



## A survey of lower limb amputation rate in patients with diabetes at Shahid Modarres Hospital, Tehran, Iran, during 5 years

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### Abstract

**Introduction:** Lower limb amputation in patients with diabetes is one of its major complications. Therefore understanding the prevalence and causes of this problem has great importance. The aim of this study was to evaluate lower limb amputation in patients with diabetes.

**Methods:** During this observational cross-sectional study, 350 patients with diabetes mellitus admitted to Shahid Modarres Hospital, Tehran, Iran, from March 2012 to March 2017 were studied and incidence of lower limb amputation was observed.

**Results:** About 64% of patients suffered from some degree of amputation. Important factors in these patients were delay in referral to surgeon, ineffective debridement and longtime impaired distal blood flow.

**Conclusion:** The frequency of lower limb amputation in patients with diabetes is high and therefore there is a great need to find and reduce its underlying problems.

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### Introduction

Diabetes mellitus is one of the most important health issues in the world. Based on available data, its prevalence in Iran is about 1.5 to 8.5 percent.<sup>1</sup> This metabolic disease can cause major physical and psychological problems which can lead to reduced quality of life. So that its diagnosis and treatment is of great importance.<sup>2</sup> Thus, identifying the factors that increase the burden of disease can also help greatly in reducing suffering from the disease.<sup>3</sup>

One of the major complications of diabetes mellitus is diabetic foot ulcer, which can be caused by different mechanisms such as diabetic neuropathy and vasculopathy or both and is seen in 3.5% of diabetic patients.<sup>3-7</sup> Diabetic foot ulcers can lead to lower limb amputation if diagnosed late or managed inadequately. This problem is seen in 1.2% to 13.7% of patients with diabetes and is the

most common cause of amputation all over the world, while easily preventable.<sup>8-10</sup>

Nowadays many effective conservative managements have been proposed in order to prevent its progression and the need for amputations.<sup>11-13</sup> These managements can prevent a great deal of economic losses caused by diabetic foot complications and enhance patients quality of life.<sup>6,14</sup>

In this context, the knowledge of factors affecting progression of diabetic foot and its treatment is of particular importance.<sup>13-15</sup>

### Methods

Total of 350 patients were included in the study who have been diagnosed with diabetic foot ulcer and were admitted to Shahid Modarres Hospital, Tehran, Iran, from March 2012 to March 2017. Patients were enrolled in the study using census method. Data were collected using patients'

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hospital records and through contact with the patient or their relatives. Epidemiologic, biologic and demographic data were recorded including age, sex, occupation, smoking, alcohol, type of diabetes control, duration of diabetes, history of underlying disease, and the type of intervention.

Inclusion criteria were all patients with diabetic foot ulcer who were admitted to general surgery ward.

Eleven patients were excluded from the study due to deficiencies in the records and loss to follow-up. Statistical analysis was performed using SPSS software (version 22, IBM Corporation, Armonk, NY, USA). Quantitative variables were defined by the mean and standard deviation. Qualitative variables were defined by number and percentage of cases.

Comparison of quantitative variables was done by Student's t-test. Comparison of qualitative variables was performed with chi-square test;  $P < 0.05$  was regarded as level of significance. Also logistic regression was used to determine the factors affecting the amputation rate. All data were reserved by the researchers and patients were reported anonymously.

## Results

A total of 350 cases were studied. Mean age and duration of diabetes were 64.4 and 23.1 years, respectively. About 69% of patients were men and 31% women. Almost 74% of patients were dependent to insulin and 26% were treated with oral antihyperglycemic agents. Nearly 60% patients were suffering from type 2 diabetes and 40% were suffering from type 1 diabetes and there was no meaningful relation between kind of diabetes and rate of amputation. Fifty percent of patients had underlying disease; hypertension accounts for 43% of these patients and end stage renal disease (ESRD) were seen in 30% of the patients. About 47% of them were smokers.

In 33% of patients, trauma was the trigger of the complication. Also 16% of patients had positive history of peripheral vascular disease

which led to peripheral vascular intervention. Successful vascular intervention was done on 5 hospitalized patients that led to limb salvage in 4 of them and in the remaining one led to reduced level of amputation.

Level of amputation was fingers in 55.2% and ankle in 19.7%. In 22.3% of patients amputation level was below the knee and in 2.8% above the knee (Figure 1).

