Original Article

Association between Blood Group Typing and Clinical Manifestations of Dermatophytosis Patients

Ahmed MNU[1], Yousuf M[2], Gomes RR[3], Rahman K[4], Mahmud H[5], Johora FT[6], Nurunnabi M[7]

DOI: https://doi.org/10.3329/jafmc.v20i2.80406

Abstract

Background: Superficial mycotic infections have a global prevalence of 20-25%, with dermatophytes being the most common causative agents.

Objective: To explore the association between blood group typing and clinical manifestations of dermatophytosis patients.

Methods: This case-control study was conducted using data collected from the outpatient department of Dermatology and Venereology at Kurmitola General Hospital, Dhaka from April 2024 to September 2024. A control group of 115 clinically healthy people and 115 patients with dermatophytosis composed up the 230 participants in total. All subjects were diagnosed by a dermatologist. Blood samples were taken from each participant for ABO blood grouping and Rh typing were evaluated in the hematology laboratory of this hospital.

Results: A significant relationship was found between the clinical manifestations of dermatophytosis in males and blood group types. Statistical analysis revealed that tinea pedis had the strongest association with blood groups, with groups B and O being the most affected. Tinea capitis also showed a significant correlation with blood group O, indicating greater susceptibility within this group. Other clinical manifestations did not show a notable correlation with blood group types. In contrast, there was no significant association within blood groups and the clinical manifestations of dermatophytosis in females, except for tinea capitis, which was most significantly associated to blood group A.

Conclusion: The study revealed that males with blood group O and females with blood group A were the most commonly infected among dermatophytosis patients. Furthermore, the majority of dermatophytosis patients had Rh (+ve) blood type. Dermatophytosis was found to be significantly associated with blood types in males, specifically with tinea pedis in blood groups B and O and with tinea capitis in blood group O.

Keywords: Dermatophytosis, Blood groups, Outpatients.

Introduction

Dermatophytes in the Microsporum, Trichophyton, and Epidermophyton genera produce superficial cutaneous fungal infections that only affect the epidermis.[1] Dermatophytes, inevitably known as ringworm, are a genus of closely related fungus that can infect superficial keratinised tissues such as skin, hair, and nails in humans and other animals.[2] The Latin terms for the diseased anatomical region are used to categorise tinea infections, which include tinea capitis, tinea corporis, tinea manuum, tinea cruris, tinea pedis, and tinea unguium.[3,4]

Due to the fungi's incapacity to enter the deeper tissues or organs of immunocompetent hosts, infections are often cutaneous and limited to the nonliving cornified layers.[2,5] Direct contact with diseased humans and animals or indirect contact with contaminated fomites are the two ways that dermatophytes are spread.[6] Clinical manifestations of dermatophytic infections include skin lesions with vesiculation and oedema.[2]

In Nigerian dermatophytic patients, the impact of dermatophytosis on a few haematological indices and biochemical profiles was examined using conventional techniques.[7] Another study explored the relationship within ABO blood group and cutaneous mycosis using blood typing and isolated dermatophyte identification. Based on these results, there is evidence that these individuals are prone to develop superficial mycosis.[8]

The fungus' cell walls antigenically similar glycoproteins to human erythrocyte isoantigen A have been found in Trichophyton mentagrophytes, Trichophyton rubrum, and Epidermophyton floccosum.[9] The hypothesis that people with these erythrocytic antigens would be more prone to developing generalised dermatophytosis and would also be more resistant to treatment than people without them.[10,11] In order to determine whether blood groups are susceptible to a skin fungal infection, it is crucial to do research on the relationship within blood group and tinea incidence.

