Section: Miscellaneous

Original Research Article

TINEA PEDIS AMONG DIABETIC PATIENTS: CLINICAL CORRELATES AND RISK FACTOR ANALYSIS IN A TERTIARY CARE SETTING

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ABSTRACT

Background: Diabetes mellitus (DM) predisposes to superficial fungal infections owing to impaired immunity, poor glycaemic control, neuropathy, and footwear practices. Tinea pedis is a common dermatophytic infection in diabetics, associated with increased risk of secondary bacterial infections and diabetic foot complications. However, limited data are available from southern India on its prevalence and associated risk factors. **Objectives**: To determine the prevalence of tinea pedis among diabetic patients attending a tertiary care hospital and to evaluate demographic and clinical factors associated with infection.

Materials and Methods: This cross-sectional study included 198 patients with type 1 and type 2 DM attending outpatient and inpatient services at Prathima Relief Institute of Medical Sciences, Warangal, Telangana. Demographic and clinical data including age, sex, residence, smoking, BMI, glycaemic control, footwear practices, and peripheral neuropathy were recorded. All participants underwent clinical foot examination for evidence of tinea pedis. Data were analysed using SPSS v26.0, applying descriptive statistics and Chi-square tests.

Results: The mean age of participants was 54.1 ± 9.4 years; 54.0% were males and 61.1% resided in urban areas. The overall prevalence of tinea pedis was 35.4%. Prevalence was higher among rural residents (41.5%), smokers (40.4%), those with poor glycaemic control (38.6%), neuropathy (40.0%), and improper footwear users (41.7%). However, none of these associations reached statistical significance, though footwear showed a near-significant trend ($p = 0.08$).

Conclusion: Tinea pedis is common among diabetic patients, affecting more than one-third of individuals. While no factor showed a statistically significant association, rural residence, poor glycaemic control, neuropathy, and footwear practices emerged as clinically relevant contributors. Routine foot examination, patient education, and preventive strategies remain essential to reduce morbidity in diabetic populations.

Key words: Diabetes mellitus, Tinea pedis, superficial fungal infections, Glycaemic control, Peripheral neuropathy.

INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by persistent hyperglycaemia resulting from defects in insulin secretion, insulin action, or both. Globally, the prevalence of diabetes continues to rise, with India emerging as one of the countries most affected.[1] Patients with diabetes are at increased risk of various cutaneous infections owing to immune dysfunction, microvascular complications, and altered skin barrier function.[2] Among these, superficial fungal infections, particularly tinea pedis, are of considerable clinical importance.

Tinea pedis, commonly known as athlete's foot, is a dermatophyte infection of the feet caused predominantly by Trichophyton rubrum and Trichophyton mentagrophytes.[3] It is estimated to affect up to one-third of the general population worldwide, with an even higher prevalence among

individuals with diabetes.[4] Factors such as impaired immunity, poor glycaemic control, peripheral neuropathy, peripheral vascular disease, and occlusive footwear contribute to the increased susceptibility of diabetic patients to fungal foot infections.[5] Furthermore, tinea pedis can act as a portal of entry for bacterial pathogens, thereby predisposing individuals to cellulitis, diabetic foot ulcers, and, in severe cases, lower-limb amputations.[6]

Several studies have reported variable prevalence rates of tinea pedis in diabetic cohorts, ranging from 20% to 50%, depending on geographic region, diagnostic criteria, and study design.[7,8] For instance, hospital-based studies in Europe and Asia have documented higher frequencies, whereas community-based surveys tend to report lower rates. Despite these variations, there is consensus that diabetes constitutes an important risk factor for dermatophytic infections of the feet.[9] Footwear habits, hygiene practices, and climatic conditions further modulate the burden of disease.[10]

Early identification and management of tinea pedis in diabetic patients is essential, not only to relieve symptoms but also to prevent secondary complications that may increase morbidity.[6,11] However, there is limited regional data in India, particularly from southern states, regarding the prevalence and determinants of tinea pedis in diabetic populations.

The present study was therefore undertaken to estimate the prevalence of tinea pedis among diabetic patients attending a tertiary care hospital in Telangana and to assess the associated demographic and clinical risk factors.

MATERIALS AND METHODS

This cross-sectional study was conducted at the Department of General Medicine in association with Department of Dermatology at Prathima Relief Institute of Medical Sciences, Warangal, Telangana between April 2024 and May 2025. A total of 198 patients with type 1 and type 2 diabetes mellitus attending OPD and admitted to IPD were considered eligible.

Inclusion Criteria: Patients aged ≥ 18 years and above, clinically diagnosed as type 1 or type 2 diabetes mellitus according to American Diabetes Association (ADA) criteria, and willing to provide informed consent were included.

