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Original Article

Socio-Demographic and Environmental Risk Factors Associated with Superficial Fungal Infections in School-Aged Children

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ABSTRACT

Background: *Superficial fungal infections are common among school-aged children, especially in low- and middle-income countries. These infections, though often not life-threatening, can lead to significant discomfort, stigma, and school absenteeism. This study aimed to assess the socio-demographic and environmental risk factors associated with superficial fungal infections in children.* ***Methods & Materials:*** *This cross-sectional, descriptive study was conducted at the outpatient department of the Department of Dermatology and Venereology, Mugda Medical College Hospital, Dhaka, Bangladesh, from January 2024 to June 2024. A total of 385 children aged 5-17 years with superficial fungal infections were included in this study.* ***Results:*** *The majority of participants (38.18%) were between 9-12 years old, and 54.29% were females. Most children were from lower socioeconomic backgrounds (57.92%) and lived in urban areas (69.35%). Common environmental exposures included sharing towels or bedding (60.26%) and wearing synthetic clothes (46.23%).. Tinea corporis is the most prevalent type of superficial fungal infection (57.66%), followed by tinea cruris (42.86%), tinea faciei (20.52%), and tinea capitis (16.62%). Older children (11–17 years) were more likely to belong to lower socioeconomic class ($p = 0.001$), poor personal hygiene ($p < 0.0001$), have contact with animals ($p < 0.001$), wear synthetic clothing ($p < 0.001$), and experience frequent sweating ($p < 0.001$).* ***Conclusion:*** *Socioeconomic status, family size, hygiene practices, and environmental exposures significantly influence the risk of superficial fungal infections in school-aged children. Targeted public health interventions focusing on hygiene education and environmental improvements could help reduce the burden of these infections in vulnerable pediatric populations.*

Keywords: *Superficial fungal infections, School-aged children, Socio-demographic factors, Hygiene, Risk factors*

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INTRODUCTION

Superficial fungal infections of the skin refer to fungal infections that affect the outer layers of the skin, as well as the nail and hair. These infections are primarily caused by dermatophytes and yeasts, with non-dermatophyte moulds being less common[1]. They are a common cause of skin disease globally and pose a significant public health concern[2,3].

Superficial fungal infections are particularly prevalent among schoolchildren, leading to considerable morbidity and reduced quality of life[4,5]. In low and middle-income countries like Bangladesh, superficial fungal infections often contribute to poor school attendance. It is estimated that approximately 20% to 25% of the global population suffers from superficial fungal infections[2].

Superficial fungal infections are primarily caused by dermatophytes, responsible for infections such as *tinea capitis, tinea faciei*, *tinea corporis, tinea unguium, tinea manuum, and tinea pedis*. Other agents include yeasts and non-dermatophytes, which cause conditions like *pityriasis versicolor*, cutaneous *candidiasis*, *tinea nigra*, *black piedra*, and *white piedra*[1]. However, dermatophytes account for the majority of superficial fungal infections[6]. Among school-aged children**,** *tinea capitis* is the most commonly reported superficial fungal infection[7].

Various risk factors for superficial fungal infections have been identified in the literature, though their prominence can vary

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depending on regional climate, human activity, and the socioeconomic development of the population[8]. In tropical regions, warm and humid climates increase the risk of fungal infections through mechanisms such as excessive sweating and skin maceration[2,3]. Other contributing factors include poor personal hygiene, overcrowding, poor sanitation, frequent skin contact, and low socioeconomic status, all of which elevate the risk of superficial fungal infections among school-aged children[9,10].

Despite the burden of disease, risk factors for acquiring superficial fungal infections in schoolchildren have not been extensively documented. It is therefore crucial to develop evidence-based, effective preventive strategies. The present study aimed to determine the socio-demographic and environmental risk factors associated with superficial fungal infections in school-aged children.

METHODS & MATERIALS

This cross-sectional, descriptive study was conducted at the outpatient department of the Department of Dermatology and Venereology, Mugda Medical College Hospital, Dhaka, Bangladesh, from January 2024 to June 2024. In this study, we included a total of 385 children with superficial fungal infections attending the dermatology and venereology outpatient department.

The following criteria were used to determine eligibility for enrollment as study participants:

Inclusion Criteria

a) Children aged between 5 to 17 years;
b) Children diagnosed with superficial fungal infections;
c) Children whose parents or guardians provided written informed consent.
d) Both treated and untreated cases were included.

Exclusion Criteria

a) Participants with incomplete clinical or questionnaire data;
b) Children aged ≥18 years were excluded from our study.

Data Collection Procedure: Parents or legal guardians of children diagnosed with superficial fungal infections clinically were asked to be included in the study. Consent was taken after an explanation of the study procedure. A thorough physical examination, conducted in a well-lit room with minimal clothing, was performed from head to toe to detect any superficial fungal infections in the presence of an attendant or guardian to ensure privacy. Demographic information, medical history, and systemic diseases such as asthma, allergy, chronic infection, liver dysfunction, renal disease, epilepsy, etc, of the participants were documented. Skin scrapings (scales and crusts), hair pluck, and nail clippings were collected for 20% potassium hydroxide microscopic examination, and Wood's light examination was done to aid our diagnosis. The findings from the laboratory tests were duly noted.

