

Original Article:**Superficial dermatomycoses: a prospective clinico-mycological study**A. Surekha,¹ G. Ramesh Kumar,¹ K. Sridevi,¹ D.S. Murty,² G. Usha,¹ G. Bharathi¹Departments of ¹Dermatology, Venereology and Leprosy, ²Microbiology,
Sri Venkateswara Medical College, Tirupati**ABSTRACT**

Background: Dermatomycoses are more prevalent in India due to favourable climatic conditions, poverty, poor hygiene and overcrowding. Sparse published data are available regarding superficial dermatomycoses from India.

Methods: In this prospective study, demographic characteristics, clinical spectrum and risk factors for the development were studied in 198 patients with superficial dermatomycoses.

Results: Their mean age was 34.1 ± 15.3 years; there were 108 (54.5%) males. Majority of the patients (50.5%) belonged to upper-lower socio-economic status (Class IV as per modified Kuppaswamy's classification). Most of the patients (69.7%) had presented with dermatophytoses. Among superficial dermatomycoses, tinea corporis was the most common (29.3%) clinical type. Potassium hydroxide mount was positive in 77.7% and culture was positive in 30.8%. *Trichophyton rubrum* was the most common species isolated (64%). Multivariable analysis using logistic regression revealed older age (> 50 years) to be an independent predictor for the development of tinea corporis ($p < 0.001$).

Conclusions: Our observations suggest that superficial dermatomycoses are an important cause of morbidity and should be carefully searched for especially in the elderly so that effective curative treatment can be instituted.

Key words: *Superficial dermatomycoses, Dermatophytoses, Pityriasis versicolor, Candidal intertrigo*

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INTRODUCTION

Fungal infections of the skin and its appendages are more prevalent in India, due to favourable climatic conditions. Malnutrition, humidity, overcrowding, poverty, poor personal hygiene, immunosuppressive conditions, such as, diabetes mellitus, human immunodeficiency virus (HIV) infection, cancer chemotherapy are considered to be factors that influence the prevalence and severity of superficial dermatomycoses.¹ The type and frequency of dermatomycoses may vary with time, due to changes in standards of living and attention to personal hygiene.¹ Though superficial fungal infections are usually diagnosed and treated clinically in routine practice, the identification of the fungal species is epidemiologically

important since the source of infection can be traced and its transmission halted.

Few studies have been carried out on dermatophytoses from this geographical area and these date back to 1977² and 1990.³ Given this paucity of data, we have undertaken this study to determine the clinical types of superficial fungal infections, ascertain the causative organisms, and to identify the risk factors for the development of superficial fungal infections.

MATERIAL AND METHODS

The present study was conducted on symptomatic patients presenting to the Out-patient service of the Department of Dermatology, Venereology and Leprosy, (DVL) of Sri Venkateswara Ramnarayan Ruia

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Government General Hospital, the teaching hospital attached to Sri Venkateswara Medical College (SVMC), Tirupati, Andhra Pradesh, during the period February to August 2011. Patients clinically diagnosed to have superficial dermatomycoses were included in the study. Patients unwilling to participate in the study were excluded. Institutional Ethical committee (IEC) approved the study. Informed consent was obtained from all the study subjects.

In all of them, a detailed history was obtained and a thorough clinical examination was carried out. The detailed history included presenting complaints, history of past illness, personal history, socio-demographic data (occupational types; family income), household condition, hygiene behaviour (number of family members, number of family members sharing room space, sources of water, use of soap and wiping of body parts). Overcrowding was defined as being present if more than two persons were staying per room; or more than two persons were staying in 11 m² area; or two persons over the age of 9 years of opposite genders (who are not husband and wife) are obliged to sleep in the same room.⁴ Socio-economic status of the subjects was recorded and categorized as per the updated Kuppuswamy's socioeconomic scale.⁵

A thorough clinical examination was done in good day light with the patient adequately stripped and in sitting position. Clinical examination of the lesions including number, type, presence of inflammatory margin and sites affected was recorded. Appropriate specimens from skin, nail and hair were collected and sent for direct microscopy and culture for isolation of causative organism.

