The pattern of diabetic foot and its complications in Albaha, Saudi Arabia

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Abstract

The progressive increase in the incidence of diabetes mellitus (DM), both worldwide and in Saudi Arabia, is associated with progressive complications rates development. Diabetic foot ulcerations and complications are major morbidities associated with progressions of DM neuropathies and vasculopathies. They contribute to marked health expenditure and efforts. Our study aimed at measuring the magnitude of the problem of diabetic foot in the special area of Albaha in Saudi Arabia.

Material and method: We included 53 patients who presented to the diabetic foot center in Al Baha, Saudi Arabia over 1 year. The included patients were assessed by meticulous clinical examination including eye examination and foot assessment for ulcer, neuropathy, skin manifestations like abscesses, and foot deformities. Investigations included fasting blood glucose, hemoglobin A1C (HbA1C), lipid profile, and Doppler Ultrasonography of the lower limbs.

Results: 52 (98.1%) had type II DM, duration of DM was 17.0 (10.0-25.0) years, fasting blood glucose 10.1 (7.6-14.8) mmol/L, and HbA1C 9.1±1.3%. Hypertension was found in 24 (45.3%), atherosclerotic cardiovascular disorders (ASCVD) in 27 (50.9%) and eye complications in 20 (37.7%) of cases. ASCVDs were found to be significantly higher (p 0.009) in patients aged >66 years (18 (69.2%)) in comparison to those <66 years (8 (30.8%)). Regarding foot complications; ulcers were found in 44 (83.0%), foot deformities in 4 (7.6%), skin complications in 28 (52.8%), infections in 20 (37.7%) and gangrene in 10 (18.9%) of cases. Interestingly, diabetic foot ulcers were found to be significantly higher (p 0.038) in patients aged <66 years (24 (88.9%)) in comparison to those aged >66 years (20 (76.9%)). Surgical management including debridement, abscess drainage, dressings, and a skin graft was required in 25 (47.2%) of cases and amputation in 7 (13.2%) of cases.

In conclusion; diabetic foot ulcers and complications are a major health problem contributing to devastating morbidities up to amputations. Poor glycemic control is a major contributing factor for diabetic foot problems. Good glycemic control, diabetic foot meticulous care, and early interventions are recommended health practice strategies.

Key words: Diabetes, Foot, ulcer, complications

Introduction

There is a relentless increase in the incidence of diabetes mellitus (DM) that is associated with increments in diabetic complications. The World Health Organization (WHO) and the International Diabetes Federation (IDF) warned that these complications, if untreated, can threaten many lives (1). Saudi Arabia, with a prevalence of DM of 25.4%, has ranked among the top ten countries with the highest DM prevalence (2). The prevalence of diabetic complications in Saudi Arabia is very high; with 82% for neuropathy, 32% for nephropathy, and 31% for retinopathy (3-5). It is estimated that diabetic foot complications are responsible for 24.4% of the total health care expenditure of the diabetics (6) with expenditures of about 456 million USD in the United Kingdom (7) and 11 billion USD in USA (8). It was estimated that the prevalence of diabetic foot complications among Saudi Arabia population was 3.3% with about 2% with foot ulcers and 0.19% with gangrene and amputation was performed in 1.06% (9).

Regardless of the type of diabetes; progression of age and longer duration of DM were associated with two to four folds increase in the risk of ulcerations and amputations (10). In comparison to patients without diabetic foot ulcers, patients with diabetic foot ulcers have more than two folds higher mortality rates and the main causes of death in the diabetic foot ulcer group are strokes and myocardial infarctions (11-13). Smoking, diabetic nephropathy, and male gender are among the other high-risk factors of mortality in patients with DM (12, 14). Diabetic foot ulcers can be prevented and programs aiming at reducing risk factors can result in up to 70% amputation prevention (10).

Albaha is an area in Saudi Arabia that has its special weather and circumstances. Albaha is located in the south-west of Saudi Arabia, and it is located in an area with elevations of up to 2450 meters above sea level which affects oxygen levels (15). The effect of this special case on the pattern of diabetic foot ulcerations and complications is unclear.

The aim of this study was to assess diabetic foot magnitude of the problem and its pattern in the special area of Albaha region.

