



ELSEVIER

Contents lists available at SciVerse ScienceDirect

Primary Care Diabetes

journal homepage: <http://www.elsevier.com/locate/pcd>PCDE
primary care diabetes europe

Original research

The importance of clinical biomechanical assessment of foot deformity and joint mobility in people living with type-2 diabetes within a primary care setting

Cynthia Formosa^{a,*}, Alfred Gatt^a, Nachiappan Chockalingam^b^a Faculty of Health Sciences, University of Malta, Malta^b Faculty of Health, Staffordshire University, UK

ARTICLE INFO

Article history:

Received 29 January 2012

Received in revised form

2 December 2012

Accepted 21 December 2012

Available online 16 January 2013

Keywords:

Diabetes mellitus

Foot deformity

Foot type

Hallux limitus

Hallux valgus

Pes cavus

Pes planus

Hammer/claw toes

ABSTRACT

Aims: The aim of the study was to assess foot morphology and document foot deformities and joint mobility in a cohort of subjects living with type-2 diabetes mellitus in Malta in a Primary Care setting.

Methods: A retrospective observational study was conducted on 243 subjects who participated in a local pilot diabetes foot screening project. Assessments included hammer/claw toes, hallux valgus, hallux limitus, prominent metatarsal heads, bony prominences, Charcot deformity, plantar callus, foot type and ankle and hallux mobility. The clinical assessments used during this screening program were based on validated and previously published tools.

Results: Upon clinical examination 38% of the sample was found to have developed some form of corns or callosities in their feet. Hallux valgus deformity was present in 49.4% of the sample, whilst 39% of the sample had hammer toes. Prominent metatarsal heads (24%), other bony prominences (44%) and limited joint mobility were also reported. Furthermore, 56% of the sample presented with unsuitable footwear and upon clinical biomechanical examination a further 28% of the sample required prescription orthosis.

Conclusions/interpretation: A significant proportion of participants living with type-2 diabetes presented with foot deformities which are known to be predictive of foot ulceration in this high risk population. This research conducted in a primary care setting highlights the importance of increased vigilance coupled with strengthening of existing screening structures and introducing clinical guidelines with regards to biomechanical assessment of the feet in a primary care setting in order to reduce the incidence of diabetes foot complications.

© 2012 Primary Care Diabetes Europe. Published by Elsevier Ltd. All rights reserved.

1. Background

The relationship between foot morphology, foot deformity and foot mobility in relation to foot ulceration has been explored

previously [1]. Research has shown that diabetes affects the biomechanics of patients' feet in a number of ways [2]. Motor neuropathy is said to cause foot deformities due to alteration in mechanical balance between the extrinsic and intrinsic muscles of the foot. Limited joint mobility is a common

* Corresponding author at: Faculty of Health Sciences, University of Malta, Tal-Qroqq, Msida, Malta. Tel.: +356 99861396.

E-mail address: Cynthia.formosa@um.edu.mt (C. Formosa).

1751-9918/\$ – see front matter © 2012 Primary Care Diabetes Europe. Published by Elsevier Ltd. All rights reserved.

<http://dx.doi.org/10.1016/j.pcd.2012.12.003>

complication of diabetes occurring in 30–40% of patients [3]. The non-enzymatic glycation of type 1 collagen is said to be the cause of limited joint mobility especially in the ankle joint and first metatarsophalangeal joint. Furthermore abnormal/increased plantar pressures due to foot deformities are known to overload certain anatomical parts of the foot leading to hyperkeratosis which could later develop into ulcerations [4]. Whilst assessing the prevalence of foot abnormalities, the authors also report on the importance of early identification of foot morphology and deformities in a diabetes primary care setting which are recognized as risk factors of diabetic foot complications.

2. Foot biomechanics in diabetes

The literature suggests that plantar ulceration has been linked to several factors such as neuropathic and vascular insufficiencies, however, ulcer aetiology has also been shown to be linked to mechanical or structural abnormalities [1]. It has been acknowledged that diabetes leads to characteristic changes to the structure of the foot which affects the biomechanics of patients' feet in several ways. Such structural changes often occur at sites of abnormally high pressure, which can result in tissue breakdown and ulceration particularly in individuals who also have sensory neuropathy. It has also been demonstrated that foot structure can affect peak pressures which in turn can predict ulceration [5].

