MICROBIOLOGICAL PROFILE OF DERMATOPHYTE INFECTIONS IN A TERTIARY CARE HOSPITAL

Trupthi Gowda¹, Rajini Manikonda², Abhineetha Hosthota³

¹Assistant Professor, Department of Microbiology, The Oxford Medical College, Hospital and Research Centre.

²Professor and HOD, Department of Microbiology, The Oxford Medical College, Hospital and Research Centre.

³Associate Professor, Department of Dermatology, The Oxford Medical College, Hospital and Research Centre.

ABSTRACT**BACKGROUND**

Dermatophytosis refers to fungal infection of skin, hair and nails (keratinised tissue). The fungi causing these superficial mycoses belong to three genera Trichophyton, Microsporum and Epidermophyton. These fungi produce cutaneous infections with restriction to the non-living cornified layers of skin failing to invade deeper tissues or organ. Trichophyton species infects skin, hair and nails. Microsporum species infects skin and hair and Epidermophyton species infects skin and nail. Dermatophyte infections are commonly known as ringworm or tinea infections.

The purpose of this study is to know the epidemiological data of dermatophyte infection, compare the results of KOH and culture, identify the anatomical region most affected (clinical type) and to know the prevalence of dermatophyte species.

MATERIALS AND METHODS

A total of 200 clinically suspected cases of dermatophytoses were examined and the appropriate samples were collected. Direct microscopy in 10% KOH (skin, hair) and 40% KOH (nails) along with culture using Sabouraud Dextrose Agar (SDA) was done in each case.

RESULTS

Of the 200 cases, majority of them belonged to the age group of 21 - 30 years. Tinea cruris (31%) was the most common clinical type followed by Tinea corporis (19%). The overall positivity by culture was 54% and by direct microscopy was 84%. Trichophyton rubrum (49%) was the predominant dermatophyte species isolated followed by T. mentagrophytes (44%).

CONCLUSION

Tinea cruris was the most common clinical type followed by Tinea corporis. The study indicates the changing trends of clinical presentations associated with dermatophytoses.

KEYWORDS

Dermatophytosis, Tinea, Trichophyton spp.

HOW TO CITE THIS ARTICLE: Gowda T, Manikonda R, Hosthota A. Microbiological profile of dermatophyte infections in a tertiary care hospital. J. Evolution Med. Dent. Sci. 2018;7(01):67-70, DOI: 10.14260/jemds/2018/16

BACKGROUND

Dermatophytosis refers to fungal infection of skin, hair and nails (keratinised tissue). The fungi causing these superficial mycoses belong to three genera Trichophyton, Microsporum and Epidermophyton.¹ These fungi produce cutaneous infections with restriction to the non-living cornified layers of skin failing to invade deeper tissues or organ.² Trichophyton species infects skin, hair and nails. Microsporum species infects skin and hair, and Epidermophyton species infects skin and nail.³ Dermatophyte infections are commonly known as ringworm or tinea infections.² The lesions are usually identified clinically, but often misdiagnosed due to its resemblance with other skin infections as the patients use steroid ointments and creams which are easily available.⁴ Prevalence of dermatophyte infections has been reported worldwide, but is common in regions which are hot and humid. India experiencing this kind of climatic conditions makes our country prone for dermatophytosis.⁵

'Financial or Other Competing Interest': None.

Submission 09-11-2017, Peer Review 13-12-2017,

Acceptance 19-12-2017, Published 01-01-2018.

Corresponding Author:

Dr. Rajini Manikonda

The Oxford Medical College, Hospital and Research Centre,
Yadavanahalli, Attibele, Bengaluru- 562107.

E-mail: manikonda_rajini@yahoo.co.in 67-70

DOI: 10.14260/jemds/2018/16

There is a constant need to define the epidemiological and mycological characteristics of dermatophytosis for appropriate control measures. Hence, this study was conducted to know the clinico-epidemiological profile of dermatophyte infection, compare the results of KOH and culture, to know the anatomical region most affected (clinical type) and identify the species of causative fungi.

MATERIALS AND METHODS

The study included 200 clinically suspected cases of dermatophytosis attending the Outpatient Department of Dermatology and Venereology at a Medical College Hospital, Bangalore, during a period of 1 year (February 2016 - January 2017). A detailed case history was taken which included age, sex, socio-economic status, occupation, similar complaints in family, duration of disease and treatment received previously. Patients previously treated with antifungals and steroids were excluded from the study. General physical examination and systemic examination was done. Baseline investigations like complete haemogram, blood sugar and renal function tests were performed to rule out predisposing conditions.

Study Design

Descriptive Study.

