ORIGINAL ARTICLE

Clinicomycological study of dermatophytosis in a tertiary care centre

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ABSTRACT

Background: Fungal infections constitute a major health problem all over the world. Signs and symptoms induced by various dermatophytic infections are hardly distinguishable clinically from each other. Hence, characterisation by *in vitro* culture is required for the appropriate diagnosis and treatment as well as for studying the epidemiological characteristics in a region. **Objectives:** The objectives of this study are: (1) To isolate and identify dermatophytes affecting skin and nail. (2) To compare two different culture media, namely Sabouraud's dextrose agar (SDA, Himedia Laboratories, Mumbai) with Chloramphenicol and Actidione with dermatophyte test medium (DTM, Hi-Media Laboratories). **Materials and Methods:** This is a cross-sectional study in which patients attending the outpatient wing of the Department of Dermatology and Venereology, Government Medical College, Thiruvananthapuram, Kerala, India, with clinical features of dermatophytosis were included from March 2011 to February 2012. Skin and nail scrapings were subjected to direct microscopy by 10% potassium hydroxide (KOH), 40% KOH and cultured on SDA with Actidione (Hi-Media Laboratories) and DTM (Hi-Media Laboratories). **Results:** The total number of samples in this period was 150, of which 99 (66%) samples were positive by direct microscopy and 74 (49.33%) were positive by culture. The most common clinical type was tinea corporis 75 (50%) followed by tinea cruris 40 (26.67%). Out of the 74 isolates, *Trichophyton rubrum* 40 (54.05%) was the most common species followed by *Trichophyton mentagrophytes* 29 (39.19%), *Microsporum gypseum* three (4.05%), *Trichophyton schoenleinii* one (1.35%) and *Epidermophyton floccosum* one (1.35%). Nearly 86.1% of the dermatophytes were isolated on DTM within 5–10 days of inoculation whereas 47.05% were isolated on SDA within 10 days of inoculation. This was statistically significant with $P < 0.0001$ ($\chi^2 = 22.43$). **Conclusion:** DTM can be used as a rapid screening medium for the isolation and identification of dermatophytes compared to SDA with Actidione. However, DTM is inferior to SDA with Actidione in the identification of dermatophyte species.

Key words: Dermatophytes, dermatophyte test medium, Sabouraud's dextrose agar with Actidione, tinea

INTRODUCTION

Infections caused by dermatophytes (dermatophytosis) are one of the earliest known fungal infections of humanity and are very common throughout the world. Dermatophytosis has been reported to be encouraged by hot and humid conditions and poor hygiene and occurs throughout in the tropical and temperate regions of the world. Dermatophytes are pathogenic fungi that have a high affinity to keratinised structures such as skin, nails or hair, causing superficial infections. A single species may be involved in several disease types, each with its distinctive pathology. Dermatophytosis is the colonisation of the keratinous tissues by a dermatophyte. The disease resulting from such colonisation is a consequence of the host's response to the metabolic products of the dermatophyte. The severity of the disease depends on the strain or the species of the dermatophyte and the susceptibility of the host to that fungus.[1] At present, there are 42 species of dermatophytes classified into three genera – Trichophyton, Microsporum and Epidermophyton. The common virulent pathogens are *Trichophyton rubrum, Trichophyton mentagrophytes, Trichophyton tonsurans, Trichophyton violaceum, Microsporum audouinii, Microsporum gypseum, Microsporum canis* and *Epidermophyton floccosum*. Although common, the precise

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size of the problem defies measurement. Very often, the clinical presentation is confused with other skin disorders, making laboratory diagnosis and confirmation necessary by direct microscopy and culture.

MATERIALS AND METHODS

Patients seeking medical advice at the dermatology outpatient department of Government Medical College, Thiruvananthapuram, with clinical features suggestive of dermatophytosis and not on antifungal therapy were included in this study. The study was conducted over a period of one year from March 2011 to February 2012. The study population included consecutive patients, diagnosed clinically as having dermatophytosis. Skin and nail scrapings collected were first subjected to potassium hydroxide (KOH) wet mount examination (10% KOH for skin, 40% KOH for nail). The rest of the specimen was cultured on Sabouraud's dextrose agar (SDA) with Chloramphenicol and Actidione (Hi-Media Laboratories) and dermatophyte test medium (DTM; Hi-Media Laboratories). Duplicate culture tubes were inoculated and incubated at room temperature for four weeks. The growth in DTM (Hi-Media Laboratories) resulted in colour change of medium from yellow to red due to the presence of phenol red indicator and production of alkaline by-products. The growth was further studied for morphology of colony, rate of growth and typical microscopic morphology (macroconidia and microconidia). Further, morphology was confirmed by slide culture. Speciation was done based on microscopic morphology, hair perforation test and urease test.