Statistical Analysis: All data were recorded systematically in a pre-formatted data collection form. Quantitative data was expressed as mean and standard deviation, and qualitative data was expressed as frequency distribution and percentage. The data were analyzed using the chi-square test. A p-value <0.05 was considered significant. Statistical analysis was performed by using SPSS 22 (Statistical Package for Social Sciences) for Windows version 10.

RESULTS

Table – I: Sociodemographic characteristics of our study participants (*n*=385)

Variables	N	P (%)
Age (years)		
5-8	126	32.73
9-12	147	38.18
13-17	112	29.09
Mean age	11.13±3.91	
Sex		
Male	176	45.71
Female	209	54.29
Type of Education		
Not attending school	29	7.53
School	250	64.93
Madrasa	106	27.53
Parents' Education		
SSC	206	53.51
HSC or Graduate	140	36.36
No formal Education	39	10.13
Parents' Occupation		
Rickshaw pullers/Laborers	216	56.10
Business	104	27.01
Employees	51	13.25
Others	14	3.64
Residence		
Urban	267	69.35
Rural	118	30.65
Socio-economic Status		
Upper class	4	1.04
Middle class	158	41.04
Lower class	223	57.92
Size of Family		
Large (≥7)	35	9.09
Medium (4–6)	304	78.96
Small (≤3)	46	11.95

Table I shows that most participants (38.18%) were aged between 9 and 12 years. In terms of sex distribution, 54.29% were females and 45.71% were males. Regarding educational status, most of the children (64.93%) attended regular schools, 27.53% were enrolled in madrasa, and 7.53% were not attending any educational institution. Most parents (53.51%) had primary, secondary, or SSC-level education, while 10.13% had no formal education. The majority of parents (56.10%) were engaged in manual labor working as rickshaw pullers or laborers, etc, followed by business

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(27.01%) and employees (13.25%). Most of the children resided in urban areas (69.35%). A majority of the study participants (57.92%) came from a low socioeconomic background. Family size was predominantly medium-sized (4–6 members), accounting for 78.96% of all participants.

Table – II: Hygiene-related baseline characteristics of the study participants (*n*=385)

Variable	N	P (%)
Bathing (daily)	305	79.22
Washing clothes (daily)	268	69.61
Touching animals	121	31.43
Sharing bed or clothes	232	60.26
Synthetic clothes wearing		
Frequently	178	46.23
Not frequently	207	53.77
Use sweaty clothes or socks for a prolonged period	210	54.55
Frequency of daily hand wash (Mean ± SD)	6.54 ± 2.66	

Table II shows that the majority of children reported bathing daily (79.22%) and washing their clothes daily (69.61%). However, 60.26% of participants shared bed or clothes with others, and 31.43% reported frequent contact with animals. Regarding clothing habits, 46.23% of children frequently wore tight or synthetic clothes, and 54.55% admitted to wearing sweaty clothes or socks for prolonged periods. The mean frequency of hand washing per day was 6.54 ±2.66 times.

Table – III: Clinical characteristics of study participants (*n*=385)

Variables	N	P(%)
Duration of Disease		
<2 weeks	49	12.73
2-4 wees	102	26.49
>4 weeks	234	60.78
Site of Involvement		
Scalp	65	16.88
Abdomen	96	24.94
Back	63	16.36
Limbs	90	23.38
Hand	23	5.97
Feet	8	2.08
Face	85	22.08
Chest	42	10.91
Groin	161	41.82
Genitalia	16	4.16
Finger nail	4	1.04
Toe nail	2	0.52
Family History		
Affected family members	248	64.42
Non-affected	137	35.58
Associated systemic disease		
Asthma	20	5.19
Allergy history	47	12.21
Liver dysfunction	9	2.34
Renal disease	6	1.56
others	11	2.86

In Table 3, this study shows that a significant proportion of the children (60.78%) had infections lasting more than 4 weeks. Regarding the site of infection, the groin was the most frequently affected place, accounting for 41.82% of cases, followed by the abdomen (24.94%), limbs (23.38%), face (22.08%), scalp (16.88%), back (16.36%), and chest (10.91%). A positive family history of superficial fungal infections was reported by 64.42% of participants. Regarding comorbid conditions, 12.21% of the children had a history of allergies, and 5.19% reported asthma.

Table – IV: Clinical pattern of superficial fungal infections (*n*=385)

Type of Superficial Fungal Infection	N	P(%)
Tinea capitis	64	16.62
Tinea corporis	222	57.66
Tinea unguium	2	0.52
Tinea faciei	79	20.52
Pityriasis versicolor	10	2.60
Cutaneous candidiasis (oral, genital, intertrigo)	14	3.64
Tinea cruris	165	42.86
Tinea manuum	19	4.94
Tinea pedis	8	2.08

Table IV shows that the most prevalent type of superficial fungal infection (SFI) was tinea corporis, accounting for 57.66% of cases, followed by tinea cruris at 42.86%, tinea faciei at 20.52%, and tinea capitis at 16.62%. Multiple infections were seen in some patients for which percentage of clinical patterns of superficial infections was more than 100.

