

Fungal Skin Diseases and Related Factors in Outpatients of Three Tertiary Care Hospitals of Dhaka, an Urban City of Bangladesh: Cross-Sectional Study

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ABSTRACT

The main objective was to determine the prevalence of the fungal skin diseases and explore the related factors including demographical, personal hygiene aspect and socio-economic status of the patients, the study was performed at the Dermatology Departments of three tertiary care hospitals. Collection of skin samples and personal interviews of patients were followed by laboratory confirmation of the diseases and their pathogens were completed by direct microscopy and culture. Among 800 patients, 310 patients had fungal infection with highest prevalence [38.75%] where ringworm [81.61%] and Oral candidiasis [2.9%] were highest and lowest. Onchomycosis [27.41%] had highest prevalence among ringworm patients. In case of factors, summer season [59.68%], married [71.93%], secondary education [36.45%], 12000-20000tk monthly [38.06%] and upper-middle class status [38.06%], Muslims [86.13%], businessmen [39.73%], urban areas [69.35%], tap water [69.35%], recurrent infections [62.9%] and overcrowding of family [66.13%] had higher prevalence of fungal infections of skin. This research would add to the scientific literature and health policies as unlike other studies it has specifically evaluated the prevalence of fungal skin diseases of an urban city with associated factors in Bangladesh.

Introduction

Globally, fungal skin diseases are very common in human. As a densely populated developing country and having poor hygiene, sanitation practice, Bangladesh is no different to fungal skin infections. The skin protects us from microbes and the elements of skin help in regulating body temperature and permit the sensations of touch, heat, and cold. As it interfaces with the environment, skin plays an important immunity role in protecting the body against pathogens. It is subject to a wide range of medical conditions and infections ranging from simple manifestations to complicated ones like skin cancer. Symptoms and severity of skin disorders vary greatly. They can be temporary or permanent and may be painless or

painful. Some have situational causes, while others may be genetic. Some skin conditions are minor, and others can be life-threatening. However, fungal, bacterial, parasitic and viral infections are very common in the healthy people. Several types of parasitic, bacterial and fungal infections are found which causes negligible mortality but most of the diseases have chronic course and sufferings [1].

The skin is the body's initial defense against parasites, fungi, bacteria, viruses and other microbes. But skin and venereal diseases cause a large part of illness. About 50% of people in Bangladesh suffer from skin disorders in their lifetime. Incidence of infection on skin is very frequent due to some environmental, natural,

occupational and individual habitat variations. It increases when people are herded together and facilities for washing the body and clothing are reduced. Recurrence, excessive use of chemicals and cosmetics, environmental pollution, delayed marriage etc is the major leading factors for the initiation and transmission of the diseases.

About 80% of population in Bangladesh live in the rural areas, where poverty, literacy, ignorance, high family members, disease and disasters are the constant companion of them. Increasing population, socio economic conditions have become poor and due to this population explosion, all the reversible socio-demographic conditions go in favor of disease occurrence, recurrence, and complications. In addition, overcrowding, urbanization, industrialization, migration, excessive use of chemicals and cosmetics, environmental pollution, greenhouse effect, education, delayed marriage and use of multiple partners are also the major leading factors for inflation and transmission of diseases.

Skin and venereal diseases are one of the major public health problems in developing countries. Though it occurs in all class of society but people living in insanitary and poor housings conditions suffer more from the disease, poverty-stricken people with poor hygienic habits and unclean clothing are the usual victims of these diseases. Symptoms of infection depends on the type of organisms that has caused the infection and both symptom and appearance also depend on the part of the body infected. In many studies it has been shown that 30-40% of our population is suffering from skin diseases. Of which about 80% are scabies and pyogenic infections.

Children are the worst sufferers from these diseases (Khanum and Alam 2010). The relation between the skin and venereal diseases of the diabetic patients of different age group and socio-demographic characteristics is very complicated. The socio-demographic aspects are very important to know because in different societies and social groups explain the causes of illness, the type of treatment they believe and to whom they turn if they go get ill (Khanum *et al.* 2007).

