



Clinical Profile and Prognosis of Diabetes Mellitus Type 2 Patients with Diabetic Foot Ulcers in Chomi Medical and Surgical Clinic, General Santos City, Philippines

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Abstract

A big percentage of patients with diabetes mellitus type 2 develop diabetic foot ulcers. This complication entails high costs to the patients. This retrospective study determined the clinical profile and prognosis of diabetic patients with foot ulcers in the Chomi Medical and Surgical Clinic (CMSC) in General Santos City. Medical records of 412 patients were reviewed from August 2010 – January 2011. Eighty-two of the patients have diabetes mellitus type 2, 50 of whom have diabetic foot ulcers. A ratio of 1.4 males: 1 female was observed indicating that more males than female were affected. For both genders, the mean age is between the 5th and 6th decade of life with 53 + 12.51 years, most of which belong to the 50-59 age-group. In body mass index (BMI) categorization, majority of the patients belong to the normal and overweight category at 48% and 42%, respectively. Of the 50 patients with diabetic foot ulcers, 39 (78%) had previous diagnosis of type 2 diabetes mellitus of 2.36 + 1.7 years (range = 0.2 – 7 yrs.) while the other 11 (22%) were walk-in patients and were diagnosed upon the day of consultation. Ulcerations were commonly found in the toes while rarely on the shin. Degrees of wounds were graded according to Wagner's classification. Forty-eight percent (24) of patients had grade 0, 26% (13) had grade 1, 16% (8) had grade 2, 6% (3) had grade 4, and 4% (2) had grade 5 ulcers. Sixteen (32%) underwent debridement, seven (14%) underwent amputation with five toe disarticulations and two below knee amputation while only one (2%) underwent internal screw fixation. Results indicate that diabetic foot ulcer mostly occurs in patients in the 5th to 6th decade of life and affects more males than females.

Keywords: body mass index, debridement, disease, retrospective, Wagner's classification.

Introduction

Diabetes mellitus (DM) is characterized by elevated blood glucose level (hyperglycemia)¹. In the year 2013, about 5.1 million deaths were reported due to diabetes-related complications². In the same year, 382 million people had diabetes³ type 1 and type 2. Type 1 DM is due to the deficiency of insulin secretion⁴. Type 2 DM on the other hand results from insulin resistance and insulin deficiency⁵. Type 1 DM is common among juveniles while type 2 DM is the most common for all age-groups and accounts for 90-95% of all diabetes mellitus-related cases⁶. In the Philippines, the prevalence of type 2 DM is about 28%⁷.

Diabetic foot ulcer is a common complication affecting 15% of people with diabetes⁸. Diabetic foot ulcer (DFU) has a 1% to 4% annual incidence rate and 15% to 25% lifetime risk^{9,10}. It is becoming a great concern affecting quality of life and social and economic aspects¹¹. Diabetic foot ulceration has prevalence of 4.75% in a population based in Greece¹². In the Philippines, diabetic foot ulcers are very common, accounting to 16- 20% of the yearly emergency room admissions at the Philippine General Hospital (PGH)¹³. In a local study done in Santo Tomas

University Hospital, diabetic foot ulcers (DFU) occur in 19% among patients with diabetes mellitus type 2¹⁴. This implies that many diabetic patients have the tendency of developing DFU. Diabetic foot ulcers are caused by either or both peripheral vascular disease and neuropathy¹⁵. Peripheral vascular disease can result in poor circulation, which may sooner lead to gangrene, foot ulcers, and eventually amputation¹⁶. Severe foot problems can result from peripheral neuropathy¹⁷.

A local retrospective study done at Quirino Memorial Medical Center showed that diabetic foot ulcers occur mostly in the 6th decade of life of patients with a mean age of 57 + 14.07 years and the ratio is 1.6 males : 1 female. Among the 36 patients, seven (19.4%) patients were diagnosed with diabetes only upon admission while 29 (80%) had previous diagnosis for about 4.01 + 4.71 years¹⁸.

The awareness on diabetes mellitus and its complications has been an issue worldwide and became popular even in the Philippines. However, the local studies done so far are limited to the areas near the National Capital Region (NCR). This study aimed to: determine the demographic characteristics of diabetic

patients with foot ulcer, including gender, size, mean age, and body mass index (BMI) classification; describe the clinical characteristics such as the average blood glucose, duration of diabetes, and the complications that occur in patients with diabetic foot ulcers (DFU); determine the locations of the foot ulcerations and their intensity based on Wagner’s classification; determine the clinical procedures performed for the diabetic patients; and determine the prognosis of the patients.

Material and Methods

Medical records of diabetes mellitus type 2 patients from August 2010 – January 2011 in the Chomi Medical and Surgical Clinic were retrieved and reviewed. Patients were previously diagnosed with DM type 2. Other patients had fasting blood glucose of >110 mg/dL upon consultation. Demography, complications, co-morbid illnesses, clinical characteristics, procedures, and clinical outcome were documented and analyzed. Degree of wounds was described in the clinical records and graded according to Wagner’s classification as this was also done by Raymundo and Mendoza in their study on diabetic foot infections among patients¹⁹. The Wagner’s classifications are as follows²⁰: Grade 0: Pre-ulcerative lesion, healed ulcers, presence of bony deformity. Grade 1: Superficial ulcer without subcutaneous tissue involvement. Grade 2: Penetration through the subcutaneous tissue (may expose bone, tendon, ligament, or joint capsule). Grade 3: Osteitis, abscess, or osteomyelitis. Grade 4: Gangrene of the forefoot. Grade 5: Gangrene of the entire foot.

