

## Evaluating Diabetic Foot in King Abdulaziz University Hospital - One year Review (2014-2015)

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**Abstract:** Diabetes mellitus is associated with increased foot problems. Methodology: In King Abdulaziz University Hospital (KAUH) we reviewed the data of 109 patients with diabetic foot problems between 01 May 2014 and 30 April 2015, data included demographic data, duration, and type of diabetes, HBA1C, complications, treatment and compliance to medication. Results: 71.6% were males and 28.4% females. 73.4% were managed through the outpatient while 26.6% required hospital admission. Most patients were in the age group 55.1-65 years, 81.7% had type II DM and 18.3% had type I DM, of all patients 64.2% were compliant to their medications and 78.1% had regular follow up. Risk factors included hypertension 65.1%, nephropathy 31.2%, ischemic heart disease 36.7%, retinopathy 63.3%, dyslipidemia 63.3% and morbidly obese 8.3%. 55% had ischemic claudication, 63.4% were uncontrolled with HBA1c  $\geq 8$  and 7.1-7.9 in 21.1%. 80.7% had an ulcers, 18.3% of them healed, 67.9% improved and 13.8% got worse. **Conclusion:** In KAUH diabetic foot is more common in age group 55.1-65 years with high amputation rate; PVD and ulcers. The main risk factors were male gender, elevated HBA1c and age among the different predictors.

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**Key Words:** Diabetes Mellitus, Diabetic Foot

### 1. Introduction:

Diabetes mellitus (DM) continues to be a growing health problem worldwide, it is a life-long disease associated with neuropathy, vasculopathy and wide range of foot complications [1&2]. Impaired foot sensation can lead to significant complications to the diabetic patient including ulceration, neuropathic arthropathy, Charcot foot and the risks of amputation [3]. Diabetic patients are at high risk of developing chronic foot problems; 15-25% of will develop foot ulcers during their lifetime with increased risk of morbidity as well as mortality, among diabetics the prevalence of foot ulcers, gangrene and amputations are 7.9%, 1.8% and 3.5% respectively[2&4]. Up to 70% of ulcers recur within 5 years i.e., chronic non-healing ulcers [5].

In the Arab countries foot disorders are common problems, it occurs in 11.6% of diabetics and can lead to serious complications, in addition to the social, psychological and financial consequences [6-8]. 40-70% of lower limb amputations are diabetics and 85% are preceded by foot ulceration [9&10].

Saudi Arabia ranks number 4 among the top five Middle Eastern and North African countries with the highest diabetes prevalence of 23.9%, [International Diabetes Federation statistics 2013].[11&12].

The aim of this study is to determine the prevalence of diabetic foot problems, the related risk factors and complications, including foot ulcers, gangrene and amputations among patients with diabetes in King Abdul-Aziz university hospital.

### 2. Methodology:

A retrospective study of 109 patients with diabetic foot who undergone treatment at King Abdul Aziz University Hospital, Jeddah, Saudi Arabia either at the surgical department or attending diabetic foot clinic for follow up during the period from 01 May 2014 to 30 April 2015.

Data were collected from patients' medical records using the electronic hospital database on a specifically designated collection sheets, the findings were confirmed by contacting the patient on their mobile or home phone numbers.

The variables used in our study included demographic data (age, gender, nationality, weight, height and BMI), duration and type of diabetes, HBA1C, treatment and compliance to medication.

Risk classification was as follows, atherosclerosis (HTN, dyslipidemia, claudication and smoking), neuropathy and the presence of related

deformities like plantar callus, claw toes and Charcot's osteoarthropathy with no ulcers.

Complications include previous or current ulcer (type, state and treatment), amputation (major amputation if above the ankle joint and a minor as below the ankle joint) as well as nephropathy and retinopathy.

These variables were reviewed as factors affecting diabetic foot and analyzed using Statistical Package for Social Sciences (SPSS) software Version 16.0, from a total of 301 patients we included 109 in our study. Data are reported as mean (SD) or as absolute numbers (percentage), unless otherwise stated.