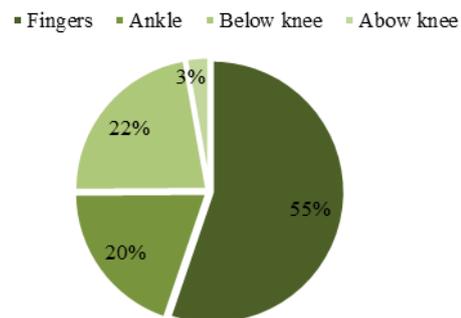


Figure 1. Amputation level

About 60% of patients had been referred with established infection, 30% with gangrene and remaining 10% with limb discoloration (Figure 2).

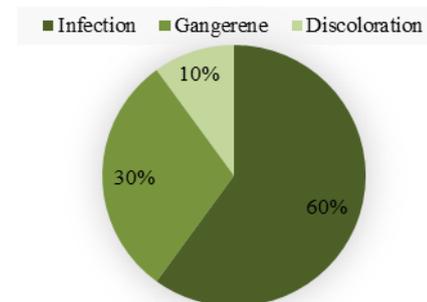


Figure 2. Presenting symptom

All of them received broad-spectrum antibiotics in the hospital. Debridement of necrotized tissues was performed on 60% of patients.

## Discussion

Diabetes mellitus is the most common endocrine disorder in the world and one of its major complications is diabetic foot ulcer which can lead to amputation in 1.2% to 13.7% of patients. Diabetic foot ulcer is the most common cause of limb amputation in

the world while easily preventable.<sup>8-10</sup>

Understanding the factors affecting the progression or improvement of diabetic foot ulcer is of particular importance. Therefore, in this article the incidence of lower limb amputation and its underlying factors in patients with diabetes admitted to Shahid Modarres Hospital within 5 years has been studied.

The results of this cross-sectional study showed that amputation was performed in 64% of patients. Important factors in these patients were delay in referral to surgeon after established infection, ineffective debridement and longtime impaired distal blood flow.

Zhao et al. studied amputations in diabetic foot ulcers and its affecting factors on 35368 patients with diabetes in 2013. About 578 of them suffered from lower extremity amputation. The results showed that the risk of lower limb amputation was significantly increased with elevated levels of hemoglobin A1C but in this study we could not evaluate this relationship because of incomplete recording in dossiers.<sup>16</sup>

The need for amputation is estimated about 1.2% to 13.7 % in the articles.<sup>8-10</sup> Also in Iran, Ranjbar et al. studied amputation rate in Namazi Hospital, Shiraz, Iran in a 12-year period and their results showed 4.8% amputations in the patients.<sup>17</sup> But the amputation rates in our hospital were higher. This higher result may be because of design of our study. Shahid Modarres Hospital is one of the referral centers in Tehran and this study was done on the patients who need hospitalization because of complicated diabetic foot ulcers not all the patients who just referred to the clinics.

Our results showed that the prevalence of lower limb amputation in patients with diabetes is high and therefore there is a great need to find and reduce its underlying problems.

It can be concluded that prevention of any kind of complications such as infection and gangrene in the setting of reduced blood flow is more effective than treatment of diabetic feet.

In this study 47% of patients were smoker which may have led to higher amputation rates. Because of harmful effects of smoking on distal blood flow, it can be reasonable solution to strongly advise to cut smoking.

Our study showed that 50% of patients had underlying disease particularly ESRD and hypertension and good control of them can decrease amputation rate.

In 33% of patients, the onset of symptoms was due to some degree of trauma. Due to the impairment of sensory and motor neurons in patients with diabetes mellitus, they are more prone to distal trauma. So that the recommendation to pay more attention to foot care and wearing orthopedic shoe might be more effective in prevention of diabetic foot ulcers.

### **Conclusion**

In conclusion, appropriate vascular intervention and effective debridement along with proper antibiotic therapy can somewhat prevent the amputation or at least reduce the level of amputation.

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### **Authors' Contribution**

Nasser Malekpour-Alamdari was the operating surgeon and supervised the project. Pravin Pashaii collected the data and Barmak Gholizadeh performed the data analysis.

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### **Conflict of Interest**

Authors have no conflict of interest.

### **Ethical Approval**

This work was a case review without any intervention.

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