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## Limb amputation in patients with diabetes: A clinical study

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### Abstract

**Background:** Diabetic foot ulcer is the common complication of uncontrolled diabetes with the prevalence of diabetes being four times more than any other complication. Diabetes leads to 4 million deaths per annum. The present study was conducted to determine the prevalence of amputations in study population.

**Materials & Methods:** This study was conducted in the department of Orthopaedics which included 212 patients of both gender above 18 years of age. Patients with either type 1 or type 2 diabetes and coexisting DFU were included in the study. General information such as name, age, gender etc. were noted. All were informed regarding the study and written consent was taken. In all patients, WBC, serum creatinine, Serum calcium, phosphorus, C- reactive protein were recorded.

**Results:** Out of 212 patients, males were 102 and females were 110. The difference was non- significant (P-1). Type I DM was present in 42 patients and type II DM was present in 170 patients. 92 patients had ischaemic ulcers and 120 had non- ischaemic ulcers. Patients with minor amputations were 32 having ischaemic ulcers (21) and non-ischaemic ulcers (11), major amputations were 102 having ischaemic ulcers (36) and non-ischaemic ulcers (66) and indigenous ulcers were 78 having ischaemic ulcers (35) and non-ischaemic ulcers (43). The difference was significant ( $P < 0.05$ ). HbA1c level in patients having ischaemic ulcers was 8.6% and in patients having non- ischaemic ulcers was 9.2%. CRP level was 36.8 and 70.2 respectively. Serum calcium level was 9.3 g/dl and 8.7 g/dl respectively. Serum creatinine level was 156.2  $\mu\text{mol/L}$  and 124  $\mu\text{mol/L}$  respectively. GFR level was 58.4 ml/min and 64.6 ml/min respectively. Albumin level was 38 g/l and 35 g/l respectively.

**Conclusion:** Diabetes is a multifactorial and multiorgan disease affecting large amount of population. Diabetic foot is a complication in patients with uncontrolled diabetes. Amputation in diabetic foot patients requires a major decision.

**Keywords:** amputation, creatinine, diabetes

### Introduction

Diabetic foot ulcer is the common complication of uncontrolled diabetes with the prevalence of diabetes being four times more than any other complication. Diabetes leads to 4 million deaths per annum. DFU involves multifactorial pathogenesis including peripheral neuropathy as the primary causal factor, together with variable contribution from peripheral vascular disease (PVD), repetitive trauma, and superimposing foot infection<sup>[1]</sup>.

Infected DFU is a major cause of prolonged hospital admission and resulting into 90% of nontraumatic lower limb amputations (LLAs). In future, if this trend continues, it may lead to significant burden leading to an associated increase in diabetic amputations. All this leads to poor quality of life<sup>[2]</sup>.

Amputation is the removal of a limb by trauma, medical illness, or surgery. As a surgical measure, it is used to control pain or a disease process in the affected limb, such as malignancy or gangrene. In the Saint Vincent Declaration of 1989, representatives of governments, health authorities, and patients' organizations from all European countries demanded, under the auspices of the World Health Organization (WHO), that the rate of amputations in diabetics be halved within 5 years<sup>[3]</sup>.

There are many reasons an amputation may be necessary. The most common is poor circulation because of damage or narrowing of the arteries, called peripheral arterial disease. Without adequate blood flow, the body's cells cannot get oxygen and nutrients they need from the bloodstream. As a result, the affected tissue begins to die and infection may set in<sup>[4]</sup>. The present study was conducted to determine the prevalence of amputations in study population.

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**Materials & Methods**

This study was conducted in the department of Orthopaedics which included 212 patients of both gender above 18 years of age. Patients with either type 1 or type 2 diabetes and coexisting DFU were included in the study. General information such as name, age, gender etc. were noted. All were informed regarding the study and written consent was taken. In all patients, WBC, serum creatinine, Serum calcium, phosphorus, C-reactive protein were recorded. Results were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant (P< 0.05).

**Results**

Table I shows that out of 212 patients, males were 102 and females were 110. The difference was non- significant (P=1). Table II shows that type I DM was present in 42 patients and type II DM was present in 170 patients. 92 patients had ischaemic ulcers and 120 had non- ischaemic ulcers. Table III shows that patients with minor amputations were 32 having ischaemic ulcers (21) and non-ischaemic ulcers (11), major amputations were 102 having ischaemic ulcers (36) and non-ischaemic ulcers (66) and indigenous ulcers were 78 having

ischaemic ulcers (35) and non-ischaemic ulcers (43). The difference was significant (P< 0.05).

Graph I shows that HbA1ac level in patients having ischaemic ulcers was 8.6% and in patients having non- ischaemic ulcers was 9.2%. CRP level was 36.8 and 70.2 respectively. Serum calcium level was 9.3 g/dl and 8.7 g/dl respectively. Serum creatinine level was 156.2µmol/L and 124 µmol/L respectively. GFR level was 58.4 ml/min and 64.6 ml/min respectively. Albumin level was 38 g/l and 35 g/l respectively.

