



MYCOLOGICAL PROFILE OF SUPERFICIAL FUNGAL INFECTIONS CAUSED BY DERMATOPHYTES IN A TERTIARY CARE CENTRE OF SOUTH INDIA

Dr Sunitha B U*

MBBS MD, Associate Professor, Department of Microbiology, SABVMCRI, Bengaluru. *Corresponding Author

Dr Ravi G S

MBBS MD, Professor, Department of Microbiology, ESIC MC & PGIMSR, Bengaluru.

ABSTRACT The current study was carried out to determine the occurrence of superficial fungal infection caused by dermatophytes. The aim of this study was to know the occurrence of superficial fungal skin infections and to study the mycological pattern. We also aimed at speciating the isolates using standard mycological tests. We conducted a prospective study over a period of one year from dec 2020 to dec 2021. Samples were obtained from patients who attended the dermatology out patient department of Microbiology of a tertiary care hospital, Devanahalli, Bengaluru. Samples included skin scrapings 84.16% (101/120) followed by nail clippings 11 (9.17%) and plucked hair 8(6.67%). In the Microbiology laboratory samples were subjected to direct microscopy and culture. Among the 120 subjects with superficial fungal infections, majority of about 25.84% (31/120) presented with tinea corporis followed by 22.50% (27/120) with tinea cruris. Out of a total of 120, about 57.5% (69/120) showed positivity by KOH mount, and 79.16% (95/120) by both KOH mount and culture. Out of 95 fungi grown, 63 were dermatophytes, another 32 were non dermatophytes. Among the dermatophytes Trichophyton mentagrophytes was the most common isolate isolated 52.38% (33/63) followed by Trichophyton rubrum 28.57%(18) Dermatophytes are drawing importance mainly in superficial fungal infection. Knowledge about their clinicomycological pattern may help in prevention, early diagnosis and treatment of the condition

KEYWORDS : Dermatophytes, clinicomycological pattern, Trichophyton species, Immunocompromised, Keratinophilic Fungi

Introduction:

Superficial fungal infection affects the upper layer of skin, hair and nail. Although they are not very risky or dangerous, they carry risk of person to person transmission and wide spread distribution. They also have an aesthetic importance due to skin and hair involvement. Chronic superficial fungal infection can point out an underlying immunocompromised state.^[1] Invasive fungal infections have increased recently mainly in immunosuppressed people like in AIDS, those on prolonged drugs and antibiotics. along with them even dermatophytes have increased^[2]

Common synonyms are “Ring worm”, “tinea” or “dermatophytosis”. Dermatophytosis are group of infections involving skin, hair and the nails caused by keratinophilic fungi^[3,4] Main risk factors could be close contact with animals, use of antibiotics and steroids Tinea infection presents with central clearing surrounded by an advancing red, scaly, elevated border. This inflammation helps in colonization and can lead to vesicles on the border of the affected area. The inflammation tends to be more in atopic persons and those infected with zoophilic fungi^[5]

Dermatophyte infections are common in tropical countries like India due to environmental factors like heat and humidity. Other factors are socio-economic conditions like overcrowding, poverty and neglect of personal hygiene^[6]. Hence the present study was undertaken to know the occurrence of dermatophytes in Superficial dermatomycosis and their speciation.

Materials and Methods:

Study population and period:

This is a Prospective study. This study was conducted in department of microbiology, on 120 samples for a period of one year from Dec 2020 to Dec 2021, taken from patients presenting to skin out patient unit with clinical features suggesting of fungal skin infections after obtaining written informed consent. Ethical Committee Clearance was obtained before the work.

Statistical analysis was done using Microsoft Excel and SSPS software

Inclusion criteria

All patients presenting to skin out patient with a clinical diagnosis of superficial fungal infection were included in the study.

Exclusion criteria

Patients already on antifungal treatment.