Materials and Methods

This cross-sectional study was conducted at the diabetic center of Al Baha city, Saudi Arabia for the duration of 1 year; where diabetic foot patients, whether at their first, or at the follow-up visits, were assessed. This study included 53 patients with diabetic foot who were divided into two groups according to age (<66 years (27 patients) and >66 (26 patients) years) based on the fact of progressive increments of diabetic complications and atherosclerosis with age progression.

Inclusion criteria: patients with diabetes mellitus who presented to Albaha diabetic foot center with any diabetic foot manifestations.
Exclusion criteria: patients refusing to be included in this study.
The included cases were assessed according to the following parameters:

- **Basic data:** age, gender (male/female), body mass index (BMI) and smoking history.
- **Diabetic state:** type, duration, treatment (insulin, oral antidiabetics or combined), fasting blood glucose level and hemoglobin A1C (HA1C).
- **Other therapies:** aspirin, clopidogrel and angiotensin converting enzyme inhibitors (ACEIs) / angiotensin receptor blockers (ARBs).
- **Co-morbidities:** hypertension, kidney functions, eye examination, atherosclerotic cardiovascular disorders (ASCVD) and lipid profile (total cholesterol, low density lipoproteins (LDL), high density lipoproteins (HDL) and triglycerides (TG)).
- Diabetic foot:

1. Ulcer: if any and its/their site/s.
2. Skin abnormalities.
3. Foot deformities.
4. Doppler ultrasonography results.
5. Complications: infections (mild, moderate or severe) and gangrene.
6. Surgical management: if any.
7. Type of amputation: if any.
8. Foot prosthesis.

Data analysis
Data were analyzed using Statistical Package for Social Science software computer program version 26 (SPSS, Inc., Chicago, IL, USA). Data were presented in mean and standard deviation for quantitative parametric data and as median and interquartile range (IQR) for quantitative nonparametric data while qualitative data were presented as frequency (Number-percent). Student's t-test was used for comparing quantitative parametric data while Mann Whitney was used for comparing quantitative nonparametric data. Pearson's chi-square or Fischer's exact tests was used to compare the qualitative data for a table (2x2) and Monte-Carlo for tables with more than (2x2) when indicated. P value less than 0.05 was considered statistically significant.

Results

This study included 53 patients with diabetic foot who presented to the diabetic foot center at Albaha city. The basic characteristics of these cases showed that the mean age was 63.9±13.7 years (mean±SD), 43 (81.1%) of them were males and only 10 (18.9%) were females, MBI was 29.7±5.8 kg/M2 (mean±SD), most of them were non-smokers (48(90.6%)), only 3(5.7%) were smokers and 2(3.8%) ex-smokers (Table 1).

Table 1: Basic characteristics of the included cases:

Characteristic		Results (No / %)
Age in years (mean±SD)		63.9±13.7
Gender	Male	43(81.1%)
	Female	10(18.9%)
BMI(mean±SD)		29.7±5.8
Smoking	No	48(90.6%)
	Ex-smoker	2(3.8%)
	Yes	3(5.7%)

Of the included 53 patients; only 1 (1.9%) had type I DM and 52 (98.1%) had type II DM. The duration of DM in the included cases was 17.0 (10.0-25.0) years. Laboratory features assessing the diabetic status of the included patients showed that Fasting blood glucose was 10.1 (7.6- 14.8) mmol/L and HbA1C was 9.1±1.3% (mean±SD). Regarding drugs used for the treatment of DM and co morbidities; insulin was used in 37 (69.8%), oral anti-diabetics in 33 (62.3%), aspirin in 27 (50.9%), clopidogrel in 7 (13.2%), and ACEIs / ARBs in 10 (18.9%) of the included cases (Table 2).

Table 2: Diabetes Mellitus characteristics, treatment and other therapies of the included cases:

Characteristic			Results (No / %)
DM type		Type I	1(1.9%)
		Type II	52(98.1%)
DM duration (years)			17.0(10.0-25.0)
Fasting blood glucose (mmol/L)			10.1(7.6- 14.8)
HbA1C % (mean±SD)			9.1±1.3
Drugs used	Insulin	No	16(30.2%)
		Yes	37(69.8%)
	Oral antidiabetics	No	20(37.7%)
		Yes	33(62.3%)
	Aspirin	No	26(49.1%)
		Yes	27(50.9%)
	Clopidogrel	No	46(86.8%)
		Yes	7(13.2%)
	ACEIs / ARBs	No	43(81.1%)
		Yes	10(18.9%)

