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Risk factors for Diabetic foot amputation in sample of Iraqi patients

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Abstract
Background: Diabetes Mellitus is a metabolic disorder of different etiologies, characterized by chronic hyperglycemia with alterations in metabolism resulting from defects in the secretion or action of insulin.
Objective: To assess the risk factors for Diabetic foot amputation.
Patients and method: A descriptive cross-sectional study was carried out in the Al-Kindy Teaching hospital, in the period between January 2016 and December2018. The study was constituted by all the elderly patients of 19 years old and more, we studied 120 patients with diabetic foot who collected the inclusion criteria and accepted to participate in the study.
Results: Male was more than female and represents 74 (61.7%) patients, while female were represents 46 (38.3%) patients. Amputation treatments were done for 64 diabetic foot patients 50 were male and 14 were female. And 56 patients were treated with non-amputation 24 were male and 32 were female. Highly significant associations were found regarding Age, HbA1c, Dyslipidemia, BMI, HT, and long duration of DM with the amputation treatment. The types of amputation were as follow, Ray's amputation 22(34.37%) patients, and trans-metatarsal amputation in 2 (3.125%) patients, below knee amputation in 16 (25%) patients and above knee in 24 (37.5%) patients.
Conclusion: Old age, uncontrolled HbA1c, dyslipidemia, BMI, HT and long duration of DM, is the main risk of Diabetic foot amputation.

Keywords: DM, diabetic foot, amputation

Introduction

Diabetes Mellitus is a metabolic disorder of different etiologies, characterized by chronic hyperglycemia with alterations in metabolism resulting from defects in the secretion or action of insulin [1].

Diabetes is currently an important public health problem due to the fact that in the last decades the number of cases and its prevalence have increased. According to WHO estimates, 422 million adults worldwide had diabetes in 2014, compared to 108 million in 1980. The global prevalence of diabetes has almost doubled since that year, rising from 4.7% to 8.5% in the adult population. In the American continent, in the year 2013, 59 million diabetics were estimated: 24 million in Central and South America and 35 million in North America and the Caribbean [2].

Among the complications, diabetes is considered the first cause of non-traumatic amputations of lower limbs, being 85% because of diabetic ulcers in the foot, constituting one of the main causes of disability. It is considered worldwide as a significant public health problem, in addition to being used as an indicator of poor health outcomes, since it reflects the overall quality of care in diabetic patients [3].

The prevalence of diabetic foot is between 8% and 13% of diabetics, in a greater proportion between 45 and 65 years of age. The risk of amputation increases between 20-40 times more in diabetics than in non-diabetics [3, 4].

It has been estimated that at least 25% of diabetics will suffer some ulcer throughout their lives and it is believed that every 30 seconds a lower limb is amputated in the world as a consequence of diabetes. One out of every four amputees of a lower limb will undergo amputation of the other lower limb, or a re-amputation, and the survival of these patients is significantly less than that of the rest of the population [3, 4].

Aim of the study: To assess the risk factors for Diabetic foot amputation

Methods

A descriptive cross-sectional study was carried out in the Al-Kindy Teaching hospital, in the period between January 2016 and December 2018. The study was constituted by all the elderly patients of 19 years old and more, we studied 120 patients with diabetic foot who collected the inclusion criteria and accepted to participate in the study. The variables studied were: age, duration of DM, sex, smoking habit, location of the disease, all the information was obtained from hospital or ambulatory histories, where the data was collected in a collection notebook. Statistical processing a database was created in Excel and the information was processed using the statistical package SPSS version 23. For the descriptive analysis of the data, frequency measurements were used absolute and relative, for qualitative variables.

Result

The current study included (120) patients with diabetic foot who admitted to our hospital in the study period, the male were more than female and represents 74 (61.7%) patients, while female were represents 46 (38.3%) patients. Amputation treatments were done for 64 diabetic foot patients 50 were male and 14 were female. And 56 patients were treated with non-amputation 24 were male and 32 were female. It was found that there is highly significant association between gender and amputation (p=0.1) (table 1).

Table 1: Association between gender and amputation in diabetic foot patients.