The affected part (skin/nail) was cleaned with 70% ethyl alcohol and allowed to evaporate. Skin scrapings were collected from active border of lesion with the help of sterile scalpel

blade. Nail specimens were clipped from free edge including its full thickness. Hair specimens were epilated with sterile forceps. All the specimens were collected into a sterile paper envelope and subjected to 10% potassium hydroxide (KOH) wet mount. The specimen was placed in a few drops of freshly prepared 10% KOH on a clean glass slide, then the glass slide was gently heated over Bunsen burner flame and then left for 20 minutes. Nail clippings were placed in few drops of 20% KOH and left for 12-24 hours. Then the glass slides were examined under low power and high power of microscope respectively.

Dermatophytes were identified by the presence of hyaline, branching, septate hyphae with frequent arthrospores. *Malassezia* species was identified by the presence of coarse, fragmented to short hyphae with spherical, thick walled yeasts giving characteristic "spaghetti and meat ball" or "banana and grapes" appearance. *Candida* species were identified by the presence of oval thin walled yeast buds on narrow base along with pseudohyphae.

Scrapings from dermatophytoses were inoculated into slopes of Sabouraud dextrose agar (SDA). Each sample was inoculated into a pair of SDA slants one incubated at room temperature and another at 37 °C. Scrapings from pityriasis versicolor cases were inoculated on SDA with a film of sterile olive oil in a concentration of 10 mL/L and incubated at 32-35 °C. Scrapings from Candidal intertrigo samples were inoculated into SDA media free of cycloheximide and incubated at 37 °C. Growths were identified based on macroscopic and microscopic appearance of colonies. Macroscopic appearance of dermatophytic colonies was identified by color (white/pearly/ivory) and consistency (cottony/fluffy/suede) on obverse side and by the presence or absence of pigment, diffusion of pigment and topography (flat/plicate/rugose) on reverse side for further classification of dermatophytes.

Colonies of *Malassezia* were identified as small, cream or yellowish colonies, slightly raised with irregular edges. Colonies of *Candida* were white to cream soft colonies. Microscopic appearance of dermatophytic colonies by tease mount/needle mount revealed the presence of hyphae, macroconidia and microconidia. *Malassezia* species was identified by the presence of typical globose cells with narrow budding base. *Candida* was identified by the presence of predominantly budding yeast cells.⁶

Patients with tinea corporis, tinea cruris and tinea pedis/manuum were treated with oral fluconazole 6 mg/kg/week for 2-6 weeks or oral griseofulvin 10-20 mg/kg/day for 4-8 weeks along with topical 1% clotrimazole or 1% terbinafine cream twice daily. Patients with tinea capitis and tinea barbae were treated with oral griseofulvin 20-25 mg/kg/day for 8 weeks or fluconazole 8 mg/kg/week for 8 weeks. Relapsing cases were treated with oral terbinafine 250 mg/day for 2-6 weeks or oral itraconazole 200 mg/day for 1 week, 2-4 weeks in patients with tinea pedis along with topical anti fungals. Patients with tinea unguium were treated with oral terbinafine 250 mg/day for 6 weeks for finger nail infections, 12 weeks for toe nail infections along with topical antifungals. Patients with pityriasis versicolor were treated with 2% ketoconazole shampoo or 1% clotrimazole cream twice daily or 2.5 % selenium sulphide shampoo for 2-4 weeks and oral fluconazole 400 mg single dose. Patients with candidal intertrigo were treated with topical 2% miconazole or 1% clotrimazole cream and oral fluconazole 150 mg/week for 4 weeks.⁷

Statistical analysis

Descriptive statistics regarding age, sex, socio-economic status, living conditions, clinical type, KOH mount, culture positivity and causative organism were presented. Continuous

variables with normal distribution were summarized as mean \pm standard deviation. Categorical variables were presented as percentages.

Multivariable analysis using step-wise logistic regression was done to find out the independent predictors of superficial dermatomycoses considering the following variables as covariates: socio-demographic features like age, gender, educational level, socio-economic class, occupational types, household size and per person space use; behavioural factors, such as, regular use of soap, frequency of bath/day, careful wiping of body parts; and other related variables like history of previous superficial dermatomycoses, site of infection, duration of work per day and nature of work.. The statistical analysis was carried out using statistical software Package PASW Statistics 18, Release 18.0.0, (IBM SPSS Statistics, Somers NY, USA).

