The Egyptian Journal of Hospital Medicine (October 2018) Vol. 73 (3), Page 6316-6323

Prevalence and Risk Factors of Diabetic Septic Foot among Attendees of Diabetes Center of Arar City, Northern Saudi Arabia

Najah Dhaher Y Alanzi [1], Rehab Thayib R Alanazi [1], Hadeel Saud D Alanazi[1], Fadih Nada M Alenezi [2], Rehab Mohammed A Alanazi [2], Itizaz Hatim R Alanazi [2], Malak Sayah S Alkuwaykibi [2], Marwah Motlaq A Alanazi [2], Banan Khalid M Alotaibi [2], Huda Owaid H Alanazi [2], Rehab Zaid M Alayyashi [2], Reem Meshal T Almjlad [2], Rahmah Subhi H Alanazi [2], Amer Ahmed Balla [3]

1 Medical Intern, Northern Border University, Arar, KSA,2 Medical student, Northern Border University, Arar, KSA,3 Assistant Professor and Endocrine specialist, Faculty of medicine, Northern Border University, Arar, KSA

Abstract

Background: Diabetic septic foot contributes significantly to morbidity and mortality of patients with diabetes leading to substantial physical, physiological and financial burden for the patients and community at large. **Objective:** to determine the prevalence, patterns and risk factors of diabetic foot ulcers amongst patients with diabetes mellitus who were attending the diabetes center of Arar city in the period of the study. **Methods:** This was a retrospective study in the patients of the diabetes center of Arar city, Northern Saudi Arabia. The study was carried out during the period from 1 April to 31 May, 2018. All the patients attended the diabetes center in the period of the study were included in our data. The data were collected using a predesigned questionnaire. The questionnaire covered all the necessary items in the research. Data were collected through personal interviews with the participants and filling the questionnaires. **Results:** The prevalence of diabetic foot among the included diabetic patients was 52.8%. 77.8% had type II and 22.2% had type I, 83.3% had glucometer and 38.9% monitor their blood glucose level daily, 41.7% were obese, 77.8% had hypertension, 52.8% had hyperlipidemia. Only 11.1% examined the pulse and sensation the foot of the population. For diabetes control, 58.3% of them use oral tablets, 27.8% use insulin injection and 13.9% use both tablets and insulin but 52.8 of them have complication with treatment. **Conclusion:** The prevalence of diabetic foot among the included diabetic patients was high (52.8%). This emphasizes the importance of the more health education and better management of the diabetic patients in order to reduce the burden of health care costs of diabetic foot.

Key words: Diabetes, ulcers, septic, complications.

Introduction:

Diabetes, considered as a disease of developed countries, is one of the endocrine disorders that reached epidemic proportions worldwide [(1)]. Therevalence of diabetes worldwide was estimated to be 2.8% in 2000 and is projected to be 4.4% in the year 2030, with the total number of people with diabetes expected to rise from 171 million in 2000 to 366 million in 2030 [(1)]. Lots of complications are associated with DM. Those complications arise chiefly from the disruption of the vascular system which can result in inadequate circulation to the peripheral body. This places the foot at higher risk of ulceration and infection which is mainly the cause of diabetic septic foot [(2)]. Diabetic septic foot contributes significantly to morbidity and mortality of patients with diabetes leading to substantial physical, physiological and financial burden for the patients and community at large [(3)]. Epidemiologic studies suggest that 2.5% of diabetic patients develop diabetic foot (DF) ulcers each year and 15% develop DF ulcers during their lifetime [(4)]. It is a common complication of diabetes which may require long hospitalization or frequently leads to amputation of the extremities [(5)]. It is estimated that approximately 2.5% of all diabetic patients will develop foot problems yearly [(6)]. Individuals with diabetes are at a 30-times higher risk for lower extremity amputation compared with those without diabetes [(5)]. Globally, it is estimated that every 30 seconds a lower limb is lost somewhere in the world as a consequence of diabetic septic foot (DSF) [(7)]. The risk of ulceration and

Received: 12/7/2018
Accepted: 22/7/2018

amputation among diabetic patients increases by two to four folds with the progression of age and duration of diabetes regardless of the type of diabetes [8]. The increase in diabetic foot could be due to inadequate information about diabetes and its complications that should be disseminated to the public. It could be attributed to some traditions and social habits that delay the presentation to health care, leading to deterioration of the wounds. In the West, various reports are available on the risk factors for complications of diabetes; the aim of identifying these risk factors being to develop strategies for avoiding the severely reduced quality of life following amputation [9,10].

