

Spectrum of Dermatophytes Causing Tinea Corporis and Possible Risk Factors in Rural Patients of Madurai Region, South India

ANAND BHIMARAY JANAGOND, RAJENDRAN T, SURJEET ACHARYA, VITHIYA G, RAMESH A, JHANSI CHARLES

ABSTRACT

Introduction: Fungi are among the most common causes of skin infections in tropical developing countries and dermatophytes are responsible for largest number of superficial mycoses. Dermatophyte species causing infections vary with time and geographical location. Identifying responsible risk factors may help in prevention and control of the dermatophytosis.

Aim: To determine the spectrum of dermatophytes causing Tinea corporis and possible risk factors in patients residing in rural areas around Madurai city, South India.

Materials and Methods: It was a prospective cross sectional study conducted in a private tertiary care hospital in Madurai during July to August 2015. Skin scrapings from 50 consenting individuals from rural areas (irrespective of their age, sex) with typical Tinea corporis lesions were used for KOH examination and culture on Sabouraud's Dextrose Agar. A detailed history of patient occupation, address, contact with animals/soil, family history of similar disease, hygiene details including bathing frequency per day, type of water used for bathing, sharing of clothing with other individuals, were recorded in the structured questionnaire. Descriptive statistical tools like mean

and percentages were used to analyze the results.

Results: Among the 50 subjects, 48% were students and 26% were doing agriculture related work, 18% individuals had regular exposure to pet animals and 10% to farm animals. About 20% individuals had similar lesions in family members/ classmates. Majority of the subjects (70%) shared clothes (mostly bath towel, lungi) with family members. 20% of the subjects had positive past history. Dermatophytes were isolated in 36% of the subjects, most common being *Trichophyton rubrum* (16%), followed by *Trichophyton mentagrophytes* (10%), *Trichophyton tonsurans* (4%), *Trichophyton verrucosum* (4%) and *Trichophyton violaceum* (2%); Most (89%) of them were anthropophilic dermatophytes

Conclusion: Anthropophilic dermatophytes are commonest causes of Tinea corporis in rural population of Madurai region. Thus, infected men (84%) are the commonest sources of infection. Sharing of clothes and close contact with infected persons at home/school environment was most common potential risk factor. Proper education about maintenance of personal hygiene and importance of compliance to treatment should be provided to the population.

Keywords: Dermatophytoses, Rural population, Trichophyton

INTRODUCTION

Fungi are among the most common causes of skin infections in tropical developing countries and dermatophytes are responsible for largest number of superficial mycoses [1]. Dermatophytoses are caused by three genera of keratinophilic fungi that affect skin, hair and nail – *Trichophyton*, *Microsporum* and *Epidermophyton*. Depending upon their habitats, which act as sources of their infection, the dermatophytes can be zoophilic (animals), geophilic (soil) or anthropophilic (humans). Incidence of dermatophytoses is increasing [1]. The prevalence of dermatophytosis was 13% in 2015 in Madurai [2]. Tinea corporis affecting glabrous skin of the trunk and limbs (i.e., skin regions other than the scalp, groin, palms, and soles) is the commonest clinical form of dermatophytosis [2-4].

The spectrum of dermatophytes causing skin infections

keep changing with time and geographical location [3,5]. Dermatophytoses tend to re-occur [1], reasons for the recurrence could be continued exposure to the same source or persistence of some risk factors. Poor personal hygiene, sharing of clothes with others, close contact with animals or soil harbouring dermatophyte propagules occupationally or otherwise are some of the risk factors for development of dermatophytoses [6]. Though, several risk factors can influence on dermatophytosis, identifying common risk factors in a particular population or geographical area can help in deciding on specific interventions.

This study intended to find out the spectrum of dermatophytes causing Tinea corporis and to assess possible risk factors for getting dermatophytosis specifically among patients from rural areas around Madurai. The clinico-epidemiological data could be helpful for creating public awareness and

for the development of specific diagnostic, preventive and treatment strategies to suite the population studied [7]. Since literature review showed very few articles on risk factors for dermatophytosis in this area, the current study will also provide preliminary and baseline data.