Exclusion Criteria: Patients under systemic or topical antifungal therapy within the last 4 weeks, with severe comorbid illness, with amputation or severe foot deformities and not willing to participate were excluded.

Written informed consent was obtained from study participants and study protocol was approved by the institutional ethics committee.

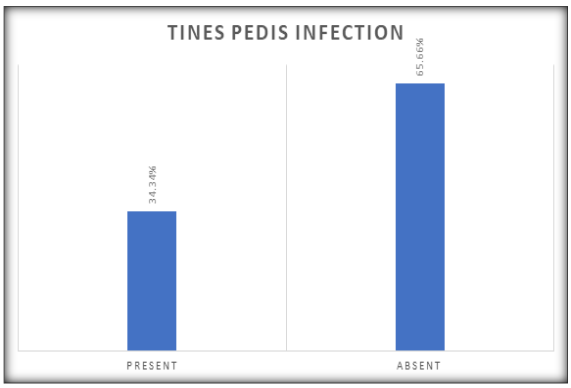
A structured clinical proforma were used to collect demographic details such as age, gender, and residence, clinical profile including duration of diabetes, smoking history, body mass index (BMI), glycaemic control, footwear practices, and presence of peripheral neuropathy. All the cases were subjected to clinical examination of both feet for evidence of dermatophyte infection.

The collected data was analysed by using SPSS v.26.0. Continuous variables were expressed as mean and standard deviation (SD). Categorical variables were expressed as frequency and percentage. Chi-square test was used to assess the association between risk factors and tinea pedis. p-value <0.05 was considered statistically significant outcome.

RESULTS

The mean age was 54.10 ± 9.36 years, with a male predominance (54.0%) compared to females (46.0%). The majority were from urban areas (61.1%), while 38.9% belonged to rural settings. The mean duration of diabetes was 7.39 ± 3.83 years, and the mean BMI was 26.50 ± 2.89 kg/m². A history of smoking was reported in 26.3% of cases. Regarding glycaemic status, 61.1% had poor control, whereas 38.9% maintained good control. In terms of footwear practices, 57.6% used proper footwear and 42.4% used improper footwear. Peripheral neuropathy was clinically present in 28.3% of patients. [Table 1]

Out of 198 participants, 35.4% were affected, while 64.6% showed no clinical evidence of infection, highlighting the considerable burden of superficial fungal infections in diabetic individuals. [Graph 1]



Graph 1: Prevalence of Tinea pedis infection among study participants

Gender was not significantly associated (χ^2=0.05, p=0.82). Although higher prevalence was observed among rural residents (41.5%) compared to urban (29.8%), the difference was not statistically significant (χ^2=2.41, p=0.12). Similarly, smoking history, glycaemic control, and neuropathy did not show statistically significant associations. Notably, footwear practices demonstrated a near-significant trend, with tinea pedis being more common among those using improper footwear (41.7%) compared to proper footwear users (28.9%) (χ^2=2.93, p=0.08). [Table 2]

Table 1: Demographic and clinical profile of study participants

Baseline characteristic	Mean ± SD
Age (In years)	54.10±9.36
Gender	
Male	107 (54.0%)
Female	91 (46.0%)
Residence	
Urban	121 (61.1%)
Rural	77 (38.9%)
Duration of diabetes	7.39 ± 3.83
Smoking	
Yes	52 (26.3%)
No	146 (73.7%)
BMI (kg/m2)	26.50 ± 2.89
Glycaemic control	
Good	77 (38.9%)
Poor	121 (61.1%)
Footwear	
Proper	114 (57.6%)
Improper	84 (42.4%)
Neuropathy	
Present	56 (28.3%)
Absent	142 (71.7%)

Table 2: Association of risk factors with Tinea Pedis

Risk Factor	Tinea infection	Baseline characters	Chi-square value	df	p-value
Gender	Absent	Female (n=61) Male (n=69)	0.05	1	0.82
	Present	Female (n=30) Male (n=38)			
Residence	Absent	Rural (n=45) Urban (n=85)	2.41	1	0.12
	Present	Rural (n=32) Urban (n=36)			
Smoking	Absent	No (n=99) Yes (n=31)	0.81	1	0.37
	Present	No (n=47) Yes (n=21)			
Glycaemic Control	Absent	Good (n=54) Poor (n=76)	0.82	1	0.36
	Present	Good (n=23) Poor (n=45)			
Footwear	Absent	Improper (n=49) Proper (n=81)	2.93	1	0.08
	Present	Improper (n=35) Proper (n=33)			
Neuropathy	Absent	Without (n=91) With (n=39)	0.33	1	0.56
	Present	Without (n=51) With (n=17)			

DISCUSSION

In this cross-sectional study of 198 patients with diabetes mellitus, the prevalence of clinically diagnosed tinea pedis was substantial (35.4%). Although several putative risk factors (rural residence, poor glycaemic control, peripheral neuropathy, and improper footwear) demonstrated higher proportions of tinea pedis, none reached conventional statistical significance; footwear practices showed a near-significant association (p = 0.08). These results both align with and differ from prior reports, and several methodological and contextual factors likely account for the similarities and differences observed.

