Section: Dermatology

Original Research Article

CLINICO-MYCOLOGICAL PROFILE OF TINEA CORPORIS AND ITS ASSOCIATION WITH DIABETES MELLITUS IN EASTERN INDIA

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Received *: 20/05/2026*
Received in revised form *: 12/07/2026*
Accepted *: 27/07/2026*

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DOI: 10.70034/ijmedph.2026.3.469

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (3); 2994-3000

ABSTRACT

Background: Due to rising chronicity, recurrence, and antifungal resistance, tinea corporis—one of the most prevalent superficial fungal diseases globally has become a major public health problem in India. Although diabetes mellitus has been identified as a possible risk factor affecting the severity and duration of dermatophyte infections, little is known about how it relates to the clinico-mycological profile of tinea corporis in Eastern India. Supplies and Procedures. **Materials and Methods:** In a tertiary care facility in Eastern India, 150 adult patients with clinically confirmed tinea corporis participated in cross-sectional research. In-depth clinical assessment, fungal culture on Sabouraud Dextrose Agar, direct microscopic inspection using potassium hydroxide (KOH) mount, species identification, and antifungal susceptibility testing were carried out. Glycated haemoglobin levels, fasting plasma glucose, and recorded medical history were used to diagnosis diabetes mellitus. Using the proper statistical procedures, clinical and mycological features were compared between patients with and without diabetes; $p<0.05$ was deemed statistically significant. **Results:** Males predominated, and most patients were in the 31–45 age range. Fungal culture positive was found in 78.7% of cases and KOH positivity in 88.0% of cases. The most often isolated dermatophyte was Trichophyton rubrum, which was followed by the Trichophyton mentagrophytes complex. While multidrug-resistant isolates and decreased susceptibility to fluconazole were found, itraconazole showed the greatest susceptibility rate. 32.0% of patients had diabetes mellitus, which was substantially linked to prolonged illness duration ($p<0.001$), multiple-site involvement ($p=0.002$), severe pruritus ($p=0.008$), recurrent infection ($p=0.002$), and poor treatment response ($p=0.006$).
Conclusions: Trichophyton mentagrophytes complex predominance and growing antifungal resistance are the hallmarks of tinea corporis in Eastern India. Increased disease severity, recurrence, and poor treatment results are all closely linked to diabetes mellitus. Clinical results for people with diabetes may be improved by early detection of the condition and the use of focused care techniques."

Keywords: Tinea corporis; Dermatophytosis; Diabetes mellitus; Clinico-mycological profile; Antifungal resistance; *Trichophyton mentagrophytes*; Eastern India.

INTRODUCTION

One of the most common superficial fungal diseases in the world, dermatophytosis poses a serious threat to public health, especially in tropical and subtropical areas with high humidity and temperatures. One of the most common clinical presentations of dermatophyte infections is tinea corporis, which appears as annular, erythematous, scaly lesions on the body's glabrous skin.[2] The prevalence, clinical behaviour, and treatment response of dermatophytosis have changed significantly over the last ten years, particularly in

South Asian nations like India, despite the condition's historical perception of being largely benign and readily curable.[1-9]"

The prevalence of chronic, recurring, and treatment-refractory dermatophytosis has increased unprecedentedly in India, prompting some researchers to characterise the condition as an epidemic of resistant fungal infections.[1,10-13]

This evolving situation has been linked to a number of causes, including the rise of antifungal-resistant dermatophyte strains, indiscriminate antifungal usage, poor treatment adherence, and widespread overuse of topical corticosteroid-containing formulations.[8,10,13] The Trichophyton mentagrophytes/Trichophyton indotineae complex has replaced Trichophyton rubrum as the predominant causative species, according to recent molecular and epidemiological research. This change has been linked to increased virulence, widespread disease, and decreased susceptibility to widely used antifungal medications like terbinafine.[3,5,7-15]

At the same time, diabetes mellitus has become a significant global health concern, and India has one of the biggest diabetic populations in the world. Because hyperglycemia is known to disrupt innate and adaptive immune responses, change the function of the epidermal barrier, and promote microbial colonisation of the skin, the combination of dermatophytosis and diabetes mellitus is particularly clinically significant.[6,8-15] These pathophysiological changes may make diabetics more susceptible to fungal infections and lead to longer illness duration, repeated episodes, widespread lesion distribution, and worse than ideal treatment results.[6,9] Dermatophytosis is more common in diabetic patients, according to earlier research; nevertheless, the extent of its impact on clinical presentation, mycological traits, and treatment response is still unclear, especially in settings with limited resources.[6,8]

"Understanding host-related variables that contribute to the persistence and recurrence of dermatophyte diseases has received more attention in recent years. However, only a small number of studies have thoroughly examined the relationship between diabetes mellitus and the clinico-mycological profile of tinea corporis; the majority of existing research has either concentrated on the epidemiology of dermatophytosis or on antifungal susceptibility patterns.[4,6,14] Furthermore, even though the climate in Eastern India is quite favourable for the spread of dermatophytes, there is still a dearth of data from this area."