Sample collection and processing

The samples were collected from skin, hairs and nail. The affected area

was cleaned with 70% ethyl alcohol and allowed to dry. Skin scales, crusts and pieces of nail or plucked hairs were collected in clean white paper packs. Skin scrapings were collected from the erythematous, peripheral, actively growing margins of the lesions. The dull lusterless hair samples were plucked by sterile epilator forceps, nail samples were taken from the deeper part of the discoloured or dystrophic parts of nails^[3]

Direct microscopy

A portion of the sample was taken. The specimen was then subjected to potassium-hydroxide (KOH) wet preparation of various concentrations (10%, 20% and 40%) depending upon the type of clinical specimen for the presence of fungal elements. The slide was later examined under low(10 X) and high (40 X) Magnification of a simple light microscope for the presence of yeast cells, hyphae and arthroconidia. The fungal elements appear as highly refractile, hyaline septate branching filaments.^[3]

Culture

Culture was performed on Sabouraud's dextrose agar (SDA) with and without chloramphenicol 50 mg/L. Pure isolates were generated by sub-culturing on Sabouraud's Dextrose And Potato Dextrose Agar (PDA) media respectively for both visual and microscopic examinations of cultural (colour and growth pattern) and morphological characteristics respectively for further differentiation. After morphological examination by microscopy, they were inoculated onto dermatophyte test media (DTM) for further confirmation.^[3]

Results and Discussion:

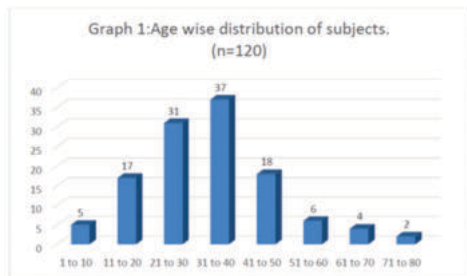
A total of 120 samples were received from clinically diagnosed cases of superficial fungal infection during the study period. Majority of these samples were from males, constituting 64.17% (77/120) and remaining 35.83% (43/120) samples were from females.

The 120 clinically diagnosed cases of superficial fungal infections were distributed among the varying age groups of 1-80 years. The most common age group to be affected were among 31-40 years forming 30.84% (37) followed by 21-30 years 25.83% (31). Less common age group affected above 51 years constituted 10% (12). Table 1.

Table 1 : Age wise distribution of subjects. (n=120)

| Age range (Years) | No. Of subjects (%) |
|-------------------|---------------------|
| 1 to 10 | 5 (4.16) |
| 11 to 20 | 17 (14.17) |
| 21 to 30 | 31 (25.83) |
| 31 to 40 | 37(30.84) |

| | |
|----------|-----------|
| 41 to 50 | 18(15.00) |
| 51 to 60 | 6(5.00) |
| 61 to 70 | 4(3.34) |
| 71 to 80 | 2(1.66) |
| Total | 100 |

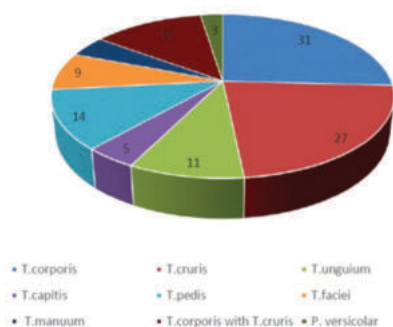


Among the 120 subjects with superficial fungal infections, majority of about 25.84% (31/120) presented with tinea corporis followed by 22.50% (27/120) with tinea cruris. Only about 2.55(3) presented with pityriasis versicolor. However 12.5% (15/120) with both *T.corporis* and *T.cruris*. Table 2.

Table 2 : Spectrum of clinical disease

| Type of clinical disease | Numbers | Percentage |
|--|---------|------------|
| <i>T.corporis</i> | 31 | 25.84 |
| <i>T.cruris</i> | 27 | 22.50 |
| <i>T.unguium</i> | 11 | 9.17 |
| <i>T.capitis</i> | 5 | 4.16 |
| <i>T.pedis</i> | 14 | 11.66 |
| <i>T.faciei</i> | 9 | 7.50 |
| <i>T.manuum</i> | 5 | 4.16 |
| <i>T.corporis</i> with <i>T.cruris</i> | 15 | 12.50 |
| <i>P. versicolor</i> | 3 | 2.50 |
| Total | 120 | 100 |

Graph 2:Spectrum of clinical disease



Majority of the sample included were skin scraping forming 84.16% (101/120) followed by nail scrapping or clipping 11 (9.17%) and least commonly were plucked hair 8(6.67%). Analysis of socio economic conditions of subjects revealed the majority to be from low socio economic group comprising 59.175(71/120) followed by middle socio economic group of 35 %(42/120) and least from high socio economic group consisting 5.83%(7/120).

