A comprehensive diabetic foot screening and risk stratification programme in Kuwait


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The authors introduced a foot screening and risk stratification model that included a 20-minute health education video, implementation of recommendations and a one-to-one consultation. A review and follow-up appointment was offered where appropriate. During the first 12 months, 728 patients attended for foot screening. Patients were generally older (mean: 63.5 years), had a long duration of diabetes (mean: 17.5 years) and overall, 51% were treated with insulin. Three per cent had an active foot ulcer and 9.5% had a history of ulceration. Seventy-one per cent of patients were at increased risk of developing an ulcer. Levels of deformity (25.5%), callus (43%), xerosis (76%), loss of protective sensation (48%), painful neuropathy (53.3%) and comorbidities (70% were hypertensive, 22% had coronary artery disease and 20% had retinopathy) were very high in this patient group.

People with diabetes are at risk of developing a wide range of foot complications (Jeffcoate et al, 2006), including a loss of protective sensation, autonomic nerve dysfunction, increased arteriosclerosis, skin and joint changes — combinations of which may lead to ulceration and/or amputation (Boulton et al, 2008). Given that foot ulceration precedes lower-extremity amputation (LEA) in up to 85% of cases (Pecoraro et al, 1990), identifying patients at increased risk of ulceration is an essential starting point for prevention. Despite apparent improvements in knowledge, technology and healthcare, an LEA occurs every 20 seconds somewhere in the world (Boulton et al, 2005; International Diabetes Federation, 2015). This clearly indicates that we have a lot of work to do if we are going to prevent unnecessary LEAs.

There is clear evidence that amputation rates can be significantly reduced when services are well structured, coordinated and multidisciplinary (Traunter et al, 2007; Krishnan et al, 2008; Ikonen et al, 2010; Moxey et al, 2011; Holman et al, 2012; Jørgensen et al, 2014). A simple but effective part of these models of care is simple foot screening, which allows the detection and stratification of people with diabetes at increased risk of developing foot ulceration. In essence, screening is a process for determining whether a condition is present or absent. This process should be simple, quick and reliable, using validated clinical tools to determine risk factors (Crawford et al, 2011). It should not be confused with assessment, which is an involved and more complex process for defining or diagnosing the extent and severity of a condition (Al-Muzaini and Baker, 2017). Providing foot screening is kept simple, it can be undertaken by any trained healthcare professional or ancillary staff member using evidence-based tools and guidelines. Adequate, proper and structured training must be given, audited and reviewed to ensure consistency and validity and to identify any poor screening techniques (Leese et al, 2011).

Diabetic foot screening and risk stratification has proven effective in clinical practice (Leese et al, 2006; 2007) and is commonplace across the world. Within the UK, it occurs as part of an annual general diabetes review as set by the Quality and Outcomes Framework diabetes clinical indicators (British Medical Association, 2014). In Kuwait, there is currently no nationally-organised diabetes annual review programme or structured diabetic foot screening. A recent paper reported a 40% prevalence of diabetes and prediabetes in Kuwait using World Health Organization criteria (Al-Khandari et al, 2018), thus the propensity for foot ulceration may

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Box 1. Objectives

- To introduce diabetic foot screening
- To introduce risk stratification
- To offer education and interventions
- To collate screening outcomes for our local clinic population

