Skin Infections among Type II Diabetic Patients in Faisalabad Region, Pakistan

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Abstract

Background: Endocrine disorders occasionally manifest themselves by their associated or induced cutaneous abnormalities. Skin is a frequently overlooked source of pathology. Several cutaneous abnormalities are more prevalent in diabetes mellitus. The purpose of the study was to evaluate the frequency of skin infections among type 2 diabetic patients and associated risk factors in Faisalabad, Pakistan

Methods: Type 2 diabetic patients (disease duration >1 year) and healthy volunteers were recruited and skin infections were assessed.

Results: Diabetes related skin infections were detected in 43% of type 2 diabetic patients and in 22.5% of the control subjects. Onychomychosis, candida vaginitis and herpes simplex were identified in 9.2 % of the diabetic patients compared to 2.5% of the control subjects. Skin infections had an insignificant association with sex, mean age, age at diabetes diagnosis, diabetes duration, secondary complications of diabetes, blood glucose and cumulative haemoglobin.

Conclusion: A broad spectrum of cutaneous disorders was seen in type 2 patients. While the pathogenesis of the most of the skin lesions remains ambiguous, additional studies should be performed to determine whether skin lesions could be used for predicting imminent diabetic complications. *(Iran J Dermatol 2009;12:47-51)*

Keywords: diabetes mellitus, hyperglycaemia, microvascular complications, skin infections

Introduction

Diabetes mellitus is described as a major global health problem worldwide due to its serious consequences for morbidity and mortality [1]. Skin complications in diabetes mellitus are largely the result of combined effects of hyperglycaemia, neuropathy, and both microvascular and macrovascular angiopathies [2]. In 2003, 6.2 million Pakistani people had diabetes and this is expected to rise to 11.6 million by 2025 [3]. A large number of diabetic people in the Pakistani population can be justified by the widespread presence of associated risk factors [4]. Consanguineous marriages are preferred according to the social and religious values that result in relative homogeneity within the various ethnic groups. Such social trends make people genetically predisposed to diabetes. Therefore, the genetic and environmental factors make ground for diabetes onset and skin manifestations [5-8]. We overtook the present study to evaluate the prevalence of infectious skin diseases and to ascertain associated risk factors in type 2 diabetes mellitus patients to support the adoption of effective measures for the prevention and control of diabetes and its complications in Faisalabad.

Patients and Methods

In this hospital based study, we screened 76 diabetic patients (42 men, 34 women) who consecutively entered Out-Patient Departments of District Headquarter Hospital, Faisalabad between August 2008 and January 2009. The diagnosis of diabetes was based on World Health Organization criteria (fasting plasma glucose ≥ 7.0 mmol/l [126mg/dl] or post-prandial plasma glucose ≥ 11.1mmol/l [200mg/dl]). Inclusion criterion for these randomly recruited case participants was the duration of type 2 diabetes >1 year. A total of 40 non-diabetic subjects (22 men, 18 women) as control were also included. Before enrolment, an ethical approval from institutional advanced studies and research board was secured.

Following an informed consent, quintessential assessment of every patient included a comprehensive history taking and physical examination. A pre-coded questionnaire was the survey instrument. Trained investigators pre-tested the validity and reliability of the questionnaire before using.

All the biochemical analyses were conducted in Clinical Biochemistry Laboratory, department of chemistry and biochemistry, university of agriculture, Faisalabad, with adherence to quality control procedures. An internal quality check was done by retesting 5% of the samples. Individual variations in measurement were kept minimal by involving the same team of doctors/investigators and the diagnostic laboratory.

The presence of renal diabetic complication was assessed using following standards: no albuminuria (<20µg/min.) vs. microalbuminuria (20-200µg/min)[9]. An ophthalmologist performed eye examination using fundoscopy through dilated pupils. Diabetic retinopathy was established as none vs. Proliferative [10].

For each subject, a detailed history was taken with particular reference to diabetes, cutaneous complaints and treatments, if any. As far as possible, existing medication for glycaemic control, blood pressure or lowering of blood lipids were not altered throughout the course of the study. Skin infections related to diabetes [2] were confirmed as described by Arnold *et al*,[11] under the supervision of two of the authors. 10 ml samples of whole blood were collected from the cephalic vein with a sterilized syringe. The heparinized blood samples were centrifuged and stored in vials at -80°C until further analysis. Plasma glucose and cumulative HbA_1 were measured by an enzymatic kinetic colorimetric kit (Biocon) and A_{1C} Kit (Biosystem), respectively. All the parameters were strictly checked according to manufacturer's instructions. Analar grade reagents were used along with doubled glass-distilled water in the preparation of solutions and standards. All glassware was washed with dilute nitric acid before rinsing with distilled water.

Preliminary statistical analysis included utilizing *t*-test to identify the difference between the two groups. The degree of association between different variables was assessed by using Pearson's correlation coefficient (r). Step-wise logistic regression by SPSS (version 14) with the level of significance set at $P \leq 0.01$ was performed to find the association between skin infections and the variables involved.

Results

The clinical data related to diabetes and the incidence of cutaneous infections in 76 type 2 diabetic patients are given in tables 1 and 2, respectively. The mean age of the patients confirmed that type 2 diabetic patients developed these skin manifestations during the course of their chronic underlying disease, especially at an advanced age. Though diabetic patients had poor glycaemic control, the blood glucose and glycated haemoglobin levels were measured in both case and control participants to find the association of these exposure variables with skin infections.

Thirty four (45%) patients out of a total of 76 had secondary diabetic complications including retinopathy and nephropathy. Twenty five (32%) and 29 (38%) were found to have paternal and maternal diabetes, indicative of genetic propensity for diabetes among the Pakistani population.