In human anatomy, the largest outer organ, covering throughout the whole body is skin. Skin performs a very significant role in immunization by defending against outer microbes and pathogens. Moreover, the elements of skin help the body to regulate the temperature throughout the body and create the feelings of heat, cold and touch. However, this important organ of the body has been exposed to a variety of infections and medical sufferings varying from simple acne to very intricating skin cancer types. Worldwide, among human diseases, the most common is skin disease. It can affect individuals anytime during their lifetime [1], can strike at any age, can spread over all societies and cultures. In time skin disease can lead to systematic disorders. Its damaging effects lead to physical disability even death [2].

In 2010, the global burden of disease [GBD] published that skin diseases ranked fourth as the prominent reason for non-fatal disease burden affecting both high- and low-income countries [3]. In 2013, GBD published that skin diseases are responsible for 39 million years lived with disability [YLDs] and in case of disability-adjusted life years [DALYs] sit has attributed 1.79% to the global burden of diseases [4].

Fungal Disease: Ringworm (Dermatophytosis)

Ringworm, also known as dermatophytosis or Tinea, is a fungal infection of the skin. The name "ringworm" is a misnomer, since the infection is caused by a fungus, not a worm. Ringworm infection can affect both humans and animals. The infection initially presents with red patches on affected areas of the skin and later spreads to other parts of the body. The infection may affect the skin of the scalp, feet, groin, beard, or other areas. Ringworm can go by different names depending on the part of the body affected.

1. **Tinea capitis** [Ringworm of the scalp] is a fungal infection affecting on scalp.
2. **Tinea corporis** [Ringworm of the body] is a fungal infection that affects the skin of body.
3. **Tinea cruris** [Jock itch] is a fungal infection that affects the warm and moist area such as buttocks, groin, inner thighs etc.
4. **Tinea pedis** [Athlete's foot] is a fungal infection that affects the skin of feet.
5. **Tineaunguium** [Onychomycosis] is a fungal infection that affects either the fingernails or toenails.
6. **Tinea facie** is a fungal infection that affects the face.
7. **Tinea barbae** is a fungal infection that affects the beard area of men.
8. **Tinea mannum** is a fungal infection that affects the area of hands.
9. **Tinea versicoloris** a fungal infection that affects the whole body as the form of discolored patches of skin.

Dermatophytosis tends to get worse during summer, with symptoms alleviating during the winter. The disease can be transmitted between animals and humans [zoonotic disease]. Three different types of fungi can cause this infection. They are called *Trichophyton*, *Microsporum* and *Epidermophyton*. It's possible that these fungi may live for an extended period as spores in soil. Humans and animals can contract ringworm after direct contact with this soil. The infection can also spread through contact with infected animals or humans. The infection is commonly spread among children and by sharing items that may not be clean. Fungi thrive in moist, warm areas, such as locker rooms, tanning beds,

swimming pools and in skin folds. It can be spread by sharing sport goods, towels, and clothing.

Symptoms and severity of skin disorders vary greatly. The consequence of this problem is serious for the patient as well as for the society. Among skin diseases, fungal, bacterial, parasitic and viral infections are very common. The distributional pattern of skin diseases varies widely from country to country, even within the country itself [1]. Although they are attributable to a very insignificant mortality rate but most of the skin diseases comes with a possibility of prolonged sufferings thus raising public health concerns in developing countries.

Bangladesh is a densely populated country with 164.69 million population and 24% of people live under the poverty line [5] and the majority of the population suffer from different infections and contagious diseases. Study conducted by Khanum and Alam, it has been shown that 30-40% of our population is suffering from skin diseases [6]. Approximately, 40% of people live in urban cities and the highest 10.3 million people live in Dhaka city [7]. Several papers have studied common skin and venereal diseases in Bangladesh [8-14] but our paper is specifically concerned about fungal skin diseases and their associated factors in three tertiary care hospitals of an urban city, Dhaka, Bangladesh.

