Identification and Prevalence of Mixed Infection of Bacteria and Fungus on Toe Webs of the Diabetic Patients in BIRDEM Hospital, Dhaka

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Abstract

Introduction: *A study was conducted in Bangladesh Institute of Research Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), Dhaka during March 2015 to December 2015, where mixed infection of bacteria and fungus on toe web of diabetic patients was observed.*

Methods: *It was a descriptive type of cross sectional study conducted among the diabetic patients in the department of Dermatology (Outpatient department) of Bangladesh Institute of Research And Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM). The study was undertaken during March 2015 to December 2015.*

Results: *Observation under light microscope revealed that, Candida was the main fungus identified in the culture process of fungi which was oval shaped, violet colored and singly occurred in the culture media whereas Staphylococcus was the main bacteria identified in the culture process of bacteria which was cocci shaped, violet colored and occurred in cluster. In the present study it was observed that about 80% of the patients were above the age of 40 and only 20% were below the age of 40. Among the infected patients 65% were female and 35% were male. So it revealed that the women suffer more in this type of infection because the housewives use more water during household works. The percentage of infected housewives was 58.33%. The site of lesion was foot (53.33%), hand (31.67%) and both hand and foot (15%). Seasonal variation was another factor found in the investigation. The infection occur 13.33% during summer, 15% during winter and 71.67% during monsoon. The types of footwear used by the infected patients was sandal (45%), shoes (21.17%) and barefooted (33.33%).*

Conclusion*: It revealed that during the monsoon season the patients comes close contact with water more than the other seasons and different types of footwear also affect the infection.*

Key words*: Staphylococcus, Candida, Diabetes Mellitus*

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Introduction

The skin is the largest organ of the human body covering the entire surface of the body. It is subject to a wide range of medical conditions and infections ranging from simple manifestations to complicated ones like skin cancer.[17] Skin and venereal diseases cause a large part of illness. About 30% of people in Bangladesh suffer from it in their life time. However, fungal and bacterial infections are very common in the healthy people. Bangladesh is one of the poorest countries of the world with the highest density of population. Tropical region with 20-37^{0}c and humidity stimulates the development of fungal infection though the disease may occur in any climate. About 80% of population live in the rural areas, where poverty, literacy, ignorance, high family members, disease and disasters are the constant companion of them.

Skin and venereal diseases are a public health problem in developing countries.[12] 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.[10] Though it occurs in all class of society but people living in insanitary and poor housing conditions suffer more from the disease, poverty striken people with poor hygienic habits and unclean clothing are the usual victims of these diseases.

There are different kinds of fungal infections commonly affecting the skin of the diabetic patients. A yeast-like fungus called "*Candida albicans*" is responsible for many of the fungal infections causing skin problems in people with diabetes.[14] Akhter[3] worked in the Dermatology Department, BIRDEM hospital, Dhaka, to determine the prevalence of fungal infection and its causal factors. This study was done to assess the socio-demographic conditions, magnitude of skin and venereal disease and to find out the preventive knowledge regarding diseases problem attending in BIRDEM hospital, Dhaka. Fungus also can occur in between the toes and fingers.[13] This fungus creates itchy, bright red rashes, often surrounded by tiny blisters and scales. These infections most often occur in warm, moist folds of the skin.[15]

A variety of fungi may exacerbate intertrigo, including yeasts, molds, and dermatophytes. There are comparatively few species that are pathogenic to animals, especially mammals. According to[9] there are approximate a little 1.5 million described species of fungi.[5] Studied on noncandidal fungal infection of the mouth. Candida is the fungus most commonly associated with intertrigo. The inflammation may begin as a dermatophyte infection, which can damage the stratum corneum and encourage the proliferation of other, usually antibiotic-resistant bacteria. Dermatophytes commonly complicate interdigital intertrigo.[11] Gram-positive and gram-negative bacteria also can worsen the effects of interdigital intertrigo.[4] However, gram-negative and gram-positive infections occasionally occur simultaneously in interdigital areas. Gram-positive infections usually are caused *by S. aureus.* Dermatophytes and bacterial infections often occur together in interdigital areas. Yeasts also are commonly found at the site of interdigital intertrigo.[8] Sometimes seborrheic dermatitis is located in the folds. Whether Malassezia-complicated intertrigo is a distinct entity or a type of seborrheic dermatitis remains unclear.[6] Cutaneous erythrasma may

complicate intertrigo of interweb areas, intergluteal and crural folds, axillae, or inframammary regions.[16]

Toe web intertrigo usually is associated with a burning sensation between the toes, often with maceration. Toe web intertrigo may be simple, mild, and asymptomatic, but it also can be seen as intense erythema and desquamation, which sometimes is erosive, malodorous, and macerated.[18] Patients also may have profuse or purulent discharge and be unable to ambulate. In severe examples, patients may have a purulent discharge with edema and intense erythema of tissues surrounding the infected area. Patients with severe toe web intertrigo who are overweight or who have diabetes are at a higher risk for cellulitis. Patients with advanced gram-negative infections may have green discoloration at the infection site. Erythematous desquamating infection may be more chronic than the acute form and may present with a painful, exudative, macerating inflammation that causes functional disability of the feet.