A thorough evaluation of the distribution of fungal species, antifungal sensitivity patterns, and clinical symptoms in both diabetes and non-diabetic people may provide important insights into the pathophysiology of the illness and guide evidence-based treatment approaches. In the present period of increased diabetes incidence and antifungal resistance, such knowledge is very pertinent. In order to assess the relationship between diabetes mellitus and disease severity, recurrence, lesion extent, and treatment response, the current study was conducted to examine the clinico-mycological profile of tinea corporis patients attending a tertiary care center in Eastern India. Characterising the prevalent dermatophyte species and their patterns of antifungal sensitivity within the research population was another goal of the investigation.

MATERIALS AND METHODS

In cooperation with the Department of Microbiology, the Department of Dermatology, Venereology, and Leprology at Hi-Tech Medical College & Hospital at Raurkela, Odisha, a teaching hospital in Eastern India carried out this cross-sectional observational research. The research was conducted from January 2024 to June 2025, a span of eighteen months. The goal was to assess the clinico-mycological profile of tinea corporis patients and look into the relationship between diabetes mellitus and treatment response, illness severity, and recurrence. Patients with clinically suspected tinea corporis who visited the dermatology outpatient department underwent eligibility screening. After receiving written informed permission, 150 consecutive patients who met the inclusion criteria were included."

Inclusion and Exclusion Criteria

Patients aged 18 years or older attending the dermatology outpatient clinic with clinical features suggestive of tinea corporis were assessed for study participation. Enrollment was restricted to individuals in whom the diagnosis was confirmed through both clinical examination and mycological investigations, thereby ensuring a high degree of diagnostic certainty. The clinical diagnosis was based on the presence of typical dermatophytic lesions, including well-defined annular or polycyclic erythematous plaques with active scaly margins, central clearing, and associated pruritus when present. Mycological confirmation was established by the detection of fungal hyphae on direct microscopic examination of skin scrapings using a 10–20% potassium hydroxide (KOH) mount and, where feasible, by the growth and identification of dermatophytes on fungal culture. Patients were included only when the clinical findings were supported by positive mycological evidence. Individuals with either newly diagnosed or previously documented diabetes mellitus were eligible, provided the diagnosis was verified according to accepted diagnostic guidelines or authenticated medical records. Written informed consent was obtained from all participants before enrollment, and only those with complete clinical, mycological, and diabetes-related laboratory data were considered for the final analysis.

Clinical Evaluation: Using a standardised case-record form, each participant provided a thorough

clinical history. Age, sex, employment, length of sickness, family history of dermatophytosis, prior therapy, infection recurrence, and related comorbidities were all noted. To evaluate the shape, distribution, quantity, and extent of lesions, a comprehensive dermatological examination was carried out. The degree of pruritus was classified as mild, moderate, or severe according to the patient's reported symptom intensity and how it affected their day-to-day activities. When lesions impacted more than one anatomical location, the disease extent was categorised as multiple-site involvement; otherwise, it was classed as localised.

"Diabetes Mellitus Assessment: Every participant had their glycated haemoglobin (HbA1c) and fasting blood glucose levels measured. The American Diabetes Association's diagnostic criteria were used to categorise patients as having diabetes. People were classified as diabetics if they had a documented history of diabetes mellitus and were undergoing treatment, or if their fasting plasma glucose was ≥126 mg/dL and/or their HbA1c was ≥6.5%. Individuals who did not fit these requirements were categorised as non-diabetic."

Specimen Collection: Using a sterile scalpel blade, skin scrapings were taken aseptically from the active peripheral perimeter of the lesion after the afflicted region had been cleaned with 70% isopropyl alcohol. Two sections of the obtained materials were separated for fungal culture and direct microscopic analysis.

Direct Microscopic Analysis: Skin scrapings were subjected to light microscopy after being treated with a 10% potassium hydroxide (KOH) solution. Dermatophyte infection was thought to be indicated by the presence of septate branching fungal hyphae. Positive or negative microscopic results were noted.