1. **Lt Col Mohammad Nesar Uddin Ahmed**, MBBS, MPhil, Instructor of Surgery, Armed Forces Medical College (AFMC), Dhaka (*E-mail:* nesarj9@gmail.com) 2. **Maj Gen Mohammad Yousuf**, MBBS, FCPS, Commandant, AFMC, Dhaka 3. **Professor (Dr) Richmond Ronald Gomes**, MBBS, FCPS, FACP, Professor and Head, Department of Internal Medicine, Ad-din Medical College & Hospital, Dhaka 4. **Dr Kaniz Rahman**, MBBS, DDV, FCPS, Associate Professor & Head, Department of Dermatology & Venereology, Ad-din Medical College & Hospital, Dhaka 5. **Dr Hasan Mahmud**, MBBS, MD, Junior Consultant of Dermatology & Venereology, Kurmitola General Hospital, Dhaka 6. **Dr Fatema Tuj Johora**, MBBS, Assistant Registrar of Dermatology & Venereology, Ad-din Medical College & Hospital, Dhaka 7. **Dr Mohammad Nurunnabi**, MBBS, MPH, Assistant Professor of Community Medicine and Public Health, Sylhet Women's Medical College, Sylhet.

Materials and Methods

This case-control study was conducted in the Department of Physiology using data obtained from the Department of Dermatology and Venereology at Kurmitola General Hospital, Dhaka-1206, from April 2024 to September 2024. A total of 230 participants were included in this study, consisting of 115 patients with dermatophytosis and 115 clinically healthy adults as control subjects. Patients attending the outpatient Department of Dermatology and Venereology were diagnosed by a dermatologist based on clinical manifestations. Blood samples were collected from all participants for ABO blood grouping and Rh typing were evaluated in the hematology laboratory of this hospital. The control group consisted of age and sex matched healthy individuals with no history of chronic diseases that could affect hematological parameters.

ABO and Rh blood grouping tests were conducted using the glass slide method as follows.[12] Three glass slides were labeled as Anti-A, Anti-B and Anti-D. Following aseptic precautions, a small drop of blood was collected on each slide using a finger prick with a lancet. A drop of normal saline was added to each slide immediately, creating a red cell suspension. Then, 1-2 drops of Anti-A, Anti-B and Anti-D serum were added to the corresponding labeled slides. After 5 minutes, all three slides were examined under a microscope for better visualization.

Consider the following possibilities for blood typing: (a) If clumping occurs with the Anti-A solution and also with the Anti-B solution, the blood type is AB. (b) If clumping occurs with the Anti-A solution but not with the Anti-B solution, the blood type is A. (c) If no clumping occurs with the Anti-A solution but clumping is observed with the Anti-B solution, the blood type is B. (d) If there is no clumping with either the Anti-A or Anti-B solutions, the blood type is O. (e) If clumping occurs with the Anti-D solution, the blood type is Rh positive. (f) If there is no clumping with the Anti-D solution, the blood type is Rh negative. All consenting patients with a history and clinical presentations suggestive of superficial fungal infections were eligible for inclusion in the study. Patients without a clear clinical and/or laboratory diagnosis were excluded.

Descriptive data are presented as frequency, percentage, and mean value. The Chi-square test (χ^2) was employed to compare categorical variables, frequencies and ratios. Independent samples t-test was used to compare normally distributed variables between two groups. Statistical analyses were conducted using the IBM SPSS v23. A p-value of <0.05 was considered statistically significant for the interpretation of results. All selected patients were thoroughly informed about the study's objectives and procedures and were encouraged to participate voluntarily. Informed written consent was obtained from all participants. Each patient underwent a comprehensive physical examination which was also documented. The study received approval from the Institutional Ethics Committee.

Results

In this study, the baseline characteristics of the study population regarding gender, BMI, blood pressure, education, socioeconomic status and marital status were similar with no statistically significant differences (Table-I). Notably, 97% of the samples studied were Rh positive, while 3% were Rh negative. The age group of 15-30 years among males and the age group of 31-49 years among females were the most susceptible to dermatophytoses, with percentages of 35.0% and 34.6%, respectively (Table-II).

The results have shown a significant difference between the clinical manifestations of dermatophytosis in males and their blood groups. Statistical analysis revealed that tinea pedis had the strongest association with blood groups, particularly affecting groups B and O. Additionally, tinea capitis showed a significant correlation with blood group O which appeared to be the most vulnerable to this condition. Other clinical manifestations did not demonstrate significant correlations with the blood groups (Table-III). Conversely, there was no significant difference between the clinical manifestations of dermatophytosis in females and blood groups. Statistical analysis directed that only tinea capitis had a notable association with blood group A (Table-IV).