This study aimed at determining the prevalence, patterns and risk factors of diabetic foot ulcers amongst patients with diabetes mellitus who were attending the diabetes center of Arar city in the period of the study.

Methodology:

This work was a retrospective study carried out at the patients of the diabetes center of Arar city, Northern Saudi Arabia. The study was done during the period from 1 April to 31 May, 2018. All the patients attended the diabetes center in the period of the study were included in our data. The data were collected using a predesigned questionnaire. The questionnaire covered all the necessary items in the research. Data were collected through personal interviews with the participants and filling the questionnaires.

Ethical considerations:

Data collector gave a brief introduction to the participants by explaining the aims and benefits of the study. Informed written consent was obtained from all participants. Anonymity and confidentiality of data were maintained throughout the study. There was no conflict of interest.

Statistical analysis

We utilized the statistical package for social sciences, version 16 (SPSS Inc., Chicago, Illinois, USA) to analyze the study data. The results were displayed as counts and percentages. The X2 test was used as a test of significance, and differences were considered significant at P value less than 0.05.

Result:

Table (1) shows gender, age group, marital status, smoking, obesity, family history of DM and family history of diabetic foot among studied population, 44.4% of the included diabetic patients ranged between 40 to 60 years old, 69.4% of them were females, and 88.9% were married. As regards smoking, 36.1% of them were smokers, 55.6% were obese, and 41.7% had family history of DM.

Among the included diabetic patients, 77.8% had type II and 22.2% had type I, 83.3% had glucometer and 38.9% monitor their blood glucose level daily. Also, 11.1% examine the pulse and sensation the foot of the population. When asked about information about diabetic foot, 75.0% said "NO" and 80.6%of them did not have information about care of diabetic foot. Peripheral neuritis and diabetic retinopathy are the most common complications and have the same proportion (16.7%). As regards diabetes treatment; 58.3% of them use oral tablets, 27.8% used Insulin injection and 13.9% used both tablets and insulin but 52.8 of them have complication with treatment.

Concerning obesity, 41.7% were obese, there are some disease related to DM such as hypertension, hyperlipidemia; 77.8%, 52.8%, and 52.8% respectively. The prevalence of diabetic foot among the included diabetic patients was 52.8%,
(Table 2). Table (3) reveals diabetic foot related characteristics among the 19 cases. Period of diabetic foot was one year in 36.8% of them, 2 years in 5.2%, 6 or 2 months in 10.5%, 1 month in 15.8% and only 1 week in 21.1%. Diabetic foot effect on one finger in 47.4%, multiple fingers in 26.3%, two foots in 5.2%, or one foot in 21.1%. We found that 84.2% received a medical treatment. Recurrences of diabetic foot after treatment was found in 52.6% of them and 84.2% of them have no previous information about diabetic foot care. We found that 47.4% of diabetic foot cases aged from 40 to 60 years old, 73.7% of them were females and all of them are married. There was non-significant relation between the weight and diabetic foot; 36.8% of cases were obese 36.1% were

smokers, 73.7% were suffering from t ype II DM. Oral tablet was the most treatment used. Moreover, 57.9% of diabetic foot cases used oral tablets for control of diabetes. Hyperlipidemia was found in 52.6% and hypertension in 84.2% of diabetic foot. All the people had no information about foot care before they suffer from it and 84.2% had no information about diabetic foot. All of cases don't examine the pulse and sensation of foot. (Table 4)

Table (1): Gender, age group, marital status, smoking, obesity, family history of DM and family history of diabetic foot among studied population, Arar, 2018 (N=36)

Variables	Frequency (No.)	Percent (%)
Gender		
▪ Female	25	69.4
▪ Male	11	30.6
Age group		
▪ < 40	10	27.8
▪ 40-	16	44.4
▪ 60+	10	27.8
Marital status		
▪ Single	4	11.1
▪ Married	32	88.9
Smoking		
▪ Yes	13	36.1
▪ No	23	63.9
Obesity		
▪ Yes	20	55.6
▪ No	16	44.4
Family history of DM		
▪ Yes	15	41.7
▪ No	21	58.3
Family history of Diabetic foot		
▪ Yes	4	11.1
▪ No	32	88.9