Sample Collection and Identification of Fungi

Skin scrapings from active edge of lesions, nail clippings and easily pluckable hair were collected onto a clean brown paper. The specimen was divided into two halves. One-half was used for direct microscopy with 10% potassium hydroxide (KOH) for skin and hair samples and 40% KOH for nail clippings. The other half of specimen was inoculated onto Sabouraud's Dextrose Agar (SDA) with 0.05% chloramphenicol and 0.5% cycloheximide and incubated at 22°C for 4 weeks. The culture positives were identified based on colony morphology, pigmentation, Lactophenol cotton blue stain and slide culture. Special tests were done when necessary viz. hair perforation test, urease test for species identification.

RESULTS

Among the 200 patients enrolled in the study, majority of them were in the age group of 21 - 30 years (34%) followed by 41 - 50 years (22%) [Table 1]. Dermatophytosis was more common in males (66%) than in females (34%). Maximum no. of cases belonged to low socioeconomic status (59%) and 68% had a family history of dermatophytosis.

Out of the 200 clinically suspected cases, 168 (84%) were positive on direct microscopy and 108 (54%) were positive by culture. The isolation rate of dermatophytes being 54%. Eleven cases yielded growth on culture despite being KOH negative and 71 cases were positive on KOH examination with culture being negative. Twenty-one cases were negative by both the methods (Table 2). In our study, the correlation between KOH examination and culture was statistically significant ($p=0.015$).

Tinea cruris (31%) (Fig. 1) was the most common clinical type observed followed by Tinea corporis (19%) (Fig. 2) and Tinea unguium (8%). All nine cases of Tinea unguium identified by direct microscopy yielded growth on culture [Table 3]. Fifty-six (29%) patients presented with mixed infections of dermatophytosis. Tinea cruris with T. corporis ranked the highest with 22 cases (Table 4).

Among the 108 culture positive cases, Trichophyton rubrum contributed to the highest number (49%) [Fig. 3] followed by Trichophyton mentagrophytes (44%) [Fig. 4], Trichophyton violaceum (4%), Trichophyton verrucosum (4%) [Fig. 5], Microsporum gypseum (2%) and Trichophyton tonsurans (1%) [Fig. 6]. However, no species of Epidermophyton was recovered in our study. In relation with the clinical types, a similar kind of pattern was observed with T. rubrum being the most common isolate in cases of Tinea

cruris, corporis and unguium. All cases of Tinea pedis, faciei and manuum yielded growth of T. mentagrophytes (Table 5).

Age	Results (N= 200)
0-10	18 (9%)
11-20	15 (7.5%)
21-30	68 (34%)
31-40	34 (17%)
41-50	44 (22%)
51-60	15 (7.5%)
>60	6 (3%)

Table 1. Age Wise Distribution of Dermatophytosis Cases

KOH	Culture		Total
	+	-	
+	97	71	168
-	11	21	32
Total	108	92	200

Table 2. Comparison of KOH and Culture Results of Dermatophytosis Cases

Clinical Type	Total No. of Cases	No. Positive by KOH Smear	No. Positive by Culture
T. cruris	64 (32%)	61	34 (31%)
T. corporis	38 (19%)	31	21 (19%)
T. unguium	17 (9%)	9	9 (8%)
T. capitis	10 (5%)	8	4 (4%)
T. pedis	9 (4.5%)	7	7 (6.5%)
T. faciei	4 (2%)	3	1 (0.9%)
T. manuum	2 (1%)	-	1 (0.9%)
Mixed Type	56 (28%)	49	31 (29%)
Total	200	168 (84%)	108 (54%)

Table 3. Comparison of KOH Smear Positive with Culture Positive according to Clinical Types

Clinical Types	Total Number
T. cruris + T. corporis	22
T. cruris + T. unguium	6
T. cruris + T. capitis	5
T. cruris + T. manuum	4
T. cruris + T. corporis + T. unguium	4
T. pedis + T. manuum	4
T. corporis + T. faciei	3
T. corporis + T. capitis	3
T. corporis + T. manuum	3
T. corporis + T. pedis	2
Total	56

Table 4. Combination of Various Clinical Types of Dermatophytosis

Clinical Type	T. rubrum	T. men*	T. vio**	T. verr#	T. ton##	Microsporum gypseum	Total Isolated
T. cruris	19	13	-	1	1	-	34
T. corporis	14	3	1	2	-	1	21
T. unguium	7	1	1	-	-	-	9
T. capitis	2	-	2	-	-	-	4
T. pedis	-	7	-	-	-	-	7
T. faciei	-	1	-	-	-	-	1
T. manuum	-	1	-	-	-	-	1
Mixed Type	11	18	-	1	-	1	31
Total	53 (49%)	44 (44%)	4 (4%)	4 (4%)	1 (1%)	2 (2%)	108