High arterial blood pressure (ABP) was found in 24 (45.3%) of the included cases. ASCVD was positive in 27 (50.9%) of the included cases (atherosclerosis 1 (1.9%), cardiomegaly 1 (1.9%), hypertension 8 (15.1%), hypertension 8 (15.1%), ischemic heart disease 9 (17%), combination of hypertension and ischemic heart disease 7 (13.2%) and stroke 1 (1.9%)). Eye manifestations were positive in 20 (37.7%) of the included cases (cataract 4 (7.5%), DME 1 (1.9%), double vision 1 (1.9%), glaucoma 2 (3.8%), IMSC 1 (1.9%), NPDR 7 (13.2%), PDR 2 (3.8%), pseudophakia 1 (1.9%) and total blindness 1 (1.9%)). Lipid profile of the included cases showed total cholesterol 4.2±1.2 mmol/L (mean±SD), LDL 2.5±.9 mmol/L (mean±SD), TG 1.9±.9 mmol/L (mean±SD) and HDL 1.0±.2 mmol/L (mean±SD) (Table 3).

Table 3: Comorbidities and dyslipidemia of the included cases

Disorder			Results (No / percentage)
High ABP on visits	No (Normal ABP)		29(54.7%)
	Yes (High ABP)		24(45.3%)
ASCVD	No		26(49.1%)
	Yes	Total	27(50.9%)
		Atherosclerosis	1(1.9%)
		Cardiomegaly	1(1.9%)
		HTN history	8(15.1%)
		IHD	9(17%)
		IHD + HTN	7(13.2%)
		Stroke	1(1.9%)
Eye manifestations	No		33(62.3%)
	Yes	Total	20 (37.7%)
		Cataract	4(7.5%)
		DME	1(1.9%)
		Double vision	1(1.9%)
		Glaucoma	2(3.8%)
		IMSC	1(1.9%)
		NPDR	7(13.2%)
		PDR	2(3.8%)
		Pseudophakia	1(1.9%)
		Total blindness	1(1.9%)
Lipid Profile	Cholesterol(mean±SD)		4.2±1.2
	LDL(mean±SD)		2.5±9
	TG(mean±SD)		1.9±9
	HDL(mean±SD)		1.0±2

ABP: Arterial Blood Pressure,
ASCVD: Atherosclerotic Cardio-Vascular Disorders,
HTN: Hypertension,
IHD: Ischemic Heart Disease,
MDE: Diabetic Macular Edema,
IMSC: immature cataract,
NPDR: Non-Proliferative Diabetic Retinopathy,
PDR: Proliferative Diabetic Retinopathy,
LDL: Low Density Lipoprotein cholesterol,
TG: Triglycerides,
HDL: High Density Lipoprotein cholesterol.

Of the included 53 cases; 44 (83.0%) had diabetic foot ulcer (left foot 26 (49.1%), right foot 15 (28.3%) and bilateral 15 (28.3%)), 49 (92.5%) had no foot deformity but only 4 (7.6%) were positive for foot deformities (cavovarus 2 (3.8%) and Charcot joint 2 (3.8%)); 28 (52.8%) had skin abnormalities (abscess 2 (3.8%), unilateral swelling 7 (13.2%), bilateral swelling 2 (3.8%), swelling & redness 1 (1.9%), bullae 1 (1.9%), abscess & swelling 1 (1.9%), bullae & swelling 1 (1.9%), cellulitis 3 (5.7%), swelling & cellulitis 1 (1.9%), cellulitis & abscess 1 (1.9%), delayed wound healing 1 (1.9%), dirty wound 1 (1.9%), pus collections 2 (3.8%), redness, swelling, pus and diabetic dermopathy 2 (3.8%) and wound 2 (3.8%)); 20 (37.7%) had infection with diabetic foot, 10 (18.9%) had gangrene in their foot and 50 (94.3%) showed diabetic foot complications. Doppler ultrasonography of the lower limbs showed bilateral limb ischemia in 1 (1.9%) of cases and diffuse atherosclerotic changes in 1 (1.9%) of the cases. On the other hand; ECHO showed Mild mitral regurgitation & trace aortic regurgitation in 1 (1.9%) of the cases and Mild diastolic dysfunction in 3 (5.7%) of the included cases (Table 4).