Fungal Culture and Identification: Samples were inoculated onto Sabouraud Dextrose Agar (SDA) supplemented with cycloheximide and chloramphenicol. For up to four weeks, culture tubes were frequently checked while being incubated at 28–30°C. Fungal isolates were identified utilising colony shape, pigmentation, growth parameters, and microscopic analysis with lactophenol cotton blue mounts. Standard mycological criteria were used to identify dermatophyte species.

"Antifungal Susceptibility Testing: The Clinical and Laboratory Standards Institute (CLSI) broth microdilution technique was used to evaluate culture-positive isolates for antifungal susceptibility. Itraconazole, fluconazole, and terbinafine susceptibility patterns were identified. Multidrug resistant isolates were defined as those that showed resistance to two or more antifungal drugs."

Ethical Considerations: Prior to the study's start, the Institutional Ethics Committee examined and approved the protocol. Every procedure was carried out in compliance with the Declaration of Helsinki's ethical guidelines; all participants gave their written informed permission before being enrolled, and patient data was kept private at all times."

Statistical Analysis: "The Statistical Package for the Social Sciences (SPSS) program, version 26.0 (IBM Corp., Armonk, NY, USA), was used to analyse the data after they were imported into Microsoft Excel. While categorical data were shown as frequencies and percentages, continuous variables were given as mean ± standard deviation (SD). The independent Student's t-test for continuous variables and the Chi-square test or Fisher's exact test for categorical variables, as applicable, were used to compare the diabetes and non-diabetic groups. To assess the strength of connections, odds ratios (ORs) with 95% confidence intervals (CIs) were computed. Statistical significance was defined as a two-tailed p-value of less than 0.05.

RESULTS

The research participants' clinical and demographic details are shown in Table 1. The research comprised 150 participants with a clinical diagnosis of tinea corporis. With 56 (37.3%) patients, the age group of 31–45 years old had the largest percentage of cases, followed by 42 (28.0%) patients in the 18–30 age range. Patients between the ages of 46 and 60 made up 25.3% (n=38) of the study population, while those beyond 60 made up the smallest age group with 14 (9.4%) instances. The study's male-to-female ratio was almost 1.6:1, with 92 (61.3%) of the participants being male and 58 (38.7%) being female. Sixty-three (42.0%) patients said that their symptoms had persisted for three to six months. 51 (34.0%) patients had lesions that lasted less than three months, whereas 36 (24.0%) had lesions that lasted more than six months. When pruritus was assessed, 74 individuals (49.3%) had moderate itching, which was the most prevalent manifestation. 32 (21.3%) of the subjects reported only moderate itching, while 44 (29.4%) reported severe pruritus. While 52 (34.7%) individuals had multiple-site involvement, the majority of patients (65.3%, n=98) had localised lesions affecting a single body location. 47 (31.3%) of the patients had a positive family history of dermatophytosis, but the remaining 103 (68.7%) patients denied that any family members had a comparable condition. Of the participants in the research, 102 (68.0%) did not have diabetes, whereas 48 (32.0%) had been diagnosed with the disease.

Table 1: Demographic and Clinical Characteristics of Patients with Tinea Corporis (N = 150)

Variable	Number (n)	Percentage (%)
Age Group (years)		
18–30	42	28.0
31–45	56	37.3
46–60	38	25.3
>60	14	9.4
Gender		
Male	92	61.3
Female	58	38.7
Duration of Disease		
<3 months	51	34.0
3–6 months	63	42.0
>6 months	36	24.0
Pruritus Severity		
Mild	32	21.3
Moderate	74	49.3
Severe	44	29.4
Extent of Lesions		
Localized	98	65.3
Multiple sites	52	34.7
Family History of Dermatophytosis		
Present	47	31.3
Absent	103	68.7
Diabetes Mellitus Status		
Diabetic	48	32.0
Non-diabetic	102	68.0

The mycological results for the research participants are shown in Table 2. Using potassium hydroxide (KOH) mount, direct microscopic analysis revealed fungal elements in 132 (88.0%) patients, while 18 (12.0%) samples tested negative. In 118 (78.7%) specimens, fungal culture produced growth, whereas in 32 (21.3%) instances, no growth was seen. With 58 (49.2%) of the isolates that were culture-positive, the Trichophyton mentagrophytes complex was the most common dermatophyte species. The second most common isolated organism was Trichophyton rubrum, which was found in 34 (28.8%) instances. Additional dermatophyte species included Epidermophyton floccosum in 6 (5.0%) isolates, Microsporum gypseum in 8 (6.8%) isolates, and Trichophyton tonsurans in 12 (10.2%) isolates. The maximum sensitivity was found with itraconazole, to which 96 (81.4%) isolates were sensitive, according to an analysis of antifungal susceptibility patterns. Only 52 (44.1%) isolates showed susceptibility to fluconazole, whereas 71 (60.2%) isolates showed sensitivity to terbinafine. Additionally, 18 (15.3%) fungal isolates showed multidrug resistance, suggesting the existence of strains with decreased sensitivity to many antifungal medications.

