ORIGINAL ARTICLE

NATIONAL JOURNAL NJMR MEDICAL RESEARCH

Clinico-Epidemiological Study of Cutaneous Superficial Fungal Infections: Multicentre Descriptive Study

Parvaiz A Rather[1], Mohd R Tilwani[2*]

[1]Government Medical College Baramulla, J&K, India
[2]Teerthanker Mahaveer Medical College & Research Centre, Moradabad, Chadoora Budgam, J&K, India

DOI:
10.55489/njmr.150120251021

***Corresponding author**:
Mohd Rafiq Tilwani
(Email: rafiqderma90@gmail.com)

Date of Submission: 03/09/2024
Date of Acceptance: 01/11/2024
Date of Publication: 01/01/2025

Funding Support:
None Declare

Conflict of Interest:
None Declare

How to cite this article:
Rather PA, Tilwani MR. Clinico-Epidemiological Study of Cutaneous Superficial Fungal Infections: Multicentre Descriptive Study. Natl J Med Res 2025;15(01):9-13. DOI: 10.55489/njmr.150120251021

ABSTRACT

Background: Cutaneous superficial fungal infections or dermatophytosis, have emerged as common dermatoses with increasing incidence, prevalence, and relapse rate. This study aimed to provide a comprehensive clinico-epidemiological profile of dermatophytosis in our population.

Material & Methods: This cross-sectional, descriptive study was conducted in two teaching hospitals in north India. A total of 1,520 patients with clinically diagnosed dermatophytosis were enrolled. Demographic data, clinical presentation, risk factors, and comorbidities were recorded. Scrapings from skin, nails, and hair were collected for direct microscopic examination. Patients were prescribed appropriate antifungal therapy and appropriately followed up.

Results: Tinea corporis was the most common clinical presentation (41.0%), followed by tinea cruris (31.0%) and tinea pedis (15.0%). Poor hygiene practices (31.0%), occlusive clothing (26.0%), and obesity (21.0%) were the most common risk factors. KOH mount had positivity rate of 80.0%. Complete resolution of lesions was achieved in 70.0% of patients, while recurrence rate within 12 weeks was 18.0%.

Conclusion: This study provides valuable insights into the clinico-epidemiological profile of dermatophytosis in India. High prevalence and recurrence rates highlight the need for targeted prevention strategies and optimized treatment approaches. Further research is warranted to explore emerging trends and develop novel diagnostic and therapeutic strategies.

Keywords: Dermatophytosis, tinea, epidemiology, risk factors, antifungal treatment, India

INTRODUCTION

Cutaneous superficial fungal infections, also known as dermatophytosis or tinea, are among the most common skin diseases encountered in clinical practice worldwide, caused by a group of keratinophilic fungi that primarily invade the keratinized tissues of skin, hair, and nails.[1,2,3]

The prevalence of cutaneous superficial fungal infections varies across different regions and populations, influenced by factors such as climate, socioeconomic conditions, cultural practices, to mention a few.[4] In tropical and subtropical countries, including India, these infections are particularly prevalent due to hot and humid climate, which favours the growth of dermatophytes.[5] Studies have reported a prevalence rate ranging from

Publisher: Medsci Publications [www.medscipublications.com] ISSN: 2249 4995 Official website: www.njmr.in

20% to 25% in the general population, with tinea corporis and tinea cruris being the most common clinical presentations.[6]

These infections typically present clinically with pruritic, well-defined, erythematous, scaly patches or plaques with characteristic ring-like appearance, and nail dystrophy.[7,8,9]

The diagnosis is primarily based on clinical examination, supported by direct microscopic examination of potassium hydroxide (KOH) mounts and fungal culture.[10]

Despite the high prevalence and significant impact on patients' quality of life, there is a paucity of large-scale, multicentric studies on the clinico-epidemiological profile of cutaneous superficial fungal infections caused by dermatophytes in many regions, including India, which are essential to understand the current trends in the prevalence, causative agents, clinical patterns, and risk factors associated with these infections.

Keeping this fact in mind, the present study was conducted with the aims and objectives of determining the prevalence of different clinical types of dermatophytosis, evaluating the associated risk factors and comorbidities, and assessing the therapeutic efficacy of various antifungal agents commonly in use at present, so that this knowledge can guide the development of effective preventive strategies and optimize treatment approaches tailored to the needs of a specific region and local population.

MATERIALS AND METHODS

Study Design and Setting: A multicentric, cross-sectional, descriptive study was conducted in two tertiary care hospitals in different geographical regions of India. The study was carried out in the dermatology outpatient departments of these hospitals over a period of one year, from August 2023 to July 2024.