		Total no. of patient (120)		Amputation (n=64)		Non-amputation (n=56)		P value
		N	%	N	%	N	%	
Gender	Male	74	61.7	50	78.1	24	42.9	<0.001
	Female	46	38.3	14	21.9	32	57.1	
Total		120	100.0	64	100.0	56		

Among the lesion types in patients studied, 12 of them (10%) had blister, 48 patients (40%) had ulcer, and 8 patients (6.7%) had abscess while 52 patients (43.3%) had gangrene, when observe figure (1) we found that gangrene and ulcer were the main presenting feature

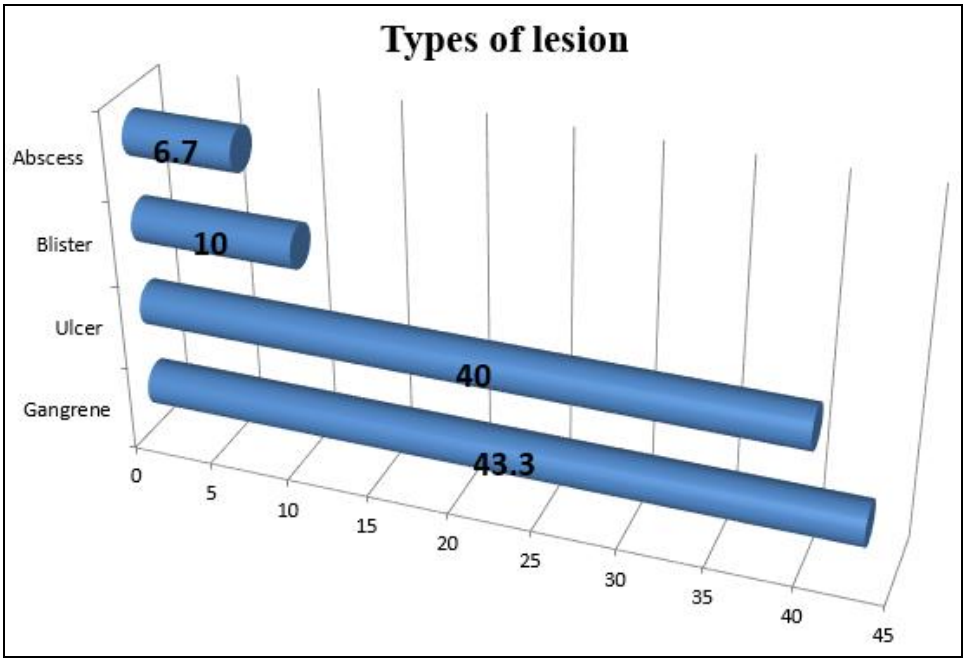

Fig 1: Distribution of lesion in diabetic foot patients

As for the grading according to the Wagner's, it was found that Grade 4 is the common (36.7%), then Grade one (21.7%), and the lowest one is Grade zero (3.3%), all these found in table 2.

Table 2: Distribution of the studied sample according to the Wagner's grading.

Wagners' grade	Treated by amputation	conservative treatment	Total	
			N	%
Grade zero	None	4	4	3.3
Grade one	None	26	26	21.7
Grade two	4	12	16	13.3
Grade three	10	6	16	13.3
Grade four	42	2	44	36.7
Grade five	14	None	14	11.7
Total	70	50	120	100.0

56 (53.33%) patients treated with non-amputation, among them 44 (78.57%) treated conservatively and 12 patients (21.42%) treated by debridement or drainage of pus, 64 (53.33%) treated by amputation. The types of amputation were as follow, Ray's amputation 22 (34.37%) patients, and trans-metatarsal amputation in 2 (3.125%) patients, below knee amputation in 16 (25%) patients and above knee in 24 (37.5%) patients.

As shown in table 3, there is highly significant association were found regarding Age, HbA1c, Dyslipidemia, BMI, HT, and long duration of DM with the amputation treatment.