RESULTS

During the study period, 8,453 patients had attended the DVL out-patient service at S.V.R.R. Government General Hospital, S.V. Medical College, Tirupati. Of these 822 (9.7%) patients had superficial dermatomycoses. Of these, 198 consenting patients were included in the study. Their mean age was 34.1 ± 15.3 years; there were 108 (54.5%) males. The clinical types of dermatomycoses diagnosed is shown in Figure 1; dermatophytoses (n = 138; 69.7%) were the most frequently encountered type. Their demographic characteristics are shown in Table 1. Overall, majority of patients were in the age group of 21-30 years (n = 49; 24.7%). In dermatophytoses group, most of the patients (33/138; 16.6%) were found in the age group 21-30 years. In the pityriasis versicolor group, majority of the patients (15/52; 28.8%) were in the 10-20 years age group, while in the candidal intertrigo group, 4 of the 8 patients were in the 31-40 years age group.

Table 1: Demographic characteristics of 198 patients with superficial dermatomycoses

Variable	Dermatophytoses (n = 138)	Pityriasis versicolor (n = 52)	Candidal intertrigo (n = 8)
Age (mean \pm SD)	36.0 \pm 16.3	29.4 \pm 11.3	31.6 \pm 14.4
Gender (No.)			
Males	73	32	3
Females	65	20	5
Socio-economic status*			
Class I	3	0	0
Class II	27	11	2
Class III	31	19	1
Class IV	74	21	5
Class V	3	1	0
Past history of superficial (No.) dermatomycoses			
Present	41	18	3
Absent	97	34	5
Overcrowding (No.)			
Present	66	27	2
Absent	72	25	6
No. of baths/day (No.)			
Daily	121	46	8
Irregular	17	6	0
Uses soap (No.)			
Yes	135	51	8
No	3	1	0
Wipes body dry (No.)			
Yes	109	46	6
No	29	6	2
Contact history (No.)			
Present	26	17	0
Absent	112	35	8
KOH mount (No.)			
Positive	101	49	4
Negative	37	3	4
Culture (No.)			
Positive	25	29	7
Negative	113	23	1

SD = standard deviation; KOH = potassium hydroxide

* classified as per updated Kuppaswamy classification⁴

Unskilled workers were more likely to be affected with various types of superficial fungal infections (74/198; 37.4%), followed by skilled workers (38/198; 19.2%) and home makers (32/198; 16.2%). Most of the patients reported that they regularly take bath daily (175/198; 88.4%).

Based on number of persons sharing of the room, there was overcrowding in 47.9% of patients. Contact history was present in 43 (21.7%), past history of superficial dermatomycoses was present in 62 (31.3%) patients.

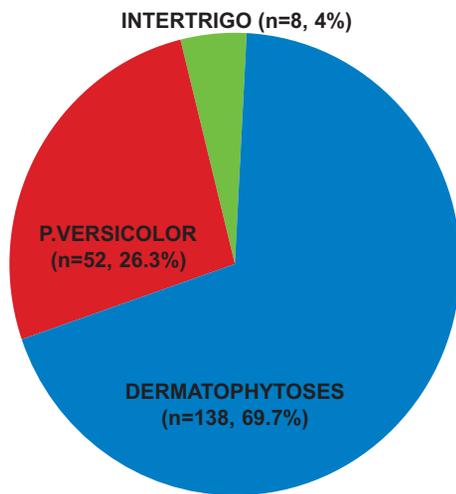


Figure 1: Distribution of various types of superficial dermatomycoses

Among dermatophytoses (Figure 2), tinea corporis (58/138; 42.3%) was the most common clinical type (Figures 2A, 2B), followed by tinea cruris (Figure 2C) (49/138; 35.5%) and onychomycosis (11/138; 7.9%). Less than 15% of patients were affected with other types (tinea faciei, tinea capitis, tinea manuum, tinea imbricata) (Figure-3).

Tinea corporis was more common in males (30/58; 51.7%) and in the age group of 41-50 years (20/58; 34.5%). Tinea cruris was common in males (28/49; 57.1%) and in the age group of 21-30 years (15/49; 30.6 %). Onychomycosis was more common in females (7/11; 63.6%) and common in the age group of 31-40 years (4/11; 36.4%). Tinea faciei was more common in males (5/9; 55.5%) and common in the age group of 31-40 years (4/9; 44.4%). Candidal intertrigo was more common in females (5/8; 62.5%) and common in the age group of 10-40 years (6/8; 75%).