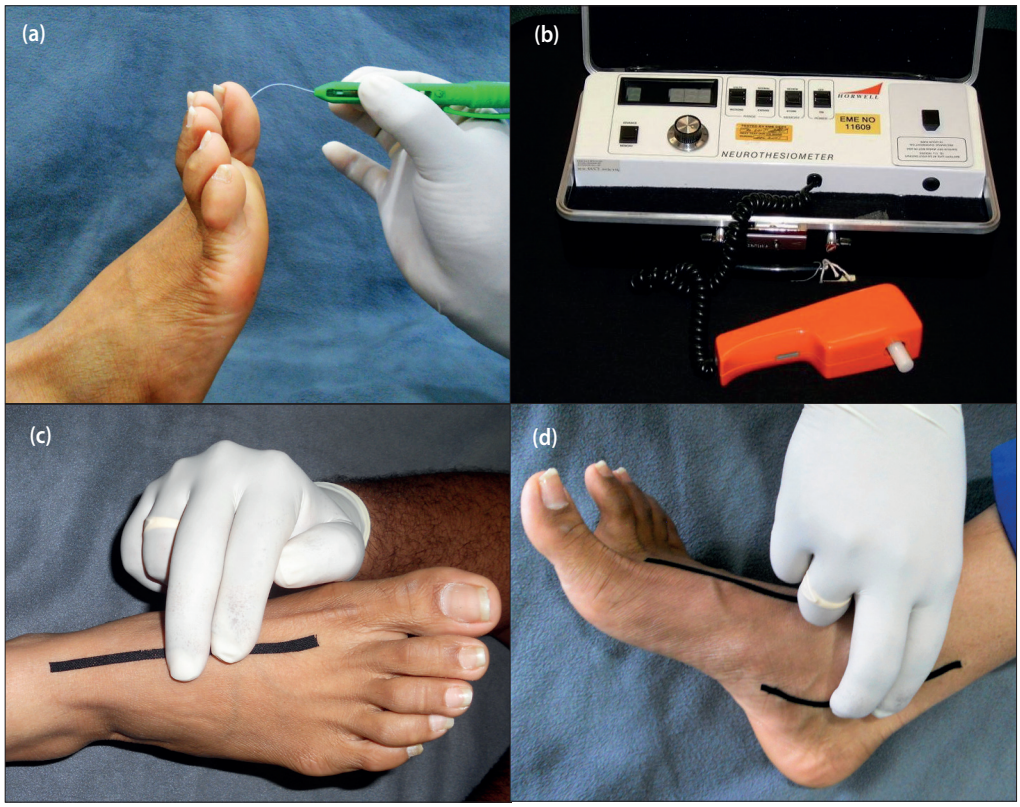

Figure 1. Diabetic foot screening: (a) 10 g monofilament test for loss of protective sensation; (b) neurothesiometer to assess for peripheral neuropathy; Pedal pulse palpation sites (c) d. pedis pulse palpation and (d) p. tibial pulse palpation.

be high. No data have yet been reported on the proportion of people with diabetes in Kuwait at increased risk for foot ulceration or amputation (Ahmed et al, 2011). As diabetes-related amputations are usually preceded by foot ulceration (Pecoraro et al 1990, Unwin, 2000), the authors decided to introduce a structured diabetic foot screening/risk stratification programme into our large private-sector multidisciplinary diabetic foot and noninvasive vascular clinic in Kuwait.

Method

Four objectives were set for our comprehensive diabetic foot screening programme *[Box 1]*. All patients and or their relatives attending the clinic were offered screening. Patients were recruited prospectively over a 12-month period from June 2017 to June 2018. Anyone who was unable to understand or have the capacity to respond to screening tests or questions was excluded, as was anyone unwilling to comply with the total screening programme.

The authors based their screening programme on that used in Scotland (*www.sci-diabetes.scot.nhs.uk*). A three-page standardised screening form was developed and used for all patients. This form consisted of:

- Patient demographics, diabetes-related information and screening tests
- Risk stratification criteria and assignment
- Suggested interventions and follow-up recommendations.

In addition to patients' demographic information, a basic diabetes and related comorbidities/medication history was taken. The presence of hypertension was determined based on the prescription of relevant medication. Coronary artery disease was identified based on a history of interventions or related medications. Retinopathy (proliferative) was determined based on a history of retinal bleeds or photocoagulation treatment. Patients were considered to have chronic renal failure in the presence of an estimated glomerular filtration rate of ≤30 mL/min/1.73 m^2.