According to the 2010 GBD, fungal skin infections were among the top 10 most dominant diseases globally [3]. According to the 2013 GBD, 0.15% of DALYs of the global burden of skin diseases are contributed by fungal skin diseases [4]. In rural areas of Bangladesh fungal skin infections are very common [15]. A study on the common skin diseases revealed that out of 440 patients 13% had fungal infections [11]. Other studies of Bangladesh showed prevalence ranging from 15.5%- 26.7% [12-14]. India, neighboring country to Bangladesh also reported that Fungal diseases were the highest group of all skin diseases with 18.74% prevalence [16] and second highest with 17.19% prevalence [17]. In Pakistan, a study conducted in 2017 showed 34.80% prevalence of fungal skin infections out of 95983 patients in a tertiary care hospital of Karachi [18]. A community-based survey studying the skin diseases of South Asian Americans found that fungal had 11% prevalence after Acne and Eczema [19].

Numerous factors can influence the prevalence of skin infections mentioning geographical and cultural factors [20-21], educational status, nutritional status, socio-economic status, as well as seasons, overcrowding, unhygienic habits, and environments are significant factors of defining the distribution of skin diseases in developing countries [1,22-24]. The socio-demographic aspects are very significant to know because in different societies and social clusters rationalize the reasons of illness, what types of treatments and whom they believe in case of their treatments [5].

Materials and Methods

This research study was performed at the Dermatology Department of the Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders [BIRDEM], Dhaka Medical College and Hospital [DMCH] and Uttara Adhunik Medical College and Hospital [UAMCH]. The study was undertaken from 25th March 2018 to 10th February 2019. A total of 800 outdoor patients were randomly selected of all genders, ages, sexes, with different occupations irrespective of their skin problems during the data collection period of BIRDEM, DMCH, and UAMCH. The present study was conducted in two steps, firstly collecting samples and data through personal interviews and secondly laboratory confirmation of the diseases and their pathogens. A literature review was carried out about the factors relating to skin diseases before a structured questionnaire was prepared for interviewing the patients about their demographics and socio-economical aspects.

Statistical Analysis

Analysis of the data has been achieved by using the statistical software SPSS [version-20.0] and the results were presented in percentages. We have matched our results with comparable studies of other cities of the country and nearby countries through similar hospital attendance-based studies.

Ethical Approval

We informed each and every patient about our study aims, methods as well as we assured them about their privacy and confidentiality at any stage of the study [at the time of data, sample collection and laboratory diagnosis] before including them into our study. We also made it flexible to the patients to enter the study and also to withdraw their consent.

Results

In the present observation cross-sectional study has been outlined to determine the prevalence of the fungal skin diseases of tertiary care hospitals in an urban city. The present study also provides a descriptive profile of factors related to the fungal skin diseases including demographical, personal hygiene aspect and socio-economic status of the outpatients attending the Dermatology Department of major three tertiary care hospitals in Dhaka city, Bangladesh.

There were a combination of skin infections including fungal, viral, bacterial, parasitic, sexually transmitted diseases [STD] but maximum patients had fungal skin infections. Among the 800 patients, 310 patients were infected with fungal infections [38.75%]. It was observed, of those 310 patients 183 [59%] were male patients and 127 [41%] were female patients. Out of 310

fungal infected patients, most of the patients, were infected by ringworm [81.61%] and the lowest prevalence was found in case of Oral thrush [2.9%] (Table 1). Besides, ringworm patients were infected by Pityriasis versicolor, Seborrhoeic dermatitis. Among

253 patients of ringworm patients the highest prevalence was found in case of Onchomycosis [21.94%] and the lowest prevalence was found in case of *Tinea capitis* [0.97%] (Figure 1).