Out of 198 patients with superficial dermatomycoses, 154 (77.7 %) were KOH positive and 61 (30.8%) were culture positive. Out of 138 patients with dermatophytoses, 101 (73.1 %) were KOH positive (Figure 4A) and 25 (18.1 %) were culture positive. Out of 101 KOH positive patients 21 were culture positive and out of 37 KOH negative patients 4 were

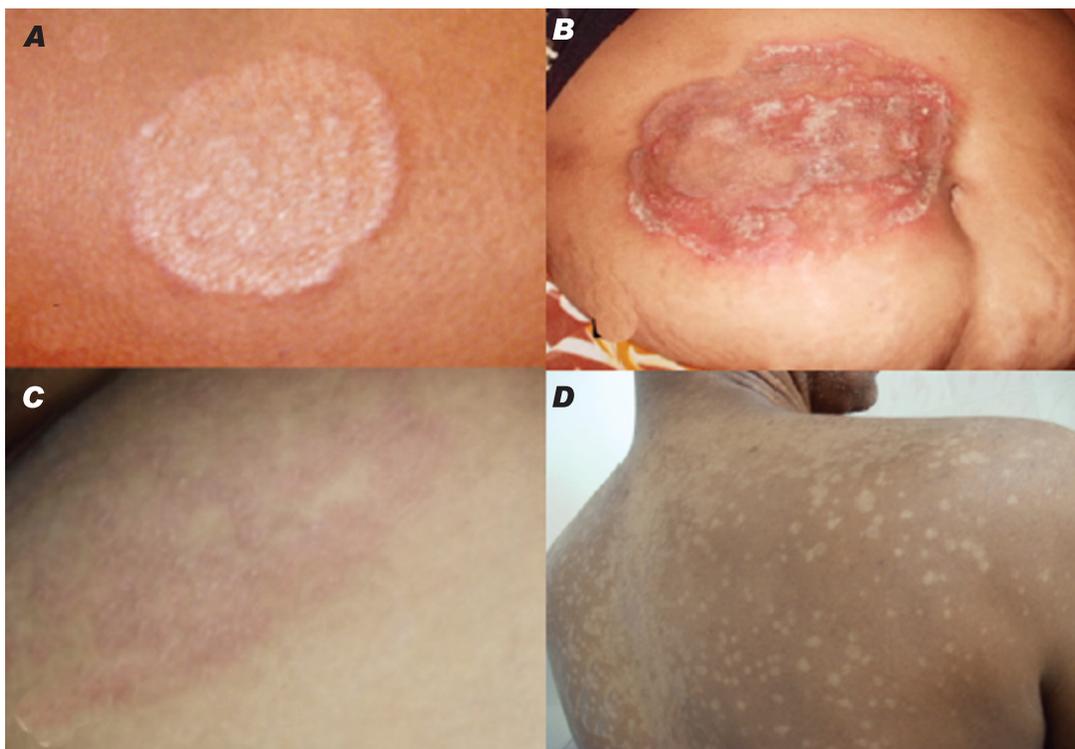


Figure 2: Clinical photographs showing well-defined annular lesion with polycyclic border and scales over hand suggestive of tinea corporis (A); well-defined annular lesion with central clearing and peripheral erythema with scaling over abdomen suggestive of tinea corporis (B); well- to ill-defined plaque with central clearing and peripheral erythema over groin suggestive of tinea cruris (C); well-defined multiple discrete hypopigmented macules over dorsum of the trunk suggestive of pityriasis versicolor (D)