Table 4: Diabetic foot characteristics in the included cases:

Characteristic			Results (No / %)
Ulcer	No		9(17.0%)
	Yes (site)	Total	44 (83.0%)
		Left foot	26(49.1%)
		Right foot	15(28.3%)
		Bilateral	3(5.7%)
Foot deformity	No		49(92.5%)
	Yes	Total	4 (7.6%)
		Cavovarus	2(3.8%)
		Charcot joint	2(3.8%)
Skin abnormalities	No		25(47.2%)
	Yes	Total	28(52.8%)
		Abscess	2(3.8%)
		Unilateral swelling	7(13.2%)
		Bilateral swelling	2(3.8%)
		Swelling & redness	1 (1.9%)
		Bullae	1(1.9%)
		Abscess & swelling	1(1.9%)
		Bullae & swelling	1 (1.9%)
		Cellulitis	3(5.7%)
		Swelling & cellulitis	1 (1.9%)
		Cellulitis & abscess	1 (1.9%)
		Delay wound healing	1 (1.9%)
		Dirty wound	1 (1.9%)
		Pus collections	2(3.8%)
		Redness, swelling, pus and diabetic dermopathy	2 (3.8%)
		Wound	2(3.8%)
Infection	No		33(62.3%)
	Yes		20(37.7%)
Gangrene	No		43(81.1%)
	Yes		10(18.9%)
Complications	No		3(5.7%)
	Yes		50(94.3%)
Doppler US of the lower limbs and ECHO abnormalities	No		47(88.7%)
	Yes	Total	6 (11.3%)
		Bilateral limb ischemia	1 (1.9%)
		Diffuse atherosclerotic changes	1 (1.9%)
		Mild MR & trace AR	1 (1.9%)
		Mild diastolic dysfunction	3 (5.7%)

MR: Mitral Regurgitation, AR: Aortic Regurgitation.

Surgical management of the diabetic foot was required in 25 (47.2%) of the included cases (debridement 14 (26.4%), dressing 6 (11.3%), abscess drainage 3 (5.7%), compression with wet gauze 1 (1.9%) and skin graft 1 (1.9%)). Amputation was done in 7 (13.2%) of the included cases (right toe 3 (5.7%), left toe 2 (3.8%), disarticulation 1 (1.9%) and above the knee (left) 1 (1.9%)) (Table 5).

Table 5: Surgical management and amputations (if any) for the diabetic foot in the included cases

Surgical interference			No (%)
Surgical management	No		28(52.8%)
	Yes	Total	25 (47.2%)
		Debridement	14(26.4%)
		Dressing	6(11.3%)
		Abscess drainage	3 (5.7%)
		Compression with wet gauze	1 (1.9%)
		Skin graft	1 (1.9%)
Amputation	No		46(86.8%)
	Yes	Total	7 (13.2%)
		Right toe	3 (5.7%)
		Left toe	2 (3.8%)
		Disarticulation	1 (1.9%)
		Above the knee (left)	1 (1.9%)

There was no statistically significant difference between patients aged <66 years and those aged >66 years regarding BMI and smoking history. In respect of DM characteristics in the included group; there was no statistically significant difference between patients aged <66 years and those aged >66 years regarding the duration of DM, fasting blood glucose measurements, HbA1C percentage, and drugs used for the treatment of DM but there was a statistically significant positive history of usage of aspirin (19 (73.1%)- p value 0.002) and ACEIs/ARBS (8 (30.8%) - p value 0.039) in patients aged >66 years in comparison to those aged <66 years old (8 (29.6%) and 2 (7.4%) respectively) (Table 6 and Table 7).

Table 6: Association between basic characteristics of the included cases in relation to age groups:

Characteristic		Age (No / percentage)		P value
		<66 years	>66 years	
BMI		30.1±5.1	29.2±6.6	0.63
Smoking	No	24 (88.9%)	24 (92.3%)	0.85
	Ex-smoker	1 (3.7%)	1 (3.8%)	
	Yes	2 (7.4%)	1 (3.8%)	

Table 7: Association between Diabetes Mellitus characteristics, treatment and other therapies of the included cases in relation to age groups:

