Original Research Article

THE PATTERN OF DIABETES SEPTIC FOOT IN TABUK CITY, SAUDI ARABIA

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ABSTRACT

Background: Diabetic septic foot is common due to the increasing rate of diabetes and population age. The study aimed to assess the pattern of diabetes septic foot in Tabuk City.

Subjects and Methods: This cross-sectional study was conducted at two diabetes tertiary centers in Tabuk City (King Fahd Specialty Hospital and King Khalid Civil Hospital), Saudi Arabia during the period from March 2020 to September 2020. A structured questionnaire was used to collect demographic factors, family history of diabetes mellitus, the presenting complaint (pain, trauma, burning sensation or routine clinical visit, type of medications used, the degree of diabetes control, smoking status, diabetes complications), and comorbid diseases if any. The ethical committee of the Medical College approved the research; all the participants signed written informed consent.

Results: There were 176 patients with a diabetic septic foot (75% aged>50 years), 57.7% were males, 16.5% were current smokers, the commonest presentation was a pain in 38.9%, a trauma in 31.4%, and burning sensation in 10.3%, while 19.4% were picked up during routine visits. The majority were on insulin and had poor glycemic control. (64.6%) Age and poor glycemic control were related to insulin use and diabetes complications, P-value<0.05.

Conclusion: patients with diabetic foot syndrome were elderly; the majority were on insulin with poor glycemic control and diabetes complications. The commonest presentations were trauma, pain, burning sensations, a great effort is needed to prevent this morbid disorder, and physicians may need to adhere to ADA guidelines. Further multicenter studies are recommended.

Keywords: Diabetic septic foot, Pattern, Saudi Arabia.

INTRODUCTION

Diabetes mellitus is a global health burden; the number is increasing at an alarming rate. Currently, 285 million are affected by this lifelong morbid metabolic disorder. The number is projected to reach 438 million by the year 2030 [1]. The Kingdom of Saudi Arabia is among countries with the highest prevalence according to the International Diabetes Federation [2].

Foot problems are an important cause of morbidity in patients with diabetes mellitus. The lifetime risk of a foot ulcer for diabetic patients (type 1 or 2) may be as high as 25 percent [3]. A potentially preventable initiating event (most often minor trauma that causes cutaneous injury), can often be identified. Many foot amputations are preventable with early recognition and therapy, thus, early intervention is required [4]. These observations illustrate the importance of frequent evaluation of the feet in patients with diabetes to identify those at risk for foot ulceration [5]

If the above risks for foot problems are ignored, amputation could be the last resort. People with diabetes are far more likely to have a foot or leg amputated compared to their counterparts without diabetes. Many people with diabetes have peripheral arterial disease, which reduces blood flow to the feet. Another common factor is a nerve disease, which reduces sensation. Both of these problems make it easy for infections to occur and may lead to amputation [5]. Fungal infections are mysterious, dangerous, and hidden; besides, the deleterious consequences are more serious when complicating bacterial infections [6]

The great news is that most amputations are preventable with regular care and proper footwear. Realistic goals and strategies are highly needed for the prevention of this disabling costly disorder that affects nearly 26.1 million people over the globe [7]. Literature assessing diabetic septic foot in Saudi Arabia scares, to our best of knowledge, no researchers have studies diabetic septic foot in Tabuk Region. Thus, we conducted this research to study the pattern of diabetes septic foot among patients with diabetes in Tabuk City.

SUBJECTS AND METHODS

This cross-sectional study was conducted at two diabetes tertiary centers in Tabuk City (King Fahd Specialty Hospital and King Khalid Civil Hospital), Saudi Arabia during the period from March 2020 to September 2020. The two clinics were chosen because they are the only two Civil Hospital in Tabuk. The patients came for regular follow-up and were diagnosed according to American Diabetes Association guidelines [8]. A structured questionnaire was used to collect demographic factors, family history of diabetes mellitus, the presenting complaint (pain, trauma, burning sensation or routine clinical visit, type of medications used, the degree of diabetes control, smoking status, diabetes complications (microvascular and macrovascular), and comorbid diseases if any.