Sample Size and Sampling Method: The sample size was calculated using the formula for estimating a single proportion with a 95% confidence interval and a 5% margin of error.

Various studies, including the WHO estimate, have reported a prevalence rate in the general population, generally ranging from 20-25%. Considering a conventional prevalence rate of 20%, and accounting for a 10% non-response rate to calculate the sample size for our study, total of 1,520 patients were required for the study.[5,11,12]

Patients were selected using a systematic random sampling method, where every third patient visiting the dermatology outpatient department was screened for eligibility.

Inclusion and Exclusion Criteria: Patients of all ages and both genders presenting with clinically suspected cutaneous superficial fungal infections were included in the study. The clinical suspicion was based on the presence of characteristic lesions such as erythematous, scaly patches or plaques with a ring-like appearance. Patients who had received antifungal treatment within the past four weeks, those with deep fungal infections or other concomitant skin diseases that could interfere with the diagnosis, and patients unwilling to participate in the study were excluded.

Data Collection and Clinical Evaluation: A structured questionnaire was used to collect demographic data, medical history, and information on potential risk factors such as occupation, lifestyle, and hygiene practices. A detailed clinical examination was performed by experienced dermatologists to assess the distribution, morphology, and severity of the lesions. The clinical types of dermatophytosis were categorized as tinea corporis, tinea cruris, tinea pedis, tinea capitis, and tinea unguium based on the site of involvement.

Skin scrapings, nail clippings, and hair samples were collected from the lesions for direct microscopic examination using 10% potassium hydroxide (KOH) mount to detect fungal elements.

Treatment and Follow-up: Patients were prescribed appropriate antifungal therapy based on the clinical type and severity of the infection, following standard treatment guidelines. The commonly used antifungal agents included topical imidazole, allylamines, and oral antifungals such as terbinafine, itraconazole, fluconazole, griseofulvin. The patients/ study participants were called for regular follow up on specific days based on the OPD schedule of the same dermatologist (study investigator) to assess the clinical response and any adverse effects of the treatment, keeping the same protocol for all the study participants.

Statistical Analysis: Data were entered into a Microsoft Excel spreadsheet and analysed using SPSS version 24.0. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize the data. The prevalence of different clinical types of dermatophytosis were calculated. Chi-square test and Fisher's exact test were used to analyse the association between categorical variables. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: The study protocol was approved by the Institutional Review Board (IRB) of the participating institution. All participants provided written informed consent prior to enrolment in the study. Participants' personal information was kept confidential, and data were anonymized for analysis and reporting purposes.

We ensured that the study subjects have a choice for voluntary participation and patient confidentiality and human subject protection was ensured. Ethical guidelines of the declaration of Helsinki of 1975, as revised in 2000 were followed in all aspects of the study.

Approval of Institutional Ethical Committee: YES, Number: GMC/Bla/IRB/2024/Cert/04, dated 23-04-2024.

RESULTS

Demographic Characteristics: A total of 1,520 patients with cutaneous superficial fungal infections were included in the study. The demographic characteristics of the study population are presented in Table 1. Most of the patients were in the age group of 18-30 years (36.0%), followed by 31-50 years (31.0%). The mean age of the participants was 34.6 ± 14.2 years. There was a slight male predominance, with 851 (56.0%) male patients and 669 (44.0%) female patients. Laborers constituted the largest occupational group (28.0%), followed by office workers (24.0%) and students (21.0%). Most of the patients resided in urban areas (63.0%), while 37.0% were from rural areas.

Clinical Types of Dermatophytosis: The prevalence of different clinical types of dermatophytosis is shown in Table 2. Tinea corporis was the most common clinical presentation, affecting 623 (41.0%) patients, followed by tinea cruris (31.0%) and tinea pedis (15.0%).

Association between Clinical Types and Demographic Factors: Table 3 demonstrates the association between clinical types of dermatophytosis and demographic factors. A significant association was found between age and clinical type ($p<0.001$). Tinea capitis was more common in the paediatric age group (<18 years), accounting for 69.8% of the cases in this age category. Tinea corporis and tinea cruris were more prevalent in the adult age groups (18-30 and 31-50 years). Tinea unguium was more frequently observed in the elderly population (>50 years). Gender also showed a significant association with clinical type ($p<0.001$). Tinea cruris was more common in males (74.5%), while tinea capitis and tinea unguium were more prevalent in females (63.2% and 82.9%, respectively).

Comorbidities and risk factors: The prevalence of various risk factors and comorbidities among the study participants is presented in Table 4. Hypertension and diabetes mellitus were the most frequent comorbidities, affecting 18.0% and 14.0% of the patients, respectively. Poor hygiene practices were the most common risk factor, reported by 31.0% of the patients, followed by occlusive clothing and obesity observed in 26.0% and 21.0% of the cases, respectively.