Characteristic			Age (No / percentage)		P value
			<66 years	>66 years	
DM duration (years)			14.5(10.0-20.0)	22.0(15.0-25.0)	0.13
Fasting blood glucose (mmol/L)			9.2(7.1-14.0)	11.3(8.3-15.7)	0.46
HbA1C % (mean±SD)			9.0±1.0	9.1±1.5	0.88
Drugs used	Insulin	No	8 (29.6%)	8 (30.8%)	0.9
		Yes	19 (70.4%)	18 (69.2%)	
	Oral antidiabetics	No	9 (33.3%)	11 (42.3%)	0.5
		Yes	18 (66.7%)	15 (57.7%)	
	Aspirin	No	19 (70.4%)	7 (26.9%)	0.002*
		Yes	8 (29.6%)	19 (73.1%)	
	Clopidogrel	No	25 (92.6%)	21 (80.8%)	0.25
		Yes	2 (7.4%)	5 (19.2%)	
	ACEIs / ARBs	No	25 (92.6%)	18 (69.2%)	0.039*
		Yes	2 (7.4%)	8 (30.8%)	

There was no statistically significant difference between patients aged <66 years and those aged >66 years in the included cases regarding comorbidities (hypertension and eye manifestations of DM) and dyslipidemia apart from ASCVD which was more common in the older patient's group (8 (30.8%) and 18 (69.2%) respectively - p value 0.009).

Table 8: Association between comorbidities and dyslipidemia of the included cases in relation to age groups:

Disorder		Age (No / percentage)		P value
		<66 years	>66 years	
High ABP	No (Normal ABP)	15 (55.6%)	14 (53.8%)	0.9
	Yes (High ABP)	12 (44.4%)	12 (46.2%)	
ASCVD	No	18 (66.7%)	8 (30.8%)	0.009*
	Yes	8 (30.8%)	18 (69.2%)	
Eye manifestations	No	16 (59.3%)	17 (65.4%)	0.6
	Yes	11 (40.7%)	9 (34.6%)	
Lipid profile	Cholesterol	4.4±1.2	4.1±1.3	0.6
	LDL	2.4±0.8	2.6±1.1	0.6
	TG	1.9±0.6	1.9±1.1	0.76
	HDL	1.0±0.2	0.9±0.3	0.58

In respect of diabetic foot characteristics; there was no statistically significant difference between patients aged <66 years and those aged >66 years regarding foot deformities, infection, gangrene, overall complications, and lower limb vascularity assessed by lower limb Doppler ultrasonography apart from diabetic foot ulcer which was significantly higher in the younger patient's group (24 (88.9%) and 23 (76.9%) respectively - p value 0.038).

Table 9: Association between diabetic foot characteristics in the included cases in relation to age groups:

Characteristic		Age (No / percentage)		P value
		<66 years	>66 years	
Ulcer	No	3 (11.1%)	6 (23.1%)	0.038*
	Total ulcers	24 (88.9%)	20 (76.9%)	
	Left foot	18 (66.7%)	8 (30.8%)	
	Right foot	6 (22.2%)	9 (34.6%)	
	Bilateral	0 (0.0%)	3 (11.5%)	
Foot deformity	No	24 (88.9%)	25 (96.2%)	0.6
	Cavovarus	2 (7.4%)	0 (0.0%)	
	Charcot's joint	1 (3.7%)	1 (3.8%)	
Skin abnormality	No	15 (55.6%)	10 (38.5%)	0.2
	Yes	12 (44.4%)	16 (61.5%)	
Infection	No	17 (63.0%)	16 (61.5%)	0.9
	Yes	10 (37.0%)	10 (38.5%)	
Gangrene	No	22 (81.5%)	21 (80.8%)	1.00
	Yes	5 (18.5%)	5 (19.2%)	
Complications	No	1 (3.7%)	2 (7.7%)	0.6
	Yes	26 (96.3%)	24 (92.3%)	
Doppler and ECHO abnormalities	No	24 (88.9%)	23 (88.5%)	0.58
	Bilateral limb ischemia	0 (0.0%)	1 (3.8%)	
	Diffuse atherosclerotic changes	1 (3.7%)	0 (0.0%)	
	Mild MR & trace AR	0 (0.0%)	1 (3.8%)	
	Mild diastolic dysfunction	2 (7.4%)	1 ((3.8%)	

There was no statistically significant difference between patients aged <66 years and those aged >66 years in the included cases regarding surgical management done for the included cases (debridement, dressings, abscess drainage, wet gauze compression, and skin grafts) and amputations done.

