Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Dermatology

Recurrence of Fungal Infection in Rural People in Jashore Medical College Hospital, Bangladesh

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DOI: https://doi.org/10.36347/sjams.2025.v13i12.012 | **Received:** 23.10.2025 | **Accepted:** 11.12.2025 | **Published:** 22.12.2025

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Abstract **Original Research Article**

Background: Fungal infections are among the most common skin diseases in Bangladesh, especially in rural areas where warm, humid climates and limited access to healthcare contribute to higher prevalence. Despite their frequency, recurrent fungal infections remain a neglected issue in clinical research. Factors such as poor hygiene, incomplete treatment, and comorbidities like diabetes may increase recurrence, but local data are scarce. Understanding recurrence patterns is essential for developing effective management strategies in resource-limited settings like rural Bangladesh. ***Aim:*** To assess the recurrence of fungal infections and associated factors among rural patients attending Jashore Medical College Hospital, Bangladesh. ***Method:*** A cross-sectional observational study was conducted at the Dermatology Department of Jashore Medical College Hospital, Jessore, Dhaka Division, from November 2024 to October 2025. A total of 170 rural patients with clinically diagnosed superficial fungal infections were selected through purposive sampling. Data were collected using structured questionnaires and clinical examinations, with KOH microscopy performed when needed. Variables included demographics, hygiene practices, comorbidities, prior infection history, and treatment adherence. Recurrence was defined as reappearance of infection at the same site within six months of treatment completion. Data were analyzed using SPSS-26, applying descriptive statistics and chi-square tests to identify associations, with $p<0.05$ considered significant. ***Results:*** In this cross-sectional study involving 170 rural patients diagnosed with superficial fungal infections, the most prevalent clinical forms were tinea corporis (30.0%), tinea cruris (21.2%), and tinea pedis (16.5%), reflecting typical patterns in humid, tropical environments. The overall recurrence rate was 37.1%, indicating a substantial burden of persistent or relapsing infections. Recurrence was significantly associated with several modifiable risk factors, including incomplete treatment (71.4%), diabetes mellitus (31.7%), use of steroid-containing creams (44.4%), reuse of unwashed clothing (61.9%), and poor personal hygiene (65.0%) (all $p < 0.05$). Among infection types, tinea corporis and tinea cruris showed the highest recurrence rates (49.0% and 41.7%, respectively), while candidiasis (21.1%) and other less common forms had lower recurrence. ***Conclusion:*** The recurrence of superficial fungal infections among rural patients was notably high and significantly associated with incomplete treatment, diabetes, steroid misuse, and poor hygiene. Targeted interventions focusing on treatment adherence, hygiene education, and regulation of topical medications are essential to reduce recurrence rates in resource-limited rural settings.

Keywords: Fungal infection, Recurrence, Dermatophytosis, Rural health, Tinea, Superficial mycoses.

INTRODUCTION

Superficial fungal infections (SFIs), also known as dermatophytoses, represent a widespread global health problem, affecting 20–25% of the population at any given time.[1] These infections primarily involve the skin, nails, and hair, and are most commonly caused by dermatophytes such as *Trichophyton*, *Microsporum*, and *Epidermophyton* species.[2] In tropical and subtropical regions, including Bangladesh, the prevalence is particularly high due to a combination of hot and humid climate, poor hygiene, and limited healthcare access.[3,4]

The most common clinical forms of SFIs include tinea corporis, tinea cruris, tinea pedis, tinea unguium (onychomycosis), and candidiasis.[5] These conditions, while not usually life-threatening, contribute significantly to dermatological morbidity and reduced quality of life, especially in underserved rural areas.[6]

Recent studies from South Asia indicate a growing trend of recurrent fungal infections, often linked to incomplete treatment, poor treatment compliance, misuse of topical steroids, and comorbidities such as diabetes mellitus.[7,8]

In Bangladesh, fungal skin diseases are frequently encountered in both urban and rural settings, with recurrence being a common issue. Sarker *et al.*, reported that 62.9% of patients presenting with fungal infections in Dhaka had a history of recurrence, particularly among those living in overcrowded households and lacking basic hygiene.[9] Similarly, Saher *et al.*, in Pakistan found a recurrence rate of 14.5% among tinea cruris patients, emphasizing the need for improved diagnosis and long-term follow-up.[10]

