

Exploring the Factors Contributing to Treatment Failure and Recurrence in Superficial Dermatophytosis

Alam A¹, Akhter T², Sultana T³, Rahman I⁴

Article info

Received : 16-12-2023
Accepted : 04-02-2024
No. of Table : 04
No. of figure : 02
No. of references : 20

Cite the Article:

Alam A, Akhter T, Sultana T, Rahman I. Exploring the Factors Contributing to Treatment Failure and Recurrence in Superficial Dermatophytosis, Pabna Med. Col. J. 2024;3(1): 24-29.

Keywords: Superficial dermatophytosis, topical steroids, treatment failure and recurrence, fungal infections.

Abstract

Background: Superficial dermatophytosis, commonly known as ringworm, is a fungal infection of the skin, hair, or nails caused by dermatophytes, primarily belonging to the genera *Trichophyton*, *Microsporum*, and *Epidermophyton*. Despite being a superficial infection, the rising incidence of treatment failure and recurrence has become a matter of concern in recent years.

Method: This prospective observational study was conducted at the Department of Dermatology and Venereology of Pabna Medical college Hospital, aimed to investigate the epidemiological factors associated with treatment failure and recurrent cases of superficial dermatophytosis. The study spanned from March 2022 to February 2023, involving 125 participants diagnosed with *Tinea corporis*, *Tinea cruris*, *Tinea facies*, or *Tinea pedis*. Factors such as excessive sweating, use of warm water, clothing habits, sharing practices, and topical corticosteroid application were analyzed.

Results: The most common age group affected was 21-30 years, with a male preponderance (1.6:1). Excessive sweating, wearing water-soaked garments, and sharing towels were prevalent among participants. After 4 weeks of treatment, 81.6% achieved complete cure, but 52.95% of these cases experienced a recurrence within the subsequent 4 weeks.

Conclusion: The study emphasizes the importance of linen (sharing towels) in the transmission of dermatophytosis and highlights the increased risk associated with a family history of the condition. Additionally, the injudicious use of topical steroids emerged as a significant factor contributing to treatment failure and recurrence.

Introduction

It is believed that around a billion individuals worldwide suffer from dermatomycoses, or fungal infections of the skin, hair, and nails.¹ Fungal skin disorders are incredibly widespread. The disease is characterized by an unprecedentedly high rate of transmission among family members and intimate contacts, and it now occurs regardless of climate variations, age, sex, educational attainment, or socioeconomic status.² Although superficial dermatophytosis was once thought to be purely

cosmetic, it has recently emerged as a serious public health issue. These infections are now to be viewed like other chronic and recurrent disorders because of its altered nature. The degree of discomfort caused by superficial dermatophytosis can have a negative impact on an individual's quality of life, even though it seldom results in mortality.^{2,3}

Dermatologists have observed that a large number of patients with persistently resistant dermatophytosis experience emotions of helplessness, guilt, and rage;

1. Dr. SM Akhter-UI Alam, Associate Professor & Head, Department of Dermatology and Venereology, Shahid Ziaur Rahman Medical College, Bogura, Bangladesh.
2. Dr. Tunergina Akhter, Associate Professor of Physiology, Army Medical College, Bogura, Bangladesh
3. Dr. Mst. Tajmery Sultana, Assistant Professor, Department of Dermatology and Venereology, Shahid Ziaur Rahman Medical College, Bogura, Bangladesh
4. Dr. Md. Ikteder Rahman, Junior Consultant, Department of Dermatology and Venereology, 250 Bedded General Hospital, Pabna, Bangladesh

Correspondence: Dr. SM Akhter-UI Alam, Associate Professor & Head, Department of Dermatology and Venereology, Shahid Ziaur Rahman Medical College, Bogura, Bangladesh. Email: azadakterulalam1992@gmail.com

a small percentage even show suicidal thoughts.⁴ When the disease (lesions) returns a few weeks (less than four weeks) after treatment is finished, dermatophytosis is deemed recurrent.^{5,6} However, even though they have received appropriate treatment, patients are deemed to have had the condition for more than six months to a year, with or without a recurrence.⁷ Various antifungal agents have been used for the treatment of these infections.

