

Patient-centred health educational intervention to empower preventative diabetic foot self-care

ABSTRACT

Introduction Diabetes is a disease in which the body's ability to produce or respond to the hormone insulin is impaired, resulting in abnormal metabolism of carbohydrates and elevated levels of glucose in the body. Due to these factors, diabetes can cause several complications that include heart disease, stroke, high blood pressure, eye complications, kidney disease, skin complications, vascular disease, nerve damage and foot problems.

Aim The primary objective of the project was to educate patients who had been diagnosed with diabetes or were being followed up for diabetes management by other departments with regard to their own responsibility in maintaining preventative foot self-care. Educating patients with diabetes to take an active part in their own self-care is the cornerstone of establishing effective diabetes self-management. Diabetes education allows patients to explore effective interventions into living their life with diabetes and incorporate the necessary changes to improve their lifestyle.

Method Ten patients completed a validated educational foot care knowledge assessment pre-test to determine their existing knowledge about their own foot care after a thorough foot assessment. Preventative diabetic foot self-care education was conducted through a lecture, visual aids and a return demonstration. Patients were then subjected to a post-test questionnaire with the same content as the aforementioned pre-test to determine their uptake of the educational content.

Results Correct cutting of toenails was the most identified educational need. It was a limitation in the pre-test (30%) and it remained the lowest scoring item on the post-test (70%). Walking barefoot was thought not to be dangerous by 60% of participants pre-test but, with remedial education, all participants identified this as a dangerous activity post-test. The importance of having corns and calluses looked after by a health professional rather than self-care was also understood to be of high importance.

Conclusion Effective communication with patients by healthcare providers who can mould educational content to the identified patient needs by teaching much needed skills is a key driver in rendering safe, quality-related healthcare educational interventions.

Keywords Foot care education, prevention, diabetes, toenail cutting

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INTRODUCTION

Type 2 diabetes mellitus is one of the most prevalent major chronic disease burdens currently in the world, with a prevalence that has risen from 4.7% in 1980 to 8.5% in 2014¹,

and which currently touches 422 million patients worldwide. It is expected to be the seventh most common cause of death in the world by 2030, primarily due to its rapid rise in middle- and low-income countries². Diabetes has also been a leading cause of severe morbidities and disabilities^{1,2}.

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Diabetes is a disease in which the body has completely or partially lost its ability to produce or respond to the hormone insulin, resulting in abnormal metabolism of carbohydrates and elevated levels of glucose in the body. Due to these metabolic changes, diabetes is associated with several complications² such as heart disease, stroke, high blood pressure, eye complications, kidney disease, skin complications, vascular disease, nerve damage and foot problems. Foot problems can range from mild to major damage to the foot structure and

are associated with a pathology pathway that can include damage to the vascular blood supply, soft tissues and resultant infection, all of which are magnified further by pressure and loss of protective sensation known as peripheral neuropathy³.

People affected with these foot pathologies have a higher risk of developing a diabetic foot ulcer (DFU) and associated infection; this then carries the risk for a lower limb amputation^{2,3}. While some patients suffer from severe pain and discomfort in their feet – stinging, stabbing shooting, burning – others remain asymptomatic. However, having an insensate foot is the leading cause to unidentified complications of the foot in the early stages³. The incidence of non-traumatic lower extremity amputation is at least 15 times greater in those with diabetes than non-diabetes⁴, followed by a high incidence of death within 5 years thereafter⁵. In a 6-year follow-up study in Saudi Arabia, it was found that those persons with a DFU were more prone to be deceased within the study period than those followed up without a DFU present⁵. In the UAE there are more than 1 million people living with diabetes, ranking 15th worldwide for age-adjusted comparative prevalence⁶.

Educational interventions for persons with diabetes is therefore internationally accepted as a cornerstone of diabetes management and patient empowerment⁷. It creates the needed awareness to enable patients to take control of their own disease and make correct lifestyle decisions in order to control their disease process and resultant outcomes. Diabetes education allows patients to identify their own specific educational needs in order to create needs-based learning, a valuable adult learning concept that fosters increased adherence to living a normal life with a disease in accordance with best practice⁸. It also empowers them to make the necessary changes to improve their lifestyle and prevent complications. The best time for this kind of intervention is early in the disease process after being diagnosed with diabetes mellitus^{8,9}.