Table (2): Diabetes mellitus related characteristics, related diseases, performing daily muscular exercise and percentage of diabetic foot among studied population (N=36)

Type of DM	No.	%
▪ Type I	8	22.2
▪ Type II	28	77.8
Having glucometer		
▪ Yes	30	83.3
▪ No	6	16.7
Frequency of monitoring blood glucose level		
▪ Daily	14	38.9
▪ Weekly	4	11.1
▪ Twice daily	8	22.2
▪ On demand only	10	27.8
Examination of pulse and sensation of the foot		
▪ Yes	4	11.1
▪ No	32	88.9
Having information about diabetic complications (diabetic foot)		
▪ Yes	9	25.0
▪ No	27	75.0
Having information about care of diabetic foot		
▪ Yes	7	19.4
▪ No	29	80.6
Having diabetic complications		
▪ Yes	12	33.3
▪ No	24	66.7
Type of diabetes complications		

▪ No complications	23	63.9
▪ Peripheral neuritis	6	16.7
▪ Diabetic nephropathy	1	2.8
▪ Diabetic retinopathy	6	16.7
Diabetes treatment		
▪ Oral tablets	21	58.3
▪ Insulin injection	10	27.8
▪ Both tablets and insulin	5	13.9
Compliance with diabetes treatment		
▪ Yes	19	52.8
▪ No	17	47.2
BMI groups (Kg/m^2)		
▪ Normal	11	30.6
▪ Overweight	10	27.8
▪ Obese	15	41.7
Hypertension		
▪ Yes	28	77.8
▪ No	8	22.2
Hyperlipidemia		
▪ Yes	19	52.8
▪ No	17	47.2
Performing daily muscular exercise		
▪ Sometimes	19	52.8
▪ Yes	1	2.8
▪ No	16	44.4
Diabetic foot		
▪ Yes	19	52.8
▪ No	17	47.2

Table (3): Diabetes foot related characteristics among diabetic foot studied cases (N=19)

Period of diabetic foot	**No.**	**%**
▪ 1 week	4	21.1
▪ 1 month	3	15.8
▪ 2 months	2	10.5
▪ 6 months	2	10.5
▪ 1 year	7	36.8
▪ 2 years	1	5.2
Site of injury		
▪ One finger	9	47.4
▪ Multiple fingers	5	26.3
▪ 2 foots	1	5.2
▪ One foot	4	21.1
Type of provided treatment for diabetic food		
▪ Surgical treatment	3	15.8
▪ Medical treatment	16	84.2
Recurrence of diabetic foot after treatment		
▪ Yes	10	25.6
▪ No	9	47.4
Having information about diabetic foot care before		
▪ Yes	3	15.8
▪ No	16	84.2

Table (4): relationship between diabetic foot and socio-demographic and diabetes related variables among the studied cases

Variables	**Diabetic foot**		**Total (N=36)**	**P value**
	No (N=17)	**Yes (N=19)**		
Age group				
▪ >40	6	4	10	0.624
	35.3	21.1	27.8	

	%	%	%	
▪ 40-	7	9	16	
	41.2 %	47.4 %	44.4 %	
▪ 60+	4	6	10	
	23.5 %	31.6 %	27.8 %	
Sex				
▪ Female	11	14	25	0.412
	64.7 %	73.7 %	69.4 %	
▪ Male	6	5	11	
Marital status				
▪ Married	13	19	32	NA *
	76.5 %	100.0 %	88.9 %	
▪ Single	4	0	4	
	23.5 %	.0%	11.1 %	
	35.3 %	26.3 %	30.6 %	
Family history of diabetic foot				
▪ Yes	2	2	4	0.655
	11.8 %	10.5 %	11.1 %	
▪ No	15	17	32	
	88.2 %	89.5 %	88.9 %	
BMI groups				
▪ Normal	6	5	11	0.438
	35.3 %	26.3 %	30.6 %	
▪ Overweight	3	7	10	
	17.6 %	36.8 %	27.8 %	
▪ Obese	8	7	15	
	47.1 %	36.8 %	41.7 %	
Smoking				
▪ Yes	7	6	13	0.401
	41.2 %	31.6 %	36.1 %	
▪ No	10	13	23	
	58.8 %	68.4 %	63.9 %	
Type of diabetes				
▪ Type I	3	5	8	0.414
	17.6 %	26.3 %	22.2 %	
▪ Type II	14	14	28	
	82.4 %	73.7 %	77.8 %	
Compliance with diabetes treatment				
				0.624
▪ Yes	9	10	19	
	52.9 %	52.6 %	52.8 %	
▪ No	8	9	17	
	47.1 %	47.4 %	47.2 %	
Diabetes treatment				
▪ Oral tablets	10	11	21	0.764
	58.8 %	57.9 %	58.3 %	
▪ Insulin injection	4	6	10	
	23.5 %	31.6 %	27.8 %	
▪ Both	3	2	5	
	17.6 %	10.5 %	13.9 %	