According to the results presented in Table-V, the most prevalent blood group among individuals diagnosed with dermatophytoses with a chronic duration of 6 weeks or more was blood type B, with 22 individuals (31.4%). This was followed by blood type A with 21 individuals (30.0%), blood type O with 18 individuals (25.7%) and blood type AB with 9 individuals (12.9%). However, there was no significant association between blood type and the duration of the disease.

Discussion

The relationship within blood types and dermatophytoses has been studied by a number of researchers. Through blood typing and isolated dermatophytes identification in 54 participants. They observed that individuals with blood group A had a higher prevalence of dermatophytosis. The authors came to the conclusion that no statistical evidence that blood group A patients were more prone to dermatophytosis, even though they had seen more patients with Trichophyton mentagrophytes infection.[13] The results of Balajee et al., who found a higher percentage of blood group A patients, suggesting that individuals with this blood group were more prone to dermatophyte infections were in conflict with this finding.[14]

Table-I: Socio-demographic variables distribution of study participants (n=230)

Variables	Categories	Dermatophytic Group (n=115)	Control Group (n=115)	P – value
Gender	Female	52(45.2%)	48(41.7%)	0.213
	Male	63(54.8%)	67(58.3%)	
BMI (kg/m^2)		23.4±3.1	23.1±2.1	0.142
Blood pressure (mmHg)	SBP	115±15	120±16	0.121
	DBP	75±12	78±10	0.142
Educational status	Illiterate	34(29.6%)	37(32.2%)	0.211
	Primary	39(33.9%)	32(27.8%)	
	Secondary	25(21.7%)	26(22.6%)	
	Higher level	17(14.8%)	20(17.4%)	
Socioeconomic status (scores)		1.3±0.2 (1-4)	1.44±0.1 (1-4)	0.311
Married		82(71.3%)	75(65.2%)	0.452
Single		33(28.7%)	40(34.8%)	

BMI: Body Mass Index; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure. Data were expressed as mean±SD. Figures in parentheses indicate ranges. Statistical analysis was done with independent sample 't' test and Chi-square test

Table-II: Age and sex distribution of dermatophytoses patients (n=115)

Age (year)	Number of patients		Percentage %	
	Male	Female	Male	Female
5-14	11	8	17.5	15.4
15-30	22	12	35.0	23.1
31-49	12	18	19.0	34.6
50-64	7	6	11.1	11.5
65-75	5	5	8.0	9.6
76-85	6	3	9.5	6.0
Total	63	52	100	100

Table-III: Blood groups of clinical manifestations of dermatophytoses male patients (n=63)

Clinical manifestation	ABO Blood Group				Total	p-value
	A	B	AB	O		
Tinea Capitis	4(28.6%)	1(7.1%)	3(21.4%)	6(42.9%)	14(100%)	*0.016
Tinea Corporis	2(25.0%)	3(37.5%)	0(0.0%)	3(37.5%)	8(100%)	0.215
Tinea Manuum	2(40.0%)	1(20.0%)	0(0.0%)	2(40.0%)	5(100%)	0.314
Tinea Cruris	2(14.3%)	4(28.6%)	2(14.3%)	6(42.9%)	14(100%)	0.187
Tinea Pedis	1(6.7%)	7(46.7%)	1(6.7%)	6(40.0%)	15(100%)	*0.006
Tinea Unguium	2(28.5%)	1(14.3%)	1(14.3%)	3(42.9%)	7(100%)	0.219
Total	13(20.6%)	17(27.0%)	7(11.1%)	26(41.3%)	63(100%)	

Table-IV: Blood groups of clinical manifestations of dermatophytoses female patients (n=52)

Clinical manifestation	ABO Blood Group				Total	p-value
	A	B	AB	O		
Tinea Capitis	7(63.6%)	3(27.3%)	1(9.1%)	0(0.0%)	11(100%)	*0.021
Tinea Corporis	5(45.5%)	4(36.4%)	2(18.2%)	0(0.0%)	11(100%)	0.112
Tinea Manuum	2(50.0%)	1(25.0%)	0(0.0%)	1(25.0%)	4(100%)	0.174
Tinea Cruris	2(20.0%)	4(40.0%)	3(30.0%)	1(10.0%)	10(100%)	0.212
Tinea Pedis	1(33.3%)	1(33.3%)	0(0.0%)	1(33.3%)	3(100%)	0.261
Tinea Unguium	5(38.5%)	5(38.5%)	1(7.7%)	2(15.4%)	13(100%)	0.181
Total	22(42.3%)	18(34.6%)	7(13.5%)	5(9.6%)	52(100%)	