In particular, patient education about basic foot care is important to reduce lower extremity complications^{5,6}. Nurses working in vascular and podiatry clinics encounter patients with differing degrees of diabetic foot complications. Patients who attend these clinics may have been suffering with diabetes for years. The most common finding in our clinic is that patients are not educated nor empowered with the self-assessment methods to control their own disease and prevent complications in the early period just after initial diabetes diagnosis.

In addition, management of a DFU is expensive and, if compounded with wound infection or amputation, the cost escalates accordingly^{5,6}. The duration of time to treat and save as much of a foot as possible once a DFU develops is lengthy and requires a multidisciplinary team approach to facilitate rehabilitation processes. However, if the development of DFUs, surgical intervention and amputation can be prevented with appropriate educational interventions, cost savings can be accomplished⁷, as well as improved quality of life outcomes.

These interventions require a health professional with sufficient knowledge on diabetes management and prevention of complications with the ability to convey the most essential content in small bite-sized pieces in a short period of time. The education provided also requires regular follow-up with health professionals for monitoring uptake of lifestyle modifications and ongoing re-assessment to determine whether more education is required. Targeting patients at increased risk for developing a DFU is therefore believed to constitute a cost-effective strategy to control progression to end-stage foot complication and mechanical destruction⁸.

It can therefore be argued that the greatest weapon in the fight against diabetes mellitus complications is knowledge. Information can help people assess their risk of diabetes, motivate them to seek proper treatment and care earlier, and inspire them to take charge of their disease for their lifetime^{7,8}. The preferred mode of teaching in this clinic setting due to the adult learning component need, as identified by the patients themselves¹⁰, is that of lectures accompanied by clinical demonstration. This method also accommodates the language barrier between care providers and patients in an appropriate manner¹¹. Information given to patients shows them how to conduct their own foot inspection and apply treatment if needed, and this can be tested back simultaneously. This ensures that, once a patient is at home and in self-care, they are empowered with sufficient knowledge and skills to undertake any required foot care assessment interventions themselves.

STUDY OBJECTIVE

The primary objective of the project was to educate patients who had been diagnosed with diabetes – or who are being followed up by another department such as internal medicine and endocrinology – with regard to the patient's own responsibility in maintaining preventative foot self-care.

This was completed through evaluating any gaps in patients' knowledge. Evaluation is a process that critically examines a program. It involves collecting and analysing information about a program's activities, characteristics and outcomes that allows informed decisions to be made about a program in order to improve its effectiveness and/or to inform programming decisions^{8,9}.

METHODS

Patient recruitment and study inclusion criteria

On average there are 20 new patients referred to our podiatry clinic for diabetic foot screening every month. Most of these patients already have foot-related symptoms such as numbness, tightness, burning and a tingling sensation which are signs of neuropathy. Most patients present with callus over bony prominences, corns and a dry plantar area indicative of the presence of peripheral neuropathy (see Figure 1).

The decision was made to recruit, include and group teach the first 10 patients in the clinic who met the following inclusion criteria:

Figure 1. Patient referral distribution at our vascular clinic, November and December 2018.

