The outcome of using the 60-second diabetic foot screen to identify the diabetic foot at risk in Tanzania

Mwandri MB, MD, MMed, IWCC
Surgeon and Wound Care Specialist, Temeke Municipal Hospital, Dar es Salaam, Tanzania
Correspondence to: Michael Mwandri, e-mail: mwanrister@gmail.com

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Abstract

Objective: To determine the pattern of risk for the development of diabetic foot complications in Tanzania.

Setting: Diabetic care is offered in all public hospitals in Tanzania. Over 100 000 documented patients receive free or subsidised services. This is a small portion of the estimated one million patients with diabetes countrywide. Often, the clinics are congested and lack structured protocols for the focused screening of conditions and for risks that have the potential to cause diabetic foot.

Subjects: Fifty patients were recruited from the diabetic clinic of Temeke Municipal Hospital. The 60-second diabetic foot screen was used for the diabetic foot risk assessment.

Outcome measures: Risks factors that can cause diabetic foot and other foot complications were assessed.

Results: It was determined that 10% of the studied population had a significant neuropathy. Other identified risk factors in this group of investigated diabetic feet were fissures (37%), calluses (27%), active ulcers (8%), fungi in toe-web spaces (27%), a previous history of foot ulcers (8%), ingrown toe nails (6%), blisters (4%), Charcot foot deformities (4%) and hammer toe lesions (2%). In this study, approximately 46% of the patients with diabetes wore inappropriate footwear upon presentation to the clinic.

Conclusion: Patients with diabetes in Tanzania had risk factors that are associated with the development of diabetic foot complications. A screening tool, such as the adapted 60-second diabetic foot screen, may be used to facilitate a structured protocol for assessing the feet of patients with diabetes in busy Tanzanian clinics.

Introduction

Tanzania is a country in East Africa with a large population of 45 million people. Seventy-four per cent of its population live in a rural setting, of which most (80%) engage in subsistence farming. The doctor-patient ratio is one of the lowest in the world. It is estimated that there are approximately one million patients with diabetes in Tanzania. Reports from the Tanzania Diabetes Association show that 350 000 people have been diagnosed with either type 1 or 2 diabetes. However, it is speculated that this is lower than the real figure. Approximately 100 000 patients with diabetes are estimated to have access to free or subsidised diabetic treatment from clinics in the district, or from regional and referral hospitals.

The International Working Group on the Diabetic Foot (IWGDF) has reported the prevalence of diabetic foot complications to be between 3-4%. Only a few community-based prevalent studies have been conducted on diabetic foot in Africa and none in Tanzania. A hospital-based study that was carried out by Challya showed the prevalence of foot complications to be 3.2%. In neighboring Kenya, a similar hospital-based study that was performed by Nyamu found the prevalence to be 4.6%.

The Step by Step Diabetic Foot Project in Tanzania showed diabetic foot complications in 37% of patients who were referred to the diabetic unit in a tertiary hospital. The amputation rate at this main hospital in the country was estimated to be 17.6%. Similar to many other developing countries, the concept of a multidisciplinary diabetic foot clinic doesn’t exist in Tanzania, although the Step by Step Diabetic Foot Project has successfully demonstrated a reduction in leg amputations. In the past seven years, more than 11 000 patients with diabetes have accessed foot care services through this project.

Studies on the pathways to diabetic foot complications and lower limb amputation have shown the significant impact of a previous amputation, reduced vascular perfusion, infection, neuropathy, poor wound healing and minor trauma. According to the 2011 IWGDF international consensus, foot ulcers are described as a major trigger that lead to amputation in situations in which ulcers develop...
Peripheral neuropathy, foot ulceration and the presence of reduced vascular supply have been described as independent risk factors for the development of lower extremity amputation. Peripheral neuropathy, peripheral vascular disease and ulceration are noted to be the highest risks for the development of diabetic foot complications. Other described risks include plantar callus formations, cutaneous foot ulcerations and tight footwear.

Grouping risk factors to predict diabetic foot complications has been carried out. Some risk factors have been shown to be more predictive of the timely identification of the diabetic foot at risk of ulceration. A diabetic clinic model of Georgetown, Guyana, employs the 60-second diabetic foot screen. Such tools systematically guide assessment of the risks of foot complications.

Foot screening is seldom conducted in diabetic clinics in Tanzania. Monofilament tests for neuropathy and other forms of foot assessment are rarely performed. Rendered services are often neither routine nor focused. A diabetic foot is a complicated and potentially life-threatening condition in patients and requires focused and multidisciplinary attention. Specialised services may only be available in a few tertiary centres because of poor medical infrastructure and lack of clinical skills in developing countries. Studying the distribution of encountered risk factor patterns in individual communities may help in timely detection of risk and early referrals. This study sought to demonstrate a pattern of the previously described risks of diabetic foot in patients attending busy routine diabetic clinics in urban Tanzania, using the 60-second diabetic foot screen.

**Method**

A cross-sectional investigation was conducted in the diabetic clinic at the Temeke Municipal Hospital, Dar es Salaam, Tanzania, between June 2010 and November 2011. Ethical clearance (NIMR/HQ/R.8a/Vol.IX/1160) was granted by the National Institute of Medical Research, Dar es Salaam, Tanzania. A diabetic clinic nurse was familiarised with the 60-second diabetic foot screen. Proper usage of this tool was ascertained by the author prior to commencement of the study. In addition, a footwear definition guide was created based on a good shoe guide. (Table I).