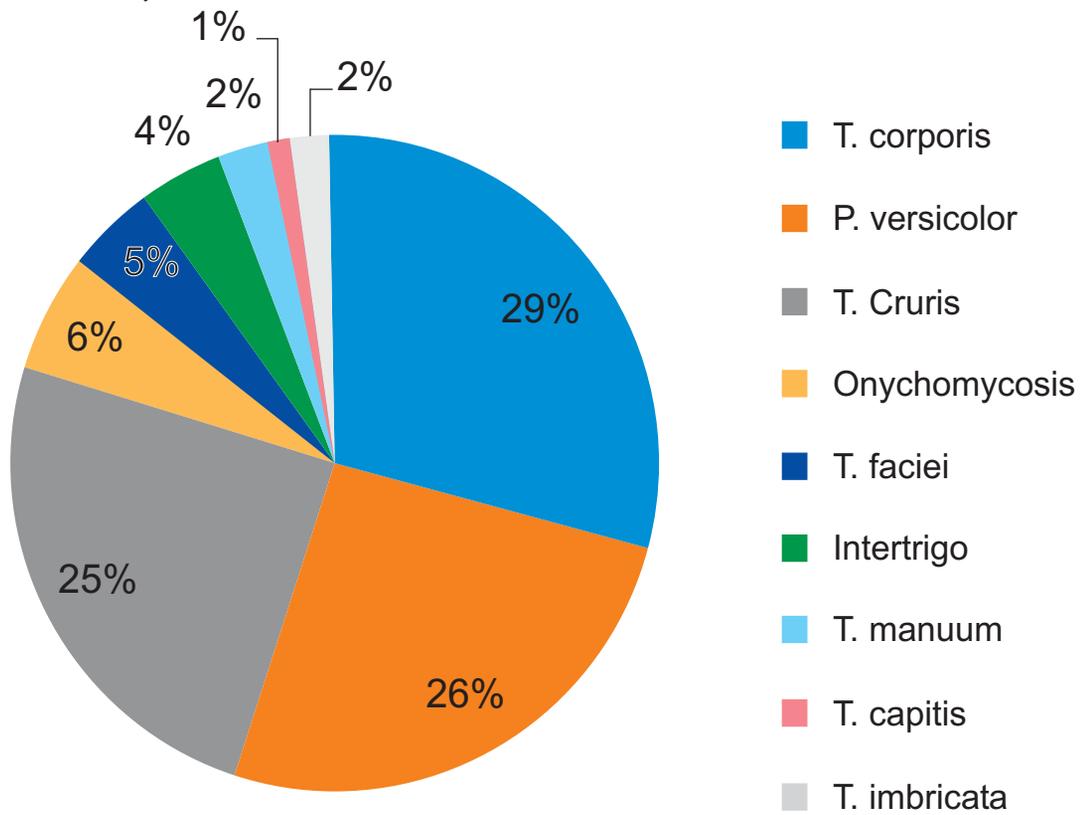


Figure 3: Distribution of various clinical types among superficial dermatophytoses