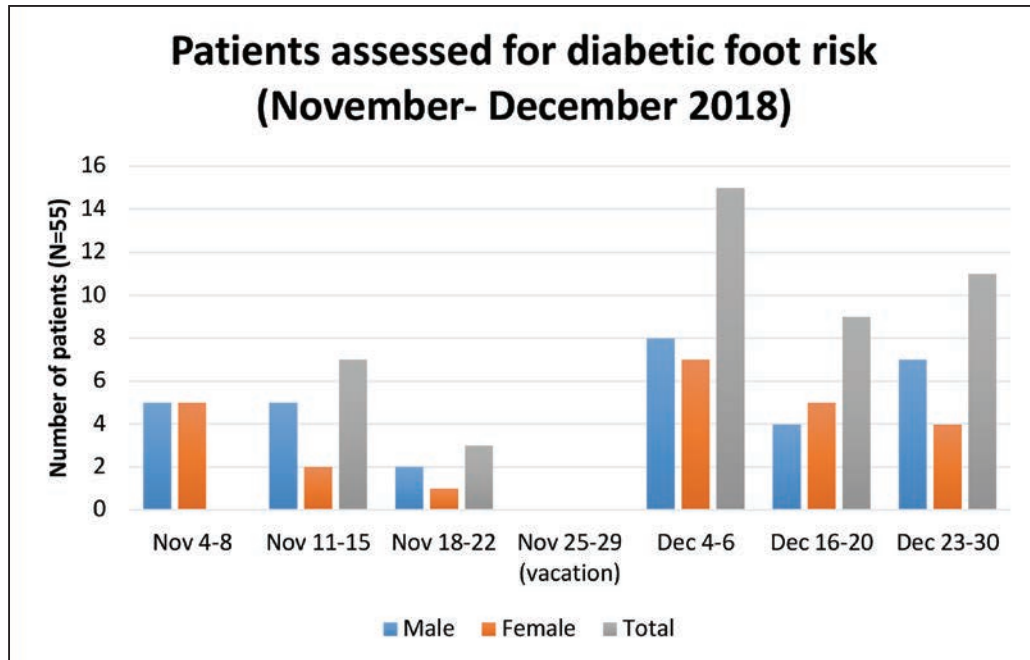


Figure 2. The pre- and post-test educational foot care knowledge assessment questionnaire.

FOOT CARE EDUCATION FOR DIABETIC PATIENTS



1. High blood sugar can cause problems on the feet?
YES **NO**

2. Is the use of proper foot wear important?
YES **NO**

3. Is it ok to have dry skin on the feet?
YES **NO**

4. What should be used to wash the feet?
A. Mild Soap and water
B. Alcohol

5. How will you cut the toenails?

A **B**

6. Should you see a specialist if there is callus/ corn/ blister in your feet?
YES **NO**

7. Should you walk barefoot inside or outside the house?
YES **NO**

- Be diagnosed with diabetes and be formally referred to the podiatry clinic for diabetes foot screening.
- Have the ability to speak and understand English as the materials were in English.
- Agree to be part of a confidential pre- and post-test educational foot care knowledge assessment.
- Be adults able to provide consent to participate.

Pre/post-test knowledge assessments

Assessment material used were based on the Diabetes Foot Care Questionnaire (Figure 2) and the Diabetic Foot Risk Assessment (Figure 3) from the Diabetes Care Program of Nova Scotia (DCPNS) 2009⁸. The teaching plan and content were patterned on what the clinicians were normally teaching the patients when visiting the podiatry and vascular clinic.

Initially, nurses completed routine clinic assessments, including vital signs and history taking as well as a foot examination.

Patients were then assessed with their knowledge regarding foot care by asking them to answer the DCPNS Diabetes Foot Care Questionnaire⁸ and to complete the pre-test educational foot care knowledge assessment (Figure 2).

Intervention: foot care education

Foot care education was given through short lectures, discussions and visuals aids (some examples are shown in Figures 4 & 5). Educational content was associated with the activities of daily living of the patient to make it more doable and realistic. Patients' and family members' questions were then answered and, to measure the uptake of taught knowledge, patients then completed the post-test educational foot care knowledge assessment which had the same content as the pre-test (Figure 2). The entire education process took about 10–15 minutes. All assessments were manually recorded in the patients' notes folders.

Figure 3. The DCPNS Diabetic Foot Care Questionnaire⁸.

Diabetes Foot Care Questionnaire (DCPNS- September 2009)		
NAME: _____	GENDER: _____	
AGE: _____	YEARS OF BEING DIABETIC: _____	
History of Foot Problems	YES	NO
• Have you ever had a sore or a cut on your foot or leg that took more than two weeks to heal?	<input type="checkbox"/>	<input type="checkbox"/>
• Have you ever had a foot ulcer?	<input type="checkbox"/>	<input type="checkbox"/>
• Have you ever had an amputation of a toe, foot, or leg? (If yes, date: _____)	<input type="checkbox"/>	<input type="checkbox"/>
Current Foot or Leg Problems	YES	NO
• Do you have an ulcer, sore or blister on your feet at this time?	<input type="checkbox"/>	<input type="checkbox"/>
• Do you have blood or discharge on your feet?	<input type="checkbox"/>	<input type="checkbox"/>
• Do you have any calluses on your feet?	<input type="checkbox"/>	<input type="checkbox"/>
• Do you have any numbness, tingling, pins and needles, Or itching sensation on your feet?	<input type="checkbox"/>	<input type="checkbox"/>
• Do you have any tightness, heaviness, pain or cramps in your feet or legs?	<input type="checkbox"/>	<input type="checkbox"/>
Foot Care	YES	NO
• Can you reach and see the bottoms of your feet?	<input type="checkbox"/>	<input type="checkbox"/>
• Do you examine your feet? (if yes, how often?) <input type="radio"/> Everyday <input type="radio"/> 2-6 times a week <input type="radio"/> Once a week <input type="radio"/> When I have a problem		
• Do you wash your feet everyday?	<input type="checkbox"/>	<input type="checkbox"/>
• Do you dry well between the toes?	<input type="checkbox"/>	<input type="checkbox"/>
• Do you use a moisturizing cream on your feet?	<input type="checkbox"/>	<input type="checkbox"/>
• Do you cut your own toenails? (if no, who does it for you?) <input type="radio"/> Family member <input type="radio"/> Caregiver <input type="radio"/> Foot Care Nurse <input type="radio"/> Podiatrist		
Foot Wear		
• What kind of shoes do you wear? (check all that apply)		
<input type="checkbox"/> Pointed toes <input type="checkbox"/> Broad, round toes <input type="checkbox"/> High heels		
<input type="checkbox"/> Sandals <input type="checkbox"/> Flipflops/ thongs <input type="checkbox"/> Athletic/ sneakers/ runners		
<input type="checkbox"/> Shoes made of leather or canvas <input type="checkbox"/> Special/ custom shoes		
<input type="checkbox"/> Shoes with adjustable laces, buckles or Velcro		