Table 2: Mycological Findings among Study Participants (N = 150)

Mycological Parameter	Number (n)	Percentage (%)
KOH Mount Examination		
Positive	132	88.0
Negative	18	12.0
Fungal Culture		
Positive	118	78.7
Negative	32	21.3
Species Isolated (n = 118)		
Trichophyton mentagrophytes complex	58	49.2
Trichophyton rubrum	34	28.8
Trichophyton tonsurans	12	10.2
Microsporum gypseum	8	6.8
Epidermophyton floccosum	6	5.0
Antifungal Susceptibility Pattern		
Sensitive to terbinafine	71	60.2
Sensitive to itraconazole	96	81.4
Sensitive to fluconazole	52	44.1
Multidrug-resistant isolates	18	15.3

The relationship between diabetes mellitus and the clinical severity of tinea corporis is shown in Table 3. Patients with and without diabetes had significantly different illness outcomes and features. Patients with diabetes had a substantially longer mean illness duration (7.2 ± 2.8 months) than those without the disease (4.6 ± 2.1 months), and this difference was statistically significant ($p<0.001$). Only 27 (26.5%) individuals without diabetes showed a comparable pattern of disease distribution, whereas 25 (52.1%) diabetic patients had multiple-site involvement. There was a statistically

significant difference (p=0.002). Compared to 23 (22.5%) patients in the non-diabetic group, 21 (43.8%) diabetes patients reported having severe pruritus (p=0.008). The observed difference did not achieve statistical significance (p=0.074), despite the fact that fungal culture positive was greater in diabetes patients (87.5%) than in non-diabetic individuals (74.5%). Patients with diabetes had recurrent bouts of tinea corporis at a rate of 19 (39.6%) compared to 17 (16.7%) in the non-diabetic group (p=0.002). Similarly, only 14 (13.7%) non-diabetic patients shown insufficient clinical improvement after eight weeks of therapy, whereas 16 (33.3%) diabetic patients had unsatisfactory therapeutic response (p=0.006). In general, individuals with tinea corporis who had diabetes mellitus had longer illness duration, more lesion spread, more severe symptoms, higher recurrence rates, and worse treatment results.

Table 3: Association of Diabetes Mellitus with Clinical Severity and Recurrence of Tinea Corporis

Variable	Diabetic (n=48)	Non-diabetic (n=102)	p-value
Mean duration of disease (months)	7.2 ± 2.8	4.6 ± 2.1	<0.001
Multiple-site involvement	25 (52.1%)	27 (26.5%)	0.002
Severe pruritus	21 (43.8%)	23 (22.5%)	0.008
Positive fungal culture	42 (87.5%)	76 (74.5%)	0.074
Recurrent infection	19 (39.6%)	17 (16.7%)	0.002
Poor treatment response after 8 weeks	16 (33.3%)	14 (13.7%)	0.006

DISCUSSION

In this research, patients at a tertiary care facility in Eastern India were assessed for the clinico-mycological profile of tinea corporis and its correlation with diabetes mellitus. The results show that in individuals with dermatophytosis, diabetes mellitus has a significant role in determining the chronicity, severity, recurrence, and responsiveness to therapy. The report also emphasises the Trichophyton mentagrophytes complex's ongoing dominance and the growing problem of antifungal resistance in the Indian subcontinent."

The bulk of the patients in this research were male and fell within the economically productive age range of 31 to 45. Increased work exposure, perspiration, outdoor activities, and healthcare-seeking behaviour among men were suggested as contributing variables in a number of Indian research that observed similar demographic patterns.[1,12] Our study's preponderance of young and middle-aged people supports global findings indicating post-pubertal individuals and working-age populations exposed to humid environments are more likely to develop tinea corporis.[2] Dermatophyte multiplication and transmission are facilitated by the study's high humidity and extended warm weather.

"The large percentage of patients with moderate-to-severe pruritus, multifocal involvement, and a disease duration longer than three months was a significant clinical finding in this research. These results are consistent with the evolving dermatophytosis epidemiological trend in India, where persistent and resistant infections have been more prevalent over the last ten years.[13] Prolonged illness duration was identified as a key clinical issue in a study that indicated a significant burden of recurrent dermatophytosis in India.[12] Recent international studies that describe an increasing global frequency of recurring and challenging-to-treat tinea infections have shown similar findings.[14]"

The current study's mycological results showed that 78.7% of samples had culture positive and 88.0% of cases had KOH positivity. These percentages are similar to those seen in recent Indian clinico-mycological investigations, where culture positive varies between 60% and 85% depending on specimen quality and laboratory procedures, whereas KOH positivity typically ranges between 75% and 90%.[4,15] Our study's excellent diagnostic yield validates the use of fungal culture and direct microscopy as supplementary diagnostic techniques in standard clinical practice.

