris. Nail and scalp involvement were less commonly observed (Table 2).

Table 2. Distribution of Clinical Types of Dermatophytosis (n=45)

Clinical Type	Frequency (n)	Percentage (%)
Tinea corporis	**18**	**40.0**
Tinea cruris	**12**	**26.7**
Tinea unguium	**6**	**13.3**
Tinea capitis	**4**	**8.9**
Tinea pedis	**3**	**6.7**
Others	**2**	**4.4**

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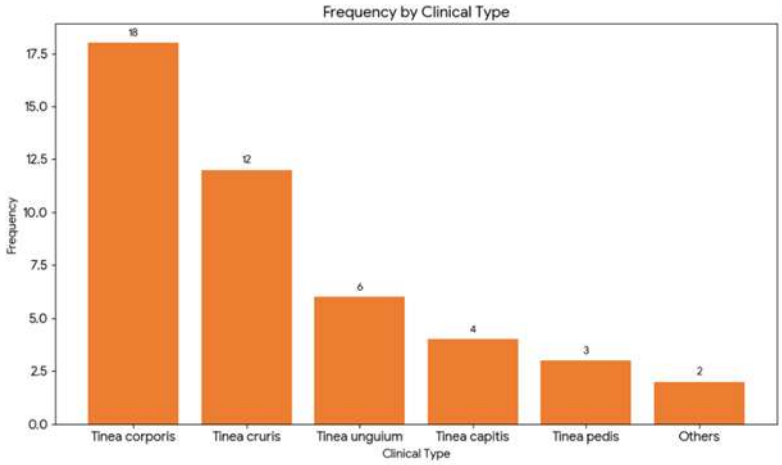
Graph 2: Clinical distribution of dermatophytosis cases



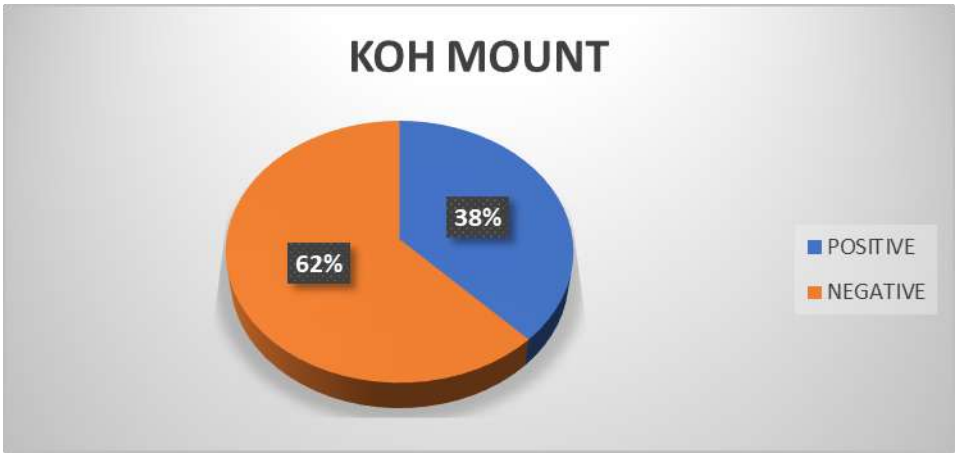
3. KOH mount positivity among study samples

KOH mount was positive in 37.78% of clinically suspected cases, demonstrating its utility as a rapid screening tool. However, a proportion of samples remained negative despite clinical suspicion (Table 3).

Table 3. KOH Mount Findings (n=45)

KOH Result	Frequency (n)	Percentage (%)
Positive	17	37.78
Negative	28	62.22

Graph 3: KOH Mount Findings



4. Comparison of dermatophyte isolation on SDA and DTM

DTM demonstrated a slightly higher isolation rate compared to SDA. Both media showed good recovery of dermatophytes, with DTM remaining the reference medium (Table 4).

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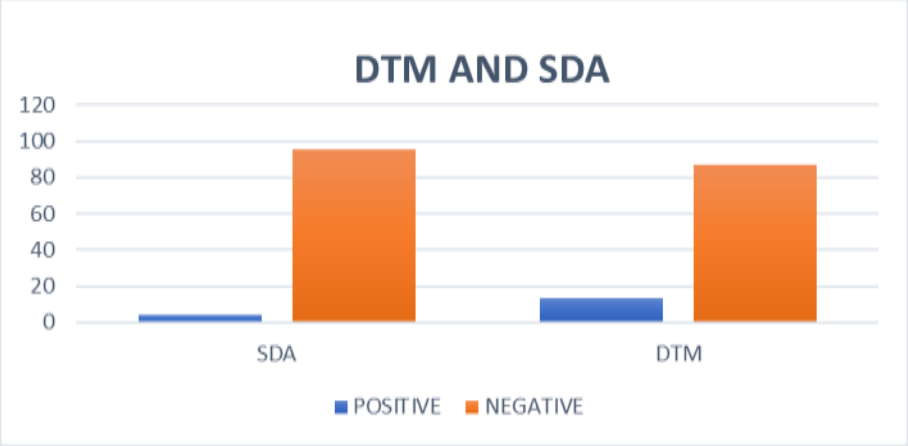
Table 4. Comparison of Culture Positivity on SDA and DTM (n=45)

Culture Medium	Positive n (%)	Negative n (%)
SDA	2 (4.44)	43 (95.56)
DTM	6 (13.33)	39 (86.67)