• What kind of socks do you wear? (check all that apply)		
Cotton	wool	acrylic/ synthetic
Knee high	elastic- free	seamless socks
Nylons/ pantyhose	"diabetes" socks	prescription/ compression
Safety and Prevention	YES	NO
• Do you ever soak your feet?	<input type="checkbox"/>	<input type="checkbox"/>
• Do you always test water temperature before putting your foot in?	<input type="checkbox"/>	<input type="checkbox"/>
• Do you use medicated products for warts, corn, calluses?	<input type="checkbox"/>	<input type="checkbox"/>
• Do you put moisturizing creams or lotions between your toes?	<input type="checkbox"/>	<input type="checkbox"/>
• Do you ever walk around in your bare feet?	<input type="checkbox"/>	<input type="checkbox"/>
• Do you ever wear shoes without wearing any socks?	<input type="checkbox"/>	<input type="checkbox"/>
• Do you always inspect your shoes for foreign objects or torn linings?	<input type="checkbox"/>	<input type="checkbox"/>
• Do you use a hot water bottle or heating pad on your feet?	<input type="checkbox"/>	<input type="checkbox"/>
• Do you sit with your legs crossed?	<input type="checkbox"/>	<input type="checkbox"/>
• Do you smoke?	<input type="checkbox"/>	<input type="checkbox"/>
Foot Care Education	YES	NO
• Have you ever attended a class on how to care for your feet?	<input type="checkbox"/>	<input type="checkbox"/>
• Have you ever read any handouts on foot care?	<input type="checkbox"/>	<input type="checkbox"/>
• Have you ever read any handouts on proper footwear?	<input type="checkbox"/>	<input type="checkbox"/>
• Would you like a handout on how to care for your feet?	<input type="checkbox"/>	<input type="checkbox"/>
THANK YOU FOR COMPLETING THIS QUESTIONNAIRE!		

Figure 4. Educational teaching visual aid on risky foot conditions that need to be avoided.



Figure 5. Educational teaching visual aid on actions that add to foot safety.



RESULTS

Based on the selection criteria described above, 10 patients were selected to be assessed and educated in this group learning session. Of these patients, six were male and four were female. Age range was from 40–70 years old. The foot examination revealed one patient with an existing DFU, two who had previous ulcers on their legs that took more than 2 weeks to heal, and one person with a previous DFU that had healed (Figure 6). The majority of the patients showed signs of neuropathy – numbness, tightness, burning and a tingling sensation – and dry plantar areas (90%). Callus over bony prominences and corns were present in 80% of the patients examined (Figure 7).

With regard to patients' current foot care activities, their current self-management of foot care seemed to be inadequate,

with 30% of participants unable to see the sole of their foot (Figure 8). Furthermore, 20% admitted they did not wash their feet every day and 50% complained that it was difficult to clean between their toes and make sure the skin was dry after washing their feet. The use of moisturiser during foot care was not popular, with 70% of participants identifying they did not routinely moisturise their feet. In addition, despite 30% of participants stating they could not see the bottom of their own feet, 70% of patients cut their own toenails.