Table 10: Association between surgical management and amputations (if any) for the diabetic foot in the included cases in relation to age groups:

Surgical interference		Age (no / percentage)		P value
		<66 years	>66 years	0.75
Surgical management	No	13 (48.1%)	15 (57.7%)	
	Debridement	8 (29.6%)	6 (23.1%)	
	Dressing	4 (14.8%)	2 (7.7%)	
	Abscess drainage	0 (0.0%)	3 (11.5%)	
	Compression with wet gauze	1 (3.7%)	0 (0.0%)	
	Skin graft	1 (3.7%)	0 (0.0%)	
Amputation	No	24 (88.9%)	22 (84.6%)	0.09
	Right toe	3 (11.1%)	0 (0.0%)	
	Left toe	0 (0.0%)	2 (7.7%)	
	Disarticulation	0 (0.0%)	1 (3.8%)	
	Above the knee (left)	0 (0.0%)	1 (3.8%)	

Discussion

Diabetic foot complications are responsible for about 24% of health expenditure in patients with DM (6). These complications can lead to both morbidities and mortalities in diabetics and physiological and physical burdens are a consequence. To set better health programs; it is the role of health personnel and organizations to identify diabetic foot-related problems and set up prevention programs to avoid these complications (9).

Our study included 53 patients with diabetic foot who presented to the diabetic foot center in Albaha, Saudi Arabia. The mean age of the included cases is 64 years; most of them were males 43 (81.1%), BMI is 29.7±5.8 and most of them were non-smokers 48 (90.6%). Current smoking was shown to be a hazardous risk for diabetic complications (12). The low smokers' ratio in our study may be related to the high altitude in Albaha that makes smoking difficult with the low atmospheric oxygen tension. Nordström and colleagues found that the prevalence of DM was 14.6% in men and 9.1% in women (P < .001) and this was related to visceral obesity which was evidenced in our study with BMI of 29.7±5.8 (16).

The average DM duration in our study was 17.0 (10.0-25.0) years. It is well established that diabetic foot complications are directly related to the duration of DM (9, 10, 17). A longer duration of DM is associated with more risk of development of vasculopathy and neuropathy that are related to the development of diabetic foot complications and other diabetes-related complications. Poor glycemic control is significantly correlated with diabetic complications (18). Poor glycemic control in or study population was indicated by a high HbA1C of 9.1±1.3% and elevated fasting blood glucose of 10.1 (7.6- 14.8) mmol/L and this was manifested with their presentation to the diabetic foot center with diabetic foot, its complications, and other DM related complications. Poor control of DM management is composed of revision of dietary plans and exercise and drug management plans and revision. Insulin may be needed at some stages of type II DM. This was shown in our study; although 52 (98.1%) had type II DM, 37 (69.8%) used insulin therapy. Although only 8 patients had a history of hypertension, 10 patients were using ACEIs / ARBs. It was shown that ACEIs / ARBs reduce the risk of progressive renal diseases, microalbuminuria, and cerebrovascular event, even in normotensive people (19, 20) (Tables 2, 3).

Type II DM and hypertension are frequent comorbidities. In our study; although 8 (15.1%) had a history of hypertension, 24 (45.3%) were found to have hypertension at their presentation to the diabetic foot center (Table 3). The frequent coexistence of DM and hypertension is related to common pathophysiological mechanisms like obesity and insulin resistance. It was found that 50% of hypertensives can experience type II DM or insulin resistance. On the other hand, the San Antonio Heart Study found that 85% of patients with type II DM experienced hypertension in their fifties (21). Insulin resistance in conjunction with chronic hyperglycemia plays a major role in the development of vascular complications, both macrovascular and microvascular (22). In our study, atherosclerotic cardiovascular diseases were found in 27 (50.9%) ranging from atherosclerosis to stroke. It was found that the risk of cardiovascular events is increased even at the early stages of prediabetes and insulin resistance (23). Eye complications are a major problem related to morbidity and lifestyle compromise in patients with DM. In our study; eye manifestations were found in 20 (37.7%), non-proliferative diabetic retinopathy in 7 (13.2%), and proliferative diabetic retinopathy in 2 (3.8%). Diabetic retinopathy was found in 28% of type II DM patients in the United States (24). It is responsible for 10,000 cases of blindness worldwide every single year (25). Strict glycemic control with a HbA1C target of <6.0 % was shown to be significantly correlated with a lower rate of diabetic retinopathy progression according to the Action to Control Cardiovascular Risk in Diabetes (ACCORD) Trial (26). In our study; the blood levels of LDL cholesterol (2.5±.9 mmol/L) and triglycerides (TG) (1.9±.9 mmol/L) are marginally above the recommended lipid profile levels in diabetics (27, 28). Dyslipidemia associated with DM is characterized by low HDL, elevated LDL-cholesterol, and TG (29). There is an interplay between DM and dyslipidemia and it may not only be a consequence of impaired glucose metabolism but also cause it (30).