Fifty adult patients with diabetes, who agreed to participate in the study, were enrolled consecutively. A history was taken and a physical examination conducted using the 60-second diabetic foot screen as a guide. Assessment of footwear was also documented when patients presented to the clinic. Information obtained from both tools was summarised in case report form. Collected data were equated and proportions calculated to describe the variables of interest.

**Results**

The 50 diabetic patients who enrolled in this study had the following characteristics. The male:female ratio was 60:40. Forty per cent of the studied population had loss of sensation in one to three points of the feet, indicating mild protective sensation loss. Established neuropathy (more than six areas of protective sensation loss per foot) was observed in 10% of the screened individuals in this study (Figure 1).

The most prevalent risk factors that were observed in this group were fissures (37%), calluses (27%), fungal lesions in the toe-web spaces (27%), the presence of an active plantar ulcer (8%), blisters (4%) and ingrowing toenails (8%). Eight per cent of the screened individuals had a history of foot ulcerations. Six per cent had a history and the current presence of a bony deformity, Charcot foot (4%) or a hammer toe (2%). All individuals had foot pulses. None had a history of any previous lower extremity amputation (Table II). The most frequently encountered diabetic foot risks and complications were fissures, fungal infections and calluses.

Forty-two per cent of screened individuals presented wearing sandals with a fixative piece between the first and second toe (flip-flops) as their habitual footwear. Two per cent wore nonaccommodative footwear, such as tight shoes that exerted pressure on the toes (Table III).

**Table I: Types of footwear among the studied population, based on a good shoe guide**

<table>
<thead>
<tr>
<th>Footwear type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodative</td>
<td>Snugly fitting, smooth lining, soft upper top, roomy toe box, cushioned sole, low heel height, shoes or sandals perceived to be suitable for a diabetic patient, taking his or her occupation into account.</td>
</tr>
<tr>
<td>High-risk sandals</td>
<td>Flip-flop, with an in-between-toes fixation piece.</td>
</tr>
<tr>
<td>Nonaccommodative</td>
<td>Tight, ill-fitting shoes that leave an impression on the foot or impart pressure on parts of the foot by leaving an indentation, or present as blister formation.</td>
</tr>
</tbody>
</table>

**Figure 1: Proportion of patients with neuropathy**
Discussion

In this study, 10% of patients were found to have neuropathy. As an important factor in the pathogenesis of diabetic foot ulcerations, this variable constitutes a high-risk status that requires immediate referral to a diabetic foot team.

Fissures and calluses were the most prevalent foot lesions that were observed. These also carry a risk of foot ulcerations. Fissures and calluses have been linked to neuropathy, because of dry skin changes and mechanical failure associated with this condition.12,14 In our setting, the main reason for the high prevalence of foot lesions may have been use of inadequate footwear or walking barefoot. This was the case, especially in inhabitants in rural communities. In such a situation, the sensitivity of the 10 g monofilament test for the presence of neuropathy in a foot that is characterised by fissures, calluses and complete plantar surfaces (that have been hardened by walking barefoot) should be interpreted with caution.

We have found fungal infections between the toe-web spaces to be the most frequently identified diabetic foot risk factor. Researchers have shown that this factor is a significant contributor to the development of infection in the pathway to amputation. In situations in which simultaneous mechanical trauma is present as a result of wearing poor footwear, or in the presence of calluses and fissures, progression to the development of diabetic foot infections may be hastened. These risk factors are consistent with the high leg progression to the development of diabetic foot infections that was carried out by the Step by Step Diabetic Foot Project,9 should help to curb the high rate of lower leg amputation.

In a study that was carried out by Lavery, peripheral arterial occlusive diseases were noted to have a higher contribution than other parameters in the development of diabetic foot complications.11 In our study, that level of impaired vascular perfusion was not detected, as all our patients had palpable foot pulses. Similarly, none of our patients had a history of previous amputation. We speculate that our sample was too small to detect the presence of less impaired vascular perfusion. Also, perhaps infection carries a higher risk in our country than vascular insufficiency does in more developed countries.

A small number of individuals presented with a foot deformity. According to the existing guidelines,12,17 the presence of a bony deformity carries a high risk of an associated lower leg amputation. It is an indication to refer the patient to a specialist or diabetic foot clinic. These findings exemplify lack of such services in Tanzania.

Although the concept of a multidisciplinary team or referral system is less often encountered in Africa, detecting and stratifying existing patterns of risk factors in individual communities may be a powerful way to identify trends and actively implement preventative measures to combat the development of further diabetic foot complications and sequelae. In Tanzania, current initiatives have only reached a small portion of the estimated one million patients with diabetes.4,9

On the other hand, promptness and simplification of assessment, as evidenced through use of the 60-second diabetic foot screen, may impact positively on assessment in busy diabetic clinics in developing countries. Combined efforts, such as the use of the 60-second diabetic foot screen to identify patients with foot complications, as demonstrated by the diabetic foot care intervention in Georgetown, Guyana,18 and by health providers who were trained on the prevention and management of diabetic foot that was carried out by the Step by Step Diabetic Foot Project,9 should help to curb the high rate of lower extremity amputation in patients with diabetes.

Conflict of interest

The author declares no competing interest.

Declaration

This study was carried out as a requirement for completion of the International Interdisciplinary Wound Care Course. As such, it was solely self-funded.

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References