Hyperlipidemia				
▪ Yes	9	10	19	0.624
	52.9 %	52.6 %	52.8 %	
▪ No	8	9	17	
	47.1 %	47.4 %	47.2 %	
Hypertension				
▪ Yes	12	16	28	0.281
	70.6 %	84.2 %	77.8 %	
▪ No	5	3	8	
	29.4 %	15.8 %	22.2 %	
Diabetes complications				
▪ Peripheral neuritis	3	2	5	0.075
	17.6 %	10.5 %	13.9 %	
▪ Diabetic nephropathy	1	1	2	
	5.9%	5.3%	5.6%	
▪ Diabetic retinopathy	0	6	6	
	.0%	31.6 %	16.7 %	
▪ No complications	13	10	23	
	76.5 %	52.6 %	63.9 %	
Having diabetic complications				
▪ Yes	3	9	12	0.061
	17.6 %	47.4 %	33.3 %	
▪ No	14	10	24	
	82.4 %	52.6 %	66.7 %	
Having information about diabetic foot care before				
▪ Yes	7	0	7	NA
	41.2 %	.0%	19.4 %	*
▪ No	10	19	29	
	58.8 %	100.0 %	80.6 %	
Having information about diabetic complications (diabetic foot)				
▪ Yes	6	3	9	0.168
	35.3 %	15.8 %	25.0 %	
▪ No	11	16	27	
	64.7 %	84.2 %	75.0 %	
Examination of pulse and sensation of the foot				
▪ Yes	4	0	4	NA *
	23.5 %	.0%	11.1 %	
▪ No	13	19	32	
	76.5 %	100.0 %	88.9 %	

* P value not applicable

Discussion:

The present study was carried out to investigate the prevalence and the risk factors of diabetic septic foot. Our results demonstrated that DM led to chronic complications. The presence of DF mostly associated with: age range between 40 to 60, females gender, obesity and type 2 diabetes. There was no relation between DF and hereditary or smoking. However, peripheral neuritis and diabetic retinopathy are the most complicating and have the same proration. DF was reported mainly at age of 40 or more at many studies. In a Kenyan study, the mean age of the patients was 56.9 years and the majority had type 2 diabetes. **Margueritte *et al.*** [(11)] in Seattle, USA, found a comparable mean age of 60 years. These studies were conducted in different centers that offer diabetes care of different qualities. This comparable mean age may suggest certain time-dependent risk factors in the evolution and course of diabetic septic foot. The present study confirmed that