Diabetic foot ulcers are a devastating complication of DM and are usually associated with vasculopathy causing peripheral arterial disease or neuropathy. It is encountered in about 10% of the diabetic population (31). In our study; 44 (83.0%) of the cases are presented with active diabetic foot ulcers. This is related to the fact that the diabetic foot center is aimed at the management of diabetic foot complications. It was estimated that the prevalence of diabetic foot complications among the Saudi Arabia population was 3.3% with about 2% with foot ulcers and 0.19% with gangrene and amputation was performed in 1.06% (9). Generally; 10–15% of diabetic foot ulcers will remain active and limb amputation may be needed in 5-25% of these cases (32). In our study; amputation was done in 7 (13.2%) cases. Besides neuropathy and vasculopathy, structural foot deformities may also contribute to the development of diabetic foot ulcers and complications (33). Foot deformities were found in 4 (7.6%) of our study cases, 2 (3.8%) with Cavovarus deformity, and 2 (3.8%) with Charcot's joint. The dermatological examination is an important entity in the examination of diabetic foot. It includes a visual inspection of the skin of the legs and feet, particularly the dorsal, plantar, medial, lateral, and posterior surfaces, as well as a close examination of each toenail. It includes also the observation of skin fissuring, sensations, and complications (34). Skin complications were encountered in 28 (52.8%) of our cases, ranging from swelling and neuropathy to pus collections and abscess formation.

The gold standard for diabetic foot ulcer treatment includes debridement of the wound, management of any infection, revascularization procedures when indicated, and off-loading of the ulcer (35). Surgical management of diabetic

foot complications was required in 25 (47.2%) of our cases, debridement in 14 (26.4%), dressing in 6 (11.3%), abscess drainage in 3 (5.7%), wet gauze compression in 1 (1.9%) and skin graft in 1 (1.9%) of cases. Management of diabetic foot complications is a big challenge and implementations of its therapeutic plans are required.

The prevalence of diabetes-related complications shows continuous progression with aging; including neuropathy, vasculopathy, and foot deformities. This is manifested by increased diabetic foot ulcers and rates of amputations in the elderly (36). Based on this fact; we divided our cases into two groups according to age; <66 years (27 cases) and >66 years (26 cases). In our study; 18 (69.2%) of the older group cases had ASCVD in comparison to 8 (30.8%) in the group <66 years (p value 0.009). This was reflected on therapies where Aspirin and ACEIs / ARBs use was significantly used in patients >66 years in comparison to patients >66 years (p value 0.002 and 0.039 respectively). It was found that diabetes remains a risk factor for cardiovascular events and mortality in elderly populations (37). In our study; diabetic foot ulcers were found in 24 (88.9%) of patients aged <66 years in comparison to 20 (76.9%) in patients aged >66 years (p value 0.038) and there was no statistically significant difference between the two age groups regarding deformities, infections and skin and other abnormalities . The higher rate of foot ulcers in our study group is in opposition to most of the studies that show that the risk of ulcers is increased with age progress (36, 38). The age of the patient is not the sole factor affecting foot ulcers, other factors such as the duration of DM, glycemic control, the severity of infection, and pressure sites like heel are also ulcer effectors. Despite this higher rate of foot ulcers in patients aged <66 years in our study, no statistically significant difference was detected regarding surgical management required in these cases. Mahmoud and colleagues found that ulcer healing rate was higher in the younger age group than the older one (38).

Conclusion and Recommendations

In conclusion; diabetic foot ulcers and complications are a major health problem contributing to devastating morbidities up to amputations. Poor glycemic control is a major contributing factor for diabetic foot problems. A good glycemic control, diabetic foot meticulous care, and early interventions are recommended health practice strategies.

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