Table 3: Risk factors of Amputation in the studied group

		Amputation (n=64)	No Amputation (n=56)	
Age		56.7±11.3	46.2±4.9	<0.001
HbA1c		11.5±3.4	8.9±2.2	<0.001
Dyslipidemia		280.3±55.1	256.1±45.4	<0.001
BMI		31.4±3.4	29.7±2.3	0.001
BP	Systolic	156±25	132±18	<0.001
	Diastolic	95±10	90±5	<0.001
Duration of DM		7.3±1.2	4.1±0.9	<0.001

Among 120 patients admitted with diabetic foot, 64 (53.33%) patients treated with amputation, 60(93.75%) of them discharged well and 4 (6.25%) patients died of systemic complications (two patients with renal failure, and two of ischemic heart disease), of those treated conservatively [56 (46.66%)] patients, it was found that 2(3.57%) patient died because of ischemic heart disease while 54(96.42%) patients discharged well; and followed for two visits, one month apart, did not need amputation during this period (fig:2).

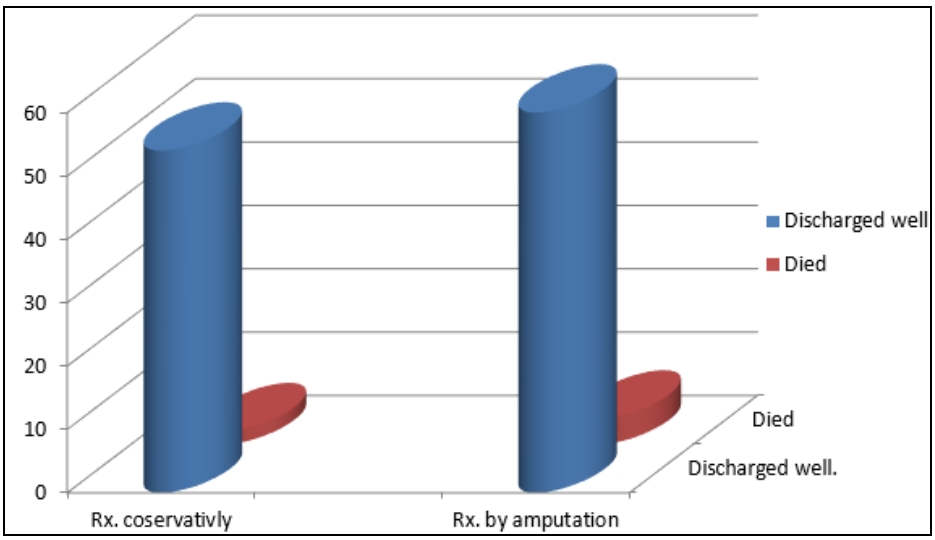

Fig 2: Distribution of the Patients outcome

Discussion

The current study revealed that the risk factors of the DM were: old age of patients, uncontrolled HbA1c, dyslipidemia, BMI, HT and long duration of DM, and lead to treatment by amputation. A total of 120 patients were included, of which 61.7% were men, (10%) had blister, 48 patients (40%) had ulcer, and 8 patients (6.7%) had abscess while 52 patients (43.3%) had gangrene. The types of amputation were as follow, Ray's amputation 22(34.37%) patients, and trans-metatarsal amputation in 2 (3.125%) patients, below knee amputation in 16 (25%) patients and above knee in 24 (37.5%) patients.

In a control case study carried out by Tjokorda G de Dalem P. *et al.* carried out in Indonesia in 2015. The risk factors were determined and quantified in 47 patients hospitalized with diabetic foot ulcers with subsequent amputation and 47 patients without amputation. It resulted as independent risk factors associated with subsequent amputation in patients with diabetic foot ulcers: HbA1c 8% OR 20.47; presence of peripheral arterial disease OR 12.97; hypertriglyceridemia OR 5.58; and hypertension OR 3.67. [5] In a control case study carried out by Buckley C *et al.* in Ireland in 2015. The association between the time of patient access to secondary care services for diabetes control and lower extremity amputation (LEA) was investigated among patients with diabetes. The cases were 116 patients with diabetes who underwent a first non-traumatic LEA and controls were 348 patients with diabetes. The statistically significant risk factors associated with LEA in patients with diabetes include: chronic kidney disease, hypertension and hyperglycemia [6].