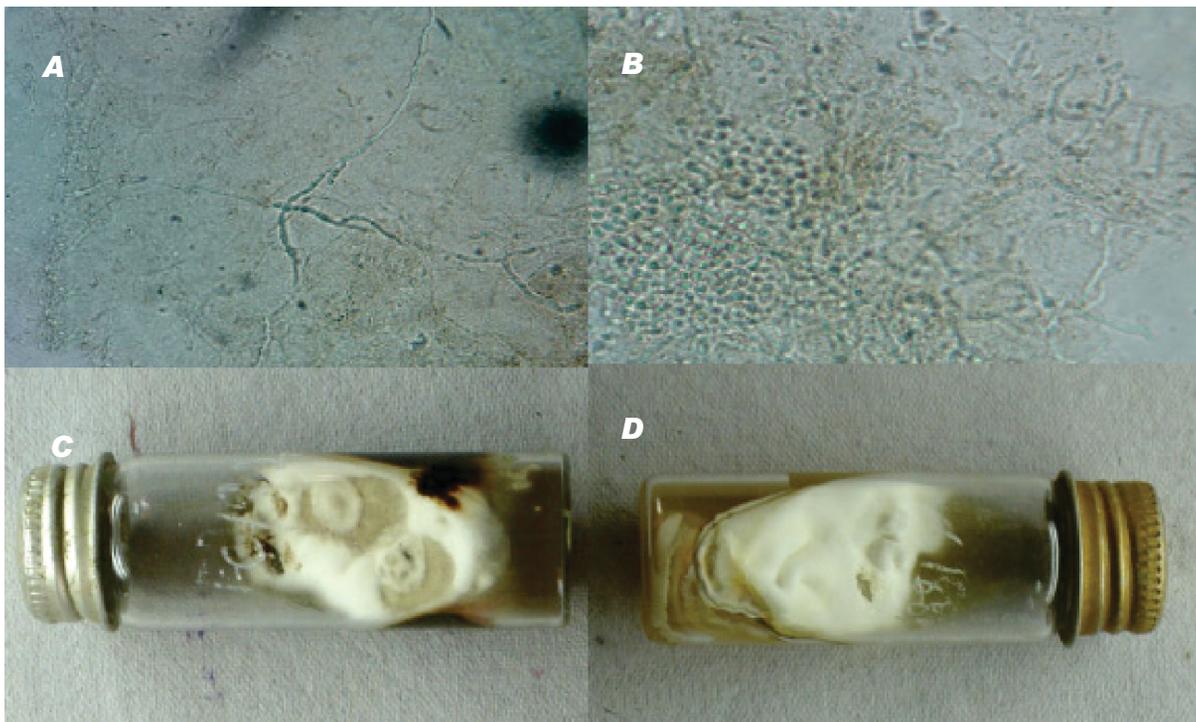


Figure 4: Photomicrograph of KOH preparations of skin scales showing hyaline septate branching hyphae typical of dermatophytes (A) ($\times 400$); clumps of yeast cells and short thick hyphae (“spaghetti and meat-ball appearance”) typical of malassezia furfur (B) ($\times 400$). Photograph showing growth of *Trichophyton mentagrophytes* (C); and *Trichophyton verrucosum* (D) on Sabouraud dextrose agar

culture positive. Out of 52 patients with pityriasis versicolor, (Figure 2D) 49 (94.2 %) were KOH positive (Figure 4B) and 29 (55.7%) were culture positive. Out of 49 KOH positive patients 28 were culture positive, out of 3 KOH negative patients one was culture positive. Out of 8 patients with candidal intertrigo, 4 were KOH positive and 7 were culture positive. All KOH positive patients were culture positive, out of 4 KOH negative patients 3 were culture positive.

Out of 138 patients of dermatophytoses, the organism could be isolated in 25 (18.1%). Among them, *Trichophyton rubrum* was the commonest species isolated (n = 16; 64%), followed by *Trichophyton mentagrophytes* (n = 5; 20%) (Figure 4C), *Trichophyton verrucosum* (n = 3) (Figure 4D) and *Trichophyton tonsurans* (n = 1). Out of 52 patients with pityriasis versicolor, (n=29; 55.7%) were culture positive for *Malassezia*. Out of 8 patients with candidal intertrigo, 7 were positive for *Candida* species (Table 2).

Out of 58 patients with tinea corporis, *Trichophyton rubrum* was the most common species isolated (n=8; 27%), followed by *Trichophyton mentagrophytes*, *Trichophyton verrucosum* and *Trichophyton tonsurans* (1 each). Out of 49 patients with tinea cruris, *Trichophyton rubrum* was the most common species isolated (n = 6; 12.2%), followed by *Trichophyton mentagrophytes* (n = 3; 6.1%). Out of 11 patients with onychomycosis, each one of *Trichophyton rubrum*, *Trichophyton mentagrophytes* and *Trichophyton verrucosum* were isolated. *Trichophyton rubrum* was isolated from one patient with tinea barbae.

Step-wise multivariable logistic regression analysis showed older age (above 50 years) to be an independent predictor to the development of tinea corporis (p<0.001). Comparative incidence of various clinical types of superficial dermatomycoses observed in other published

studies and the present study is shown in Table 3.

DISCUSSION

Superficial dermatomycoses form a large group of patients attending our O.P.D. The present study included patients from Chittoor, YSR Kadapa and P.S. Nellore districts. The temperature in these areas is very high most of the times. Higher temperature, humidity and sweating facilitate the fungal growth. Majority of cases of superficial dermatomycoses belonged to the age group 21-30 years. This is explained by the fact that this group is highly active and takes part in outdoor activity. This was comparable with the reports from other studies.⁸⁻¹⁰ This was followed by age groups 31-40 years and 11-20 years. Tinea capitis was prevalent in the age group of below 10 years. This was in accordance with another study.¹⁰ The increased incidence of tinea capitis among children has been attributed to absence of sebum containing fatty acids which has a fungistatic property. Male to female ratio in the present study was 1.2:1. Higher incidence of superficial dermatomycoses in males has been reported from other studies and is considered to be because of greater outdoor physical activity.^{10,11}

In our study, higher incidence of superficial dermatomycoses was noted in the low socioeconomic class (Class IV). This was in accordance with data reported in other studies.^{12,13} In our study, unskilled workers were more commonly affected, followed by skilled workers and home makers. This could be due to the working environment in out-doors; hot and humid climate which further increases sweating and facilitate fungal growth.