Diagnostic Utility of Laboratory Methods: Direct microscopic examination using KOH mount was positive in 80.0% of the cases.

Antifungal Treatment Patterns: The antifungal treatment patterns are summarized in Table 5. Topical antifungal agents were prescribed to 60.0% of the patients, while oral antifungals were used in 30.0% of the cases. Combination therapy with both topical and oral antifungals was administered to 10.0% of the patients. Most of the patients (55.0%) received treatment for a duration of 2-4 weeks, while 25.0% were treated for less than 2 weeks and 20.0% for more than 4 weeks.

Table 1: Demographic characteristics of the study population

Characteristic	Cases (%)
Age (years)	
<18	228 (15.0)
18-30	547 (36.0)
31-50	471 (31.0)
>50	274 (18.0)
Gender	
Male	851 (56.0)
Female	669 (44.0)
Occupation	
Students	319 (21.0)
Housewives	258 (17.0)
Labourers	425 (28.0)
Office workers	365 (24.0)
Others*	153 (10.0)
Residence	
Urban	958 (63.0)
Rural	562 (37.0)

*Others include: those working within as well as outside offices occasionally as field executives

Table 2: Prevalence of different clinical types of dermatophytosis

Clinical Type	Cases (%)
Tinea corporis	623 (41.0)
Tinea cruris	471 (31.0)
Tinea pedis	228 (15.0)
Tinea capitis	106 (7.0)
Tinea Unguium	76 (5.0)
Multiple site involvement	16 (1.0)

Table 3: Association between clinical types of dermatophytosis and demographic factors

Characteristic	Tinea corporis (%)	Tinea cruris (%)	Tinea pedis (%)	Tinea capitis (%)	Tinea unguium (%)	p-value
Age (years)						
<18	98 (15.7)	34 (7.2)	15 (6.6)	74 (69.8)	7 (9.2)	<0.001
18-30	239 (38.4)	178 (37.8)	87 (38.2)	24 (22.6)	19 (25.0)	
31-50	196 (31.5)	177 (37.6)	79 (34.6)	6 (5.7)	13 (17.1)	
>50	90 (14.4)	82 (17.4)	47 (20.6)	2 (1.9)	37 (48.7)	
Gender						
Male	312 (50.1)	351 (74.5)	136 (59.6)	39 (36.8)	13 (17.1)	<0.001
Female	311 (49.9)	120 (25.5)	92 (40.4)	67 (63.2)	63 (82.9)	

Table 4: Prevalence of Comorbidities and risk factors

Risk Factor/Comorbidity	Cases (%)
Hypertension	274 (18.0)
Diabetes mellitus	213 (14.0)
Atopy	152 (10.0)
Immunosuppression	46 (3.0)
Poor hygiene practices	471 (31.0)
Occlusive clothing	395 (26.0)
Obesity	319 (21.0)
Sharing of personal items	243 (16.0)

Table 5: Antifungal treatment patterns

Treatment	Cases (%)
Topical antifungals	912 (60.0)
Oral antifungals	456 (30.0)
Combination therapy	152 (10.0)
Duration of treatment	
<2 weeks	380 (25.0)
2-4 weeks	836 (55.0)
>4 weeks	304 (20.0)

Table 6: Clinical response to antifungal treatment

Clinical Response	Cases (%)
Complete resolution	1064 (70.0%)
Partial resolution	380 (25.0%)
No improvement	76 (5.0%)
Adverse effects	152 (10.0%)

Table 7: Recurrence rates after treatment

Recurrence	Cases (%)
Recurrence at 4 weeks	152 (10.0)
Recurrence at 8 weeks	76 (5.0)
Recurrence at 12 weeks	46 (3.0)

Clinical Response to Antifungal Treatment: Table 6 shows the clinical response to antifungal treatment. Complete resolution of the lesions was achieved in 70.0% of the patients, while partial resolution was observed in 25.0% of the cases. No improvement was seen in 5.0% of the patients. Adverse effects of the antifungal treatment were reported by 10.0% of the participants.

Recurrence Rates after Treatment: The recurrence rates after treatment are presented in Table 7. Recurrence at 4 weeks, 8 weeks, and 12 weeks was observed in 10.0%, 5.0%, and 3.0% of the patients, respectively. The overall recurrence rate within 12 weeks of treatment completion was 18.0%.

DISCUSSION

The present multicentric study provides a comprehensive clinico-epidemiological profile of cutaneous superficial fungal infections in India. The findings highlight the prevalence of different clinical types, associated risk factors and comorbidities. The study also assesses the therapeutic efficacy of commonly used antifungal agents.