With regard to patients' current safety practices with regard to foot care, the practice of wearing open-toed and open-heeled sandals or shoes was prevalent in 60% of patients. Within this patient sample, 90% (n=9) admitted to walking barefoot more often than wearing a shoe when inside the house as well as sitting cross legged on the floor on pillows (Figure 10).

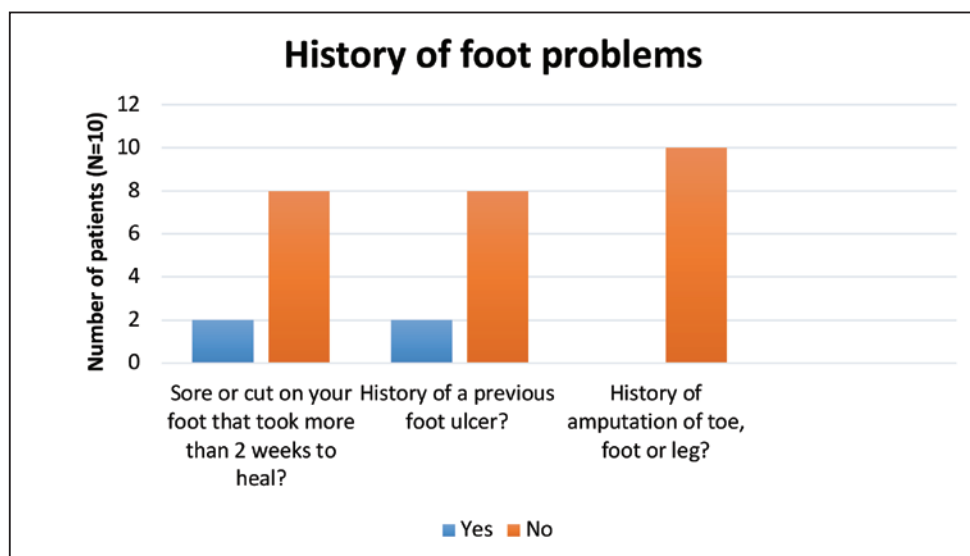


Figure 6. History of any foot problems.

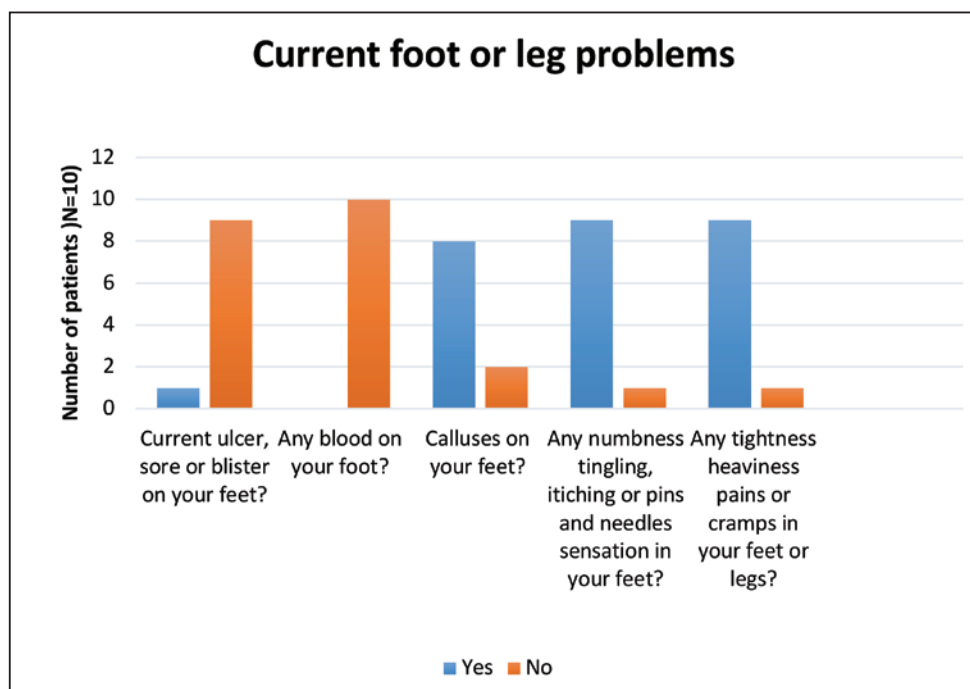


Figure 7. Current leg or foot problems.