The Fiche formula for case-control studies was used to calculate the sample size [9].

The ethical committee of the Medical College approved the research (Ref. READ, 0068, dated, 22/1/2020), all the participants signed written informed consent.

STATISTICAL ANALYSIS

Descriptive statistics for different variables was done using frequency and percentages. Analytical statistics was done using the chi-square test and fisher's exact test (when applicable) to test for the association between different variables. Multiple logistic regression was used to study the association between variables and the outcome. Statistical analysis was done using the SPSS software version 26 and p-value <0.05 was considered significant.

RESULTS

Among 176 diabetic patients with diabetic foot, our results showed their sociodemographic and clinical characteristics in table 1, and table 2. A Chi-square test is used to study the association between different predisposing factors and the usage of insulin treatment. The two variables that showed statistical association is age and diabetes control. The percentage of patients who receive insulin treatment among those older than 50 years old is (78%) which is significantly higher than that percentage among those who are less than or equal to 50 years (52%). There is also an association between diabetes control and being on insulin treatment, 77% of those whose diabetes is not controlled are on insulin as compared to 63% of those with controlled diabetes are on insulin. (Table 3)

Multiple logistic regression was done to study the association between different variables and being on insulin treatment. After controlling for the other variables, age, and family history are the only significant variables. The probability of association was studies for patients on insulin with control

Table 1. Sociodemographic characteristics of the participants

Characteristics	Frequency	Percentage
Age in years		
≤50	44	25
51-79	73	41.5
≥80	59	33.5
Gender		
Males	101	57.7
Females	75	42.3
Smoking status		
Smoker	29	16.5
Non smoker	147	83.5
Family history of diabetes		
Yes	80	45.4
no	96	54.6

Table 2: Clinical characteristics of diabetic patients

Predictors and parameters of diabetic foot	Frequency	Percentage
Presenting symptoms		
Pain	68	38.9
Trauma	55	31.4
Burning sensation	18	10.3
Clinical visit	34	19.4
Type of medication		
Insulin	126	71.6
Tablets	50	28.4
Controlled diabetes mellitus		
No	113	64.6
Yes	62	35.2
Have diabetes complication		
Yes	110	62.5
No	66	37.5
Have comorbid diseases		
Renal	59	33.5
Stroke	6	3.4
Hypertension	98	55.7
Heart diseases	13	7.4

(OHA) for its association with different age groups, an association was found regarding

Table 3. Comparison of predisposing factors and outcome among diabetic patients who take insulin treatment

Associated factors		Patients on insulin treatment		P value
		Yes	**No**	
Age	Age >51 years	103 (78%)	29 (22%)	0.001*
	Age ≤50 years	23 (52%)	21 (48%)	
Gender	Males	73 (72%)	28 (28%)	0.772
	Females	52 (70%)	23 (30%)	
Smoking status	Smoker	18 (62%)	11 (38%)	0.213
	Non smoker	108 (73%)	39 (27%)	
Family history	Positive	63 (79%)	17 (21%)	0.055*
	Negative	63 (66%)	33 (34%)	
Diabetes control	No	87 (77%)	26 (23%)	0.047*
	Yes	39 (63%)	23 (37%)	

*Statistically significant results

Table 4: Multiple logistic regression of the association between different variables and being on insulin treatment.