Results and Discussion

Out of the 412 records of patients from August 2010 – January 2012 that were reviewed, 82 (20%) belonged to diabetes mellitus type 2 patients. Among the 82 diabetic patients, 50 (61%) suffer from diabetic foot ulcer (DFU). There were more males affected with a ratio of 1.4 males to 1 female and the mean age for both genders was 53 + 12.51. The same is true with the study done by Llanes, *et al.* with a ratio of 1: 0.64¹⁸ and Raymundo and Mendoza with a ratio of 1.1: 1¹⁹. Madanchi, *et al.* also found in their study that 58.1% who had suffered diabetic foot ulcers are males²¹. Other investigators^{22, 23} reported male patients to comprise 50–63.3% of their study populations who are affected by this disease than females. This may be because male patients do not frequently consult doctors²⁴ and when they do, they give very little information about their conditions²⁵. In

the study of Shakil and Khan, it was also found that male patients with diabetic foot ulcers have poor glycemic control²⁶. Due to the lack of health care interventions and poor glycemic control, male patients with diabetes mellitus type 2 will be most likely to develop diabetic foot ulcers.

Majority of the patients were in the normal and overweight groups in terms of Body Mass Index (BMI) with 24 (48%) belonging to normal and 21 (42%) belonging to the overweight category. The other four (8%) were underweight while there was only one (2%) obese (table-1). This confirms the study done by Bays, *et al.* wherein 75% of the diabetic patients had a BMI of >25 kg/m², and this falls under the normal, overweight, and obese categories²⁷. Moreover, overweight and obesity are important risk factors to develop insulin resistant and type 2 diabetes mellitus²⁸. Body weight and body mass index emerged as influential factors for developing diabetic foot ulcer, with higher risk associated with greater weight and increased body mass index²⁹.

There was only a slight difference in average blood glucose between the males and females with 223.1 + 93.46 mg/dL and 223.8 + 111.36 mg/dL, respectively. Thirty-nine (78%) patients were previously diagnosed with DM type 2 with a mean duration of disease of 2.36 + 1.7 years (0.2 – 7 yrs) and were prescribed with hypoglycemic drugs while the other 11 (22%) were walk-in patients and were diagnosed upon the day of consultation (table-2).

Patients mostly belong to the 50-59 age group (table-3). This supports the mean age of 53 + 12.51 years as described to be in the 5th to 6th decade of life. This result concurs with the study of Llanes, *et al.* that most patients affected with DFU were in the 5th to 6th decade of life¹⁸. Moreover, same results were obtained by Madanchi, *et al.* and Raymundo and Mendoza with mean age 59.3 ± 11.2 and 56 + 28.2, respectively^{21, 19}. This is probably because older people have decreased inflammatory responses, decreased proliferation, delayed angiogenesis, and have a low rate of collagen synthesis compared to its degradation³⁰. Middle-aged diabetic patients with unregulated blood sugar and long duration of DM are more likely to develop DFU²¹. This lowers their capability of preventing infections and healing wounds thus increasing the risk of developing DFU. However, individuals with diabetes mellitus commonly have foot ulcer during their lifetime³¹.

Table-1
Demographic characteristics of patients with diabetic foot ulcers

Gender	Number	M : F ratio	Mean Age	BMI (kg/m ²)			
				Under-weight	Normal	Over-weight	Obese
Male	29	1.4 : 1	53 + 12.51 Years	4 (8%)	24 (48%)	21 (42%)	1 (2%)
Female	21						

Table-2
Age, average blood glucose, and duration of disease of patients with diabetic foot ulcers

Gender	Number	Age	Average Blood Glucose	Duration of Disease
Male	29	22 - 83 years old	223.1 + 93.46 mg/dL	2.36 + 1.7 years
Female	21		223.8 + 111.36 mg/dL	

Table-3
Age group distribution of patients with diabetic foot ulcers

Age Groups	Male (N=29)	Female (N=21)
20-29	2 (7%)	0
30-39	3 (10%)	1 (5%)
40-49	7 (24%)	5 (24%)
50-59	11 (38%)	8 (38%)
60-69	5 (17%)	4 (19%)
70-79	1 (3%)	1 (5%)
80+	0	2 (10%)

Proteinuria was the most common co-morbid illness of DFU patients occurring in 40 (80%) out of the 50 patients. Proteinuria is defined as an excessive excretion of any protein or proteins into the urine³² and is suggestive of kidney disease in patients with diabetes mellitus³³ where foot ulcers are the most common complication³⁴. Next in the order of common co-morbid illnesses are: glucosuria with 29 (58%) cases, hypertension with 26 (52%), hematuria with five (10%), and pyuria with five (10%), as shown in table 4.