In a case control study conducted by Kogani M *et al.* in Iran in 2015, the risk factors associated with amputation in patients with diabetic foot ulcers were determined. A total of 131 cases were compared with 262 controls. The results that were associated with amputation in diabetic patients were: female sex OR = 8.66; insufficient glycosylated hemoglobin controls per year OR = 13.97; inadequate shoes OR = 5.50; smoking OR = 3.44; and the high body mass index OR = 1.20 [7].

In a descriptive study conducted by Haji N *et al.* carried out in Australia in 2014. The characteristics of diabetic foot ulcers of 195 patients were evaluated. The demographic and physical characteristics were: 66.2% men, mean age of 67 years, BMI 28 kg / m2, 75.4% had peripheral neuropathy. In the Characteristics of diabetic foot ulcer: average cross-sectional area of 1.5 cm2; average volume of 0.4 cm3; 45.1% on the plantar aspect of the foot; 16.6% with ischemia; 11.8% with infection and ischemia

and 25.6% with osteomyelitis. The following were performed: 1 major amputation and 4 minor amputations [8].

In an observational study conducted by Sena Yesil *et al.* carried out in Turkey in 2009, they studied 574 patients where the possible predictors of amputation in patients with diabetic foot were evaluated. We obtained the main independent predictors of amputations determined by the Wagner classification system: limb ischemia, osteomyelitis, presence of gangrene and depth of ulcers [9].

In a cross-sectional study carried out by Verrone M. *et al.* in Brazil in 2016. Amputation risk factors were identified and quantified in 100 diabetic patients hospitalized for lower extremity infections. The most prevalent chronic complications were neuropathy and hypertension. Regarding the evolution of the patient, 61% progressed to amputation; 14% debridement; and 9% revascularization. The results showed a 42% higher risk of progression to amputation in patients with previous use of antimicrobials. In addition, the risk of amputation was 26% higher for those less compatible with the treatment of diabetes. A one-point increase in Wagner's ulcer classification criteria corresponded to a 65% increase in the risk of amputation [10].

In a cross-sectional study conducted by Parisi M. *et al.* carried out in Brazil in 2016. Factors associated with the risk of ulcers and amputations were determined. A total of 1455 patients were included. It turned out: Patients with ulcers had a longer duration of the disease (17.2 ± 9.9 vs. 13.2 ± 9.4 years, p = 0.001), and worse glycemic control (HbA1c 9.23 ± 2.03 vs. 8.35 ± 1.99, $p<$ 0.001). Independent risk factors for the ulcer: male sex OR = 1.71; smoking OR = 1.78; neuroischemic foot OR 20.34; the presence of retinopathy OR 1.68; and absence of vibratory sensation OR 7.95 [11].

In a cross-sectional study conducted by Torres H. *et al.* carried out in 2012. The clinical and epidemiological characteristics of patients with diabetic foot complications in HNDM were described. A total of 166 patients were included, of which 75.3% were men, 59.4 ± 12.0 years as the average age, 12. 5 ± 8.1 years in average time of illness. 35.5% had a history of high blood pressure, 6.6% dyslipidemia. 70.7% of 41 patients with a history of a previous ulcer on their feet received some surgical treatment for the lesion. 95.2% had the diagnosis of diabetic neuropathy and 48.8% peripheral vascular disease. Surgical treatment was provided to 125 patients: 27 (21.6%) surgical cleaning, 40 (32.0%) minor amputation and 58 (46.4%) major amputation. 63.4% of patients with neuropathy and 84.7% with diagnosis of peripheral vascular disease were amputated. A statistically significant association was found between amputation and PVS (p = 0.001) [12].

In a control case study conducted by Arana C. *et al.* carried out in Peru in 2015. Thirty-eight amputated patients and 38 without amputation were evaluated. The mean age for the cases was 62 ± 10,356 and for the controls 59.42 ± 15,259. The male sex predominated in amputees. The time of illness for amputees was 15.5 ± 9.675 years compared to 13 ± 7.189 of the controls. Disease time greater than 10 years had a frequency of 73.7% versus 71.1% of controls. 42.1% of the cases had previous amputation and 21.1% in controls. The infection was present in 86.8% of the cases compared to 50% of the controls [13].

Conclusion

Old age, uncontrolled HbA1c, dyslipidemia, BMI, HT and long duration of DM, is the main risk of Diabetic foot amputation

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