Associated factors*	OR	P-value	95% C.I. for OR	
			Lower	Upper
Age (More than 50)	3.05	0.004	1.42	6.55
Gender (Female)	0.92	0.817	0.43	1.93
smoking (Yes)	0.49	0.142	0.19	1.27
FH (Positive)	2.14	0.041	1.03	4.43
Diabetes control (yes)	0.53	0.081	0.26	1.08

* Reference categories are: age less than or equal to 50, males, non-smokers, negative family history, no diabetes control

those more than 50 years old, OR=3.05 (95%CI: 1.42, 6.55). The odds ratio of being on insulin treatment are higher for those with positive family history as compared to those with negative family history, OR= 2.14 (95%CI: 1.03, 4.43). (Table 4)

Multiple logistic regression was done to study the association between different variables and having eye or renal complications. After controlling for the other variables, age and diabetes control are the only significant variables. The odds ratio of having complications are higher for those more than 50 years old, OR=2.6 (95%CI: 1.21, 5.58). The odds ratio of having complications are lower for those with diabetes control as compared to those with no diabetes control OR= 0.3 (95%CI: 0.15, 0.58). (Table 5)

A Chi-square test was used to study the association between different factors and having underlying renal diseases. None of the studied variables showed any statistically significant association with underlying renal diseases. (Table 6). Also, we studied the association between different factors and having a history of myocardial infarction or stroke. The only significant factor is age. A higher percentage of over 50 years is having a history of myocardial infarction or stroke (14%) as compared to patients less than or equal to 50 (2%). (Table 7, 8) However, when multiple logistic regression was used, none of the variables showed any significant association with a history of myocardial infarction or stroke when controlling for other variables.

Table 5: Multiple logistic regression of the association between different variables and having eye or renal complications

Associated factors*	OR	P-value	95% C.I. for OR	
			Lower	Upper
Age (More than 50)	2.60	0.014	1.21	5.58
Gender (Female)	1.64	0.176	0.80	3.34
smoking (Yes)	1.52	0.397	0.58	4.03
FH (Positive)	1.77	0.101	0.90	3.48
Diabetes control (yes)	0.30	<0.001	0.15	0.58

* Reference categories are: age less than or equal to 50, males, non-smokers, negative family history, no diabetes control

Table 6 Comparison of predisposing factors and outcome among diabetic Patients with underlying renal diseases

Associated factors		Patients with underlying renal diseases		P-value
		No	Yes	
Age	Age >51 years	83 (63%)	49 (37%)	0.80
	Age ≤50 years	34 (77%)	10 (23%)	
Gender	Males	64 (64%)	37 (37%)	0.252
	Females	53 (72%)	21 (28%)	
Smoking status	Smoker	18 (62%)	11 (38%)	0.582
	Non smoker	99 (67%)	48 (33%)	
Family history	Positive	51 (64%)	29 (36%)	0.484
	Negative	66 (69%)	30 (31%)	
Diabetes control	Yes	46 (74%)	16 (26%)	0.101
	No	70 (62%)	34 (38%)	
Eye and renal complications	Yes	68 (62%)	42 (38%)	0.091
	No	49 (74%)	17 (26%)	
Insulin treatment	Yes	79 (63%)	47 (37%)	0.092
	No	38 (76%)	12 (24%)	

*Statistically significant results

DISCUSSION

The current data presented a sample of patients with diabetes mellitus and foot ulcers, the majority were elderly males in similarity to a study conducted in Riyadh, Saudi Arabia that showed similar results [6]. In the current study, males were more affected by diabetes mellitus in line with Wild et al. [10]; previous literature [11] reported prevalence of smoking in 33% of patients with diabetes, a result that is higher than our findings. A plausible explanation might be the conservative nature of the Saudi population. Family history of diabetes is linked to younger age of diabetes diagnosis, obesity, and cerebrovascular disease the present survey showed that 45.4% of patients had a family history in similarity to Alharithy and colleagues [12].

