Contents lists available at ScienceDirect

Primary Care Diabetes

journal homepage: http://www.elsevier.com/locate/pcd

Original research

Risk factors for foot ulcers—A cross sectional survey from a primary care setting in Brazil

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ARTICLE INFO

Article history:
Received 16 September 2012
Received in revised form
16 March 2013
Accepted 1 April 2013
Available online 30 April 2013

Keywords:
Diabetes mellitus
Foot
Classification
Risk factors

ABSTRACT

Aims: To identify the prevalence of higher risk of foot ulceration and associated factors among patients with diabetes mellitus (DM) at primary health care services.
Methods: Individuals with DM, registered at primary health care services in a municipality in southern Brazil, were interviewed and underwent foot examinations. Their risk of ulceration was classified in accordance with the recommendations of the International Working Group on the Diabetic Foot. Poisson bivariate and multivariate analyses were performed and adjusted prevalence ratios (PR) and 95% confidence intervals (CI) were calculated.
Results: The prevalence of higher risk of foot ulceration among the 337 interviewees was 27.9% (95% CI 23.1–32.9). The following factors were associated with this risk: having been diagnosed with DM for more than 10 years (Adjusted-PR 1.669; 95% CI 1.175–2.373; $p = 0.004$); having had previous diagnoses of acute myocardial infarction (Adjusted-PR 1.873; 95% CI 1.330–2.638; $p < 0.001$) and stroke (Adjusted-PR 1.684; 95% CI 1.089–2.604; $p = 0.019$); presenting interdigital mycosis (Adjusted-PR 1.539; 95% CI 1.030–2.300; $p = 0.035$) and calluses (Adjusted-PR 1.654; 95% CI 1.117–2.451; $p = 0.012$).
Conclusions: The prevalence of higher risk of ulceration was high, which reinforces the importance of continued education for health care professionals in order to prevent complications in the feet of these patients.

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http://dx.doi.org/10.1016/j.pcd.2013.04.003

1. Introduction

Diabetes mellitus (DM) is a public health problem and a study estimated that in Brazil five million people have this disease, of whom around 50% are unaware of their condition [1]. For this reason, DM is often diagnosed only when complications have already set in [2–4].

Among the chronic complications of DM, diabetic foot is prominent [5]. Half of the non-traumatic amputations among individuals with DM occur as a consequence of diabetic foot [6], and ulcers are present in around 85% of these cases [7,8]. The following risk factors for the development of foot ulcers stand out: peripheral vascular disease [9,10], peripheral neuropathy [10,11], prior ulceration [9,10,12], longer duration of diabetes [13,14], poor glycemic control [10], fungal diseases on the feet [5,12] and failure to self examine the feet [10].

In Brazil, health care for DM patients is mostly done within the public primary health care services [15], which are responsible for health care within a given geographical area. These units carry out actions aimed at disease prevention and cure as well as health promotion and recovery. This is done either at the health care facilities or at the patient's home [16], depending on the circumstance.

Because primary health care services are the first point of contact for patients within the Brazilian universal public health system [17], it is easier to identify people with DM who have an elevated risk of developing foot ulcers at this entry point, when it is still possible to do preventative care.

To reduce the number of amputations, primary care professionals need to systematically assess and classify the feet of diabetic individuals according to the risk that ulcers might appear [5] in the future. Knowing the profile of people who present a higher risk of foot ulceration is essential for taking effective preventive actions.

The hypothesis of this study is that, despite the care that is already taken by primary health care services in Brazil, the prevalence of higher risk of ulcers is still large in the diabetic population. Further, factors related to the organization and to the health services are associated with this higher risk, and may serve as markers for initiating preventative actions.

Therefore, the present study sought to identify the prevalence and associated factors of higher risk for future foot ulceration and amputation among individuals with DM, who were registered at primary health care services in a municipality in southern Brazil.

2. Materials and methods

This was a cross-sectional study conducted among individuals with type 2 diabetes who were registered and cared for at two primary health care units in the municipality of Londrina (a city with approximately 500,000 inhabitants), which is located in the southern region of Brazil. Selecting the health care units was done on an intentional basis because these units were providing better-organized care for patients with DM and were following up greater numbers of individuals when compared to other units in the municipality.

All patients that were registered in the first half of 2009 in the two primary health care units and had type 2 DM were identified through medical records. Exclusion criteria were the inability to communicate with the interviewers and the presence of active foot ulcers at the time of the interview. None of the registered patients were excluded on these criteria. Therefore, all patients were asked to participate in the survey and those who accepted were interviewed and had their feet examined in order to classify their risk of foot ulceration. This was done in accordance with the guidance of the International Working Group on the Diabetic Foot [5]. This classification took into consideration the presence of neuropathy, vascular disease and deformities, along with the history of ulcers/amputation, thus resulting in degrees of risk ranging from zero to three [5]. Classifications as 0 and 1 were considered to have a low risk of ulceration while classifications of 2 and 3 were considered to have a high risk. The foot examinations were done by a single professional who was a specialist in this type of care, in order to avoid inter-examiner variability.

Neuropathy was identified by means of the Semmes-Weinstein monofilament test. Insensitivity to the 5.07 monofilament was tested at nine sites and neuropathy was considered to be present when skin contact was not perceived by the individual [12]. If the response was negative the first time at a site, the test was repeated. Insensitivity at the site tested was only deemed to be confirmed after this reapplication [18]. Vascular disease was considered to be present when, through palpation, the tibial and foot pulses were perceived to be diminished or absent [5]. Deformity was considered to be present when abnormalities were observed in the bone [8,19] and skin structure (calluses) of the feet [8].

The following were also investigated: socioeconomic and demographic variables (sex, age, schooling and skin color); clinical data (type of treatment, length of time diagnosed with DM, results from glycemia tests and presence of comorbidities); lifestyle factors (physical activity, diet followed, alcohol intake and tobacco use); dermatological abnormalities on the feet (calluses, nail mycosis and interdigital mycosis); and foot care (adequate nail-cutting and keeping the feet clean).

Comorbidities (retinopathy, nephropathy, stroke and history of acute myocardial infarction) were identified in the patients' medical records. Data on physical activity was obtained through the interview. Patients who reported any type of moderate or vigorous physical activity during leisure-time (cycling, dancing, walking fast etc.) for at least 30 min, three times or more per week, were considered physically active. Tobacco consumption, alcohol intake and diet followed were also obtained by interview. Patients who smoked at least a cigarette per day were considered smokers. Alcohol intake was defined as having the habit of drinking alcoholic beverages of any type, and diet followed when the patient reported that he or she was following the medically recommended diet.

The length of time being diagnosed with DM and results of glycemic examinations were also obtained from the medical records. The time of diagnosis of DM was categorized as either longer than 10 years or shorter than 10 years, since the 10 year cutoff is a marker for the onset of complications in DM [19]. Results of glycemic tests (plasma glucose) were categorized according to the desirable levels presented by the Brazilian guidelines for diabetes control [20]. Poor glycemic control was

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