**Table I:** Distribution of patients

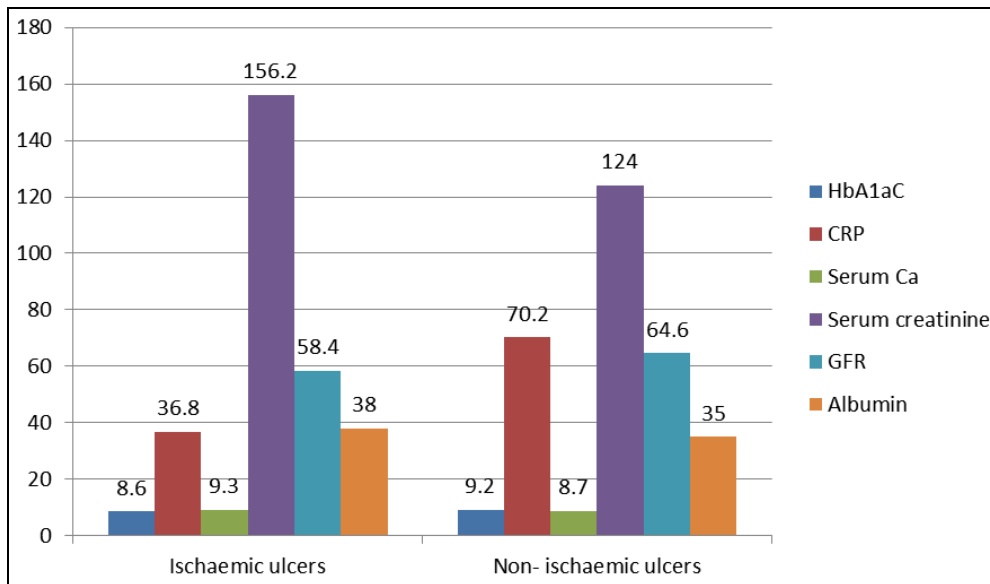
Total- 212		
Male	Female	P value
102	110	1

**Table II:** Distribution of patients based on type of diabetes and type of ulcer

Type of diabetes	Type I DM	Type II DM
Number	42	170
Type of ulcer	Ischaemic	Non- Ischaemic
Number	92	120

**Table III:** Distribution of amputations

Clinical outcome	Study population	Ischaemic ulcer	Non- Ischaemic ulcer	P value
Minor amputation	32	21	11	0.05
Major amputation	102	36	66	
Indigenous amputation	78	35	43	
Total	212	92	120	



**Graph I:** Biochemical parameters in patients

**Discussion**

Lower-extremity amputation is one of the oldest known surgically performed procedures, dating back to prehistoric times. Neolithic humans are known to have survived traumatic, ritualistic, and punitive rather than therapeutic amputations. The present study was conducted to determine the prevalence of amputations in study population.

In this study, out of 212 patients, males were 102 and females were 110. In our patients, Table II type I DM was present in 42 patients and type II DM was present in 170 patients. This is in agreement with the finding of Vamos *et al* [5].

Diabetic foot ulcers occur as a result of various factors, such

as mechanical changes in conformation of the bony architecture of the foot, peripheral neuropathy, and atherosclerotic peripheral arterial disease, all of which occur with higher frequency and intensity in the diabetic population. In our study, 92 patients had ischaemic ulcers and 120 had non- ischaemic ulcers. This is similar to results of Goodney *et al* [6].

We found that patients with minor amputations were performed in 32 patients and out of 21 had ischaemic ulcers and 11 had non-ischaemic ulcers. Similar results were seen in study by Heyer *et al* [7]. Major amputations were performed in 102 patients and 36 had ischaemic ulcers and 66 had non-

ischaemic ulcers and out of 78 indigenous amputations 35 had ischaemic ulcers and 43 had non-ischaemic ulcers. This is in agreement with Lazarrini *et al*<sup>[8]</sup>.

We also assessed HbA1ac level in patients. It was found to be 8.6% in patients having ischaemic ulcers and 9.2% in patients having non- ischaemic ulcers. The level of CRP was 36.8 and 70.2 respectively in both ischaemic and non-ischaemic ulcer patients. We found that serum calcium level was 9.3 g/dl and 8.7 g/dl respectively. Serum creatinine level was 156.2µmol/L and 124 µmol/L respectively. GFR level was 58.4 ml/min and 64.6 ml/min respectively. Albumin level was 38 g/l and 35 g/l respectively. This is in agreement with the findings of Kurowski *et al*<sup>[9]</sup>.

### Conclusion

Diabetes is a multifactorial and multiorgan disease affecting large amount of population. Diabetic foot is a complication in patients with uncontrolled diabetes. Amputation in diabetic foot patients requires a major decision.

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