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## Original research

# Prevalence of diabetic foot disorders and related risk factors among Egyptian subjects with diabetes



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## ABSTRACT

**Introduction:** Multiple pathologies including diabetic neuropathy, peripheral vascular disease (PVD) and infection contribute to lower extremities amputation in diabetes.

**Aim:** We examined the prevalence of diabetic foot problems and related risk factors in Egypt. **Subjects and methods:** Between July 2008 and December 2009, 1000 male and 1000 female consecutive adult patients with diabetes ( $\geq 18$ -year-old) attending the Alexandria University Diabetic Foot Screening Clinic were surveyed for history/presence of foot ulcers and/or amputations, skin/nail changes, joint mobility, sensory neuropathy (10 g-Semmes–Weinstein Monofilament) and peripheral vascular disease (PVD) using Ankle Brachial Index (ABI).

**Results:** The majority of patients had type 2 diabetes (96.75%) with a mean age of  $57.30 \pm 10.47$  years and a mean disease duration of  $11.76 \pm 8.26$  years. The mean body mass index was  $32.84 \pm 6.31$  kg/m<sup>2</sup> with 29.55% being current or ex-smokers. In these subjects, 4.4% had a past history of non-traumatic amputation (male:female: 6.2% vs. 2.6%,  $p < 0.001$ ); 6.1% had past history (10.3% vs. 7%,  $p = 0.009$ ) and 8.7% had active foot ulceration (8.1% vs. 4.1%  $p < 0.001$ ) with a male preponderance. The prevalence of sensory neuropathy was 29.3% (M:F: 30.7%: 27.9%) and peripheral vascular disease (PVD) was 11% (M:F 11.8%:10.2%). Diabetic foot complications were associated with disease duration ( $p < 0.001$ ), history of coronary artery disease ( $p = 0.001$ ), stroke ( $p = 0.009$ ), PVD ( $p < 0.001$ ), laser photocoagulation ( $p < 0.001$ ), sensory neuropathy ( $p < 0.001$ ) and renal replacement therapy ( $p < 0.001$ ). On multivariate analysis, diabetes duration, foot fissures, Charcot's foot, limited joint mobility, PVD and sensory neuropathy remained independently associated with diabetic foot disorders.

**Conclusion:** In Egypt, a mosaic of risk factors contributes to the high prevalence of diabetic foot disease in type 2 diabetes. These findings call for regular assessment of vascular, neuropathic and skin status to prevent these serious foot complications.

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## 1. Introduction

The diabetic foot syndrome encompasses a number of pathologies, including diabetic neuropathy, peripheral vascular disease, Charcot's neuroarthropathy, foot ulceration, osteomyelitis, and the potentially preventable end point, amputation [1]. Subjects with diabetic foot problems are also likely to harbor other associated complications of diabetes such as nephropathy, retinopathy, ischemic heart disease and cerebrovascular disease [2].

The burden of diabetic foot disease is set to increase in the future since the contributory factors to foot disease, such as peripheral neuropathy and vascular disease, are present in more than 10% of people at the time of diagnosis of type 2 diabetes [3]. The annual population-based incidence of foot ulceration is approximately 1–4% [4], and the prevalence ranges from 4% to 10% which suggests that lifetime risk can range from 15% to as high as 25% [5].

Diabetic foot ulcers/infections negatively impact quality of life (QOL), increase morbidity and mortality and also incur a substantial economic burden for society, patients and their families [6].

Amputation is a serious consequence of diabetes. Lower limb amputation is performed 10–30 times more frequently among diabetic than among general population [7]. Every 30s, somewhere in the world, a lower limb is lost as a complication of diabetes [8]. One report noted that more than 80% of non-traumatic lower extremity amputations (LEAs) are performed in diabetic patients [9]. and more than 85% of these were precipitated by a foot ulcer that subsequently progressed to a severe infection [7]. Individuals are at high risk for amputation of the contralateral limb if they have already undergone amputation of one limb. Furthermore, 30–50% of first-episode amputations will progress to subsequent amputations within 1–3 years. Amputation carries with it a significantly elevated mortality at follow-up, ranging from 13% to 40% at 1 year to 39–80% at 5 years [10].

The study of the epidemiology of diabetic foot disease has been beset by numerous problems related to diagnostic tests and population selection. Few studies have reported the prevalence of diabetic foot disorders in Egypt. The aim of this work was to detect the prevalence of diabetic foot problems among Egyptian population, related risk factors and the associated diabetes complications among patients with ulceration or amputation.

## 2. Methods

### 2.1. Research design

This is a cross sectional study to estimate the prevalence of diabetic foot complications among attendants of the Diabetic Foot Screening Clinic (DFSC) in Alexandria. A nested case control study was undertaken to assess risk factors for the development of diabetic foot complications.

### 2.2. Setting and study population

Alexandria Main University Hospital runs two diabetes clinics, a general diabetes clinic and a Diabetic Foot Screening Clinic (DFSC). The later was recently established by a fund from the IDF BRIDGES to be a screening and a preventive center in addition to provision of primary foot care services like callus debridement, nail cutting, treatment of foot infections etc. All patients attending the general diabetes clinic (whether from Alexandria or the surrounding governorates) were given appointments to attend the diabetic foot clinic (without prior selection). Response rate was high (93.4%) as we were the only provider of foot care service in that region of the country, so the attendance rate was 4–6 patients per day amounting to around one thousand patients per year. Enrolment in the diabetic foot registry was done based on the order of patient attendance. Professors, consultants, specialist, residents, and house officers, together with trained nurses and health workers participated in the clinic.

### 2.3. Sample size

According to previous studies we expect the average prevalence of diabetic foot complications to be around 6% in adult males and females. To achieve a study power equal to 80%, at confidence level 95%, and with precision  $\pm 2$  around our estimate, the calculated sample size was found to be equal to 958. Accordingly, we planned to recruit 1000 male and 1000 female consecutive diabetic patients from among attendants of the DFSC for routine check up during the period from July 2008 to December 2009. Only Patients aged above 18 years old who had been already diagnosed with diabetes according to WHO criteria were eligible.

### 2.4. Data collection

Study participants had a face-to-face interview with one the physicians to collect data using a standardized questionnaire [11] about the following variables: Demographic characteristics, duration of DM, symptoms of neuropathy using the diabetic neuropathy symptom (DNS) score [12], smoking habits, past history of related co morbidities like hypertension, coronary heart diseases, cerebrovascular stroke, claudication, revascularization, renal transplantation or dialysis and laser photocoagulation.

All participants were clinically examined. The general clinical examination was carried by physicians (consultant, specialist, or resident) and included measurement of blood pressure, recording of the patient weight and height with calculation of body mass index (BMI).

The feet were thoroughly examined for the presence of foot ulcers and/or amputations. Foot deformities including halux valgus, hammer/claw toe, flat foot and Charcot's foot. The skin of the foot was also assessed for presence of callus, corns, fissuring and presence of toe web macerations. The foot nails were examined to detect presence of nail dystrophies, ingrowing nails & onychomycosis. Foot joint mobility was assessed to detect limited joint mobility which was defined as less than 50° of non-weight bearing passive dorsiflexion of the hallux.

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