MATERIALS AND METHODS

It was a hospital-based prospective cross sectional study conducted at Velammal Medical College Hospital, Madurai, India, after Institutional ethics committee approval. The study population included 50 consecutive out-patients from rural areas visiting the Dermatology Department and fulfilling inclusion criteria during July to August 2015.

Consenting patients of any age and gender having characteristic lesion(s) of Tinea corporis (Itching, ring-shaped scaly lesion(s) on trunk and/or limbs) were included in the study. Both old and newly diagnosed cases were selected for the study. Patients who had undergone antifungal treatment in the preceding two weeks were excluded from the study.

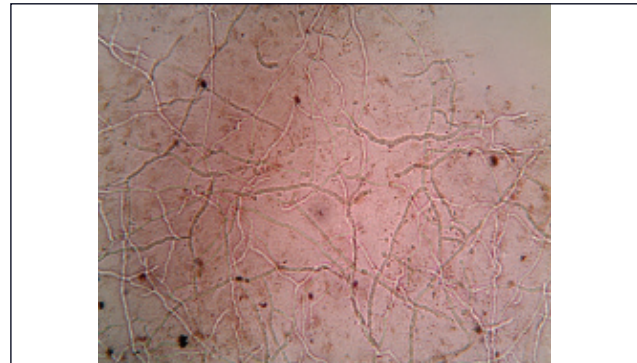
Written consent was obtained from all the participants. Detailed history of patients, which included personal particulars, history of contact with animals/soil, family history of similar disease, details of personal hygiene, sharing of clothing with other individuals were recorded in the questionnaire.

Skin scrapings were collected aseptically from active margins of lesions. These scrapings were used for KOH examination and for inoculation on to Sabouraud's Dextrose Agar (SDA) supplemented with cycloheximide (0.5 mg/ml) and chloramphenicol (0.05 mg/ml) for the isolation of dermatophyte. Inoculated SDA slants in duplicates were incubated at 25°C and 37°C for up to 6 weeks before reporting no growth. Growth obtained was identified based on standard mycological procedures which included lactophenol cotton-blue tease mounts, urease test and slide culture whenever necessary [8]. Descriptive statistical tools like mean and percentages were used to analyze the results.

RESULTS

The study group included 42 male and 8 female participants, majority of them in 10-30 years age group (64%). Microscopic examination of skin scrapings by 10% potassium hydroxide wet mount showed thin hyaline septate branching hyphae typical of dermatophyte infection [Table/Fig-1] from all the subjects. Dermatophytes were isolated on SDA in 36% of the subjects, most common being *Trichophyton rubrum* (16%) [Table/Fig-2-3].

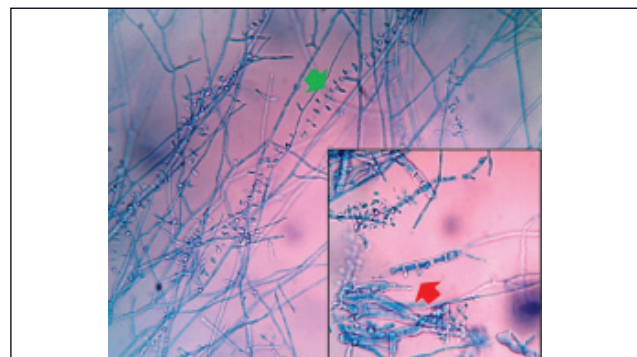
Nearly half of the subjects were students (48%) and 26% of them were doing agriculture related work. Risk factors for developing dermatophytosis are summarized in [Table/Fig-4]. All the subjects were taking bath daily, 56% with borewell water, 30% with municipal water and the remaining with water from pond/well. Majority of the subjects (70%) shared clothes (mostly bath towel, lungi) with family members. About 20% of the subjects had similar lesions in the past and all of them had taken treatment for that, mostly topical



[Table/Fig-1]: KOH mount (10%) of skin scrapings (400X) – thin hyaline septate branching hyphae.