Most common systemic agents used are terbinafine, fluconazole, and itraconazole. Although there is a rising trend of patients who tend to relapse following cessation of antifungal therapy, the relapses have not been conclusively proven to be consequent to resistance. Recently, Sardana et al. concluded from their study that *in-vitro* resistance to antifungals is not common and should not be frequently labeled as a cause of treatment failure.⁸ The problem lies in the intricate host fungal interaction, and this should be the focus for research. Various factors implicated in recalcitrant dermatophytosis are-Host fungal immune response, Virulence potential of the infecting strain or species, Clinical type of dermatophytosis, Barrier defect, Local factors (heat, humidity, sweating, type of clothing), Pharmacological factors (quality of the drug, compliance, pharmacokinetics and absorption of the drug), and Reinfection from other sources. To this end the purpose of this study was to assess the factors related to treatment failure and recurrence of superficial dermatophytosis of the patients presenting to dermatology OPD of a tertiary care hospital of Bangladesh.

Methods

This study is a prospective observational investigation conducted at the Department of Dermatology and Venereology of Pabna Medical college Hospital, Pabna, Bangladesh. The study was done from March 2022 to February 2023, during the period research focused on patients exhibiting superficial dermatophytosis. The study population comprised individuals attending the specified medical facility within the designated timeframe and carrying a diagnosis of Tinea corporis, Tinea cruris, Tinea facies, or Tinea pedis, with or without a history of recurrence or treatment failure. A total of 130 participants were included in the study through a convenience sampling method. The inclusion criteria encompassed patients aged 18 years and above, of both sexes, diagnosed with superficial dermatophytosis.

Exclusion criteria comprised individuals who refused to participate and those exclusively presenting with

Tinea capitis or Tineaunguim, as their treatment regimens differed from the primary focus of the study. A detailed history was taken from each participants regarding the duration, treatment taken, topical corticosteroid application, treatment compliance, affected family members, type of clothing, sharing of cloths, towels, soaps and footwear, bath habits, frequency of changing cloths, contact with pets/cattle, intake of any immuno-suppressants, history of any other cutaneous or systemic disease. Appropriate physical examination and reviewing of medical records was done in every cases.

Treatment was given according to hospital protocol by registered physician or specialist dermatologist in OPD of Dermatology. Data were recorded in the form of Excel worksheet. After completion of data collection, they was fed into SPSS for processing analysis. This study was conducted after receiving ethical clearance from the local Ethical Review Committee.

Results

In this study, 150 patients with superficial dermatophytosis were screened for the eligibility. Among them 135 were found eligible. Informed consent was given by 130 eligible participants and finally 125 participants were included in the study after completion of 2 consecutive follow up at 4 and 8 week.

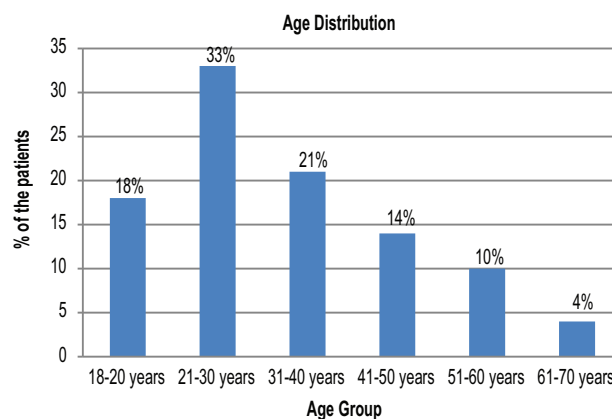


Figure 1: Graphical representation of age distribution

Age ranged between 18-70 years and the mean age was 34.4 ± 13.9 years. The most frequent age group was 21-30 years, having 32.9% of the patients, followed by 31-40 years (21.3%), 18-20 years (17.7%), 41-50 years (14.1%), 51-60 years (10%), and 61-70 years (4%). There was male preponderance with a male to female ratio of 1.6:1. Most of the patients (80.7%) reside in urban locality.