Table-4
Co-morbid illness among patients with diabetic foot ulcers

	N	N	%
Proteinuria	40	50	80
Glucosuria	29	50	58
Hypertension	26	50	52
Hematuria	5	50	10
Pyuria	5	50	10

The male patients had the higher percentage of cases of complications except for urinary tract infection (UTI) and diabetic gastropathy where more females were affected (table-5). However, only 26 (90%) out of the 29 male patients had complications while the female patients had 21 (100%) out of 21. The most common complication was nephropathy (49%). Nephropathy usually causes renal failure in about one third of patients who undergo dialysis³⁵. The high incidence of proteinuria (80%), glucosuria (58%), and hypertension (52%) among the patients are three factors significant to be major contributors to diabetic nephropathy³⁶. Another complication noted is neuropathy which occurred in 36% of the patients. Diabetic neuropathy is common in patients with diabetic foot ulcers and is a risk factor for amputation³⁷. It causes more than 60% of the foot ulcers³⁸ in diabetic patients⁸. It is characterized by numbness thus diabetic patients may injure or damage their feet without them noticing. This would then gradually worsen and lead to ulcerations³⁹.

Table-5
Complications among patients with diabetic foot ulcers (N=47)

	N	Male	Female	Total (%)
Nephropathy	2 3	13 (28%)	10 (21%)	48
Neuropathy	1 7	10 (21%)	7 (15%)	35
Urinary Tract Infection (UTI)	5	2 (4%)	3 (6%)	10
Abscess Buttock	1	1 (2%)	0	2
Diabetic Gastropathy	1	0	1 (2%)	2
Total	4 7	26	21	

The diabetic foot ulcers were located mostly in the toes occurring in 21 (42%) of the patients. Ten (20%) patients had DFUs in their soles, seven (14%) in the dorsum and ankle, four (8%) in the heels, and one (2%) in the shin (table-6). This result concurs with the report of Naude, that DFU usually occurs in toes, the heels, under the metatarsophalangeal heads and along the edges of the feet³⁴.

Table-6
Location of foot ulcerations in patients with diabetic foot ulcers (N=50)

Location	n	%
Toes	21	42
Soles	10	20
Dorsum	7	14
Ankle	7	14
Heels	4	8
Shin	1	2

Most of the diabetic foot ulcers were classified as grade 0 (48%) based on the Wagner's Classification. There were 13 (26%) ulcers that are of grade 1, eight (16%) grade 2, three (6%) grade 4, and two (4%) grade 5 (table-7). Almost all the patients with Grade 0 lesions were able to improve with medical management while some required debridement. Grades 1 and 2 lesions underwent debridement. Grades 4 and 5 had internal screw fixation and amputations. This finding concurs with the statement of Singh, *et al.* that the higher the grade, the higher the risk of amputation with a longer healing time⁸.

Table-7

Wagner’s classification of patients with diabetic foot ulcers (N=50)

Intensity	Total	Male	Female
Grade 0	24	11	13
Grade 1	13	11	2
Grade 2	8	5	3
Grade 3	0	0	0
Grade 4	3	1	2
Grade 5	2	1	1

Among the 50 DM2 patients with DFU, 24 had undergone surgical interventions. Debridement or the removal of dead tissues from wounds to stimulate healing^{40, 41} was performed in 16 (67%) patients, toe disarticulation in 5 (21%), below knee amputation (BKA) in two (8%), and internal screw fixation in one (4%), as shown in table-8. The rest of the patients had improved with medical management.

Table-8

Surgical procedures performed in patients with diabetic foot ulcers (N=24)

Procedures	n	%	N=50
Debridement	16	67	32%
Toe Disarticulation	5	21	10%
Below Knee Amputation (BKA)	2	8	4%
Internal Screw Fixation	1	4	2%

Diabetic foot ulcer (DFU) has been a major problem among diabetic patients and its incidence of amputation has never gone down. Amputation is usually the course of action even for a benign-looking ulcer in diabetic patients⁸. In this study, among the 50 patients with DFU, 7 (14%) needed amputation. This rate of amputation is significantly low compared to the study conducted in United States where 38% of all the amputations were associated with DM⁴². Higher amputation rates were also observed in big hospitals in the Philippines like Santo Tomas University Hospital (STUH) with 45% amputation¹⁴, Quirino Medical Memorial Center (QMMC) which has 30.5%¹⁸ and UP-PGH with 65%¹⁹. The UP-PGH had the highest mean in terms of patient’s duration of diabetes with 6.6 + 4.8 years. QMMC had a higher mean (4.0 + 4.71 years) while this study recorded only 2.36 + 1.7 years mean duration of diabetes. With this, it is probable that the duration of diabetes may be a contributing factor to the amputation rate in patients with DFU.

Conclusion

Diabetic foot ulcer (DFU) mostly occurs in patients in the 5th to 6th decade of life and affects more males than females. Patients with neuropathy have higher tendencies of developing DFU. This study found low incidence of amputation as it has low values in terms of duration of disease and most patients have mild forms of ulcerations.

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