Screening was predominately undertaken by the main investigator, who was supported by two other trained clinicians. Loss of protective sensation was determined using a 10 g monofilament *[Figure 1a]* at the first, third and fifth toe apices and metatarsal heads. Vibration perception thresholds were measured at the apex of the first toe using a neurothesiometer *[Figure 1b]*. A mean of three readings was calculated for each toe. All pedal

Table 1. Risk stratification of clinic patients based on medical history (*n*=728)							
Risk level, *n* (%)	**Mean age (years)**	**Diabetes treatment (%)**	**Duration of diabetes (years)**	**Hypertension (%)**	**Coronary artery disease (%)**	**Retinopathy (%)**	**Chronic renal failure (%)**
No or low risk, *n*=211 (29%)	63.5	Type 1: 53% Type 2: 47%	17.5	70	22	20	8
Moderate or high risk, *n*=517 (71%)	65.5	Type 1: 50.4% Type 2: 49.6%	14.5	74	26.5	25	9

pulses were palpated and recorded as present or absent. Ankle- and toe-brachial indexes and photophlesmography were recorded for all digital vessels but were not used for screening data. A foot examination was also undertaken, recording:

- Any deformity
- Callus
- Xerosis
- Nail pathologies
- Tinea pedis
- Limited joint range of motion at the first metatarsophalangeal joint.

The ability to self-care and the presence of partial or full blindness was recorded. Symptoms of painful neuropathy were recorded but not used for risk stratification. The Scottish Care Information – Diabetes Collaboration criteria were used to patients were used to assign risk of ulceration. Patients were assigned to one of three risk categories:

- Low/no risk (green)
- Moderate risk (orange)
- High risk (red).

Table 2. Clinical findings following patient screening (*n*=728)		
Clinical finding	**No. of patients**	**Percentage**
Loss of protective sensation*	346	47.5
Non-palpable pulses*	25	3.4
Previous ulceration/ amputation*	69	9.5
Current ulceration*	22	3
Deformity*	186	25.5
Inability to see or self-care*	131	18
Callus	196	27
Xerosis (dry skin)	553	76
Fungal skin infection	218	30
Fungal nail infection	82	11.3
Thick nail	67	9.2
Painful neuropathy	388	53.5
Smoker	517	71

** Factors used for risk stratification.*

The traffic light colours were used to facilitate the clarity of risk allocation.

Appropriate recommendations for each patient were identified and given based on their screening outcome. After screening, every patient watched a 20-minute diabetic foot health education video. Topics covered in the video included an explanation of screening, risk scores, basic foot care, footwear, etc in Arabic. Immediately after this, patients had a one-to-one discussion about their screening outcome and the interventions proposed. A follow-up visit was offered, when appropriate, based on individual risk scores.

Results

During the 12-month period, 728 patients attended for foot screening, of which 54% were male (*n*=394), 46% female (*n*=334) and 97% Kuwaiti. The mean patient age was 63.5 years (63 in men and 64 in women) and mean duration of diabetes was 17.5 years. In total, 371 (51%) patients were taking insulin.

Table 2 summarises the clinical findings. Ulceration was present in 3% of patients, while 9.5% had a history of previous ulceration. A small proportion of patients had non-palpable pulses. Deformity, inability to self-care and impaired vision were common, and over half of patients had experienced pain associated with neuropathy. The skin and nail health of patients was poor in many cases.

The majority (71%) of patients smoked, with 92% of men stating that they were smokers. Patients smoked an average of 28 cigarettes per day (range: 5–40 cigarettes).

Comorbidities were present in a high proportion of patients *[Table 3]*. Risk stratification resulted in 71% of patients being identified as at increased risk of diabetic foot ulceration *[Figure 2]*.