Patients with gestational DM, diabetics with no foot complication and those who did not respond to our call or their files were missing crucial information and deceased patients were excluded from the study.

### 3. Results:

The study was conducted on 109 patients [31 females and 78 males] Table 1.

79 patients were followed up through outpatient department and 30 patients were admitted. Inpatient group (30 patients), 22 were above 45 years with peak incidence (36.7%) in age group 45.1-55 years, while in outpatient group most of the patients (36.7%) were in age group 55.1-65 years. Patients in our study group were 71.6% males and 28.4% females with the highest incidence of DM foot problems among male gender patients (41%) in age group 55.1-65 years compared to (32.3%) in female age group 45,1-55 years.

Patient's data were organized according to the type of diabetes, compliance to treatment and their follow up, Table 2. 81.7% of the patients have type 2 diabetes and 18.3% type 1. Concerning the type of treatment, oral hypoglycemic (17.4%), Insulin (69.7%) and 12.8% were on combined treatment. 64.2% were compliant to medication and regular follow up was noted in 78.1%. The highest incidence of compliance

and follow up were both in age group 55.1 -65. (37.1% and 34.1%) respectively,

44 patients were overweight (40.4%), 34 were obese (31.2%), and 9 patients were morbidly obese (8.3%). 55% were non-smokers; the remaining 45% were smokers or ex smokers. Ischemic claudication pain was diagnosed in 55% of cases, mainly in age group 55.1-65 years and above 65 years (33.9% and 27.1% respectively). Table 3.

The most common comorbidities were hypertension (65.1%), followed by IHD (36.7%) and cerebrovascular disease (25.7%). 69 patients (63-3%) had diabetic retinopathy and 34 patients (31.2%) had nephropathy. Table 4.

Dyslipidemia and elevated HBA1C levels were high 65.1% and 63.3% (more than 8 mmol), mainly age group 55.1-65 years in both (36.1% and 41.2% respectively). Table 5.

Diabetic foot complications included foot ulcers, infection, Charcot joint, foot gangrene and amputation among our patients. 89 patients (81.7%) had history of ulcer, of which 54.1% were ischemic type mainly in age group 55.1-65 (41.4%). Incidence of Amputation and foot infection (soft tissue and bone) were the same (60.6%), most of the cases were in patients age group 55.1-65 with the highest incidence of 36.4% and 31.8% for amputee and soft tissue infection respectively.

Past medical history of ulcer as well as current foot status had been studied, of all patients in our study 81.7% had history of ulcer, of which 22% were ischemic and 8.3% were neuropathic. Ulcer duration ranged from less than 1 week (5.5%) to more than 3 months (78%), the rest of the ulcer cases (16.5%) lasted for more than a week but less than 3 months. The overall prevalence of current ulcer was 81.7%, during the time of the study ulcers improved in 67.9%, got worse in 11.9% had no changes in 1.8% of the patients. Charcot joint deformity was recorded in 33% of cases, mainly in age group 55.1-65 (44.4%). Table 6.

**Table 1: Inpatient, outpatient groups and gender in relation to ages.**

		Age				Total
		<=45	45.1-55	55.1-65	<65	
Patient source	Inpatient	8 26.7%	11 36.7%	10 33.3 %	1 3.3%	30 100%
	Outpatient	10 12.7%	15 19%	29 36.7%	25 31.6%	79 100%
	Total	18 16.5%	27 23.9%	38 35.8%	26 23.9%	109 100%
Gender	Male	11 14.1%	16 20.5%	32 41.0%	19 24.4%	78 100%
	Female	7 22.6%	10 32.3%	7 22.6%	7 22.6%	31 100%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%