Table – V: Risk Factors associated with Superficial Fungal Infections in our study participants (*n*=385)

Risk Factors	Age group (years)				P-value
	5-10		11-17		
Socio-Demographic	N=243	P (%)	N=142	P (%)	
Lower class	104	42.80	87	61.27	0.001
Having family members >4	129	53.08	58	40.84	0.020
Low parental education level	34	13.99	21	14.79	0.829
Environmental					
Shared bedding or towels	122	50.21	49	34.51	0.003
Poor personal hygiene	54	22.22	107	75.35	< 0.0001
Touching animals	37	15.23	65	45.77	< 0.001
Use of tight or synthetic clothes or footwear	49	20.16	96	67.61	< 0.001
Frequent sweating	94	38.68	129	90.85	< 0.001

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Table V shows that among the socio-demographic factors, a significantly higher proportion of older children (11–17 years) belonged to the lower socioeconomic class than younger children (61.27% vs. 42.80%; $p = 0.001$). Households with more than four family members were more common in the younger children (53.08%) than in the adolescent group (40.84%), showing statistical significance ($p = 0.020$). No significant differences were observed regarding parental education level ($p = 0.829$). Regarding environmental factors, sharing bedding or towels was significantly more common among younger children (50.21% vs. 34.51%; $p = 0.003$). On the other hand, older children were significantly more likely to have contact with animals (45.77% vs. 15.23%; $p < 0.001$), wear tight or synthetic clothing or footwear (67.61% vs. 20.16%; $p < 0.001$), and experience frequent sweating (90.85% vs. 38.68%; $p < 0.001$). Poor personal hygiene was strikingly higher among adolescents (75.35%) compared to younger children (22.22%), with a highly significant difference ($p < 0.0001$).

DISCUSSION

In the present study, the mean age of participants was 9.73 ± 2.18 years, with the majority belonging to the 9 to 12-year age group. This age range is widely recognized as the most affected population globally, aligning with findings from previous studies and fitting within the reference school-age range of six to twelve years[11-13]. In terms of gender, our study found that females (54.29%) were more infected than males (45.71%). On the contrary, it has been reported by Odeigah et al. and Olutoyin et al., who observed a higher infection rate among males[14,15]. The study revealed that children from families with lower socioeconomic status (57.s92%) were more affected by superficial fungal infections. Similar findings were observed in the study done by Karmakar et al. Tinea corporis was identified as the most common type of superficial fungal infection (57.66%), followed by tinea cruris (42.86%) and tinea faciei (20.52%). A study conducted by Akbas et al. reported that the most common superficial fungal infections were tinea corporis (26.3%), pityriasis versicolor (19.1%), candidiasis (16.6%), and tinea capitis (13.9%). These findings differ from those reported by Jena in India, where pityriasis versicolor affected over 30% of children between infancy and 14 years[16]. Such differences may reflect geographical and climatic variations across study regions. The majority of the study participants had a medium-sized family, often consisting of 4 to 6 members. In most households affected by superficial fungal infections, the person-to-room ratio ranged from two to three individuals per room. Figueroa et al. in South Western Ethiopia found no statistically significant link between overcrowding and infection[10]. Similarly, Olutoyin et al. in South Western Nigeria noted a higher prevalence of infections in urban areas and crowded settings, although the association was not statistically significant[15]. However, other researchers have established that tinea capitis was more common in children from families where three or more members shared a room[18,19]. This may be due to the increased likelihood of sharing personal items such as towels, combs, and hats that were common and statistically significant in our study ($p = 0.003$).

Overall, this study identified several sociodemographic and environmental factors, such as older age in children, lower socioeconomic class, overcrowded families, wearing tight or synthetic clothes, and various hygiene-related practices that are significantly associated with the occurrence of skin fungal infections.

Regarding environmental factors, sharing bedding or towels was significantly more common among younger children (50.21% vs. 34.51%; $p = 0.003$). Older children were significantly more likely to have contact with animals (45.77% vs. 15.23%; $p < 0.001$), wear tight or synthetic clothing or footwear (67.61% vs. 20.16%; $p < 0.001$), and experience frequent sweating (90.85% vs. 38.68%; $p < 0.001$). Similar environmental and socioeconomic conditions have been reported by Kalu et al., Oyedeji et al., and Saheed et al. in their respective studies, which highlighted poverty, poor hygiene practices, low education levels, inadequate water supply, and harmful socio-cultural behaviors as contributing factors[21-23].

LIMITATIONS OF THE STUDY

Our study was a single-center study, so it does not represent the entire community. The study period was short. After evaluating those patients, we did not follow up with them long-term and are unaware of any potential long-term interferences that may arise with these patients.

CONCLUSION

This study highlighted that superficial fungal infections (SFI) remain a common health concern among school-aged children. The key socio-demographic and environmental risk factors were identified. Children from lower socioeconomic backgrounds and larger families were significantly more affected. Environmental exposures such as sharing bedding or towels, frequent contact with animals, wearing tight or synthetic clothing, and excessive sweating were notably associated with higher infection rates, especially among older children.

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