ORIGINAL RESEARCH PAPER

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CLINICO-MYCOLOGICAL PROFILE OF DERMATOPHYTOSIS IN A TERTIARY CARE HOSPITAL - A MATTER OF PUBLIC HEALTH INTEREST

KEY WORDS:
Dermatophytes, T. rubrum, immunocompromised individuals.

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ABSTRACT

Background: Dermatophytosis refers to superficial fungal infections caused by a group of fungi that are capable of invading the keratin of skin, hair and nails. The dermatophytes includes species belonging to genera *Trichophyton, Microsporum* and *Epidermophyton*. **Aim & Objectives:** 1) To determine the frequency of dermatophytes isolated from clinical samples 2) To access the risk factors associated with dermatophytosis 3) To understand the seasonal variation. **Material & Methods:** Samples from clinically suspected cases of dermatophytic infections (skin scarping, hair plugs and nail clipping) were subjected to direct microscopy by KOH mount and to fungal culture using standard mycological techniques. Dermatophytes were identified based on the microscopic arrangement of microconidia and macroconidia. **Results:** A total of 48 clinical isolates were tested, out of which 21 isolates were positive for dermatophytes. Thus, the frequency of dermatophytic infection was found to be 43.75%. The predominant isolates were *T. rubrum* (18.75%), followed by *T. mentagrophytes* (16.66%), *Epidermophyton floccosum* (6.25%) and *T. tonsurans* (2.08%). The remaining samples showed growth of *Candida* (18.75%), bacterial isolates (8.33%) and rest were found to be culture sterile. Among the total clinically suspected cases of dermatophytosis, only a total of 5 were positive by direct microscopy and 16 samples were positive both by microscopy and culture. Dermatophytosis was more common in the age group of (21-40) years and was more predominant among the males. Most of the dermatophytic infections were recovered from immunocompromised individuals suffering from poor hgiene (42.85%) followed by diabetes (23.8%), usage of topical steroid usage/immunosuppressive agents (9.5%) and underlying chronic illnesses (4.7%). The cases were mainly seen in the months between April to July which correlates the infection with the humid season. **Conclusion:** The study highlighted T. *rubrum* as the predominant dermatophyte. Dermatophytic infection is one of the common fungal disease in immunocompromised subjects. Correct identification and timely initiation of treatment can arrest the onset of complications.

INTRODUCTION

Dermatophytosis is the commonest superficial cutaneous fungal infection affecting skin, hair and nails, caused by keratinophilic fungi called as dermatophytes. Dermatophytes inhabits the moist areas of skin, environmental surface and routine household items such as bedding, towels and other clothings.[1] Dermatophytes are classified into three anamorphic genera, *Epidermophyton*, *Microsporum*, and *Trichophyton.*[2] Based on their primary habitat, dermatophytes can also be divided into anthropophilic, zoophilic, and geophilic. Human infection can be caused by all these three groups.[3] The severity of the dermatophytic infections depends on the specific strain, the sensitivity of the host, and the site of infection.[4] Dermatophytes have attained a massive attention, both in developed and developing countries, specially due to the usage of immunosuppressive drugs and underlying chronic diseases. It has been estimated that about 20-25% of global population is infected with this group of fungi and the incidence is escalating steadily.[5]The prevalence of dermatophyte infection varies with the geographical regions. This variance is particularly due to the social practices, movements of troops, migration of labourer and immigration.[6] In our country, fungal infection of the skin and its appendages is more prevalent due to favourable climatic conditions like temperature and humidity. In India, the occurence of dermatophytosis is adversely influenced by economic factors such as poverty, poor hygiene and social conditions like overcrowding.[7] This present study has been designed to determine the frequency of dermatophytosis in the western belt of Uttar Pradesh, and to identify the causative agents and associated risk factors.

MATERIALS & METHODS

The prospective study was carried out in the Department of Microbiology of a tertiary care teaching hospital in western Uttar Pradesh, over a period of one year (June 2023 to May 2024). The study included the samples obtained from clinically suspected cases of dermatophytic infection from Department of Dermatology. A detailed history regarding age, gender, occupation, socio-economic status and seasonal variations were taken. Before collection of sample, patient was explained about the procedure and informed consent was taken.

Ethics Approval:

Approval from the institutional ethics committee was taken before conducting the study.

Sample Collection:

Suspected lesions were cleaned with 70% alcohol to remove the dirt and contaminating bacteria. Skin scrapings were collected from the margins of lesion with a sterilized blunt scalpel. Collection of samples from scalp hair were epilated from the basal portion with a pair of tweezers. Nail clippings were taken from discoloured, dystrophic or brittle parts of nails. Samples were collected in sterile paper, folded, labelled and transported to the mycology laboratory within 2 hours for microscopic and fungal culture.[8]

Sample Processing:

Samples collected were processed as per standard subjected to direct microscopy using 10% KOH for skin scrapping, and 40% KOH mount for hair and nail. Each slide was examined under low (10x) and high (40x) power objective for the presence of filamentous, septate, branched hyphae with or without arthospores. Nail and hair samples were kept on slide with 40% KOH for rapid digestion of keratin. In case of hair, arrangement of spores were noticed as ectothrix or endothrix type of infection. Each sample was cultured onto two sets of modified Sabouraud Dextrose Agar (SDA)[9] containing antibiotics (gentamicin) and cycloheximide and Dermatophyte test medium (DTM), incubated at 25^0 C and 37^{0}C in incubator. Tubes were observed for growth at least twice during the first week, and once a week thereafter, for a

total of 3 weeks before discarding them as negative. DTM were observed for colour change to red indicates alkalinity generated by dermatophyte growth. The isolates were examined for fungal colony characteristics and finding of teased mount by using lactophenol cotton blue (LCB) stain.