All the clinical samples were subjected for microscopy by KOH mount and fungal culture, out of a total of 120 clinically diagnosed cases of superficial fungal infections, 57.5% (69/120) showed positivity in KOH mount, and however 79.16% (95/120) by both KOH mount and culture, indicating still culture to be the gold standard in establishing pathogenicity. About 32 samples which were negative for KOH mount have yielded fungal growth. This could be because of less quantity of fungal elements or individual observer variation in identifying them by microscopy. Out of 95 fungi grown, 63 were dermatophytes, another 32 were non dermatophytes. Among the dermatophytes, *Trichophyton mentagrophytes* was the most common isolate , 52.38%(33/63) followed by *Trichophyton rubrum* 28.57%(18). However *Microsporium canis*, *Microsporium gypseum* and *Epidermophyton floccosum* were isolated in 7.94%(5), 6.35%(4) and 4.76%(3) respectively. [Table 3]

Table 3 : Dermatophyte species distribution among various clinical spectrums

| Species | <i>T.ca pitis</i> | <i>T.un giuum</i> | <i>T.fa ciei</i> | <i>T.m anuum</i> | <i>T.pe dis</i> | <i>T.cor poris</i> | <i>T.cr uris</i> | <i>T.corpo ris with T.cruris</i> | <i>P. versicolor</i> | Total (%) |
|--------------------------|-------------------|-------------------|------------------|------------------|-----------------|--------------------|------------------|----------------------------------|----------------------|-----------|
| <i>T.menta grophytes</i> | 3 | 3 | 3 | 2 | 5 | 5 | 7 | 5 | 0 | 33(52.38) |
| <i>T. rubrum</i> | 1 | 3 | 1 | 0 | 1 | 3 | 3 | 4 | 2 | 18(28.57) |
| <i>M. cannis</i> | 1 | 0 | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 5(7.94) |
| <i>M. gypseum</i> | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 2 | 0 | 4(6.35) |
| <i>Epiderm ophyton</i> | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 3(4.76) |
| Total | 5(7.94) | 7(11.11) | 4(6.35) | 2(3.17) | 8(12.70) | 8(12.70) | 13(20.63) | 13(20.63) | 2(3.18) | 63 |

In the present study, the commonest age group involved was 31-40 years (37 %) years and 21-30 (25.83%) years with males outnumbering females. This age predilection has been suggested due to the involvement of this age group in outdoor activity. In addition, males do more exhaustive physical work and prolonged exposure in sun which leads to excessive sweating. Also the tight fittings and synthetic clothing particularly in males provide damp, sweaty and warm skin conditions. Comparable observations have been done by other authors also. [11, 12]

The lower incidence in females could be due to negligence to the lesion they have, as in most of the communities females do not bother about their health and they do not get enough time for reporting in hospitals due to the prevailing social stigma in rural population and poor health seeking behavior of females [12, 13]. The occurrence of infection are closely related to the site of infection and consequently to the clinical materials collected. In the present study skin scales represent 84.16% of cases, while nails account for 9.17%, and hair 6.67%. Similar findings have been shown in studies from abroad also [2].

In the present study most of the cases were of students (45) followed by housewife (23) and agriculture workers. In case of students higher freedom of movement, carelessness, common sharing of articles by fellow students and perhaps lack of guidance regarding personal hygiene could be the factors in exposing students to increased dermatophytic infections [14]. In agricultural workers this may be due to increased physical activity and increased opportunity for exposure to plants, animals and soil [15] A study carried out from West Bengal found that Dermatophytoses are related to activity, living conditions and age groups [16].

Higher prevalence of dermatophytic infection was seen in low income group, 30.84% (37/120) followed by middle income group 17.5% (21/120) and least common in high income group 4.16%(5/120), which is similar to the observation of Kamothiet al., from Rajkot in (2010), who reported that higher prevalence of dermatophytic infection was seen in low income group than middle income group [17]. The reason behind this may be the poor living conditions, large family size and close contact, either directly or by sharing facilities, including combs and towels between family members in low socio economic people.