RESULTS

Among 150 patients, 80 (53.3%) were males and 70 (46.6%) were females bringing out a slight male preponderance. The peak incidence of dermatophytosis was seen in the age group of 31–40 years (33.33%). A total of 113 (75%) patients belonged to the low socioeconomic status. Occupational profile of the patients showed that the largest group consisted of manual labourers (30%) followed by students (26.67%). The most common clinical type was tinea corporis 75 (50%) [Table 1].

Figure 1 shows the sex distribution of clinical types of dermatophytosis.

Direct smear positivity (KOH) was found in 99 (66%) samples whereas culture positivity was found in 74 samples (49.33%). Out of the 150 samples, 54 (36%) were positive by both direct microscopy and culture and 45 (30%) were positive by direct microscopy alone [Table 2].

T. rubrum 40 (54.06%) was the most common species isolated followed by *T. mentagrophytes* 29 (39.18%) [Table 3]

Out of 38 culture-positive isolates of tinea corporis, *T. rubrum* 22 (58%) was the most common species [Figure 2].

In our study, 72 (97.3%) dermatophytes were isolated from DTM (Hi-Media Laboratories). Three isolates of *T. rubrum* and four isolates of *T. mentagrophytes* did not grow on SDA with Actidione (Hi-Media Laboratories) [Table 4].

In the present study, 62 (86.1%) isolates were isolated from DTM within 5–10 days of incubation whereas 32 (47.05%) dermatophytes were isolated from SDA with Actidione during the same period [Table 5].

DISCUSSION

In this study, the highest incidence of dermatophytosis was found in the age group of 31–40 years and in males. The probable reason for this is excessive sweating due to excessive physical activity, in addition to the tropical climatic conditions. This finding correlated with the studies of Hanumanthappa *et al*.,[2] and Madhavi *et al*.[3]

The most common clinical type was tinea corporis. This is in accordance with the studies of Sharma *et al*.[4] and Kumar

Table 1: Distribution of cases according to clinical types

Clinical type	*n* (%)
Tinea corporis	75 (50)
Tinea cruris	40 (26.67)
Tinea unguium	30 (20)
Tinea pedis	2 (1.33)
Tinea manuum	3 (2)
Total	150 (100)

Table 2: Comparison of culture positivity and potassium hydroxide positivity

	KOH positive (%)	KOH negative (%)	Total (%)
Culture$^+$	54 (36)	20 (13.33)	74 (49.33)
Culture$^-$	45 (30)	31 (20.6)	76 (50.66)

KOH: Potassium hydroxide

Table 3: Different species of dermatophytes isolated

Species	*n* (%)
Trichophyton rubrum	40 (54.05)
Trichophyton mentagrophytes	29 (39.18)
Microsporum gypseum	3 (4.05)
Trichophyton schoenleinii	1 (1.35)
Epidermophyton floccosum	1 (1.35)
Total	74 (100)