Dermatophyte Isolated	Number (%)	Dermatophyte Type
<i>Trichophyton rubrum</i>	8 (16%)	Anthropophilic
<i>Trichophyton mentagrophytes</i>	5 (10%)	Anthropophilic
<i>Trichophyton tonsurans</i>	2 (4%)	Anthropophilic
<i>Trichophyton verrucosum</i>	2 (4%)	Zoophilic
<i>Trichophyton violaceum</i>	1 (2%)	Anthropophilic
No dermatophyte isolated	32 (64%)	--

[Table/Fig-2]: Results of fungal culture and dermatophyte type.



[Table/Fig-3]: Lactophenol cotton blue tease mount of *Trichophyton rubrum* (400X) – Thin hyaline septate hyphae, tear drop-shaped microconidia arranged singly along hyphae (green arrow), some microconidia directly emerging from cigar-shaped macroconidia (inset, red arrow).

Risk factor	Number of study participants having the risk factor (n=50, multi response)
Close contact with pet animals	9 (18%)
Close contact with farm animals	5 (10%)
Positive family history	10 (20%)
Positive past history	10 (20%)
Sharing clothes with others	35 (70%)

[Table/Fig-4]: Risk factors for developing dermatophytosis in the study subjects.

application till the cream/ointment got over and not following any specific duration for treatment, and they had significant relief from the symptoms.

DISCUSSION

Prevalence of superficial fungal infections has been estimated to be around 20-25% worldwide by World Health Organization (WHO) [9]. It was observed that many patients from rural areas visited Dermatology Outpatient Department of our hospital with Tinea corporis lesions. Majority of the rural people being farmers, are exposed to the livestock and soil regularly, which are potential sources of dermatophyte infections.

In this study, trained dermatologists selected all the participants with classical clinical features of Tinea corporis and 10% KOH mount of skin scrapings from all the participants showed thin hyaline septate branching hyphae suggestive of dermatophytes. This was in concordance with a study by Kannan et al., [10]. Though, hyaline septate fungi other than dermatophytes can cause superficial skin infections, their presentations are different from typical Tinea lesions [11]. With these clues, all the subjects were considered to have had Tinea corporis, irrespective of isolation of dermatophyte from their specimens in culture.

Dermatophyte species were isolated in 36% of the cases. This isolation rate is lower compared to other similar studies, where it ranged from 40 to 83% [3,5,7,10]. Though all specimens showed fungal elements in KOH mounts that resembled dermatophytes isolation rate was low, this could be due to non-viability of fungal components in the specimens. Other possible factors for varying isolation rates could be due to other factors involved in collection, transporting and inoculation of the specimens, culture conditions, severity and type of the clinical illness [3]. In the present study, only one sample was collected from each patient, treatment was started on the very day after sample collection was over. Some of the studies where multiple samples were collected for culture, isolation rates have been far better [12]. In any case, by conventional culture method, none of the studies have achieved 100% isolation rates. In a study done by Ramaraj V et al., conventional culture methods and molecular techniques together could detect dermatophytes in 68% of clinically diagnosed dermatophytosis cases [4]. More sensitive detection methods based on PCR and RFLP techniques are available but cost and technical expertise required to use them, have limited their widespread regular usage for this purpose [13,14].

Men were more commonly (84%) affected than women. Children and young adults (10-30 years) were more commonly (64%) affected. In several other studies also dermatophytosis was found to be more common in young men [2-4]. This could be due to outdoor working habits of men in the productive age group which makes them sweat and also provide exposure for transmission. In the present study nearly half (48%) of the subjects were students and around one-fourth (26%) of the subjects were involved in agriculture related activities. Several other studies also

have found the prevalence of dermatophytoses to be more common in farmers and students [3,6,15]. Higher incidence among students could be due to their close physical contact with other students in the school/hostel/play environment which provides more opportunities for transmission.