Materials and Methods

It was a descriptive type of crosssectional study conducted among the diabetic patients in the department of Dermatology (Outpatient department) of Bangladesh Institute of Research And Rehabilitation in Diabetes, Endocrine and Metabolic Disorders. The study was undertaken during March 2015 to December 2015. The population of the study was the diabetic patient of all ages with different occupation during the data collection period. Among all the patients with skin disease only the toe web infected patients were selected. A total of 60 diabetic patients with infections were selected purposively. A structured pre-tested questionnaire was used for data collection by face-to-face interview.

Results

The following results are obtained after collecting and analyzing the data which are showed and discussed in Table I, II and III.

Table I: Observation of scrub of the diabetic patients in cultured media

Characteristics observed in potato dextrose agar media (culture media of fungus)	Characteristics observed in nutrient agar media (culture media of bacteria)
Shape- oval, color- violet, singly scattered yeast	Shape-cocci and rod shape, color-violet, occurred in cluster

Observation under light microscope revealed that, *Candida* was the main fungus identified in the culture process of fungi which contained the characteristics of oval shaped, violet colored and singly occurred in the culture media whereas *Staphylococcus aureus* was the main bacteria identified in the culture process of bacteria which contained the characteristics of cocci shaped, violet colored and occurred in cluster (Table I).

Table II: The socio demographic characteristics of the patients was as follows

Variable	Number of patients		Percentage (%)
Age	Above 40 yrs	48	80
	Below 40 yrs	12	20
Sex	Male	21	35
	Female	39	65
Educational status	Illiterate	22	36.67
	Primary level	17	28.83
	Secondary level	13	21.17
	Graduate	8	13.33
Occupation	Service	10	16.67
	Business	15	25
	Housewife	35	58.33
Monthly income	High	6	10
	Moderate	30	50
	Low	24	40
Residence	Urban	36	60
	Rural	24	40

In the present study it was observed that about 80% of the patients were above the age of 40 and only 20% were below the age of 40. Among the infected patients, 65% were female and 35% were male. The percentage of infected housewives was 58.33%. The highest percentage of diseases occurred among the illiterate group (36.67%) with moderate monthly income (50%). The residence of the infected patients were urban (60%) and rural (40%) (Table- II).

Table III: Diseases relation with different types of variables

Site of lesion	Hand	19	31.67
	Foot	32	53.33
	Both	9	15
Seasonal variation	Summer	8	13.33
	Winter	9	15
	Monsoon	43	71.67
Types of footwear use	Sandal	27	45
	Shoes	13	21.17
	Barefoot	20	33.33

The site of lesion was foot (53.33%), hand (31.67%) and both hand and foot (15%). Seasonal variation was another factor found in the investigation.

The infection occurred 13.33% during summer, 15% during winter and 71.67% during monsoon. The types of footwear used by the infected patients were sandal (45%), shoes (21.17%) and some 20 (33.33%) were barefooted. (Table III).

Discussion

The present study provides a description profile of socio-demographic characteristics of patients attending to skin OPD. As the study was conducted in a department of dermatology of a diabetic hospital, so the diabetic patients were preferred. A total of 60 diagnosed toe web infected patients were taken purposively as a sample size. This study was conducted for the first time in our country.

In the present study, it was found that toe web or inter digital infection occurs highly above the age of 40 years (80%), as the disease is related with diabetics whereas[10] reported that recurrence of several skin disease was high (55.06%) below the age of <10 yeas probably due to higher proportion of respondents in that age group, Moreover incomplete treatment and lack of knowledge regarding prevention of disease were also a contributing factor.

According to the present study, among the infected patients 65% were female and 35% were male. So it was revealed that the women suffer more in this type of infection because the housewives use more water during household works. The percentage of infected housewives was 58.33%. This study can be compared with the study where a total 160 dermatophyte-infected patients were studied[7] in skin and VD department of Mymensingh Medical College Hospitals. It was found that 76.9% were male and 3.5% were female and 76.25% were above 15 years and 23.25% were below 15 year since January 1997. Trichophytone mentagophytes (56.36%) were the highest incidence of skin infection in this study.

Another study was carried out by some specialist doctors at Comilla Medical College Hospital from 14th December 2000 to 10th February 2001 to shed some light on pattern of dermatology diseases.[1] Male patients were found to be visiting the inpatient departments more than females. The majority of the patients were within the age group of 10-20 and 20-30 years. Ninety four separate categories of skin disease were clinically diagnosed including some rare ones. Scabies, fungal infection, atopic dermatitis, and psychosexual diseases were however the more common ones.

Seasonal variation was another factor found in the investigation. The infections were found 13.33% during summer, 15% during winter and 71.67% during monsoon, during the monsoon season the patients comes close contact with water more than the other seasons and different types of footwear also affect the infection, it can be compared with the study whereas[2] reported that greater number of patients with scabies sought medical help during winter (43.4%), pyoderma in summer (38.1%), ringworm in monsoon (50%).

On the basis of treatment seeking pattern, it was observed that a reasonable number of patients obtain treatment from outside before came to this hospital. It indicates either irregular treatment or wrong treatment due to wrong diagnosis that worsened the diseases. The present study was conducted on a small number of patients so it can't reflect the exact situation and socio-demographic condition of the skin diseases in the whole population of our country. As skin diseases cause less mortality, patients though literate and solvent come to the specialist lately. Beside this chronic cause and most of the diseases, make patient reluctant about the long durable treatment and advice for the diseases.

Contribution of the Authors

First author was the principal researcher and data analyzer. Second one was the co-researcher, third one acted as designer of this research work. Last one worked as data collector.

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