Table 1: Epidemiological factors related to treatment failure/recurrent superficial dermatophytosis

Factors	Frequency	Percentage
Excessive sweating	91	72.8
Use of warm water	61	48.8
Weekly frequency of washing clothes	7 (7-7)	
Wear synthetic cloths mostly	63	50.4
Wearing water-soaked garments	94	75.2
Tight clothing	65	52
Sharing cloths	26	20.8
Sharing towels	60	48
Sharing footwear	5	4.0
History of cooking food oneself	58	46.4
Average time (minutes) spent in kitchen	90 (60-180)	
Pets in home	9	7.2
Family history of tinea	71	56.8
Number of rooms in home	3 (2-4)	
Number of family members living in home	5 (3-6)	

Data were expressed as frequency and percentage or median and interquartile range

Excessive sweating was reported by 91 (72.8%) of the patients, 108 (86.4%) patients gave history of taking bath every day, about 48.8% patients reported to use hot water to get relief from itching. Frequently wearing tight garments was seen in 65 patients (52%). Sharing of clothes, towels, and footwear among close contacts or family members was habitual among 26 (20.8%), 60 (48%), and 5 (4%) of the patients. History of contact with animals such as dog/cats was seen to be present in in very few patients 9 (7.2%). History of similar complaint among family members or close contacts was seen in 71 (56.8%) of the patients.

Table II: Therapeutic response after completion of therapy

Time of assessment	Frequency	Percentage
1 st follow-up (4 weeks) (n=125)		
Cure	102	81.6
Treatment failure	23	18.4
2 nd follow-up (8 weeks) (n=102)		
Cure	48	47.05
Recurrence	54	52.95

After 4 weeks of treatment, out of 125 patients complete cure was observed in 102 (81.6%) of the

patients, and other 23 (18.4%) were labelled as treatment failure cases due to persistent of the lesions. Among the cured cases 54 (52.95%) have recurrent infection in next 4 weeks follow-up period.

In this study, out of 125 patients, complete cure was achieved by 48 (38.4%) of the patients. Other 77 (61.6%) cases were either treatment failure cases or recurrent cases (Figure 2)

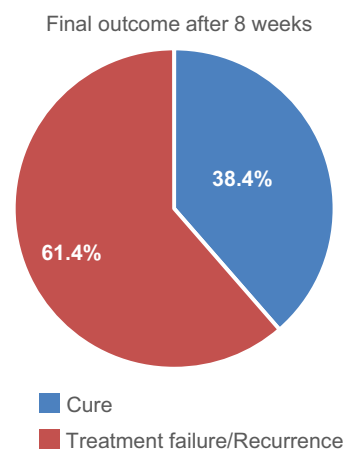
**Figure 2:** Final outcome of the studied patients after eight weeks of enrollment

Table III: Association between diagnostic modalities used and therapeutic responses

Diagnostic modalities	Therapeutic responses		P value
	Cure (n=48)	TF/Re(n=77)	
Clinical	44 (91.6)	62 (80.52)	0.063
Microscopy	2 (4.2)	9 (11.69)	
Culture	2 (4.2)	6(7.79)	

TF/Re: Treatment failure/Recurrence; Data were expressed as frequency and percentage *Chi-square test. There is no association of diagnostic modalities chosen for the therapeutic outcome.

Table IV : Association between treatment received and therapeutic responses

Treatment received	Therapeutic responses		P value
	Cure (n=48)	TF/Re(n=77)	
Terbinafine	14 (29.2)	30 (38.96)	0.130
Itraconazole	34 (70.8)	47 (61.04)	

TF/Re: Treatment failure/Recurrence; Data were expressed as frequency and percentage *Chi-square test.

There is no association between treatment regimen and therapeutic responses of the patients.