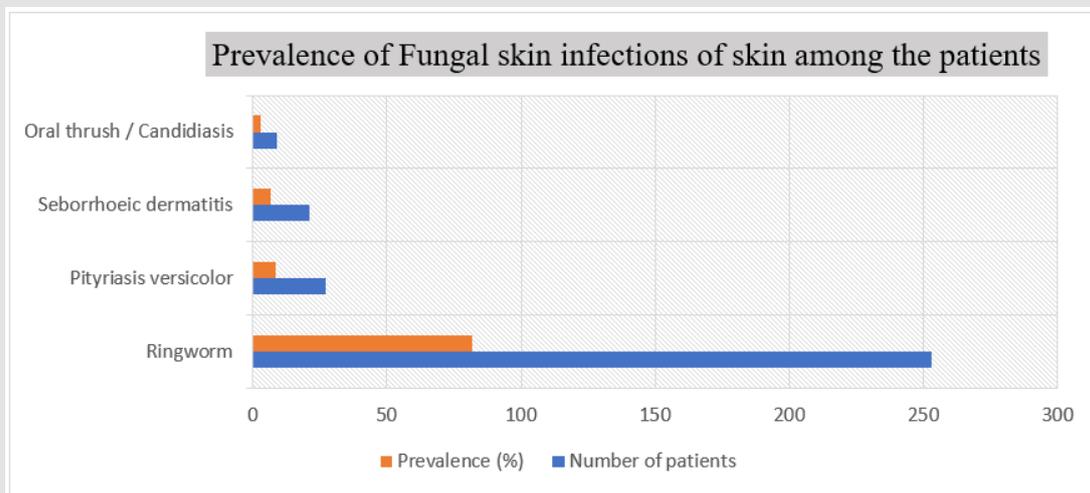


Figure 1: Prevalence of ringworm causing agents among the patients.

Table 1: Prevalence of fungal skin infections of skin among the patients.

Fungal infections	Number of patients	Prevalence (%)
Ringworm	253	81.61%
<i>Pityriasis versicolor</i>	27	8.71%
Seborrhoeic dermatitis	21	6.77%
Oral thrush / Candidiasis	9	2.90%

Among the 183 male patients highest 66.67% were infected by Oral thrush/ Candidiasis and lowest 42.86% were infected by Seborrhoeic dermatitis whereas, among the 127 female patients highest 57.14% were infected by Seborrhoeic dermatitis and 33.33% were infected by Oral thrush/ Candidiasis] (Table 2).

Moreover, in ringworm causing agents highest 67.65% male were infected by *Tinea pedis* and lowest 20% males were infected by *Tinea facie* while in female group highest 80% were infected by *Tinea facie* and lowest 32.35% were infected by *Tinea pedis* (Table 3).

Table 2: Prevalence of fungal skin diseases according to the gender of patients.

Fungal infections	Total patients	Number of male patients	Prevalence (%) in male	Number of female patients	Prevalence (%) in female
Ringworm	253	152	60.10%	101	39.90%
<i>Pityriasis versicolor</i>	27	16	59.26%	11	40.74%
Seborrhoeic dermatitis	21	9	42.86%	12	57.14%
Oral thrush/Candidiasis	9	6	66.67%	3	33.33%
Total	310	183	59%	127	41%

Table 3: Prevalence of ringworm causing agents according to gender of patients.

Ringworm causing agents	Total patients	Number of male patients	Prevalence (%) in male	Number of female patients	Prevalence (%) in female
Onchomycosis	85	54	63.53	31	36.47
<i>Tinea corporis</i>	68	37	54.41	31	45.59
<i>Tinea cruris</i>	51	34	66.67	17	33.33
<i>Tinea pedis</i>	34	23	67.65	11	32.35

<i>Tinea mannum</i>	7	2	28.57	5	71.43
<i>Tinea facie</i>	5	1	20	4	80
<i>Tinea capitis</i>	3	1	33.33	2	66.67

It was also observed that out of total 310 fungal infected patients, the highest burden of fungal infections was present among the patients of age group of 31-45 [32.26%] and the lowest burden of infections was belonged to the patients of age group of 0-15 [6.13%] (Table 4). This was also similar for the prevalence of the specific ringworm causing agents. Age group of 31-45 years had highest prevalence [32.81%] and 0-15 years group had lowest

prevalence [4.74%] (Table 5). Finally, we observed the factors from the personal interviews of the 310 patients mentioning marital status, socio-economic status, educational status, monthly income, occupation, seasons, religions, sources of water, residence location, regular bath, regular types of clothes, personal items sharing, history of recurrent infections, times of recurrent infections, overcrowding of family (Table 6).

Table 4: Prevalence of fungal infections in different age groups.