Graph 4: Comparison of Culture Positivity on SDA and DTM



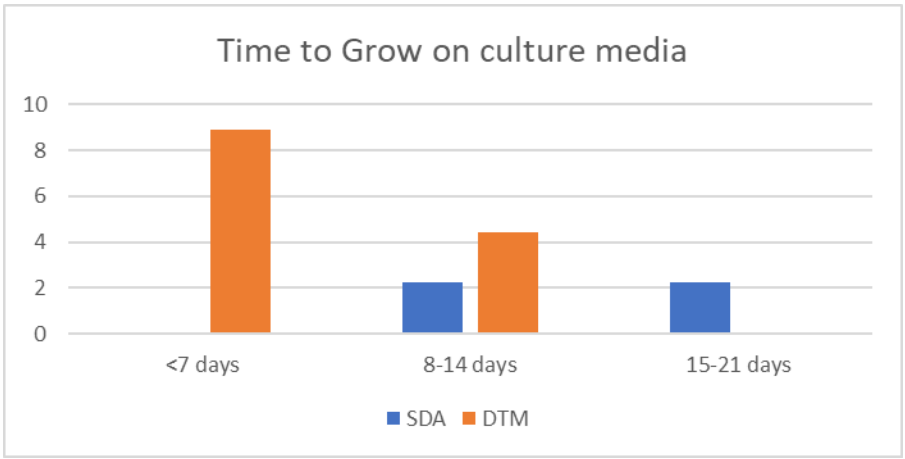
5. Comparison of time required for growth detection on SDA and DTM

DTM showed earlier detection of fungal growth compared with SDA. Most DTM-positive cultures demonstrated growth within two weeks of incubation (Table 5).

Table 5. Time Required for Detection of Growth on SDA and DTM (n=8)

Time to Growth	SDA n (%)	DTM n (%)
≤7 days	0	4(8.89)
8–14 days	1(2.22)	2 (4.44)
15–21 days	1 (2.22)	0

Graph 5: Time Required for Detection of Growth on SDA and DTM



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6. Species distribution of dermatophytes isolated

Trichophyton mentagrophytes was the most frequently isolated species followed by Trichophyton rubrum. (Table 6)

Table 6. Distribution of Dermatophyte Species Isolated (n=8)

Species Isolated	Frequency (n)	Percentage (%)
Trichophyton mentagrophytes	7	87.5
Trichophyton rubrum	1	12.5

Discussion

The present study evaluated the isolation, identification, and comparative performance of Sabouraud's Dextrose Agar (SDA) and Dermatophyte Test Medium (DTM) in the diagnosis of dermatophytosis. The majority of patients belonged to the 21–40 years age group (48.9%), and males constituted 62.2% of cases. Similar findings were reported by Singh et al. (2020) in a clinico-mycological study from Eastern India, where a male predominance was observed and most patients were in the third decade of life [12]. This higher prevalence among young adults may be attributed to increased physical activity, occupational exposure, perspiration, and greater contact with infectious sources.

Tinea corporis was the most common clinical presentation (40.0%), followed by tinea cruris (26.7%). These findings are comparable to those of Singh et al. (2020), who reported tinea corporis et cruris as the predominant clinical manifestation of dermatophytosis. The predominance of these clinical forms may be related to the hot and humid climatic conditions that favor fungal growth [12].

In the present study, KOH mount positivity was 37.78%, which is comparable to the findings of Monwar et al. (2017), who demonstrated a positivity rate of direct microscopy among clinically suspected cases [13]. These observations confirm that KOH examination remains a rapid and economical screening method, although culture is required for definitive diagnosis.

Comparison of culture media revealed a slightly higher isolation rate on SDA (4.44%) than on DTM (13.33%). Similar observations were reported by Monwar et al. (2017), who found SDA to be highly effective for the recovery and identification of dermatophytes while DTM served as a useful supplementary medium [13]. Earlier studies by Rosenthal and Furnari (1971) also demonstrated that DTM and SDA showed comparable growth support for dermatophytes, although SDA remained important for confirmatory identification [14].

A notable finding of the present study was the earlier detection of fungal growth on DTM. More than three-fourths of DTM-positive cultures showed growth within 14 days compared with less than half on SDA. This supports the observations of Rosenthal and Furnari (1971) and subsequent comparative studies, which highlighted the utility of DTM for rapid presumptive diagnosis through characteristic red colour development [14].

Among the isolates, *Trichophyton mentagrophytes* (87.5%) was the predominant species, followed by *Trichophyton rubrum* (12.5%). This finding is consistent with the recent Indian epidemiological trend reported by Nenoff et al. (2019) and Singh et al. (2020), who documented a shift from *T. rubrum* to *T. mentagrophytes* as the leading causative agent of dermatophytosis in India [15, 12].

Overall, the findings of the present study indicate that while SDA remains the gold standard for definitive isolation and species identification, DTM is a valuable adjunctive medium that provides rapid presumptive diagnosis and facilitates early clinical management of dermatophytosis.

Conclusion

The present study demonstrated that both Sabouraud's Dextrose Agar (SDA) and Dermatophyte Test Medium (DTM) are effective for the isolation of dermatophytes from clinically suspected cases of dermatophytosis. SDA showed a slightly higher recovery rate and remained superior for definitive species identification, whereas DTM facilitated earlier

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detection through rapid color change and growth recognition. *Trichophyton mentagrophytes* was the predominant isolate. The combined use of SDA and DTM can enhance diagnostic accuracy, promote early diagnosis, and support timely management of dermatophytic infections.

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