Forefoot structural changes, such as hammertoes and claw toes, and limited joint mobility have been thought to be the most relevant factors for increasing plantar pressure over a small area during walking. The force applied to a small area is associated with more harmful impact forces than the same force distributed over a larger area of the plantar foot surface. It has been suggested that the increased force and pressure on the decreased contact area can cause foot ulcers under the first metatarsal head and hallux. During barefoot walking, peak plantar pressures in the diabetic foot have been shown to be higher at the forefoot than the rearfoot. Therefore, repetitive and/or excessive forefoot plantar pressure, coupled with foot structural changes, can increase the risk to the development of forefoot plantar ulceration [6].

In a study conducted by Lavery et al. [7], it was concluded that patients with ankle equinus (defined as 0 degrees of dorsiflexion or less) had higher peak plantar pressures than those without the deformity. Subtalar joint angles were also found to be predictive of medial or lateral ulceration [8] and foot deformities such as claw/hammer toes and hallux limitus have been found to be significantly associated with ulcer incidence [9]. The affects of high levels of glucose in the blood are known to be observed in the feet in which the skin thickness is known to decrease whilst skin hardness increases, tendons thicken, joints have limited mobility, fat pads decrease, muscles atrophy and gait is altered [10]. Better elucidation of these changes throughout the course of disease can help design better treatment modalities and potentially reduce the unnecessarily high prevalence of diabetic foot ulceration and amputation. Furthermore studies have also shown that inappropriate footwear can also be the precipitating cause in the majority of ulcerations in this high risk population [11].

3. Primary care assessments

The importance of the physicians' role to examine and assess the foot need not to be emphasized, however, despite this evidence the literature reports that primary care physicians are rarely performing foot examinations. Understanding the biomechanical changes in the feet is important in the evaluation of the diabetic foot, however, several studies have reported low proportion and poor quality of diabetic foot biomechanical examination in general primary care settings and in patients hospitalized specifically for a specific foot condition [12].

This article reports the prevalence of foot deformities in subjects living with type-2 diabetes in Malta within a primary care setting. In this country 16.7% of the Maltese population is living with diabetes or impaired glucose tolerance when compared with 2–5% of its neighbouring countries in Europe [13]. To date no local prospective data exists on the common causes of diabetic foot complications and ulcerations; data which could help predict which patients are mostly at risk of foot complications and deterioration. Maltese studies exploring this concept is missing, a point which prompted the need for this study to be conducted in such a diverse population with a unique culture. Collecting and analysing key clinical information has been reported to be the stepping stone towards evidence-based improvements in the care of diabetes in a primary care setting [14]. Diabetic foot ulcerations are known to be amongst the most problematic complications of type-2 diabetes and are said to impose physical, psychological, social and economic burdens to both the patients and the health care system [15]. It has been estimated that globally approximately 1–4% of people living with type-2 diabetes develop a foot ulcer annually. Re-ulceration is also common amongst the Maltese diabetic population with an incidence rate of 32% [16].

It has been shown that 40–85% of amputations can be prevented with early screening, appropriate clinical guidelines and prompt management. To help accomplish this goal a comprehensive understanding of all risk factors that can contribute to ulceration and amputation rates is imperative. Despite the high prevalence of diabetes in Malta and the known fact that ulceration and its' recurrence is common amongst the Maltese diabetic population [16] no studies to date have explored the prevalence rate of foot deformities in this population. The aim of the study was to assess foot morphology and document foot deformities and joint mobility in a cohort of subjects living with type-2 diabetes mellitus in Malta in a Primary Care setting. Such data would help primary care healthcare professionals to categorize patients by their risk status and schedule further interventions accordingly.

4. Methods

A retrospective observational analysis study was conducted inside a primary care setting in Malta. This report includes data from a cohort of 243 patients enrolled in a pilot diabetes foot screening program inside a primary care setting, in two local catchment areas, namely Floriana and Mosta with a combined population of 126,000 persons. This study was

Download English Version:

<https://daneshyari.com/en/article/5871005>

Download Persian Version:

<https://daneshyari.com/article/5871005>

[Daneshyari.com](https://daneshyari.com)