The Trichophyton mentagrophytes complex was found to be predominant, accounting for over half of all isolates that tested positive in culture. This discovery aligns with previous observations from India that show the Trichophyton mentagrophytes/Trichophyton indotineae combination has replaced the formerly prevalent Trichophyton rubrum.[4,7,16] This epidemiological shift has been linked to greater virulence, widespread illness, higher recurrence rates, and decreased terbinafine susceptibility, according to many studies.[3,5,17] Similar patterns of these strains spreading beyond their initial geographic borders have already been shown.[5,15]

Our study's antifungal susceptibility pattern adds credence to current worries about developing resistance. While fluconazole was somewhat less effective, itraconazole had the greatest susceptibility rate. Additionally, multidrug-resistant isolates and decreased sensitivity to terbinafine were noted. These results are consistent with previous research conducted in India and elsewhere that shows Trichophyton species, especially those in the T. mentagrophytes/T. indotineae complex, are becoming more resistant to antifungals.[8,10,17] Squalene epoxidase gene alterations have been identified by researchers as a primary mechanism behind terbinafine resistance, which leads to

treatment failures and recurring illness.[8,10] As a result, reasonable antifungal management and frequent susceptibility testing may become more crucial in the treatment of persistent dermatophytosis.

The examination of the connection between tinea corporis and diabetes mellitus is the study's most important contribution. The significant overlap between these two illnesses is shown by the fact that almost one-third of the study sample had diabetes. Compared to those without diabetes, diabetic patients had much longer illness duration, more widespread lesion distribution, greater incidence of severe pruritus, increased recurrence, and worse treatment results. These results are physiologically realistic and consistent with other studies showing that hyperglycemia increases vulnerability to fungal infections by impairing neutrophil activity, cell-mediated immunity, and epidermal barrier integrity.[6,8]

Our results are in line with those of Rajagopal et al., who found that dermatophytosis is more common, severe, and persistent in people with diabetes than in those without the disease.[6] Similarly, research has shown that diabetes mellitus is a significant risk factor for both delayed clinical remission and widespread dermatophyte infections.[8,9] Persistent hyperglycemia, decreased local immune responses, and a changed epidermal milieu that encourages fungal colonisation and persistence might all contribute to the longer illness duration shown in diabetic individuals in our research. Additionally, patients with diabetes showed a markedly increased incidence of poor treatment response, corroborating earlier findings that metabolic dysregulation may negatively impact therapeutic results.[6,9]

Patients with diabetes had a numerically greater fungal culture positive, although this difference was not statistically significant. This result implies that diabetes may have more of an impact on the severity and durability of the illness than on the rates of fungus isolation. Previous research analysing the microbiological profile of dermatophytosis in diabetic individuals has shown similar findings.[6,5]

The study's limitations There are many limitations to the current investigation. First, a causal association between the severity of dermatophytosis and diabetes mellitus cannot be established due to its cross-sectional nature. Second, the results may not be as applicable to other parts of India since the research was limited to a single tertiary care facility. Third, it was unable to distinguish between Trichophyton mentagrophytes and Trichophyton indotineae because molecular identification methods such internal transcribed spacer (ITS) sequencing were not used. Fourth, there was no correlation between the severity of the illness and glycated haemoglobin (HbA1c) levels, making it impossible to evaluate how glycaemic management affects clinical outcomes. Lastly, the lack of longitudinal follow-up limited the assessment of therapy effectiveness and long-term recurrence.

CONCLUSION

The current research shows that Trichophyton mentagrophytes complex infections, high KOH and culture positive rates, and developing antifungal resistance patterns are the main characteristics of tinea corporis in Eastern India. Prolonged illness duration, substantial lesion involvement, severe symptoms, higher recurrence, and worse therapy response were all strongly linked to diabetes mellitus. These results highlight the need of routinely screening individuals with recurrent or chronic dermatophytosis for diabetes. Improving treatment results requires early diagnosis, glycaemic management optimisation, species-level fungus detection, and evidence-based antifungal medication. To further understand the intricate relationship between dermatophytosis and diabetes mellitus in the Indian population, more multicentric research using molecular diagnostics and long-term monitoring is necessary.

Conflict of interest: None among the authors.

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