Discussion

The present study shows that the young people are most commonly affected. Patients aged between 18-70 years were included, and the mean age was 34.4 ± 13.9 years. The most frequent age group was 21-30 years, having 41 (32.8%) of the patients. The age distribution of the patients was similar to the previous studies conducted in Bangladesh and India which reported age group of 20-30 years followed by 30-40 years.^{3,9-13} The predisposition of infection among adults may be attributed to their greater physical activity, mobility, and perspiration that aids in the proliferation of the fungus. Previous studies reported the association of recurrent dermatophytosis with various risk factors such as occupation, family history of dermatophytosis, pre-existing comorbidity, excessive sweating, type of undergarments (tight fit), poor frequency of washing clothes, sharing of a towel/clothes, frequency of taking baths, and prior use of topical steroids.^{12,14} In the present study, in multivariate analysis, sharing towels, having family history of dermatophytosis, and history of using topical steroid in the past were significant risk factors. In a study of recurrent dermatophytosis, observed that

a high incidence of intra-familial tinea infections, misuse of corticosteroids containing topical antifungal preparations, poor compliance to treatment and poor personal hygiene were associated with recurrences and poor responses to treatment.²

A positive association has been found between chronic and chronic relapsing tinea and pre-existing diabetes mellitus, family history of tinea and personal history of cooking food. However, the study did not show that following variables increase the risk: wearing jeans, frequency of washing clothes (including undergarments, jeans, and towel), frequency of taking bath, history of excessive sweating, presence of children below 15 years in home, pets in home, crowding in home and BMI.¹³

Comorbid conditions such as diabetes can predispose an individual to immunosuppression, thereby promoting recurrence or persistence of infection.¹⁵ In the present study, there were 34 (13.7%) known cases of diabetes mellitus. However, when it comes to treatment failure and recurrent dermatophytosis infection, present study find only statistically significant association between the presence of diabetes mellitus and recurrent tinea infection ($p = 0.021$). In a study by Singh et al., 5.3% of cases had pre-existing diabetes.¹³ The authors found a positive association between diabetes mellitus and the risk of chronic or relapsing dermatophytosis. On the contrary, Kalekhan et al. did not find a significant difference in the presence of diabetes or any other concomitant illnesses among the case of chronic and/or recurrent infection and control.¹⁶

Excessive sweating was found in 124 (81%) participant and was found to be associated with treatment failure or recurrent cases in univariate analysis in the present study, but the association did not persist in regression analysis, after adjusting for other significant variables. The association of hyperhidrosis with the duration of disease was found to be statistically insignificant in the study of Jain et al.¹⁷ Sweating has been well established as a risk factor for increasing the prevalence of dermatophytosis. Sweating in conjunction with other factors, such as poor hygiene, might further increase the incidence of dermatophytosis. In a study by Ranganathan et al., the authors found that people who were engaged in occupations associated with increased sweating (58.9%), such as laborers, exhibited increased incidence rates of

dermatophytosis relative to those who were not engaged in such occupations.¹⁸ Tinea lesions were commonly seen to be present in areas prone for occlusion due to tight fitted clothes like the waistline, groin, or infra-mammary area.¹⁹

Frequently wearing tight garments was seen in 130 (52.2%) patients in the present study. However, the association of wearing tight-fitting clothes with the recurrence or treatment failure was not statistically significant in the current study. Similar to the tight-fitting clothes, wearing synthetic clothes were not associated with treatment failure or recurrent cases in the present study. A recent consensus statement formulated by the IADVL Taskforce against Recalcitrant Tinea (ITART) advises against the use of synthetic and tight clothing. The statement also discourages wearing bands, threads, drawstrings, and rings as they could carry fungus and add to persistence and recurrence of infection.¹⁸ Family history of dermatophytosis was revealed as a significant factor associated with treatment failure and recurrent infection. Patients with FH of dermatophytosis were 2.46 (95% CI: 1.34-4.51), times more likely to have treatment failure and recurrent infection than their counterpart. Similarly, sharing towel was an independent risk factor for treatment failure/recurrent dermatophyte infection (OR: 1.97, 95% CI: 1.07-3.64). Tinearubram survived <12 weeks on towel. Tinea mentagrophyte survived >25 weeks on towel. This fact highlights the increased risk of re-infection in family members sharing same towel and the importance of disinfection which could be best done by washing clothes and towel in hot water and drying in sunlight.²