Despite these findings, there remains a lack of localized, clinic-based data focusing on recurrence patterns among rural populations in Bangladesh. Many rural patients rely on informal treatment methods or incomplete courses of antifungal therapy, which may contribute to chronicity and resistance. Moreover, environmental and occupational exposures such as working in moist fields or wearing occlusive clothing further elevate the risk of recurrence.[11]

Given the substantial burden and recurrent nature of fungal infections in resource-limited rural settings, understanding recurrence patterns and associated factors is critical. This study aims to evaluate the prevalence and recurrence of superficial fungal infections among rural patients attending the Dermatology Department of Jashore Medical College Hospital and to identify key demographic and clinical factors contributing to recurrence.

METHODS

A hospital-based cross-sectional observational study was conducted at the Dermatology Department of Jashore Medical College Hospital, located in Jessore, Dhaka Division, Bangladesh, over a 12-month period from November 2024 to October 2025. The study aimed to assess recurrence patterns of superficial fungal infections among rural patients. A total of 170 patients were enrolled using purposive sampling. Patients of all ages and both sexes, residing in rural areas, and clinically diagnosed with superficial fungal infections were included. Exclusion criteria comprised patients with systemic fungal infections, known immunocompromised conditions (e.g., HIV/AIDS), or those receiving antifungal treatment for other indications. Data were collected through structured face-to-face interviews using a pre-tested questionnaire, which recorded sociodemographic details, hygiene practices, past infection history, treatment adherence, comorbidities (e.g., diabetes mellitus), and environmental exposures. Clinical examinations were conducted by qualified dermatologists to identify infection type and site. Diagnostic confirmation was aided by direct potassium hydroxide (KOH) microscopy where necessary. Recurrence was defined as the reappearance of infection symptoms at the same site within six months of completing the previous antifungal treatment. Incomplete treatment was defined as cessation of prescribed antifungal therapy before the recommended duration.

Collected data were entered and analyzed using SPSS version-26. Descriptive statistics (frequencies, means, and percentages) were used to summarize the data. Associations between recurrence and potential risk factors were assessed using Chi-square tests, with a p-value <0.05 considered statistically significant.

Ethical approval was obtained from the institutional review board of Jashore Medical College Hospital prior to study initiation. Informed written consent was taken from all participants or guardians, with assurance of confidentiality and voluntary participation.

Table 1: Demographic profile of study participants (n = 170)

Variable	Frequency (n)	Percentage (%)
Age Group (years)		
0–18	22	12.9
19–35	68	40.0
36–50	51	30.0
>50	29	17.1
Sex		
Male	93	54.7
Female	77	45.3
Occupation		
Farmer	49	28.8
Homemaker	38	22.4
Student	32	18.8
Day laborer	28	16.5
Others	23	13.5

Table–1 shows that males (54.7%) were more affected than females (45.3%). This may reflect greater exposure to environmental risk factors in male-dominated outdoor occupations like farming (28.8%) and day labor (16.5%), where sweating, soil contact, and prolonged damp clothing are common. The majority of cases (70%) were among individuals aged 19–50, the most economically active group.

Table 2: Distribution of the study participant by clinical types of fungal infections (n=170)

Type of Infection	Frequency (n)	Percentage (%)
Tinea corporis	51	30.0
Tinea cruris	36	21.2
Tinea pedis	28	16.5
Onychomycosis	21	12.4
Candidiasis	19	11.2
Others (e.g., capitis, faciei)	15	8.7

Table–2 shows that tinea corporis (30%) and tinea cruris (21.2%) were the most common infection types, affecting body regions subject to heat, sweat, and friction. These infections are easily transmitted through shared clothing or bedding, a frequent practice in extended rural households. Tinea pedis (16.5%) is also notable, often resulting from barefoot walking in communal areas—a common rural habit. Onychomycosis (12.4%) and candidiasis (11.2%) were also present and tend to be more persistent and treatment-resistant, especially in individuals with comorbidities.

Table 3: Distribution of the study patients by prevalence of recurrence of fungal infection (n=170)

Recurrence Status	Frequency (n)	Percentage (%)
Yes	63	37.1
No	107	62.9
Total	170	100.0

Table–3 shows that 37.1% of patients experienced recurrence of superficial fungal infections within six months of completing treatment, indicating a substantial burden of relapsing infections in the rural population.