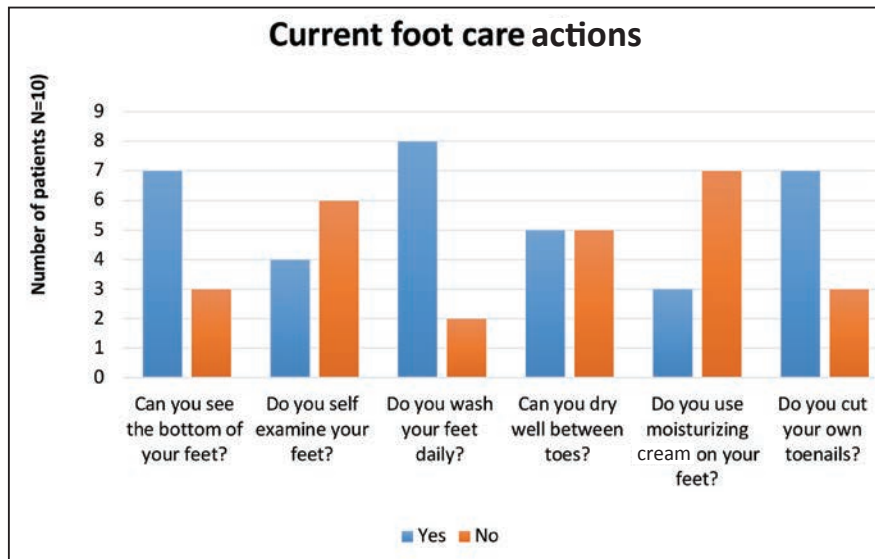


Figure 8. Current foot care activities.

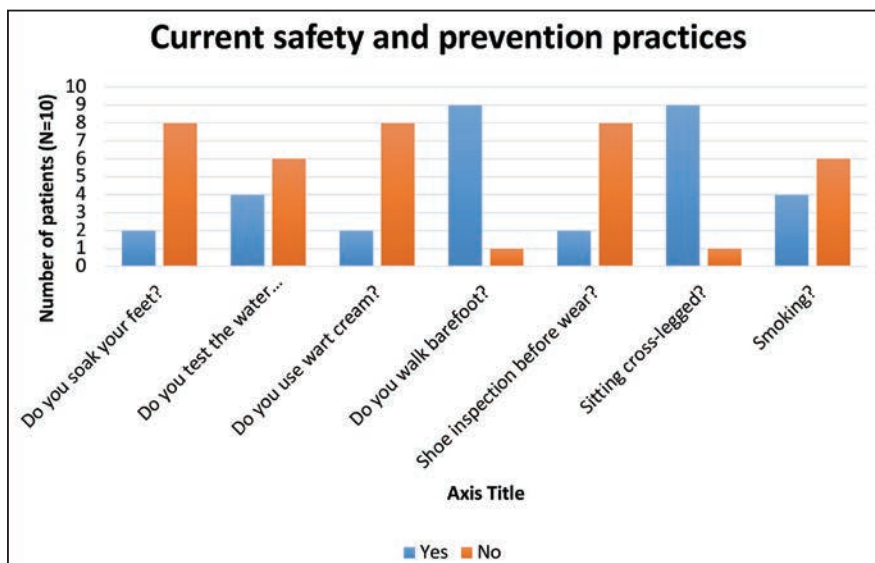


Figure 9. Current safety practices with regard to foot care.

When comparing the differences in the results between the pre- and post-tests, a number of issues were noted (Figure 10). Correct cutting of toenails was identified as a knowledge deficit in the pre-test (30%), and it remained the lowest scoring item post-test as only 70% of participants agreed they would use a straight cut when cutting their toenails. In the pre-test, 90% of participants indicated they went barefoot and only 40% indicated they understood that walking barefoot was dangerous. However, post-test, all participants indicated they understood walking barefoot to be dangerous.

None of the patients had had any prior foot education before the study commenced and only one participant had searched the internet to find a bit of information on his own with regard to foot care and foot wear. After taking the pre-test, it was revealed that most of the patients were in need of specific education and skills related to their own foot care.

DISCUSSION

Diabetes is one of the rapidly rising causes of mortality worldwide. It has a greater incidence of non-traumatic lower

extremity amputation than any other chronic disease in the world. Due to this, patients with diabetes need to be educated on how to properly take care of their feet. By providing group-based educational intervention sessions, the needs of many patients can be directly identified and addressed^{7,8}.