Re-infection from the contacts or through fomites is a significant contributing factor for the increasing prevalence of chronic and recurrent forms of superficial dermatophytosis reported that family members of 72% of patients had dermatophytosis, the spouse being frequently affected.²⁰ In the present study, patients' past prescriptions by non-dermatologists were examined, and came across many instances of improper management. Use of topical steroids either alone or in combination with antibiotics and antifungals was frequent 172 (69.1%) in the present study. The association of use of topical steroids with treatment failure and recurrence was found statistically significant ($p < 0.001$) in multivariate analysis topical corticosteroid

prescription, whether alone or in combination with other components, was strongly discouraged by all the experts of the Indian Association of Dermatologists, Venereologists and Leprologists (IADVL) Taskforce against Recalcitrant Tinea (ITART).²⁰ The main limitation of the study was the absence of calculation of MIC in cases with failed cure and recurrent cases. However, Sardana et al. found that, MIC seen in the patients with treatment failure dermatophytosis were higher than western data, in vitro resistance to antifungals was not seen and probably may not be a cause of treatment failure.⁸

Possibly, treatment failure lies in the intricate host fungal interaction and virulence of species which help it to evade host immune response. It was not possible to consistently culture the agent responsible for the tinea in the present study and, hence, it was decided to focus more on clinico-epidemiology than microbiology. 44(35.2%) participants were treated by terbinafine and among them 14 (29.2%) participants were cured and 30 (38.96%) participants were treatment failure/recurrence. 81 (64.8%) participants were treated by itraconazole and among them 34 (70.8%) participants were cured and 47 (61.04%) participants were treatment failure/recurrence. There is no association between treatment regimen and therapeutic responses of the patients.

Limitations of the study

Sample size of the study was limited and in a single Centre. So, it will be difficult to generalize the findings for the whole country.

Conclusion

There may be some important epidemiological determinants for higher chances of treatment failure or recurrent dermatophytosis. Linen (sharing towel) may play an important role in the transmission of the infection. There may be higher chances of the treatment failure or recurrent infections in people with history of topical steroid abuse. Family history of dermatophytosis was a significant risk factor for treatment failure or recurrent dermatophytosis. Excessive sweating may favor fungal growth and colonization which ultimately contribute in treatment failure and recurrent dermatophytosis.

Recommendation

Management of the patients in the current scenario requires a longer duration of treatment with comprehensive care including general measures such

as counseling on lifestyle and full adherence to the treatment. Clothing should be loose fitting, of cotton or synthetic material that removes moisture away from the skin surface. Sharing garments and towels must be discouraged. Undergarments, socks, and cloths should be regularly washed and dried in the sun and ironed. Frequent changing of clothes should be advised