Spectrum of dermatophytes causing Tinea corporis has not changed in the last 10 years in different parts of Tamilnadu state with *T. rubrum* being the commonest followed by *T. mentagrophytes* [2,4,10,16]. Except for two isolates of *T. verrucosum* (zoophilic) all other isolates in this study were anthropophilic (89% of total isolates) indicating that infected human beings are the major source of infection rather than soil or animals even in the rural community. This also correlates with the finding that school children were more commonly affected than agriculture-related occupations and housewives. Those two subjects from whom *T. verrucosum* were isolated were not exposed to pets or farm animals on a regular basis suggesting that probably they acquired the infection from infected men rather than directly from animals.

All the participants bathed on daily basis mostly with borewell water or municipal supply which can be presumed to be of good quality and not to be heavily contaminated. One-fifth of the subjects had exposure to people with similar lesions in family or school/hostel. Majority of the subjects shared clothes (bath towel, lungi, etc.) with others which could be one of the important risk factors responsible for transmission in this study population. People need to be educated about health risks associated with sharing clothing.

About 10% of the subjects had similar lesions in the past for which all of them had taken treatment, mostly topical medications. Most of them had applied them till one tube of topical cream got exhausted and not sticking to any particular duration of time and discontinued the treatment based on the relief from the symptoms. Present infection could not be ascertained as either recurrence of the previous infection that was partially treated in the past or new infection as data of dermatophyte isolation from the previous infections was not available. With the increased use of antifungal agents, including azoles, for the treatment of superficial dermatophytoses, the development of resistance remains a possibility and several new antifungal compounds are being evaluated specially from plant sources to use against dermatophytes [1, 17]. As antifungal susceptibilities of dermatophytes vary among the different species and hence it is important to identify the exact species of dermatophyte causing the infection in a given patient to choose appropriate treatment [18].

Based on the results of the study, imparting knowledge about various modifiable risk factors like maintenance of personal hygiene, avoiding sharing of clothes, regular bathing, completing proper course of treatment can be recommended especially to school going children and young adults.

LIMITATIONS

Relatively smaller sample size and collection of single specimen from each patient are limitations of this study.

CONCLUSION

Trichophyton rubrum is the commonest dermatophyte causing Tinea corporis among rural population in Madurai region. Students are most commonly affected group followed by people involved in farming-related activities. Infected men are common sources for acquiring dermatophytoses rather than animals or soil even in the rural settings. Sharing of clothes and close contact with infected persons at home/school environment are important risk factors for developing Tinea corporis.

ACKNOWLEDGEMENTS

Authors gratefully acknowledge the support provided by Indian Council of Medical Research (ICMR) under Short Term Studentship Program 2015.