Table 4: Distribution of the study patients by risk factors associated with recurrence (n=170)

Risk Factor	Recurrence		p-value
	Present	Absent	
Incomplete treatment	45 (71.4%)	27 (25.2%)	<0.001
Diabetes mellitus	20 (31.7%)	11 (10.3%)	0.002
Steroid-containing cream usage	28 (44.4%)	15 (14.0%)	0.011
Reuse of unwashed clothing	39 (61.9%)	29 (27.1%)	0.004
Poor personal hygiene	41 (65.0%)	33 (30.8%)	<0.001

Table–4 shows that recurrence of fungal infections was significantly associated with several risk factors. Patients with incomplete treatment had the highest recurrence rate (71.4%) compared to those who completed treatment (25.2%, $p < 0.001$), indicating poor treatment adherence as a major contributor. Diabetes mellitus was also a significant factor (31.7% vs. 10.3%, $p = 0.002$), likely due to impaired immune responses. Use of steroid-containing creams (44.4% vs. 14.0%, $p = 0.011$) and reuse of unwashed clothing (61.9% vs. 27.1%, $p = 0.004$) were strongly linked to recurrence, reflecting poor treatment practices and hygiene behaviors. Additionally, poor personal hygiene was associated with a significantly higher recurrence rate (65.0% vs. 30.8%, $p < 0.001$).

Table 5: Recurrence by type of fungal infection (n=170)

Type of Infection	Cases (n)	Recurrence (n)	Recurrence Rate (%)
Tinea corporis	51	25	49.0
Tinea cruris	36	15	41.7
Tinea pedis	28	9	32.1
Onychomycosis	21	8	38.1
Candidiasis	19	4	21.1
Others	15	2	13.3

Table–5 shows the distribution of recurrence by type of fungal infection, with the highest recurrence observed in tinea corporis (49.0%) and tinea cruris (41.7%). These infections commonly affect large surface areas exposed to friction and moisture, which may contribute to treatment challenges and reinfection. Onychomycosis also showed a notable recurrence rate (38.1%), likely due to poor drug penetration into nail tissue and the chronic nature of nail infections. Tinea pedis had a recurrence rate of 32.1%, often linked to barefoot walking and poor foot hygiene. Lower recurrence was found in candidiasis (21.1%) and other less common types (13.3%).

DISCUSSION

In this hospital-based study conducted over one year at Jashore Medical College Hospital, a considerable burden of recurrent superficial fungal infections was observed among rural patients. The study identified key contributing factors such as incomplete treatment, diabetes, steroid misuse, and poor hygiene, emphasizing the multifactorial nature of recurrence and the need for targeted public health interventions.

In the present study, superficial fungal infections were more common in males (54.7%) than females (45.3%), which is consistent with previous studies conducted in similar settings. Sarker *et al.*, reported a male predominance (59%) among patients in urban and peri-urban areas of Dhaka, likely due to increased outdoor occupational exposure and lower hygiene awareness among men.[9] Likewise, Ahmed *et al.*, observed a similar trend in rural Bangladesh, emphasizing that men are more frequently engaged in labor-intensive jobs such as farming and construction, leading to increased sweating and contact with contaminated environments.[3]

The 19–35-year age group accounted for the highest proportion of cases (40%), followed by the 36–50-year group (30%), highlighting the burden of fungal infections among the most economically productive age groups. These findings are in line with Bhargava *et al.*, who reported that fungal infections were most prevalent among adults aged 20–40 years in Indian outpatient clinics.[7] The higher prevalence in these age groups may be attributed to frequent exposure to occupational stressors, shared living conditions, and limited health-seeking behavior.

With regard to occupation, the majority of patients were farmers (28.8%), followed by homemakers and day laborers, which reflects the rural population's dependence on agriculture and daily wage labor. Agricultural workers are often exposed to moist soil, sweat retention, and infrequent clothing changes, all of which create favorable conditions for fungal growth. Similar occupational risks have been reported by Gugnani *et al.*, who found that field laborers in tropical climates are especially vulnerable to dermatophytosis due to constant skin maceration and inadequate access to hygiene facilities.[2]

Notably, students and homemakers also made up a significant portion of the sample, suggesting that intra-household transmission may be common, particularly in overcrowded households where clothing, towels, and bedding are frequently shared. This pattern supports findings by Ray *et al.*, and Lorraine *et al.*, who emphasized that poor household hygiene practices contribute significantly to the spread of superficial fungal infections within families. [4,6] These findings emphasize the need for targeted public health interventions focusing on hygiene promotion, behavioral change communication, and access to affordable antifungal care in rural settings. Awareness campaigns should especially address young adults and occupationally active males, while also educating households about the risks of sharing personal items and the importance of daily hygiene.