RESULTS

In our study, dermatophytoses was more common in the age group of 31-40 years, followed by 21-30 years age group, and was more predominant among the males as compared to females showing ratio of 1.7:1 (Table 1).

A total of 48 clinical samples (skin scrapings, nail clippings and hair plugs) were tested, out of which 21 were positive for dermatophytes. Thus, the frequency of dermatophytic infection was 43.75% (21/48). The predominant dermatophytes isolates were *Trichophyton rubrum* (18.75%, 9/48), followed *T. mentagrophytes* (16.66%, 8/48) followed by *Epidermophyton floccosum* (6.25%, 3/48) and *T. tonsurans* (2.08%, 1/48). Out of the remaining 27 samples, 18.75% showed the growth of *Candida*, 8.33% detected bacterial isolates and 29.16% were found to be culture sterile (Table 2).

Most of the dermatophytic infections were recovered from immunocompromised individuals suffering from diabetes (42.85%), followed by prolonged antibiotic therapy (23.8%), steroid therapy/other immunosuppresive agents (9.5%) and underlying chronic illnesses (4.7%) (Table3). Among the clinically suspected cases of dermatophytosis, only a total of 5 were positive by direct microscopy and 16 samples were positive both by microscopy and culture. (Table 4).

Table 1: Age And Gender Wise Distribution Of Cases Of Dermatophytosis (n=21)

Age groups	Male	Female	Total
< 20	02	00	02
21-30	04	02	06
31 -40	05	02	07
41 -50	03	01	04
>50	01	01	02
TOTAL	15	06	21

Table 2: Distribution Of Etiological Agents Of Clinically Suspected Cases (n=48)

Name of species	No of species	Percentage
Trichophyton rubrum	09	18.75%
Trichophyton mentagrophytes	08	16.66%
Epidermophyton floccosum	03	6.25%
Trichophyton tonsurans	01	2.08%
Candida	09	18.75%
Bacterial isolates	04	8.33%
Sterile	14	29.16%

Table 3: Risk Factors Associated With Cases Of Dermatophytosis (n=21)

Risk factors	No of samples	Percentage
Poor hygiene	09	42.85%
Diabetes mellitus	05	23.80%
Usage of topical steroids/ other immunosuppresive agents	02	9.5%
Underlying chronic illnesses	01	4.7%
No identified risk factor	04	19.04%

Table 4: Microscopy & Culture Positivity Of Fungal Isolates (n=21)

Test	No of samples	Percentage
KOH positive	05	23.40%
KOH positive and Culture positive	16	76.10%

DISCUSSION

Dermatophytosis is one of the attention seeking superficial cutaneous mycoses, especially in immunocompromised patients. In this present study, the frequency of dermatophytic infection was found to be 43.75%, which is higher (36.6%) than that reported by Bhatia VK et al.[10]in 2014 in Himachal Pradesh. However, study done in Chennai by Venkatesan G et al.[11]reported dermatophytosis in 78.9% of cases. Our study showed that the dermatophytic infection was predominant in the age group of 31-40 years, followed by 21-30 years age group. Similar observations of increased incidence in young to middle aged patients has also been made by various studies carried out in India.[12-15]The reason behind this may be attributed to increased level of physical activity in this age groups, which leads to excessive sweating, favouring the growth of dermatophytes. It is a known fact that socialization with different people is also more compared to older age groups, which may cause spreading of infection.[16,17,18] In our setup, dermatophytosis showed males predominance (1.7:1). Similar to our findings, a study done by Gahlot R et al. [19] reported dermatophytic infection in 70% males. Various other authors have also observed an increased occurrence of dermatophytosis in males compared to females.[20,21,16,11,22,10,23] This explains the fact of increased outdoor exposure among males.[16] Apart from the occupational reason in males, social taboo present in the rural population which may lead to unreporting of female patients to the healthcare facilities, also be the cause for reflecting lesser cases among females.[24,25]

In our present study, the cases were mainly seen in the months between April to July which correlates the infection with the humid season, and majority of patients were field workers/farmers, and belonging to weaker socio-economic status. The seasonal variation could be due to environmental factors such as increased humidity and hot temperature of the geographical area.