Fungal infections	Total patients	Number of patients and prevalence (%)	Age groups			
			(0-15) years	(16-30) years	(31-45) years	(46-59) years
Ringworm	253	12 (4.74%)	59 (23.32%)	83 (32.81%)	64 (25.30%)	35 (13.83%)
Pityriasis versicolor	27	4 (14.81%)	7 (25.93%)	9 (33.33%)	4 (14.81%)	3 (11.11%)
Seborrhoeic dermatitis	21	0 (0%)	6 (28.57%)	5 (23.81%)	8 (38.1%)	2 (9.5%)
Oral thrush/ Candidiasis	9	3 (33.33%)	2 (22.22%)	3 (33.33%)	1 (11.11%)	0 (0%)
Total	310	19 (6.13%)	74 (23.87%)	100 (32.26%)	77 (24.84%)	40 (12.90%)

Table 5: Prevalence of ringworm causing agents in different age groups.

Fungal infections	Total patients	Number of patients and prevalence (%)	Age groups			
			(0-15) years	(16-30) years	(31-45) years	(46-59) years
Onchomycosis	85	0 (0%)	17 (20%)	23 (27.06%)	30 (35.29%)	15 (17.65%)
<i>Tinea corporis</i>	68	7 (10.29%)	13 (19.12%)	27 (39.7%)	15 (22.06%)	6 (8.82%)
<i>Tinea cruris</i>	51	5 (9.80%)	18 (35.29%)	17 (33.33%)	5 (9.8%)	6 (11.76%)
<i>Tinea pedis</i>	34	0 (0%)	6 (17.65%)	9 (26.47%)	11 (32.35%)	8 (23.53%)
<i>Tinea mannum</i>	7	0 (0%)	2 (28.57%)	4 (57.14%)	1 (14.29%)	0 (0%)
<i>Tinea facie</i>	5	0 (0%)	2 (40%)	2 (40%)	1 (20%)	0 (0%)
<i>Tinea capitis</i>	3	0 (0%)	1 (33.33%)	1 (33.33%)	1 (33.33%)	0 (0%)

Table 6: Prevalence of fungal infections according to considered factors.

Factors		Number of patients & prevalence (%)
Marital status	Married	223 (71.93%)
	Unmarried	47 (15.16%)
	Widow/ Widower	15 (4.84%)
	Separated/ Divorced	25 (8.06%)
Socio-economic status	Lower	47 (15.16%)
	Middle	78 (24.16%)
	Upper-middle	118 (38.06%)
	Higher	67 (21.61%)

Educational status	Illiterate	33 (10.65%)
	Primary	12 (38.71%)
	Secondary	113(36.45%)
	Higher secondary	97 (31.29%)
	Degree or above	55 (17.74%)
Monthly income	Below than 6000 TK	47 (15.16%)
	6000-12000 TK	78 (25.16%)
	12000-20000 TK	118 (38.06%)
	20000+ TK	67 (21.61%)
Occupation	Govt. Service	21 (53.85%)
	Non-Govt. Service	47 (47%)
	Business	58 (39.73%)
	Industrial worker	29 (48.33%)
	Housewife	52 (39.39%)
	Driver (Rickshaw, van, bus, truck)	18 (36%)
	Student	32 (21.48%)
	Day labor	28 (39.44%)
	Others	25 (47.17%)
Seasons	Summer (March-June)	185 (59.68%)
	Rainy (July-October)	82 (26.45%)
	Winter (November-February)	43 (13.87%)
Religions	Muslim	267 (86.13%)
	Hindu	35 (11.29%)
	Others	8 (2.58%)
Sources of water	Tap	215 (69.35%)
	Tube well	80 (25.81%)
	Pond	10 (3.23%)
	others	5 (1.61%)
Residence location	Urban	215 (69.35%)
	Semi-urban	75 (24.19%)
	Rural	20 (6.45%)
Regular bath	Yes	186 (60%)
	No	124 (40%)
Regular types of clothes	Cotton	86 (27.74%)
	Synthetic	60 (19.35%)
	Nylon	32 (10.32%)
	Mixed	108 (34.84%)
	others	24 (7.74%)
Personal items sharing	Yes	198 (63.87%)
	No	112 (36.13%)
History of recurrent infections	Yes	195 (62.9%)
	No	115 (37.1%)
Overcrowding of family	Yes	205 (66.13%)
	No	105 (33.87%)

Discussion

In the present investigation, out of total 800 patients, 310 patients had fungal infections with the highest prevalence [38.75%] followed by other fungal skin problems. Out of fungal infections ringworm had highest prevalence [81.61%] followed by *Pityriasis versicolor*, Seborrhoeic dermatitis and Oral thrush/ Candidiasis. Among the ringworm, onychomycosis [27.42%], *Tinea corporis* [21.94%], *Tinea cruris* [16.45%] had the highest prevalence. It was also observed were male patients had high prevalence [59%] than female patients [41%]. In case of age group patients contained among the age group of 31-45 had the highest [32.26%] and the lowest prevalence of patients belonged to the age group of 0-15 [6.13%]. Outcomes of this study are similar to results of some studies while contradicts to some.