REFERENCES

- [1] Balakumar S, Rajan S, Thirunalasundari T, Jeeva S. Antifungal activity of *Aegle marmelos* (L.) Correa (Rutaceae) leaf extract on dermatophytes. *Asian Pac J Trop Biomed*. 2011;1:309–12.
- [2] Sudha M, Ramani CP, Anandan H. Prevalence of dermatophytosis in patients in a tertiary care centre. *Int J Contemporary Med Res*. 2016;3:2399-401.
- [3] Agarwal US, Saran J, Agarwal P. Clinico-mycological study of dermatophytes in a tertiary care centre in northwest India. *Indian J Dermatol Venereol Leprol*. 2014;80:194.
- [4] Ramaraj V, Vijayaraman RS, Rangarajan S, Kindo AJ. Incidence and prevalence of dermatophytosis in and around Chennai, Tamilnadu, India. *Int J Res Med Sci*. 2016;4:695-700.
- [5] Sahai S, Mishra D. Change in spectrum of dermatophytes isolated from superficial mycoses cases: First report from Central India. *Indian J Dermatol Venereol Leprol*. 2011;77:335–36.
- [6] Spiewak R, Szostak W. Zoophilic and geophilic dermatophytoses among farmers and non-farmers in eastern Poland. *Ann Agric Environ Med*. 2000;7:125–29.
- [7] Lone R, Bashir B, Ahmad S, Syed A, Khurshid S. A Study on Clinico-Mycological Profile, Aetiological Agents and Diagnosis of Onychomycosis at a Government Medical College Hospital in Kashmir. *J Clin Diag Res*. 2013;7:1983-85.
- [8] de Hoog GS, Guarro J, Gené J, Figueras MJ. Atlas of clinical fungi, 2nd ed. Central Bureau voor Schimmel Cultures, Utrecht, The Netherlands. 2000.
- [9] WHO, Epidemiology and management of common skin diseases in children in developing countries. World Health Organization, Geneva. 2005.
- [10] Kannan P, Janaki C, Selvi GS. Prevalence of dermatophytes and other fungal agents isolated from clinical samples. *Indian J Med Microbiol*. 2006;24:212-15.
- [11] Singal A. Butenafine and superficial mycoses: current status. *Expert Opin. Drug Metab Toxicol*. 2008;4:999–1005.
- [12] Lakshmanan A, Ganesgkumar P, Mohan SR, Hemamalini M, Madhavan R. Epidemiological and clinical pattern of dermatophytes in rural India. *Indian J Med Microbiol*. 2015;33:134-36.
- [13] Gräser Y, Czaika V, Ohst T. Diagnostic PCR of dermatophytes-an overview. *J Dtsch Dermatol Ges*. 2012;10:721-25.
- [14] Mohammadi R, Abastabar R, Mirhendi H, Badali H, Shadji S, Chadeganipor M, et al. Use of restriction fragment length polymorphism to rapidly identify dermatophyte species related to dermatophytosis. *Jundishapur J Microbiol*. 2015;8:17296.
- [15] Poluri LV, Indugula JP, Kondapaneni SL. Clinicomycological study of dermatophytosis in South India. *J Lab Physicians*. 2015;7:84-89.
- [16] Kumari B, Kapoor R, Sharma R. The major etiological cause in human dermatophytoses in Chennai. *Int J Mycol Plant Path*. 2014;1:042-44.
- [17] Ghannoum M, Isham N, Verma A, Plaum S, Fleisher A, Hardas B. In vitro antifungal activity of nifitine hydrochloride against dermatophytes. *Anti Microbiol Chemotherapy*. 2013;9:4369-72.
- [18] Magagnin CM, Stopiglia CD, Vieira FJ, Heidrich D, Machado M, Vettorato G, et al. Antifungal susceptibility of dermatophytes isolated from patients with chronic renal failure. *An Bras Dermatol*. 2011;86:694–701.

AUTHOR(S):

1. Dr. Anand Bhimaray Janagond
2. Dr. Rajendran T
3. Dr. Surjeet Acharya
4. Dr. Vithiya G
5. Dr. Ramesh A
6. Dr. Jhansi Charles

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Microbiology, Velammal Medical College, Madurai, Tamilnadu, India.
2. Assistant Professor, Department of Microbiology, Velammal Medical College, Madurai, Tamilnadu, India.
3. MBBS Student, Velammal Medical College, Madurai, Tamilnadu, India.
4. Assistant Professor, Department of Microbiology, Velammal Medical College, Madurai, Tamilnadu, India.

5. Associate Professor, Department of Microbiology, Velammal Medical College, Madurai, Tamilnadu, India.
6. Professor and Head, Department of Microbiology, Velammal Medical College, Madurai, Tamilnadu, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Anand Bhimaray Janagond,
Department of Microbiology, Velammal Medical College,
Anuppanadi, Madurai-625009, Tamilnadu, India.
E-mail: anandbj@gmail.com

FINANCIAL OR OTHER COMPETING INTERESTS:

None.

Date of Publishing: Oct 01, 2016