the type of DM effect on rate of infection with DF. About 77.8 of nowadays patients with Type2 DM suffer from DF. Where at 2011 was 94%. Most patients were married females (69%) where at another study in 2011 at Al-Riyadh [(14)] males were more affected for about (62%). In Kenyan study causative risk factors of neuropathy (78%), ischemia (48.5%) and infection (100%) that were found in different percent's in our study as nephropathy (2.8%), neuropathy (16.7%) and retinopathy also for (16.7%). The most significant contributing factors were diabetic retinopathy, CABG surgery, Charcot's foot, and Indigenous ethnicity [(13)] . Whilst **Ndip *et al.*** [(14)] provide data linking diabetic retinopathy to increased risk of DFU development, accentuating the importance of early detection and management of diabetic complications. It has been hypothesized that the presence of peripheral neuropathy, combined with the biomechanical loading of obesity, confers greater risk of diabetic foot. As in our study people who suffer from DF and they are obese are about (55.6%) and at the study of 2011 at Al-Riyadh [(12)] were about (69.4%). At Australian study [(13)], the higher prevalence of amputations in the group of Indigenous Australians could be attributed to a genetic predisposition or to a socioeconomic status that drives the patients to present late for clinical care. This result is supported by previous Australian data stating that Indigenous Australians are known to develop diabetes and its associated metabolic complications at a younger age [(15,16)]. Our results about the period of diabetic foot variable but 36.8% of the population take a one year and about 47.4% of population affected on one finger. **Wukich *et al.*** [(17)] have linked history of cellulitis and moderate-to-severe foot infection to amputation. We did not observe an association between smoking, family history and foot complications. However, due to survey measurement, the dichotomization of smoking may have resulted in misclassification and biased the results of our bivariate analysis of smoking and foot complications. BMI was measured by self-report, which also may have resulted in misclassification. Our results found a significant correlation between DF and each of marital status (0.040), having previous information about DF (0.002) and regular examination of pulse and sensation of the foot (0.042) which refers to the high effect of these factors and supported by many other studies.

References:

1. **Wild S, Roglic G, Green A *et al.* (2004):** Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care, 27: 1047-1053.
2. **Alvin C (2005):** Diabetes mellitus. Harrison T (edn) Principle of internal medicine (16th edn), New York. McGraw-Hill Companies.
3. **McIntyre BR, Deitch EA (1994):** Diabetic foot ulcerspathophysiology and treatment. Surg. Clinic. North America, **4:**537-555.
4. **Reiber GE, Lipsky BA, Gibbons GW (1998):** The burden of diabetic foot ulcers. Am J Surg., 176:5–10.
5. **Adam MA, Hamza AA, Ibrahim AE (2009):** Diabetic Septic Foot in Omdurman Teaching Hospital. Sudan J Med Sci.,4:129-132.
6. **Moss SE, Kalin R, Klein B (1997):** The prevalence and incidence of lower extremity amputations in diabetic populations. Arch. Intern. Med.,**152:**610-613.
7. **Jeffcoate WJ, Harding KG (2003):** Diabetic foot ulcers. Lancet, 361:1545-51.
8. **Katsilambros N, Tentolouris N, Tsapogas P (2003):** Atlas of Diabetic Foot. Chichester, UK: Wiley-Blackwell.
9. **Chaturvedi N, Stevens LK, Fuller JH *et al.* (2001):** Risk factors, ethnic differences and mortality associated with lower-extremity gangrene and amputation in diabetes: The WHO Multinational Study of Vascular Disease in Diabetes. Diabetologia, 44:65–71.
10. **Dos Santos VP, da Silveira DR, Caffaro RA (2006):** Risk factors for primary major amputation in diabetic patients. Sao Paulo Med J., 124:66–70.
11. **Margueritte J, Edward J, Jessie H *et al.* (1995):** The independent contributions of diabetic neuropathy and vasculopathy in foot ulceration. Diabetes Care,2:216-219.
12. **Abolfotouh MA Alfaifi SA, Al-**

Gannas AS (2011): Risk factors of diabetic foot in central Saudi Arabia. Saudi Med J ., 32 (7):708-713.

13. **Beverly TR, Venkat N V, Usman H M (2016):** Prevalence and Risk Factors for Diabetic Lower Limb Amputation: A Clinic-Based Case Control Study . J Diabetes Res., 2016: 5941957.
14. **Ndip A, Lavery L, Lafontaine J *et al.* (2010):** High levels of foot ulceration and amputation risk in a multiracial cohort of diabetic patients on dialysis therapy. Diabetes Care, 33(4):878–880.
15. **Amogne W, Reja A, Amare A (2011):** Diabetic foot disease in Ethiopian patients: A Hospital Based Study. Ethiopian Journal of Health Development, 25(1):17–21.
16. **Gibson O, Segal L, McDermott R (2012):** A simple diabetes vascular severity staging instrument and its application to a Torres Strait Islander and Aboriginal adult cohort of north Australia. BMC Health Services Research. 12:185.
17. **Wukich D K, Hobizal KB, Brooks M M (2013):** Severity of diabetic foot infection and rate of limb salvage. Foot and Ankle International, 34(3):351–358.