The prevalence of tinea pedis among diabetic patients in our sample (≈35%) lies within the range reported in earlier clinical series. Some investigators reported similar prevalence estimates: Legge et al. reported culture-confirmed tinea pedis in roughly 40% overall, with 42.5% in the diabetic subgroup in their comparative study.[1] Other diabetes-focused studies have reported higher prevalence (over 50% in some cohorts) while community surveys in general adult populations often report lower prevalence, indicating that diabetes is a population at elevated risk.[4,7,9] The wide range of reported prevalences likely reflects differences in study setting (hospital vs community), case definition (clinical vs mycological confirmation), geographic and climatic factors, footwear and hygiene practices, and population characteristics such as age and comorbidities.

Footwear-related factors in our study showed a clear trend: improper footwear users had a higher proportion of tinea pedis (41.7% vs 28.9%) and footwear was the factor nearest to statistical

significance. This observation is consistent with mechanistic and epidemiological studies showing that occlusive, moisture-retaining footwear and contaminated shoes increase the risk of foot mycoses. Sasagawa et al. demonstrated that the internal microenvironment of footwear (temperature and humidity) influences the incidence of tinea pedis and tinea unguium, with occlusive conditions favoring dermatophyte growth.[10] Similarly, culture-based work has recovered Trichophyton spp. from the insoles and interiors of the shoes of affected individuals, supporting the role of contaminated footwear as a reservoir for reinfection.[11] Public health and clinical implications of these findings are straightforward: education about breathable footwear, regular drying/sanitizing of shoes, and avoiding prolonged occlusion can be practical preventive measures.

The relationship between glycaemic control and fungal infections is biologically plausible: hyperglycaemia impairs neutrophil function, alters skin barrier properties, and predisposes to both superficial and deep infections. Several studies of diabetic populations have reported increased frequency of fungal foot infections in those with poor glycaemic control.[7,8] In our cohort the prevalence of tinea pedis was numerically higher in the poor-control group (38.6% vs 32.1%) but this did not reach statistical significance. This discrepancy may reflect limited power, differences in how glycaemic control was classified, or confounding by other unmeasured factors (e.g., foot hygiene, duration and complications of diabetes). Broad epidemiologic work supports that overall infectious morbidity increases with poorer glycaemic control, even if individual studies of tinea pedis show heterogenous results.[13]

Peripheral neuropathy is a clinically important correlate neuropathy leads to sensory loss and altered foot care behaviour and can increase the risk of minor trauma and skin breakdown that facilitate fungal colonization and secondary bacterial infections. Several recent analyses identify diabetic peripheral neuropathy (DPN) and peripheral vascular disease as independent or contributory risk factors for tinea pedis and for complicated foot infections.[2] In our study neuropathy was more common among those with tinea pedis, but again the association was not statistically significant. The cross-sectional design precludes inference about temporality (e.g., whether neuropathy predisposes to tinea or tinea contributes to skin changes that aggravate neuropathic complications), but the clinical link is plausible and consistent with the literature.

Many studies report male predominance for tinea pedis, which has been attributed to greater exposure to communal wet environments and footwear habits; however female predominance has been observed in some regions, likely reflecting cultural and occupational factors.[3] Our cohort had a modest male predominance and no significant sex effect on tinea prevalence. Rural residence showed a numerically higher prevalence in our data; differences in footwear, occupational exposure, foot hygiene, and access to health education between rural and urban settings may account for this trend, and similar rural–urban differences have been reported in some populations.[14]

CONCLUSION

In conclusion, this study adds to the body of evidence that tinea pedis is common in people with diabetes and that footwear and diabetic complications like neuropathy, poor glycaemic control are clinically relevant correlates. Larger, preferably multicentre studies with standardized mycologic confirmation, and multivariable analyses adjusting for hygiene and occupational exposures, would help clarify the independent contributions of these risk factors. Interventional trials testing footwear-focused prevention would also be valuable to reduce the burden of recurrent tinea pedis in diabetic populations.

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