**Table 2, type of diabetes and medication, compliance to treatment and follow up.**

		Age				
		<=45	45.1-55	55.1-65	<65	Total
Type of DM	Type1	6 30.0%	4 20.0%	6 30.0%	4 20.0%	20 100%
	Type2	12 13.5%	23 24.7%	32 37.1%	22 24.7%	89 100%
	Total	18 16.5%	27 23.9%	38 34.8%	26 23.9%	109 100%
Compliance to medication	Yes	13 18.6%	17 24.3%	26 37.1%	14 20.0%	70 100%
	Not	5 12.8%	9 23.1%	13 33.3%	12 30.8%	39 100%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%
Regular followup	Yes	16 18.8%	20 23.5%	29 34.1%	20 23.5%	85 100%
	No	2 8.3%	6 25.0%	10 41.7%	6 25.0%	24 100%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%
Type of treatment	OHG Agent	4 21.1%	3 15.8%	7 36.8%	5 26.3%	19 100%
	Insulin	12 15.8%	21 27.6%	24 31.6%	19 25.0%	76 100%
	Combined	2 14.3%	2 14.3%	8 57.1%	2 14.3%	14 100%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%

**Table 3: BMI, smoking and ischemic Claudication pain.**

		Age				
		<=45	45.1-55	55.1-65	<65	Total
Body Mass Index	Underweight	1 100%	0 0.0%	0 0.0%	0 0.0%	1 100%
	Normal	3 14.3%	6 28.6%	10 47.6%	2 9.5%	21 100%
	Overweight	9 20.5%	8 18.2%	14 31.8%	13 29.5%	44 100%
	Obese	3 8.8%	9 26.5%	12 35.3%	10 29.4%	34 100%
	Morbidly obese	2 22.2%	3 33.3%	3 33.3%	1 11.1%	9 100%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%
Claudication	Yes	9 15.3%	14 23.7%	20 33.9%	16 27.1%	59 100%
	No	9 18.0%	12 24.5%	19 38.0%	10 20.0%	49 100%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%
Smoking	Yes	7 24.1%	6 20.7%	14 48.3%	2 6.9%	29 100%
	No	10 16.9%	13 22.0%	20 33.9%	16 27.1%	59 100%
	Ex-Smoker	1 4.8%	7 33.3%	5 23.8%	8 38.1%	21 100%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%

**Table 4: Comorbidities in the study sample, hypertension, IHD, stroke, nephropathy and retinopathy.**

		Age				
		<=45	45.1-55	55.1-65	<65	Total
Hypertension	Yes	7 10%	16 22.9%	25 35.7%	22 31.4%	70 64.2%
	No	11 28.2%	10 25.6%	14 35.9%	4 10.3%	39 35.8%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%
Stroke	Yes	2 7.1%	4 14.3%	10 35.7%	12 42.9%	28 100%
	No	16 19.8%	22 27.2%	29 35.8%	14 17.3%	81 100%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%
Nephropathy	Yes	2 6.1%	10 30.3%	11 33.3%	10 30.3%	33 100 %
	No	16 21.1%	16 21.1%	28 36.8%	16 21.1%	76 100%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%
IHD	Yes	5 12.5%	8 20.0%	14 35.0%	13 32.5%	40 100%
	No	13 18.8%	18 26.1%	25 36.2%	13 18.8%	69 100%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%
Retinopathy	Yes	8 11.6%	15 21.7%	27 39.1%	19 27.5%	69 100%
	No	10 25.0%	11 27.5%	12 30.0%	7 17.5%	40 100%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%

**Table 5, Dyslipidemia and HBA1C levels.**

		Age				
		<=45	45.1-55	55.1-65	<65	Total
Dyslipidemia	Yes	8 11.1%	16 22.2%	26 36.1%	22 30.6%	72 100%
	No	10 27.0%	10 27.0%	13 35.1%	4 10.8%	37 100%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%
HBA1C	<=7	1 5.9%	3 17.6%	7 41.2%	6 35.3%	17 100%
	7.1-7.9	4 17.4%	5 21.7%	9 39.1%	5 21.7%	23 100%
	>=8	13 18.8%	18 26.1%	23 33.3%	15 21.7%	69 100%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%