Discussion

Diabetic foot screening and risk stratification was successfully introduced in our clinic with very few extra resources and little difficulty. The screening process was quick and very well received by patients and staff. This, to our knowledge, is the only comprehensive diabetic

Table 3. Comorbidities identified during screening (*n*=728)		
Comorbidity	**No. of patients**	**Percentage**
Hypertension	510	70
Coronary artery disease	106	22
Retinopathy	146	20
Chronic renal failure	58	8

foot screening process in Kuwait, although the authors are aware that some other centres perform various forms of *ad hoc* screening. Almost three-quarters of patients were at risk of diabetic foot ulceration and the majority have at least one diabetic foot complication. The data set is small and, as such, it is difficult to draw any substantive conclusions from our findings; however, if the authors' data are even partly reflective of the diabetic foot profile in Kuwait, the findings are quite alarming.

The authors are unable to directly compare our data with that of Scotland, but regarding risk status it would appear to be a complete mirror image, with 71% (Kuwait) *[Figure 2] versus* 36% (Scotland) of patients at increased ulcer risk *[Figure 3]*. Of course, this data may be biased as the clinic is private and, as such, the majority of patients only present if they have a perceived or real problem. This may explain the alarmingly high proportion of patients categorised as being at increased ulcer risk. However, many of the patients came as a result of social media advertisements, not just because they had a foot problem.

The data showed a very high incidence of symptomatic neuropathy (53.3%), which is disturbing as it might be viewed as reflective of poor glycaemic control. This finding may support the ulcer risk results.

When clinical examination findings were considered, the number of patients with very dry skin was extremely high (76%). This may be due to religious/cultural factors, such as foot washing five times per day during prayer time. Patient skin impedance values were collected as a marker of autonomic nerve dysfunction and the authors are currently looking at these data. The incidence of tinea pedis was quite high (30%) which, again, may be reflective of foot washing habits.

Callus was present in 27% of patients. This is probably due to the very sedentary lifestyle that exists in Kuwait due to extremely high temperatures for up to 9 months of the year.

An interesting observation was the low numbers of patients with non-palpable foot pulses and symptoms of peripheral arterial disease, given the high proportion of smokers and high prevalence of hypertension and coronary artery disease. This may be the result of skewed data due to bias and small patient numbers, and needs to be verified by robust data.

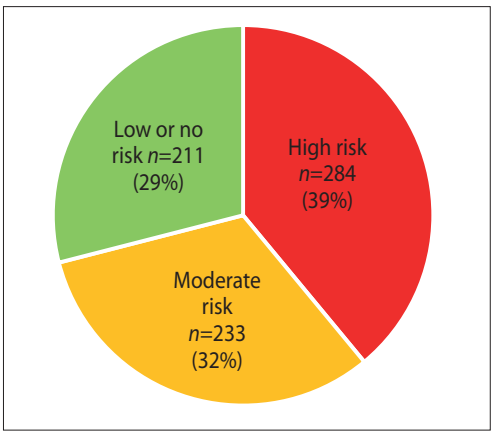

Figure 2. Risk stratification of patients screened at the clinic in Kuwait.

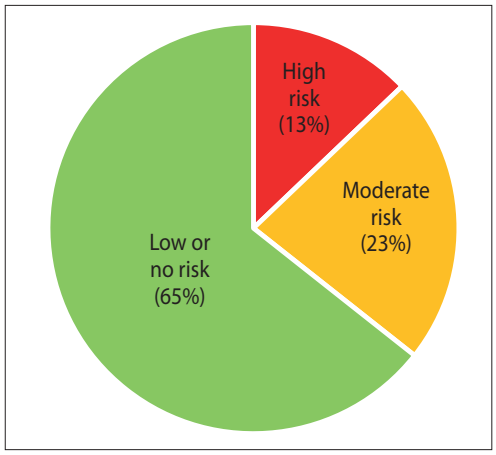

Figure 3. Risk stratification of patients in Scotland (Leese et al, 2006).