**Statistically significant value*

Table-V: Relationship between ABO blood group system and duration of disease (n=115)

Blood Type	Duration of disease				p-value
	Acute (< 6weeks)		Chronic (≥ 6weeks)		
A	15	33.3%	21	30.0%	
B	14	31.1%	22	31.4%	
O	11	24.4%	18	25.7%	0.452
AB	5	11.1%	9	12.9%	
Total	45	100%	70	100%	

According to this study, the highest incidence of dermatophytoses was observed in male blood group O patients. According to statistics, blood group O was most significantly associated with tinea pedis. These results were different from those of earlier research which could be explained by regional differences and the small sample size. Through blood typing and the finding of isolated dermatophytes in 40 participants, researchers in Brazil investigated the relation with dermatophytosis and ABO blood groups. The fungus Trichophyton rubrum which was isolated from 54.5% of the patients, was more common in blood group A individual.[15]

v A greater blood group number according to the results of a T. rubrum infection, there is no statistical indication that patients were more prone to dermatophytosis.[16] This was in contrast to the results of Balajee et al who hypothesised that because a larger percentage of patients were in blood group A, those individuals were more vulnerable to dermatophyte infections.[17] Similarly, another study found that blood group A individuals infected with the fungus Trichophyton mentagrophytesp had a higher rate of infections.[18]

In accordance with this study, dermatophytosis was found to be most prevalent in female blood group A patients. Only tinea capitis showed significant association with blood group A, according to statistical analysis. Due to geographic variations and the small number of cases- which were restricted to female participants—these results deviate from those of prior investigations. Therefore, aside from associations with blood group A and tinea capitis, our study did not find any overall relationship between dermatophytosis infections and blood groups. According to reports, tinea unguium was rare in children although it was more common in adults than in children.[19] Tinea unguium was substantially related to female gender in this study. This was consistent with recent studies showing that women in this setting may be more susceptible to these infections because they work in the kitchen and around the house which frequently results in frequent hand immersion in potentially undried water.[20]

Males were significantly prone than females to have tinea cruris. The prevalence of this kind of dermatophytosis was three times higher in men than in women, especially in young men.[21-23] The occlusive nature of masculine apparel may be the cause of this increased occurrence. Conversely, postpubescent girls who were overweight or wear tight clothing, like pantyhose, were also prone to suffer from tinea cruris.[19] Adults, especially men, accounted for the majority of tinea pedis patients. The prevalence rates did not, however, differ significantly across genders or between children and adults. Exposure to damp environments, which can occur from wearing occlusive footwear and having macerated skin, frequently facilitates the infection. It has been shown that communities where shoes were not commonly worn have lower rates of tinea pedis.[24]

Conclusion

The study findings indicate that male patients with blood group O and female patients with blood group A have the highest rates of dermatophytoses, with the majority of patients being Rh positive. In males, there is a relationship between dermatophytosis infections and blood groups, particularly with tinea pedis being associated with blood groups B and O, and tinea capitis correlating with blood group O. In females, however, there is no significant relationship between dermatophytosis infections and blood groups, except for an association between tinea capitis and blood group A.

Acknowledgement

The authors would like to express their gratitude to the Department of Dermatology and Venereology as well as the authority of Kurmitola General Hospital, Dhaka-1206, for their wholehearted cooperation during sample collection and are also thankful to the study subjects for their active and enthusiastic participation.

References

1. Weitzman I, Summerbell RC. The dermatophytes. Clin Microbial Rev. 1995; 8(2):240-59.

2. Die cas EN and Vernes A. Parasitic adaptation of pathogenic fungi to mammalian in host. Crit Rev Microbial.1986; 13(2):173-218.

3. McPherson ME, Woodgyer AJ, Simpson K, Chong AH. High prevalence of tinea capitis in newly arrived migrants at an English language school, Melbourne, 2005. Med J Aust. 2008; 189(1):13-6.