Among superficial dermatomycoses, dermatophytoses was the commonest clinical type in our study (69.7%), followed by pityriasis versicolor (26.3%). Our results are comparable with other studies.^{14,15} On the contrary, in other published studies,¹⁶⁻¹⁸ pityriasis versicolor¹⁶ and

Table 2: Various species isolated from different clinical types of superficial dermatomycoses

Species	Tinea corporis	Tinea cruris	Onychomycosis	Tinea barbae	Pityriasis versicolor	Candidal Intertrigo
<i>Trichophyton rubrum</i>	8	6	1	1	-	-
<i>Trichophyton mentagrophytes</i>	1	3	1	-	-	-
<i>Trichophyton verrucosum</i>	1	1	1	-	-	-
<i>Trichophyton tonsurans</i>	1	-	-	-	-	-
<i>Malassezia</i>	-	-	-	-	29	-
<i>Candida</i>	-	-	-	-	-	7

tinea pedis^{17,18} were the most common encountered dermatomycoses.

In the present study, among dermatophytoses, tinea corporis was most common clinical type followed by tinea cruris. This is in accordance with other studies.^{8,10-12,19-22} Our observations also reiterate the findings reported in an earlier study conducted from Tirupati.² *Tinea pedis* was the second common clinical type in other studies.^{23, 24}

Out of 198 cases of superficial dermatomycoses we could isolate fungi from 30.8% of cases. Isolation rate was more in cases of candidal intertrigo followed by pityriasis versicolor. Isolation rate was 87.5% in cases of candidal intertrigo. These observations were similar to the figures reported in another study.¹⁴ Isolation rate was 55.8% in cases of pityriasis versicolor. Similar figures were reported in another study.¹¹ Among dermatophytoses, we could isolate fungi from 18.1% of cases. Similar yield of 22%² and 29%¹⁰ has been reported in other studies. However, a higher isolation rate has been reported in other studies.^{11,14,22} The low culture positivity in dermatophytoses in the

present study compared to other studies^{11,14,22} could have been because of use of Sabouraud's dextrose agar without cycloheximide (due to nonavailability) leading to contamination in some of them.

The different species isolated in the present study were *Trichophyton rubrum*, *Trichophyton mentagrophytes*, *Trichophyton verrucosum*, *Trichophyton tonsurans*, *Malassezia* and *Candida*. *Malassezia* was the commonest isolate. Among dermatophytes, *Trichophyton rubrum* was the most common species followed by *Trichophyton mentagrophytes* and *Trichophyton verrucosum*. Similar observations were recorded in other studies.^{10,11,20} But an earlier study² done from Tirupati showed that *Epidermophyton floccosum* was the most common isolate followed by *Trichophyton violaceum*. In tinea corporis, *Trichophyton rubrum* was isolated from 13.7% of cases, *Trichophyton mentagrophytes*, *Trichophyton verrucosum* were isolated from 1.7% each. In tinea cruris, *Trichophyton rubrum* was the commonest isolate (12.2%) followed by *Trichophyton mentagrophytes* (6.1%) and *Trichophyton verrucosum* in one patient.

Table 3: Comparative incidence of various clinical types of superficial dermatomycoses

Variable	Kamalam A et al (1976) ¹⁵	Grover S et al (2001) ¹⁸	Kannan P et al (2002) ¹⁴	Bassiri-Jahromi et al (2005) ¹⁷	Present study
Place of publication	Chennai	Kolkata	Chennai	Iran	Tirupati
Dermatophytoses					
Tinea corporis	35.5	10.9	-	11.3	29.3
Tinea cruris	35	18.5	-	20.1	24.7
Onychomycosis	3	6.2	-	13.4	5.6
Others	-	34.9	-	30.9	10.1
Pityriasis versicolor	17.7	9	23.6	6.8	26.3
Intertrigo	12.4	20.5	17.5	13.6	4

Similar findings were reported in other studies.^{10,20}

In the present study, multivariable analysis showed older age (> 50 years) to be an independent predictor to the development of tinea corporis. These observations suggest that careful evaluation for superficial dermatomycoses should be an integral part of general physical examination of all elderly patients, especially in tropical countries like India.

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