Comparison of KOH mounts findings with culture findings

Out of a total of 120 clinically diagnosed cases of superficial fungal infections, 95 cases (79.16%) showed positivity in both KOH mount and culture. 63(52.5%) cases were positive in KOH mount only. 32 (26.67%) cases showed positivity only in culture. About 19(15.83%) suspected cases of superficial fungal infections were negative both by KOH mount and culture. These variations between microscopy and culture have also been noted by Grover S, Roy P. from North-East India (18). In various studies, Bindu V from Calicut, Vikeshkumar Bhatia in (2014) from Himachal Pradesh and Kamothi from Rajkot who reported that KOH positivity rate was higher than culture.

In the present study among dermatophytes isolated , *Trichophyton*

mentagrophytes was the predominant dermatophyte constituting 52.38%(33) followed by *Trichophyton rubrum* 28.57%(18). *Microsporum canis*, *Microsporum gypseum* and *Epidermophyton floccosum* were isolated less commonly in 7.94%(5), 6.35%(4) and 4.76%(3). Similar results were also reported by other workers previously from Himachal Pradesh in 2014 (19). But the findings differ in other studies from India as well as outside India, according to which *Trichophyton rubrum* was the predominant fungal pathogen than *Trichophyton mentagrophyte* [2, 17, 20]. This variation is possibly due to the different geographical regions and warm climatic conditions in southern and western part of country.

Some studies have also reported about the prevalence of *Trichophyton rubrum* in chronic dermatophytosis [21], as it is a slow growing organism, so there is a possibility that other dermatophyte species might overgrow or mask the growth of *Trichophyton rubrum* while attempting isolation. [19].

T. mentagrophytes, the predominant species was found associated mainly with *Tinea cruris* (7/33) followed by *T. pedis* and *T. corporis* (5/33). However it was seen also in all other *Tinea* condition. Similar observation have been made by authors from Himachal Pradesh in 2014, [11].

The majority of *T. rubrum* were isolated in *T. corporis* with *T. cruris* (4/18) and 3/18 each in *Tinea cruris*, *Tinea cruris* and *T. unguium*. Also grew in all other clinical *tinea* but in less frequencies. Similar finding have been shown in other studies also [22]. *M. canis* and *M. gypseum* were isolated same in *Tinea cruris* followed by *Tinea corporis* *Tinea capitis*, which is similar to findings from abroad studies

Epidermophyton spp. were isolated in one each in *Tinea unguium*, *Tinea pedis* and *Tinea corporis* with *Tinea cruris*. Similar results were also reported by other workers previously from Bijapur (2004) [23].

The current study shows *Tinea corporis* (25.84%) to be the commonest clinical type of superficial mycoses followed by *Tinea cruris* (22.50%), & *Tinea corporis* with *Tinea cruris* (12.50%). It was observed that various exposed part of the body were affected in *Tinea corporis* followed by *Tinea cruris* in groin and surrounding areas.

Similar observation has been made by Asticciol S 2008, Bhatia & Sharma 2014, Kamothi MN 2010. This *tinea* condition is more common in males due to tight clothing, maceration and high rate of sweating in groin and waist region make this site more vulnerable to dermatophytosis. [24]

However certain studies conducted in North East India, West of Orissa in Rajkot, indicated that many factors like selection of study groups, life style, levels of personal hygiene, climatic conditions affect the patterns and types of superficial fungal skin infections. [9]

Most of the occurrence of *Tinea manuum* and *Tinea unguium* in females has been found in our study, which may be attributed to repeated prolonged exposures to water and different types of detergents (especially in kitchen) while performing daily domestic chores. [25] These similar findings were also been shown by Bhatia and Sharma in 2014.

In the present study most of the cases of *Tinea pedis* were seen in male than female cases. And our study group mainly comprised of students – 45 numbers, because of wearing of closed footwear socks and shoes for a long period in all weather. These life styles promotes sweating and sweat retention a milieu conducive for fungal growth. These also provide damp conditions especially in inter-digital spaces. [11,14]

CONCLUSION:

In the recent years, the frequency, severity, clinical characteristics, treatment response, and relapse rate of dermatophytosis have dramatically changed in India. Given the surge in dermatophytosis, it is indeed required to have a stringent data on spectrum of dermatophytosis and to identify the commonest isolate by conducting regular study on change in pattern of dermatophytosis. Its also desirable to study on antifungal susceptibility of these dermatophytes.

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