4. Havlickova B, Czaika VA, Friedrich M. Epidemiological trends in skin mycoses worldwide. Mycoses. 2008; 51(Suppl 4):S2-15.

5. King RD, Khan HA, Foye JC, Greeberg JH and Jones HE. Transfering iron and dermatophytes. Serum dermatophytes inhibitory component definitively identified as understand transferrin. J Clin Med. 1975; 86:204-12.

6. Balajee SAM, Menon T and Ranganthan S. ABO blood groups in relation to the infection rate of dermatophytosis. Mycoses J. 1996; 39(11-12):475-8.

7. Raheem-Ademola RR, Thomas BT, Omolade OA and Oluwadun A. Investigation of some hematological parameters and the biochemical system in pupils with Dermatophytosis. Report and Opinion. 2012; 4(9):67-9.

8. Alkhafajii KA and Alhassnawei HH. Clinico-mycological profile of superficial mycosis and the relationship of ABO blood grouping with superficial mycosis. Journal of Yeast and Fungal Research. 2014; 5(5):63-6.

9. Young E and Roth FJ. Immunological cross-reactivity between a glycoprotein isolated from Trichophyton mentagrophytes and human isoantigen A. J Invest Derm. 1979; 72(1):46-51.

10. Verma S, Hefferman MP. Superficial Fungal Infection: Dermatophytosis, Onychomycosis, Tinea Nigra, Piedra. In: Wolff K, Goldsmith L, Katz S, Gilchrest B, Paller A, Leffell O, Editors. Fitzpatrick's Dermatology In General Medicine. 8th Ed. New York: Mcgraw-Hill; 2012:1807–21.

11. Hay RJ, Moore M. Mycology. In: Champion RH, Burton JL, Durns DA, Breathnach SDM, Editors. Rooks Text Book of Dermatology. 6th Ed. Oxford: Blackwell Science. 1998:1277–1350.

12. Ramnik S. Medical Laboratory Technology. 6th ed, 2014.

13. Al-Ibady QAK. Study the Correlated Between Human Blood Groups and Body Mass Index for Children in Thi-Qar Province. Al-Kufa Journal for Biology. 2016; 8(3):503-11.

14. Balajee SA, Menon T and Ranganathan S. ABO blood groups in relation to the infection rate of dermatophytosis. Mycoses. 1996; 39(11-12):475-8.

15. Sabour AN, Nabi HJA, Majdi HF, Mohsen MK. The Relationship between Blood Groups and Dermatophytoses of Women in Karbala City. Journal of Global Pharma Technology. 2018; 10(5):170-4.

16. Vilani-Moreno FR, Arruda MSP, de-Claro SG, Marcos EVC and Ura S. Dermatophytosis: Association between ABO blood groups and reactivity to the trichophytin. Rev Inst Med trop Sao Paulo. 1999; 41(5):285-9.

17. Balajee SAM, Menon T and Ranganathan S. ABO blood groups in relation to the infection rate of dermatophytosis. Mycoses. 1996; 39:475-8.

18. Nielsen PG. Hereditary palmoplantar keratoderma and dermatophytosis in the northernmost county of Sweden (Norrbotten). Acta dermato-venereologica. Supplementum. 1994; 188:1-60.

19. Andrews MD. Common Tinea infections in children. Am Fam Physician. 2008; 77:1415-20.

20. Asadi MA, Dehghani R, Sharif MR. Epidemiologic study of onychomycosis and tinea pedis in Kashan, Iran. Jundishapur J Microbiol. 2009; 2:61-4.

21. Otero L, Palacio V, Vázquez F. Tinea cruris in female prostitutes. Mycopathologia. 2002; 153:29-31.

22. Al- Daamy AA, Wadi HK, Abed Ali RA, Tauma RH. The Relationship between Blood Groups and Dermatophytoses of Men in Karbala City. Scientific Journal of Medical Research. 2017; 1(3):99-102.

23. Patel GA, Wiederkehr M, Schwartz RA. Tinea cruris in children. Cutis. 2009; 84(3):133-7.

24. Oninla OA, Oninla SO. Superficial Mycoses in Relation to Age and Gender. BJMMR. 2016; 13(5):1-10.