In 1993, a study performed by Hossain [25] found that fungal infection [20.19%], and seborrhoeic dermatitis [8.80%] were most common among the skin diseases [25]. In 1995, Bahmadan *et al.* [22] reported that in Abha city from Saudi Arabia among the fungal disease developing pathogens, *Tinea capitis* [9.6%] and *Tinea pedis* [1.9%] were most common [22] but we found *Tinea corporis* [21.94%], *Tinea cruris* [16.45%] had the highest prevalence. In 2011, a study conducted by Rahman *et al.* found *Tinea corporis* [22.63%] was the most frequent infection as well as males were mostly infected with fungal infections which is similar to the results of this present study [15].

In 2007, study by Khanam *et al.* informed that among the fungal infected patient's majority [42.7%] were infected by ringworm, 45.36% by *Pityriosis versicolor* and lowest [12%] were infected by Candidiasis. Khanum also reported that the prevalence of fungal infection was in highest in 40-49 age group [25.33%] and less in 20-29 age group [14.66%] and prevalence in male was highest [61.33%] than female [38.66%] [8]. In 2012, one study from a Dhamrai area near Dhaka performed by Nafiza *et al.* had reported that among the patients with cutaneous skin diseases, fungal infections were the commonest and highest [22.9%] and males had high prevalence [63.4%] than females [36.6%] [12]. In 2017, Haque *et al.* revealed among the 504 patients who were surveyed from Rajshahi, an unbar city of Bangladesh with different types of skin disease, male had highest prevalence of fungal infections [26].

In this present study we had explored not only the demographical and socio-economic aspects but also seasonal aspect and the hygiene habits of the patients to better understand the factors related to the fungal skin diseases. It has been witnessed in this study, that among the fungal infected patients who were married [71.93%], had secondary education [36.45%], earned 12000-20000tk monthly [38.06%] and had upper-middle class status [38.06%] had higher prevalence. Moreover, patients who

were Muslims [86.13%], had businesses [39.73%], lived in urban areas [69.35%], used tap water as the source of water [69.35%] also had higher prevalence of fungal infections of skin. In case of personal hygiene of the patients, who wears cotton clothes regularly [27.74%], baths regularly [60%], shares personal items [63.87%], had recurrent infections [62.9%] and had overcrowding of family [66.13%] had higher prevalence. Additionally, in summer season fungal infections had higher prevalence [59.68%]. This study had found high prevalence in Muslims as the study was conducted in an Islamic country.

There are several studies conducted in Bangladesh had found different results than ours. According to them, the prevalence was higher in rural areas [15], among students [10], patients from low socio-economic status [9], among illiterate patients [9,10], in rainy season [8]. According to Khanum *et al.* 52.16% of the patients with low socio-economic status showed a high reoccurrence of skin disease which contradicts our study result [8]. From these observations it can be said that skin infections in patients is very frequent in urban regions even if the urban cities of the country have improved standard of living, hygiene and sanitation, better quality healthcare facilities, education, and nutritious food to lessen the fungal skin diseases rather than the rural part of country. So, the present study has tried to give an approximate fungal skin disease prevalence scenario with related factors of the whole country.

Conclusion

Present cross-sectional study has provided some unique results and findings which would add to the scientific literature and health policies as it is first of its kind. No other research work has evaluated the prevalence of fungal skin diseases of an urban city with associated factors in Bangladesh. Moreover, this work can also be scaled up to other pathogens of skin diseases. However, there is no vaccine against skin diseases it is very difficult to control its transmission so to control this disease is to improve socio-economic condition, change the personal hygiene behaviour and taking appropriate preventive measures.

Conflict of Interest

No conflict of interest with any institution/organization.

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