In the present study, tinea corporis was the most frequently observed clinical type of fungal infection, accounting for 30.0% of cases, followed by tinea cruris (21.2%), tinea pedis (16.5%), and onychomycosis (12.4%). This pattern aligns with the findings of Bhargava *et al.*, who reported a similarly high prevalence of tinea corporis (33.6%) and tinea cruris (23.4%) in a dermatology outpatient study in India [7]. The predominance of these infections is often attributed to the warm, humid climate of South Asia, which promotes fungal growth, especially in areas prone to sweating and friction such as the trunk, groin, and feet.

Similar results were reported by Saher *et al.*,[1] in rural Northern Bangladesh, where tinea corporis and tinea cruris made up more than 50% of cases, particularly among males and manual laborers, due to prolonged moisture exposure and inadequate hygiene.[1] Tinea pedis, commonly known as athlete's foot, was also notable in the present study and may be linked to barefoot walking, a common practice in rural households and agricultural work. Pathania *et al.*, observed a comparable trend in rural India, linking tinea pedis to shared bathing areas, poor foot hygiene, and reuse of socks and footwear.[8]

The 12.4% prevalence of onychomycosis (fungal nail infection) in the present study is significant, as nail infections are often chronic and difficult to treat, especially when patients delay care or use inappropriate topical agents. This finding is supported by Gupta *et al.*, who found that onychomycosis was particularly persistent in patients with coexisting conditions such as diabetes or poor peripheral circulation.[5]

Candidiasis (11.2%), including intertriginous and oral types, was less common but still noteworthy. It typically affects immunocompromised individuals or those with poor hygiene in warm, occluded body folds.

Ahmed *et al.*,[12] and Gugnani *et al.*,[2] both noted that candidiasis prevalence tends to rise in areas with limited access to clean water and personal hygiene products, which mirrors the rural setting of the present study.

In the present study, 37.1% of patients experienced a recurrence of superficial fungal infection within six months after completing treatment. This is consistent with findings reported by Ahmed *et al.,* who noted a recurrence rate of 35.4% in a rural tertiary care setting in Bangladesh.[3] Similarly, Rahman *et al.,* observed a 39% recurrence rate among rural dermatology patients, particularly among those with incomplete treatment and poor hygiene practices.[10] These comparable values across multiple studies highlight a concerning trend of high recurrence in low-resource, high-humidity environments.

The recurrence rate observed in this study may be attributed to multiple interrelated factors such as incomplete treatment courses, self-medication, steroid misuse, re-infection from contaminated clothing or bedding, and persistent environmental exposures. Ray *et al.,* [4] and Gupta *et al.,* [5] emphasized that recurrence is particularly common in patients who either discontinued antifungal therapy prematurely or used over-the-counter creams containing corticosteroids, which mask symptoms but do not eliminate the pathogen.

Environmental and behavioral contributors also play a significant role. According to Gugnani *et al.,* [2], high recurrence rates are often found in communities where clothing is reused without adequate washing, personal items are shared, and bathing facilities are limited conditions that closely resemble the rural setting of Jashore.

Another critical aspect is the lack of follow-up care, which leads to under-recognition of recurrence. In a study by Bhargava *et al.,* patients with recurrent infections often failed to return for scheduled visits due to financial or travel constraints, resulting in chronic or treatment-resistant infections.[7]

In the present study, several significant risk factors were associated with the recurrence of superficial fungal infections. Incomplete treatment showed the strongest association, with 71.4% of patients who did not complete their antifungal therapy experiencing recurrence, compared to only 25.2% of those who completed treatment ($p < 0.001$). This finding mirrors the results of Saher *et al.,* who also observed a high recurrence rate (68%) in patients with irregular or early-discontinued antifungal use in rural Bangladesh.[1] Inadequate access to continuous medication, lack of follow-up, and symptom relief leading to early discontinuation are common reasons for incomplete treatment in such settings.