Conclusion

Diabetic foot screening was easily introduced into our clinic and was well received by patients. These findings are of concern as they indicate that the diabetic foot burden for Kuwait could be very large. Diabetic foot screening and follow-up data are required on a national level if the high amputation rate due to diabetes is to be reduced. WME

References

Ahmed AA, El Sharief E, Al Sharief A (2011) The diabetic foot in the Arab world. *J Diabet Foot Compl* 3(3): 55–61

Al-Khandari A, Longenecker JC, Barengo NC, et al (2018) The prevalence of pre-diabetes and diabetes in the Kuwaiti adult population in 2014. *Diabetes Res Clin Pract* 144: 213–22

Al-Muzaini A, Baker N (2017) A user's guide to diabetic foot screening. *The Diabetic Foot Journal Middle East* 3(1): 13–20

British Medical Association (2014) *QOF Guidance 2014–2015 According to Nation*. BMA, London. Available at: http://bit.ly/1b4U1gK (accessed 27.11.14)

Boulton AJ, Vileikyte L, Ragnarson-Tennvall G, Apelqvist J (2005) The global burden of diabetic foot disease. *Lancet* 366(9498): 1719–24

Boulton AJM, Armstrong DG, Albert SF et al (2008) Comprehensive Foot Examination and Risk Assessment: A report of the Task Force of the Foot Care Interest Group of the American Diabetes Association, with endorsement by the American Association of Clinical Endocrinologists. *Diabetes Care* 31(8): 1679–85

Crawford F, Mc Cowan C, Dimitrov BD et al (2011) The risk of foot ulceration in people with diabetes screened in community settings: Findings from a cohort study. *QJM* 104(5): 403–10

Holman N, Young RJ, Jeffcoate WJ (2012) Variation in the recorded incidence of amputation of the lower limb in England. *Diabetologia* 55(7): 1919–25

Ikonen TS, Sund R, Venermo M, Winell K (2010) Fewer major amputations among individuals with diabetes in Finland in 1997–2007: A population-based study. *Diabetes Care* 33(12): 2598–603

International Diabetes Federation (2015) *Diabetes Atlas – 7th Edition*. Available at: http://bit.ly/2rp1OpJ (accessed 09.01.2020)

Jeffcoate WJ, Chipchase SY, Ince P, Game FL (2006) Assessing the outcome of management of diabetic foot ulcers using ulcer-related and person-related measures. *Diabetes Care* 29(8): 1784–7

Jørgensen ME, Almdal TP, Faerch K (2014) Reduced incidence of lower-extremity amputations in a Danish diabetes population from 2000 to 2011. *Diabet Med* 31(4): 443–7

Krishnan S, Nash F, Baker N et al (2008) Reduction in diabetic amputations over 11 years in a defined U.K. population: Benefits of multidisciplinary team work and continuous prospective audit. *Diabetes Care* 31(1): 99–101

Leese GP, Reid F, Green V et al (2006) Stratification of foot ulcer risk in patients with diabetes: a population-based study. *Int J Clin Pract* 60(5): 541–5

Leese GP, Schofield C, McMurray B et al (2007) Scottish foot ulcer risk score predicts foot ulcer healing in a regional specialist foot clinic. *Diabetes Care* 30(8): 2064–9

Leese GP, Cochrane L, Mackie AD et al (2011) Measuring the accuracy of different ways to identify the 'at-risk' foot in routine clinical practice. *Diabet Med* 28(6): 747–54

Moxey PW, Gogalniceanu P, Hinchliffe RJ et al (2011) Lower extremity amputations – a review of global variability in incidence. *Diabet Med* 28(10): 1144–53

Pecoraro RE, Reiber GE, Burgess EM (1990) Pathways to diabetic limb amputation. Basis for prevention. *Diabetes Care* 13(5): 513–21

Trautner C, Haastert B, Mauckner P (2007) Reduced incidence of lower-limb amputations in the diabetic population of a German city, 1990-2005: results of the Leverkusen Amputation Reduction Study (LARS). *Diabetes Care* 30(10): 2633–7

Unwin N (2000) Epidemiology of lower extremity amputation in centres in Europe, North America and East Asia. *Br J Surg* 87(3): 328–37