In our setup, among 48 clinical suspected samples studied, *T. rubrum* (18.75%) was the commonest etiological agent, followed by *T. mentagrophytes* (16.66%), *E. floccosum* (6.25%) and *T. tonsurans* (2.08%). Our findings correlates with the study done by Tan HH et al.[26] that has reported *T. rubrum* as the most prevalent fungal pathogen isolated from all cases of superficial fungal infection of skin, hair and nail. *T. rubrum* as the most predominant isolate have also been documented by other studies in India.[16,11,22,27] In contrast to our study, *T. verrucosum* was the most dominant species isolated in a study done in Kathmandu by Mathur et al.[28] *Trichophyton* species have been a major causative agent of dermatophytosis than the other two genera, *Microsporum* and *Epidermophyton*.[28-30] Over the recent years, prevalence of *T. mentagrophytes* has been found to be escalating gradually[16,11,22] , however, in our study *T. mentagrophytes* (16.66%) was found to be second most commonest isolate next to *T. rubrum*. We observed that compared to *Trichophyton*, the isolates of other two genera were very few to represent. As per data obtained from various studies, *Microsporum* and *Epidermophyton* isolates accounted for very less number compared to *Trichophyton* species.[24,27]

T. mentagrophytes (16.66%) as the second commonest dermatophyte isolated in our study, was found to be consistent with the studies done by Jha BK et al. (2015) at Bharatpur, Nepal.[31] Another study done in Rajasthan showed, *T. mentagrophytes* as the predominant dermatophyte (55%) followed by *T. tonsurans* (22.5%) and *T. rubrum* (6.25%). *Microsporum* species and *Epidermophyton* species were isolated in 1.25% cases each.[32] *T. mentagrophytes* as a predominant dermatophyte isolated has also been described by other authors.[10,33] In our study, *Candida* species and bacterial isolates were recovered as 18.75% and 8.33%, respectively, and the remaining clinical samples were found to be culture sterile (29.16%). On the contrary, Lakshmanan *et al.*[34] reported 24.4% isolation of nondermatophytic fungi, comprising *Candida*, *Aspergillus*, *Alternaria*, *Curvularia,* and *Fusarium*, reflecting nondermatophytic molds as an important causative organisms of superficial mycoses.

In our setup, out of total 21 samples, only 05 (23.40%) were positive in direct microscopy and 16 (76.10%) were positive by both direct microscopy and culture. Dermatophytes were isolated in 43.75% cases. Similar culture positivity finding was also observed by other authors.[35,36] In contrary to the present study, some other studies have reported much higher rate (62–70%) of fungal culture positivity.[37,38] We also found that 33 cases were positive by direct microscopy but negative by culture and 37 were negative both by direct microscopy and culture. The possible reason behind KOH positive and culture negative cases could be assigned to the non-viability of fungal elements in culture media. Low culture positivity rate in our setup could be also be explained by prolonged usage of antifungal agents. However KOH positivity in a study done at Maharashtra was found to be 59.45% [39] ,which was in alignment with the study done by Singh S et al. (2003) at Baroda[27], Bindu V et al. (2002) at Calicut.[40] Our study also observed combined positivity of 76.10% which is quite approaching observations made by Jain N et al. (2008) at Jaipur [41],Komal D et al. (2015) at Ahmedabad[42].

It has been documented that, over the years, there has been a higher incidence of dermatophytosis, though these infections are managable. This could be due to re-infection, relapse or a recent infection. This recurrence may be due to continued exposure to the infective source or presence of predisposing / risk factors. Thus, it becomes important to identify risk factors, which may help in prevention and control of these dermatophytic infections.[43,44]

Among the modifiable risk factors, poor hygiene was noted in 42.85% of our cases, which has been in congruent with the data obtained from other studies.[45,38] Other risk factors identified in the present study included usage of topical steroids /other immunosuppressive agents (9.5%), diabetes (23.8%) and underlying chronic illnesses (4.7%). Low living standards, big family size, close contact, and sharing facilities like combs and towels between family members, especially in low socioeconomic strata population, promotes the transmission of these dermatophytes.[46]

The increased use of topical agents poses a therapeutic challenge, resulting in development of resistant strains.[47] Infectious diseases are more prevalent in individuals with diabetes. Hyperglycemia enhances the virulence of fungi, decreases interleukin production and inhibit phagocyosis, thereby contributing to pathogenicity.[47] We also noted that diabetes mellitus was present mostly in cases of infection with *T. rubrum* and *T. mentagrophytes*. Thus, it becomes important to identify the predisposing/risk factors. Early detection and appropriate management can curtail the recurrence and chronicity of dermatophytosis. Evaluation of newer antifungal agents has become the essential need of the present scenario to manage resistant dermatophytes.

CONCLUSION

The present study imparts an acumen about the frequency, risk factors and the distribution pattern of dermatophytes, highlighting *Trichophyton* as the predominant genus. Dermatophytoses is one of the important causes of superficial mycosis, especially in immunocompromised individuals. Approriate management and good personal hygiene can herald the onset of ensuing complications, thereby limiting the morbidity.

Limitations

1. Due to resources constraint anti fungal sensitivity testing could not be done.
2. The results could have been more conclusive if the study had been carried out for a longer duration.

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