Another significant predictor of recurrence was diabetes mellitus, present in 31.7% of recurrent cases versus 10.3% of non-recurrent cases ($p = 0.002$). Diabetes is a well-established risk factor due to its effects on local skin immunity, delayed healing, and altered skin microbiota. Similar associations were documented by Gupta *et al.,* [5], who reported a 2.5 times higher recurrence rate in diabetic individuals compared to non-diabetics. This highlights the need for integrated dermatological and diabetic management, particularly in older adults.

The use of steroid-containing creams was another key contributor, with 44.4% of recurrence cases reporting prior use ($p=0.011$). Many patients apply over-the-counter topical combinations without medical guidance, leading to tinea incognito and partially treated infections. Ray *et al.,* [4] and Gugnani *et al.,* [2] similarly highlighted this trend, warning that misuse of topical steroids not only delays proper diagnosis but also contributes to antifungal resistance and chronicity.

Environmental and behavioral factors also played a critical role. Reuse of unwashed clothing was present in 61.9% of recurrent cases ($p = 0.004$), and poor personal hygiene was reported in 65.0% ($p < 0.001$). These findings align with Pathania *et al.,* [8], who emphasized that in resource-poor settings, lack of access to clean clothes and regular bathing significantly contributes to environmental reinfection and persistent transmission. Hygiene education, therefore, remains a cornerstone of effective fungal infection control.

In the present study, the highest recurrence was observed in tinea corporis (49.0%), followed by tinea cruris (41.7%), onychomycosis (38.1%), and tinea pedis (32.1%), while candidiasis (21.1%) and other infections (13.3%) showed relatively lower recurrence rates. These findings are consistent with Bhargava *et al.,* [7], who also reported high recurrence in tinea corporis and cruris due to their tendency to affect large, friction-prone, and moist body areas, which often go undertreated or incompletely treated.[13] Recurrent infections in these regions are further exacerbated by poor hygiene, sweating, and clothing reuse, especially in tropical, rural environments.

Onychomycosis, known for its chronic and resistant nature, had a recurrence rate of 38.1%, in line with findings from Gupta *et al.,* [5], who emphasized that fungal nail infections require prolonged systemic therapy, often beyond the typical treatment duration followed by rural patients. [13,14] Inadequate therapy, poor penetration of topical agents, and irregular follow-up make onychomycosis particularly prone to relapse.

Tinea pedis showed a recurrence rate of 32.1%, which correlates with studies by Gugnani *et al.,* [2] and Pathania *et al.,* [8] that reported high rates of recurrence in individuals who walk barefoot, use communal bathing

areas, or share footwear, all common in low-income rural settings.

On the other hand, candidiasis and other types demonstrated lower recurrence. This may be because candidiasis is often linked with short-term predisposing factors like antibiotic use or moisture retention, and once these factors are removed or treated, recurrence is less likely. Moreover, candidiasis typically responds well to short-course antifungal therapy. These observations are supported by Ahmed *et al.*,[12], who found lower recurrence in mucocutaneous candidiasis among general medical patients in Bangladesh.

CONCLUSION

This study highlights a high recurrence rate of superficial fungal infections in the rural population, with significant associations identified between recurrence and factors such as incomplete antifungal treatment, diabetes mellitus, steroid-containing cream misuse, and poor hygiene practices. Tinea corporis and tinea cruris were the most recurrent forms, indicating the need for prolonged and monitored treatment for infections affecting large and moist body areas. The findings emphasize the importance of strengthening rural dermatological care through patient education, ensuring complete treatment courses, improving personal hygiene, and enforcing strict regulation on the use of over-the-counter topical steroids. Integrating these strategies into rural primary healthcare services could significantly reduce recurrence, improve treatment outcomes, and lessen the dermatological disease burden in low-resource communities.

Limitations

This study was limited to a single rural hospital, which may affect generalizability. The cross-sectional design prevents causal inference. Recurrence was based on clinical assessment and self-report, without consistent mycological confirmation, introducing potential recall and diagnostic bias. Fungal species identification and antifungal susceptibility testing were not performed.

Recommendations

Educational initiatives on treatment adherence and hygiene should be prioritized. Regulation of steroid-containing creams is essential. Dermatology services should integrate diabetes screening and follow-up care. Access to fungal culture and species identification is needed, and future studies should adopt multicenter, longitudinal designs for broader insight.

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