Table 5. Correlation between Clinical and Mycological Findings

*mentagrophytes, **violaceum, #verrucosum, ## tonsurans

Figure 1. Tinea cruris- Pustular, Scaly Lesions in the Groin

Figure 2. Tinea corporis- Hyperpigmented Patches over the Back

Figure 3. Obverse and Reverse Views of Macroscopic Colony Morphology of *T. rubrum* along with the LPCB Mount showing Abundant Tear-Drop Microconidia

Figure 4. Obverse View of Macroscopic Colony Morphology of *T. mentagrophytes* along with the LPCB Mount showing Spiral Hyphae

Figure 5. Obverse View of Macroscopic Colony Morphology of *T. verrucosum* along with the LPCB Mount showing Chains of Chlamydoconidia

Figure 6. Obverse and Reverse Views of Macroscopic Colony Morphology of *T. tonsurans* along with the LPCB Mount showing Abundant Microconidia

DISCUSSION

In the present study, dermatophytosis was more common in the age group of 21 - 30 years (34%). Similar observations were made in studies by Noronha et al and Verenkar et al.^{6,7} However, findings of Bindu et al reported a higher incidence in the 2nd decade.⁸ Dermatophytosis was more common among males when compared to females.

This is in concordance with other studies.^{6,7,9,10} The higher incidence among young aged males could be due to more exposure to physical activities and increased sweating. As maximum cases (59%) were from low socio-economic strata, maintenance of good hygiene was practiced rarely, thereby contributing to high occurrence of infection. This is in accordance with a report by Ranganathan et al, wherein majority of the cases were from low income groups.¹¹

In our study, Tinea cruris (32%) was the most common clinical type followed by Tinea corporis (19%). These observations are in accordance with few reports across India.^{12,13,14,15} This differs from other studies, which reported Tinea corporis as the most common clinical type.^{6,7,8,10,16} Tinea capitis and Tinea pedis was reported to the tune of 5% and 4.5% respectively. The lower incidence of Tinea capitis could be due to usage of hair oils, which have fungistatic effect. Wearing of open footwear among our cases could be one of the causes for low incidence of Tinea pedis. In contrast, study by Bindu et al reported no significant association with usage of hair oils and footwear among patients.⁸ In the current study, 28% of patients showed multiple site involvement which is comparable with reports by Siddappa et al.¹⁷ Among them Tinea cruris with Tinea corporis ranked highest: 22 cases which is in accordance with the findings of Noronha et al (35%) and Surendra et al (73.4%).^{6,10} Wearing of tight clothing along with increased sweating in groin and waist regions makes these sites prone for dermatophytosis.³ Similarly, Padhya et al and Das Gupta et al reported higher incidence of dermatophytosis in groin and waist regions due to infrequent washing or changing of undergarments among the lower income groups.^{18,19} Our study also reported that 68% of cases had a family history of dermatophytosis, which indicates that sharing of clothing, combs and close contact can facilitate transmission of infection. In addition, India experiencing varied climatic conditions can attribute to the various clinical patterns observed.

Of the 200 cases, 168 (84%) were positive by KOH examination and 108 (54%) showed growths on culture. This is in keeping with majority of the other studies.^{6,8,10,16} However, the isolation rate varied from as low as 7% to 71% seen with studies done from Maharashtra and Uttar Pradesh, respectively.^{20,21} Among the fungal isolates, Trichophyton rubrum (49%) was highest in frequency followed by T. mentagrophytes (44%). These findings concur with reports of Sharma (84%), Bindu (66%) and Sumathi (50%) et al

which also reported *Trichophyton rubrum* as the most common isolate.^{8,13,22} In studies by Vikesh et al and Suman et al, *T. mentagrophytes* was reported as the most common isolate, to the tune of 63% and 73% respectively.^{9,16} We isolated only one case with *T. tonsurans* as the aetiological agent in contrast to findings of Grover et al who reported this agent as the most common isolate.²³ Similar to findings of Vikesh et al, we did not isolate species of *Epidermophyton*.¹⁶ Environmental and social factors could be responsible for the distribution of the aetiological agents of dermatophytosis.

CONCLUSION

In the present study, *Tinea cruris* was the most common clinical type reported followed by *Tinea corporis*. Studies from across Karnataka have observed *Tinea corporis* as the predominant clinical condition. Thus, our study indicates the changing patterns in the prevalence of different clinical presentations. The isolation rate of dermatophytosis was 54% with *Trichophyton rubrum* being the most common dermatophyte isolated.