The present data showed that trauma was the commonest predisposing factor in line with a previous observation [13]. Loss of sensations

Table 7. Comparison of predisposing factors and outcome among diabetic Patients with history of myocardial infarction or stroke

Associated factors		Patients with history of myocardial infarction or stroke		P-value
		No	Yes	
Age	Age >51 years	114 (86%)	18 (14%)	0.046*
	Age ≤50 years	43 (98%)	1 (2%)	
Gender	Males	88 (87%)	13 (13%)	0.317
	Females	68 (92%)	6 (8%)	
Smoking status	Smoker	26 (90%)	3 (10%)	0.932
	Non smoker	131 (89%)	16 (11%)	
Family history	Positive	68 (85%)	12 (15%)	0.101
	Negative	89 (93%)	7 (7%)	
Diabetes control	Yes	55 (89%)	7 (11%)	0.891
	No	101 (89%)	12 (11%)	
Eye and renal complications	Yes	95 (86%)	15 (14%)	0.117
	No	62 (94%)	4 (6%)	
Insulin treatment	Yes	109 (87%)	17 (13%)	0.067
	No	48 (96%)	2 (4%)	

*Statistically significant results

Table 8. Comparison of predisposing factors and outcome among diabetic Patients with hypertension

Associated factors		Patients with Hypertension		P-value
		No	Yes	
Age	Age >51 years	67 (51%)	65 (49%)	0.003*
	Age ≤50 years	11 (25%)	33 (75%)	
Gender	Males	50 (49%)	51 (51%)	0.087
	Females	27 (37%)	47 (63%)	
Smoking status	Smoker	14 (48%)	15 (52%)	0.639
	Non smoker	64 (44%)	83 (56%)	
Family history	Positive	41 (51%)	39 (49%)	0.091
	Negative	37 (39%)	59 (61%)	
Diabetes control	Yes	23 (37%)	39 (63%)	0.141
	No	55 (49%)	58 (51%)	
Eye and renal complications	Yes	57 (52%)	53 (48%)	0.010*
	No	21 (32%)	45 (68%)	
Insulin treatment	Yes	64 (51%)	62 (49%)	0.006*
	No	14 (28%)	36 (72%)	

*Statistically significant results

and pain (might be pointers to peripheral neuropathy or vascular disease) are predominant symptoms in our data, these results imply a sub-optimal diabetes holistic care. The implementation of a prevention educational program focusing on self-care by the patients (daily inspection of the feet, appropriate footwear, and straight nail cutting) might prevent foot ulceration and septic foot. Physicians may need to conduct foot examination including vascular assessment, neurological lower limb

examinations, and monofilament tests. The current study findings of poor glycemic control, diabetes complications, and comorbid diseases pointed to clinical inertia and under-prescription of medications with cardio-renal protection including Sodium-Glucose co-transporters Inhibitors and Glucagon-like peptide agonists. The situation is alarming in Tabuk City, physicians, and healthcare providers may need to adhere to the American Diabetes Association Guidelines for better control of patients with diabetes mellitus [8]. The current findings of poor glycemic control and diabetes complications were observed by previous studies [14-16], further studies concluded the association of diabetic foot syndrome with macrovascular and microvascular complications [17], the use of insulin among those above 50 years of age despite being poorly controlled may be pointed to the wrong believe that insulin should be a last resort with deleterious consequences, the inertia to insulin and its predisposing factors including needle phobia should be addressed to avoid inertia to insulin [18, 19]. The association of hypertension and poor glycemic control with microvascular complications is in line with previous observations [20]. Sociodemographic factors and relation to insulin use, microvascular complications, and myocardial infarction hypertension varied considerably between studies with some showed positive correlation [21, 22] and other reported no association [23, 24], the variation might be due regional factors.

THE LIMITATION OF THE SURVEY:
The study limitations were the relatively small sample size and the fact that did not include fungal and bacterial infections. Besides, we missed to grade the ulcers which was a big limitation of this study.

CONCLUSION
patients with diabetic foot syndrome were elderly; trauma, pain, and loss of sensations were the predominant symptoms. The majority were on insulin with poor glycemic control and diabetes complications. A great effort is needed to prevent this morbid disorder, and physicians may need to adhere to ADA guidelines. Further multicenter studies focusing on the serious fungal and bacterial infections of the foot and relating them to the ulcer grades are highly recommended.

CONFLICT OF INTEREST
None to declare.

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