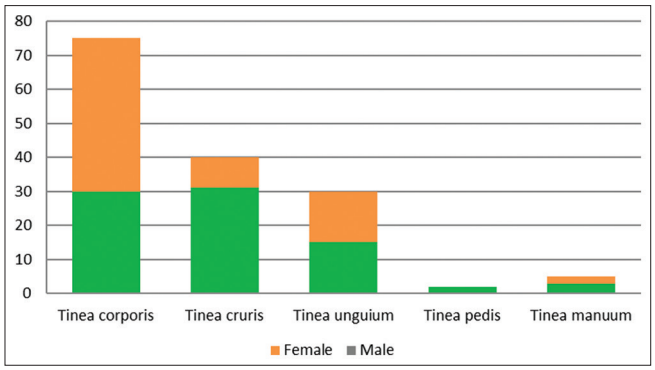

Figure 1: Sex distribution of the clinical types of dermatophytosis

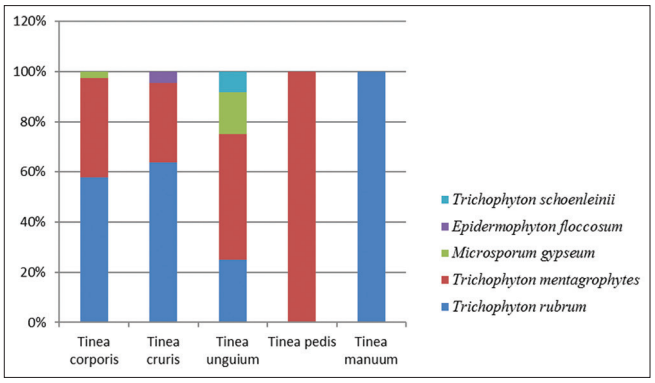

Figure 2: Correlation between clinical and mycological types of dermatophytosis

Table 4: Analysis of isolates on Sabouraud's dextrose agar and dermatophyte test medium

Isolates	Total isolates	On SDA Actidione	On DTM
Trichophyton rubrum	40	37	40
Trichophyton mentagrophytes	29	25	28
Trichophyton schoenleinii	1	1	1
Microsporum gypseum	3	3	3
Epidermophyton floccosum	1	1	1
Total	74	68	72

DTM: Dermatophyte test medium; SDA: Sabouraud's dextrose agar

Table 5: Comparison of rate of dermatophyte growth on Sabouraud's dextrose agar and dermatophyte test medium

Time duration (days)	Growth on DTM	Growth on SDA with Actidione
5-10	62	32
11-15	5	30
>15	5	6
Total	72	68

DTM: Dermatophyte test medium; SDA: Sabouraud's dextrose agar

et al. (2007).[5] Tinea corporis was more in females. In our study, tinea cruris was more common in males. This finding is supported by studies conducted by Singh and Beena[6] and Peerapur *et al.*[7]

Out of the 150 samples, 54 (36%) yielded positive results by direct microscopy and culture and 45 (30%) yielded positive results in direct microscopy alone. About 20 (13.33%) were culture positive alone and 31 (20.6%) were negative for direct microscopy and culture. This is in accordance with the studies of Hanumanthappa *et al.*,[2] Singh and Beena,[6] and Bhargavi.[8] Patel *et al.*[9] in their study reported that the isolation rate was more by direct microscopy using KOH preparation (62.12%) than culture (29.29%) compared to the rates of 7% to 49% by culture in other studies. Nearly 2.53% of the specimens were positive by culture alone and 70 (35.35%) were by direct microscopy alone, highlighting the importance of both direct microscopy and culture in the definitive diagnosis of fungal infection.

T. rubrum was the most common species isolated followed by *T. mentagrophytes*. The other less common isolates were *M. gypseum, Trichophytonchoenleinii* and *E. floccosum*. These findings are in accordance with the findings of Kumar *et al.* (2007),[5] Patel *et al.*[9] and Hanumanthappa *et al.*[2] Georg[10] has suggested that both the predominantly chronic nature of the infection and the adaptation of the dermatophyte to the human skin can explain the higher predominance of *T. rubrum*.

In this study, it could be noted that 86.1% of the dermatophytes were isolated on DTM (Hi-Media Laboratories) within 5–10 days of inoculation whereas 47.05% were isolated on SDA within 10 days of inoculation. This was statistically significant with $P < 0.0001$ ($\chi^2 = 22.43$). In the case of SDA with Actidione, the colony characteristics could be well made out. The comparative evaluation of the isolation of dermatophytes on SDA and DTM has been reported by Singh and Beena.[6] In their study, they found SDA to be 96.55% and DTM to be 98.27% effective in the isolation of dermatophytes while Yavuzdemir[11] found no significant difference in the isolation rates of these media. The effectiveness of SDA was 93.5% and that of DTM was 95.4% in his study of 225 samples. Our study had found an isolation rate of 97.3% for DTM and 91.8% for SDA with Actidione. Species-level identification was not possible with growth on DTM on primary isolation as conidial production was low on DTM, which is required for identification. For identification, it was required to subculture further on to SDA with Actidione.

CONCLUSION

The present study gives an insight about the etiological agents of dermatophytosis in this part of Kerala. Diagnosis

of these infections requires proper laboratory aid. DTM is a good screening medium in the laboratory diagnosis of dermatophytosis compared to SDA with Actidione. However, DTM is not a preferable medium for the identification of dermatophytes.

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Conflicts of interest

There are no conflicts of interest.

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