REFERENCES

- [1] Emmons CW. Dermatophytoses. In: Emmons CW, Binford CH, Utz JP, et al. (eds). *Medical mycology*. 3rd edn. Philadelphia: Lea and Febiger, 1977:117-64.
- [2] Kanwar AJ, Mamta, Chander J. Superficial fungal infections. In: Valia GR, (eds). *IADVL Text book and atlas of dermatology*. 2nd edn. Mumbai: Bhalani Publishing House, 2001:215-58.
- [3] Rippon JW. *Medical mycology: the pathogenic fungi and the pathogenic actinomycetes*. 3rd edn. Philadelphia: Saunders, 1988:140-275.
- [4] Burzykowski T, Molenberghs G, Abeck D, et al. High prevalence of foot diseases in Europe: results of the Achilles project. *Mycoses* 2003;46(11-12):496-505.
- [5] Niranjana HP, Padmaja N, Priyanka BV. Study of onychomycosis at a tertiary care hospital in South India. *J Evol Med Dent Sci* 2012;1(5):823-9.
- [6] Noronha TM, Tophakhane RS, Nadiger S. Clinico-microbiological study of dermatophytosis in a tertiary care hospital in North Karnataka. *Indian Dermatol Online J* 2016;7(4):264-71.
- [7] Venekar MP, Pinto MJ, Rodrigues S, et al. Clinico-microbiological study of dermatophytoses. *Indian J Pathol Microbiol* 1991;34(3):186-92.
- [8] Bindu V, Pavithran K. Clinico-mycological study of dermatophytosis in Calicut. *Indian J Dermatol Venerol Leprol* 2002;68(5):259-61.
- [9] Singh S, Beena PM. Profile of dermatophyte infections in Baroda. *Indian J Dermatol Venerol Leprol* 2003;69(4):281-3.
- [10] Surendran K, Bhat RM, Boloor R, et al. A clinical and mycological study of dermatophytic infections. *Indian J Dermatol* 2014;59(3):262-7.
- [11] Ranganathan S, Menon T, Selvi SG, et al. Effect of socio-economic status on the prevalence of dermatophytosis in Madras. *Indian J Dermatol Venerol Leprol* 1995;61(1):16-8.
- [12] Lal S, Rao SR, Dhandapani R. Clinico mycological study of dermatophytosis in a coastal area. *Indian J Dermatol Venereol Leprol* 1983;49(2):71-5.
- [13] Sharma SC, Talwar P, Kumar B, et al. *Tinea cruris* in Chandigarh. *Indian J Dermatol Venereol Leprol* 1980;46(4):216-7.
- [14] Verma BS, Vaishnav VP, Bhatt RP. A study of dermatophytosis. *Indian J Dermatol Venerol Leprol* 1970;36:182.
- [15] Seghal VN, Shome SK. Dermatormycosis in Varanasi a clinical and mycological study. *Indian J Dermatol* 1973;18:25-9.
- [16] Bhatia VK, Sharma PC. Epidemiological studies on dermatophytosis in human patients in Himachal Pradesh, India. *Springerplus* 2014;3:134.
- [17] Siddappa K, Mahipal OA. Dermatophytoses in Davangere. *Indian J Dermatol Venerol Leprol* 1982;48(5):254-9.
- [18] Padhye AA, Thirumalachar MJ, Gokhale BB. Dermatophytoses in Poona, India observation on incidence, clinical features, environmental factors and causal agents studied during 1958 to 1963 at Sasson hospitals, Poona. *Mycopathologia Mycol Appl* 1970;40(3-4):325-36.
- [19] Das-Gupta SN, Shome SK. Studies in medical mycology. I. On occurrence of mycotic diseases in Lucknow. *Mycopathol Mycol Appl* 1959;10(3):177-86.
- [20] Gupta RN, Shome SK. Dermatormycoses in Uttar Pradesh-an analysis of 620 cases. *J Indian Med Assoc* 1959;33:39-42.
- [21] Belakur DD, Barmi RN, Karthikeyan S, et al. A mycological study dermatophytosis in Thane. *Bombay Hosp J* 2004;46:2.
- [22] Sumathi S, Mariraj J, Shafiyabi S, et al. Clinicomycological study of dermatophytes. *Int J Pharm Biomed Res* 2013;4:132-4.
- [23] Grover S, Roy P. Clinico-mycological profile of superficial mycosis in a hospital in North East India. *Med J Armed Forces India* 2003;59(2):114-6.