Diabetic women had a higher incidence (9%) of vulvovaginal candidiasis (VVC) in comparison to controls (3%). Scabies was in equal proportion among patients and controls in our study. Regarding the prevalence of bacterial infections, erythrasma lesions were found in 4 (5%) patients, but we did not observe such lesions in healthy controls. Most noticeable findings among diabetics were a high frequency of onychomychosis (9%) and herpes simplex (9%) compared to 3% in the control subjects. Dermatomycosis was detected in five patients in our study compared to 1 control. Next in frequency came folliculitis and tinea pedis (5%). Tinea pedis was not detected in control subjects while folliculitis was found in 3% of the control subjects. Using step-wise logistic regression, we evaluated the possible interaction between study variables and incidence of skin infections. None of the diabetes-related risk factors had an association with the development of skin infections.

Discussion

This study indicated that skin infections are a common occurrence in type 2 diabetics which require serious investigation and management. These results were found in a population seeking counsel from a single health care unit during a period of six months. This hospital-based study has limited generalizability due to a small sample size. The major barriers in getting a large population sample are cultural and social beliefs. Medical problems are neglected and when unbearable for the patient, local hakeems (Greek medicine/spiritual healers), family elders or self-remedy are preferred [12] .

Table 1. *Characteristics of the study group (76 type 2 diabetic patients and 40 normal subjects)*

Characteristics	Type 2 diabetics	Normal
Age (years)	57.09 ± 8.72	52.6 ± 9.48
Age at onset (years)	47.03 ± 5.38	-
Men/Women	42(55.2%)/34 (44.8%)	22 (55%)/18(45%)
Duration of diabetes (years)	9.5 ± 3.86	-
Retinopathy (n)	17 (22.4%)	-
Nephropathy (n)	17 (22.4%)	-
HbA_{1c} (%)	10 ± 1.90	6 ± 1.11
Plasma glucose (mg/dl)	244.59 ± 55.34	112.13 ± 12.87

Data are mean ± SD, n or %

Table 2. *Incidence of various cutaneous infections in 76 type 2 diabetic patients and 40 normal subjects*

Cutaneous infections	Type 2 diabetic patients			Normal subjects		
	n	M/W	%	n	M/W	%
Dermatomycosis	5	3/2	6.6	1	1/0	2.5
Tinea pedis	4	2/2	5.3	0	-	0
Onychomychosis	7	4/3	9.2	1	2/1	3
Vulvovaginal candidiasis	7	0/7	9.2	1	0/3	3
Herpes simplex	7	5/2	9.2	1	0/1	3
Folliculitis	4	2/2	5.3	1	1/0	3
Scabies	3	1/2	3.9	3	2/1	7.5
Erythrasma	4	2/2	5.3	0	-	0

Data are n, men/women ratio or %
M/W: men/women

Dermatomycosis was more frequent in the diabetic patients (6.6%) than in the control subjects (2.5%). The prevalence of dermatomycosis is controversial. According to the literature, diabetic patients are more or less predisposed to such infections [13-15]. Clinical types of dermatomycosis or tineas are tinea capitis (ringworm of scalp and kerion), tinea barbae (ringworm of the beard),tinea faciei, tinea corporis, tinea manus, tinea pedis, tinea cruris, and onychomycosis (fungus infections of the nails)[11]. In about a third of patients with toenail onychomycosis, concomitant tinea pedis can be observed [16]. Tinea pedis can be a port of entry for infections [17]. Diabetic patients may be susceptible to tinea pedis at a younger age comparing to those without diabetes[18]. Male gender may be a causative factor for the occurrence of tinea pedis according to literature[19]. Based on the achieved results and our own experience, tinea pedis was evaluated separately from other dermatomycosis.

Most obvious findings among type 2 diabetic patients were onychomychosis (9%) and herpes simplex (9%), compared to an incidence of 3% for each in control subjects. The prevalence of onychomychosis in our study was lower than that of 29% reported in the literature [20]. Scabies was an equally prevalent parasitic infestation among controls and the patients. We did not find any epidemiological studies regarding the prevalence of scabies in diabetic patients. Scabies is a common health problem in Pakistan. Poor hygiene, overcrowded living and lack of health education may account for the high frequency of scabies among control participants [21,22].

Many investigators have suggested that vulvovaginal candidiasis (VVC) occurs more frequently in diabetics but the results are inconsistent [23,27]. whether diabetes leads to more symptomatic and/or more recurrent VVC episodes is a subject of controversy. Our results indicated that more female patients (9%) had candidal infections than the controls (3%). Among women with diabetes, Candida carriage is reported to be increased with aging or with type 1 diabetes[28]. Whether this is due to the type of diabetes or reflects different distributions of Candida species by age or both is uncertain. Presence of erythrasma lesions (5%) in our patients was in accordance with the findings [28,29] that patients with erythrasma are prone to have diabetes as the underlying pathophysiology of erythrasma is poor glycemic control [30,31].

The present study is the first ever insight into the puzzling relationship between skin infections and type 2 diabetes mellitus in Faisalabad region and highlights areas of research that may yield new diagnostic and treatment options. New developments in diabetes related skin diseases,

which are often ignored by researchers, could shorten the time course of clinical trials and extend data analyses. Basic research into the prevention and/or delay of diabetes and its complications must accompany glucose-mediated dermal alterations, which obviously requires the skills of a multidisciplinary team.

In summary, a broad spectrum of cutaneous disorders was encountered in people with type 2 diabetes compared to non-diabetic controls. While the pathogenesis of the most of the skin lesions remains ambiguous, additional studies should be performed to determine whether skin lesions could be used for predicting imminent diabetic complications.

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