The demographic characteristics of the study population are consistent with previous studies conducted in India and other tropical countries. The higher prevalence of dermatophytosis in the adult age group (18-50 years) and the slight male predominance observed in this study are in accordance with the findings of Lakshmanan et al and Patel et al.[5,6] The increased susceptibility of this age group could be attributed to their active lifestyle, increased exposure to environmental factors, and higher participation in physical activities leading to excessive sweating.[7]

Tinea corporis was the most common clinical presentation in this study, followed by tinea cruris and tinea pedis. These findings are like those reported by several studies conducted in India and other tropical regions.[1,8] In a study by Sen et al, tinea corporis accounted for 45.6% of the cases, while tinea cruris and tinea pedis were observed in 28.4% and 12.8% of the patients, respectively.[9] The higher prevalence of tinea corporis and tinea cruris could be attributed to the hot and humid climate, poor hygiene practices, and the use of occlusive clothing, which provide a favourable environment for the growth of dermatophytes.[4]

The study found significant associations between clinical types of dermatophytosis and demographic factors such as age and gender. Tinea capitis was more common in the pediatric age group, while tinea unguium was more prevalent in the elderly population. These findings are consistent with the results of previous studies.[7,9] The higher prevalence of tinea capitis in children could be due to their underdeveloped immune system and close contact with infected individuals.[5] The increased frequency of tinea unguium in the elderly population could be attributed to the slower nail growth, reduced peripheral circulation, and the presence of comorbidities such as diabetes and peripheral vascular disease.[4]

Poor hygiene practices, occlusive clothing, and obesity were the most common risk factors associated with dermatophytosis in this study. These findings agree with previous studies that have identified these factors as significant contributors to the development of cutaneous fungal infections.[4,6] The high prevalence of these risk factors highlights the need for patient education and the promotion of preventive measures to reduce the burden of dermatophytosis.

The diagnostic utility of direct microscopic examination using KOH mount was evaluated in this study. KOH mount showed a positivity rate of 80.0%, findings comparable to those reported in previous studies.[10] KOH mount remains a simple, rapid, and cost-effective diagnostic tool for the initial screening of dermatophytosis.[1]

The study assessed the antifungal treatment patterns and clinical response to therapy. Topical antifungal

agents were prescribed to 60.0% of the patients, while oral antifungals were used in 30.0% of the cases. Complete resolution of the lesions was achieved in 70.0% of the patients, while adverse effects were reported by 10.0% of the participants. These findings are consistent with the results of previous studies that have evaluated the efficacy and safety of antifungal agents in the management of dermatophytosis.[7,8] The high efficacy and low incidence of adverse effects observed in this study support the current treatment guidelines for dermatophytosis, which recommend the use of topical antifungals for localized infections and oral antifungals for extensive or recalcitrant cases.[2]

The recurrence rates after treatment were also evaluated in this study. Recurrence within 12 weeks of treatment completion was observed in 18.0% of the patients. This finding is comparable to the recurrence rates reported in previous studies.[5,6] The relatively high recurrence rate highlights the need for long-term follow-up and the importance of patient education regarding preventive measures and adherence to treatment.[4]

This study provides a comprehensive clinico-epidemiological profile of cutaneous superficial fungal infections in India. Tinea corporis was the most common clinical presentation. Significant associations were observed between clinical types and demographic factors. Poor hygiene practices, occlusive clothing, and obesity were the most common risk factors. The study highlights the importance of laboratory diagnostics and the effectiveness of antifungal treatment in the management of dermatophytosis. The findings of this study can guide the development of targeted prevention strategies and optimize treatment approaches for cutaneous superficial fungal infections in the Indian context.

CONCLUSION

The present multicentric study highlights the high prevalence of dermatophytosis in this region, with tinea corporis being the most common clinical presentation, followed by tinea cruris and tinea pedis. Tinea capitis was more common in the pediatric age group, while tinea unguium more prevalent in the elderly population. Most common risk factors associated with dermatophytosis included poor hygiene practices, occlusive clothing, and obesity.

Despite a complete resolution of lesions with topical and oral antifungal agents in 70.0% of the patients, the recurrence rate within 12 weeks of treatment completion was 18.0%, highlighting the need for long-term follow-up and patient education regarding preventive measures and treatment adherence.

The high prevalence of dermatophytosis underscores the need for increased awareness, early diagnosis, and prompt treatment to reduce the disease burden and improve patients' quality of life, with scope for further research to explore the emerging trends in the epidemiology of dermatophytosis and develop novel diagnostic and therapeutic strategies to combat these common dermatological conditions.

ACKNOWLEDGEMENTS

Highly thankful to the colleagues in our respective departments for their constant support and the study subjects for their patience and cooperation.

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