**Table (6): Data analysis of all patients.**

		Age				Total
		<=45	45.1-55	55.1-65	<65	
Ulcer history	Yes	14 15.9%	21 23.9%	32 36.4%	21 23.9%	88 100%
	No	4 19%	5 23.8%	7 33.3%	5 23.8%	21 100%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%
Type of ulcer	No Ulcer	3 14.3%	5 23.8%	6 28.6%	7 33.3%	21 100%
	Ischemic	8 13.8%	14 24.1%	24 41.4%	12 20.7%	58 100%
	Neuropathic	7 23.3%	7 23.3%	9 30%	7 23.3%	30 100%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%
Ulcer duration	<1w	0 0%	1 14.3%	5 71.4%	1 14.3%	7 100%
	1w-3m	5 20.8%	7 29.2%	8 33.3%	4 16.7%	24 100%
	>3m	13 16.7%	18 23.1%	26 33.3%	21 26.9%	78 100%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%
Charcot Joint	Yes	5 13.9%	8 22.2%	16 44.4%	7 19.4%	36 100%
	No	13 17.8%	18 24.7%	23 31.5%	19 26%	73 100%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%
Amputation	Yes	10 15.2%	15 22.7%	24 36.4%	17 25.8%	66 100%
	No	8 18.6%	11 25.6%	15 34.9%	9 20.9%	43 100%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%
Current ulcer status	No Ulcer	4 19%	5 23.8%	7 33.4%	5 23.8%	21 100%
	Improve	14 19.2%	15 20.5%	25 34.2%	19 26%	74 100%
	Worse	0 0%	6 46.2%	6 46.2%	1 7.7%	13 100%
	No Change	0 0%	0 0%	1 50%	1 50%	2 100%
	Total	18 100%	26 100%	39 100%	26 100%	109 100%
Cellulitis and abscesses	Yes	10 15.2%	20 30.3%	21 31.8%	15 22.7%	66 100%
	No	8 18.6%	6 14.0%	18 41.9%	11 25.6%	43 100%
	Total	18 16.5%	26 23.9%	39 35.8%	26 23.9%	109 100%

#### 4. Discussion:

Saudi Arabia has a large population of diabetic patients, with diabetic foot problems becoming a major medical, social and economic problem [10&11].

Several literatures have cited factors that increase the risk of amputation among diabetic patients including age [13–14], male gender and stroke [15–16], in addition to associated co-morbidities and complications such as IHD, hypertension, PVD, nephropathy [13], sensory neuropathy, duration of diabetes and raised HbA1c [17&18].

In agreement with the literature our data showed high prevalence of diabetic foot disorders among males compared to females (71.6% and 28.4% respectively), highest incidence of diabetic foot problems (34.8%) among age group 55.1-65 year. Assad-Khalil in Egypt reported a prevalence of diabetic foot disorders significantly higher among the male population (14.1%) compared to the female population (9.7%). [19], According to Yang et al, the prevalence of foot ulcers, gangrene and amputations tended to increase with age.

81.6% of the study group had type 2 diabetes, 69.7% were insulin dependent and 12.8% were on combined therapy. Comorbidities in our study sample were highest in age group 55.1-65 years for hypertension (35.7%), IHD (35%) and retinopathy (39.1%), while nephropathy (39.1%) and stroke (42.9%) were highest in age groups 55.1-65 and above 65 respectively. These complications are a frequent reason of hospital admission, 27.5% of our patients were admitted as inpatient, which impose excessive distress and expenses.

Our study is in agreement with other studies, it concluded that foot ulcers are more common in patients with previous history of ulceration or amputation, and that the prevalence of foot ulcers, gangrene and amputations tended to increase with age [4,20&21].

Claudication pain (54.1%), ischemic foot ulcers (53.2%) and history of ulcer (80.7%) were the main risk factors for amputation in our study. Peripheral vascular disease (PVD) was identified by different studies as an independent risk factor [13].

The high incidence of amputation in our study (60.5%) was attributed to the prevalence and combination of different risk factors. Past and present history of foot ulcers or infections in addition to advanced age, male gender, duration of diabetes, smoking and other risk factors may result in foot amputation that is similar to what was reported by Rathur *et al*, [22].

#### Conclusion:

This study reports frequent diabetic foot problems in KSA with high amputation rate, PVD,

foot ulcer, age group 55.1-65 years were the main risk factors among the different predictors.

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