References

- Bongomin, F., Gago, S., Oladele, R.O., & Denning, D.W. Global and multi-national prevalence of fungal diseases-estimate precision. *Journal of Fungi* 2017; 3(4), 57-66.
- Verma, S.B., Panda, S., Nenoff, P., Singal, A., Rudramurthy, S.M., Uhrlass, S., Das, A., Bisherwal, K., Shaw, D., & Vasani, R. The unprecedented epidemic-like scenario of dermatophytosis in India: I. Epidemiology, risk factors and clinical features. *Indian Journal of Dermatology, Venereology & Leprology* 2021; 87(2), 154-175.
- Sharma, B., & Nonzom, S. Superficial mycoses, a matter of concern: Global and Indian scenario an updated analysis. *Mycoses* 2021; 00, 1-19.
- Patro, N., Panda, M., & Jena, A.K. The menace of superficial dermatophytosis on the quality of life of patients attending referral hospital in Eastern India: A cross-sectional observational study. *Indian Dermatology Online Journal* 2019; 10(3), 262.
- Lever, L.R., Dykes, P.J., Thomas, R., & Finlay, A.Y. How orally administered terbinafine reaches the stratum corneum. *Journal of Dermatological Treatment* 1990; 1(sup2), 23-25.
- Piérard, G.E., Arrese, J.E., & De Doncker, P. Antifungal activity of itraconazole and terbinafine in human stratum corneum: a comparative study. *Journal of the American Academy of Dermatology* 1995; 32(3), 429-435.
- Rajagopalan, M., Inamadar, A., Mittal, A., Miskeen, A.K., Srinivas, C.R., Sardana, K., et al. Expert consensus on the management of dermatophytosis in India (ECTODERM India). *BMC Dermatology* 2018; 18(1), 1-11.
- Sardana, K., Kaur, R., Arora, P., Goyal, R., & Ghunawat, S. Is antifungal resistance a cause for treatment failure in dermatophytosis: A study focused on tinea corporis and cruris from a tertiary centre? *Indian Dermatology Online Journal* 2018; 9(2), 90-95.
- Hoq, A.J.M.S., Sultana, F., MJ, A., & GM, M.R. Efficacy of Voriconazole among 500 Dermatophytes Patients: A Study in a Tertiary Care Hospital, Cumilla, Bangladesh. *American Journal of Dermatology and Venereology* 2020; 9(2), 17-20.
- Rahim, M.R., Saleh, A.A., Miah, M.R.A., Anwar, S., & Rahman, M.M. Pattern of dermatophyte in Bangabandhu Sheikh Mujib Medical University. *Bangladesh Journal of Medical Microbiology* 2012; 6(2), 11-14.
- Sultana, R., & Wahiduzzaman, M. Emerging threat in antifungal resistance on superficial dermatophyte infection. *Bangladesh Medical Journal Khulna* 2018; 51(1-2), 21-24.
- Pathania, S., Rudramurthy, S.M., Narang, T., Saikia, U.N., & Dogra, S. A prospective study of the epidemiological and clinical patterns of recurrent dermatophytosis at a tertiary care hospital in India. *Indian Journal of Dermatology, Venereology & Leprology* 2018; 67: 84-96
- Singh, S., Verma, P., Chandra, U., & Tiwary, N.K. Risk factors for chronic and chronic-relapsing tinea corporis, tinea cruris and tinea faciei: Results of a case-control study. *Indian Journal of Dermatology, Venereology & Leprology* 2019; 85(2), 197-200.
- Jha, K., Shaw, D., Karim, A., Narang, T., Saikia, B., Rudramurthy, S.M., Saikia, U.N., & Dogra, S. Immunological response and clinical profile in patients with recurrent dermatophytosis. *Mycoses* 2021; 64(11), 1429-1441.
- Shivanna, R., & Inamadar, A.C. Clinical failure of antifungal therapy of dermatophytoses: Recurrence, resistance, and remedy. *Indian Journal of Drugs in Dermatology*, 3(1), 1-3.
- Kalekhan, F.M., Asfiya, A., Shenoy, M.M., Vishal, B., Pinto, M., & Hegde, S.P. Role of tineaunguium and other factors in chronic and recurrent dermatophytosis: A case control study. *Indian Dermatology Online Journal* 2020; 11(5), 747-752.
- Jain, A., Dhamale, S., & Sardesai, V. Factors responsible for difficult to treat superficial fungal infections: A study from a tertiary healthcare centre in India. *Mycoses* 2021; 64(11), 1442-1447.
- Ranganathan, S., Menon, T., Selvi, S.G., & Kamalam, A. Effect of socio-economic status on the prevalence of dermatophytosis in Madras. *Indian Journal of Dermatology, Venereology and Leprology* 1995; 61(1), 16-18.
- Shenoy, M.M., & Jayaraman, J. Epidemic of difficult-to-treat tinea in India: Current scenario, culprits, and curbing strategies. *Archives of Medicine and Health Sciences* 2019; 7(1), 112.
- Rengasamy, M., Shenoy, M.M., Dogra, S., Asokan, N., Khurana, A., Poojary, S., et al. Indian association of dermatologists, venereologists and leprologists (IADVL) task force against recalcitrant tinea (ITART) consensus on the management of glabrous tinea (INTACT). *Indian Dermatology Online Journal* 2020; 11(4), 502-519.