During the education session, visuals (Figures 4 & 5) were provided to each patient and their family to assist them to understand the messages provided in the lectures and discussions. This assisted to alleviate any language barriers that potentially existed between the patient and the educator as patients could adapt translation of concepts not fully understood initially to the visual descriptors and clinical demonstrations provided¹¹. Time was taken to answer all participants' questions during group discussions so all could learn through the questions asked, responses and experiences of other patients in similar situations. Family members, if present, were also involved in the teaching sessions, although they did not take the pre- and post-test in order to help in reinforcing the retention of taught information for the patients.

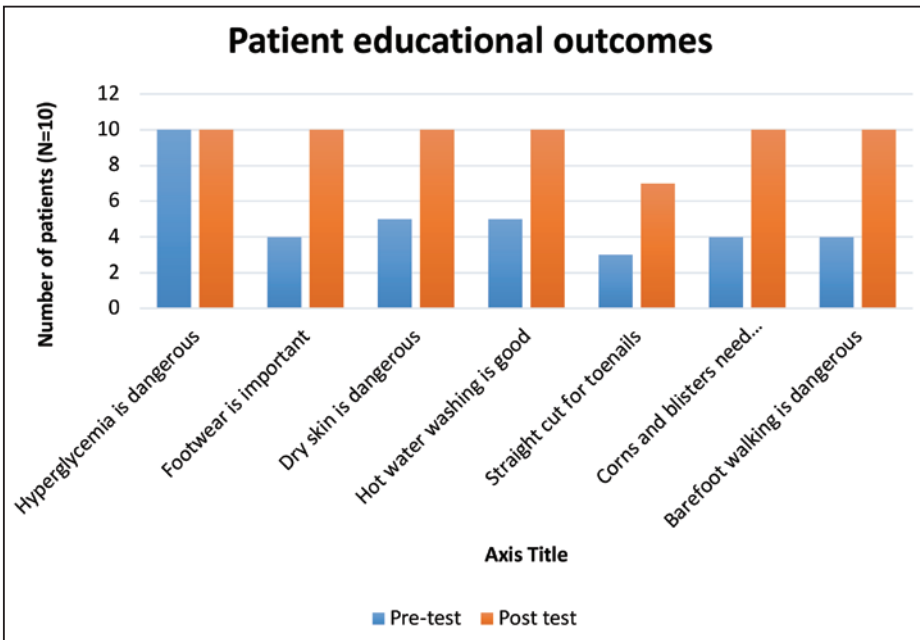


Figure 10. Pre- and post-test results.

The most important finding of this study relates to toenail cutting. Despite the fact that patients verbalised their difficulty in being able to see their own plantar aspect of the foot, they still cut their own toenails. It was a limitation in the pre-test (30%), and it remained the lowest scoring item post-test (70%) (Figure 10). With the majority of participants having peripheral neuropathy, the cutting of toenails without sufficient vision, on a foot that has loss of protective sensation, increases the risk for a traumatic injury with far reaching consequences^{3,4,5}.

Toenails should preferably be cut after a bath or shower when nails are soft and clean, otherwise this can lead to infection and foot ulceration if they are not trimmed in a straight line when clean. Diabetics in particular should avoid cutting into the corners of toenails to avoid the development of ingrown toenails which can lead to infection and foot ulceration¹². By implementing the elements identified in the DESMOND study^{7,8} – namely by initiating early teaching interventions that are fully adopted by patients with the needed lifestyle adaptations – this risk factor should be mitigated effectively. Furthermore, toenail clipping should be taught as a skill to both patients and their immediate caregiver/family circle as this skill is generally poorly executed yet it creates a huge risk burden towards lower limb loss.

In addition, patients in West Asian and Arabic regions have lifestyle habits that may add to their risk for developing a DFU later in the diabetes disease process. This includes the use of open-toed and open-heeled slip-on type of footwear that is very traditional in the region. Furthermore, the traditional practice in these regions is to be barefoot inside the house and to leave the shoes at the front door. The current study group were observed demonstrating some of these practices by simply wearing this type of footwear when they attended the clinic.

Walking barefoot was of initial concern in the pre-test result as 90% indicated they went barefoot (Figure 10). This concern was alleviated somewhat by participants stating in the pre-test they understood walking barefoot to be dangerous. This view was confirmed in the post-test when all participants identified they understood walking barefoot to be dangerous. However, in practice, walking barefoot in houses is a habit that would be very hard to address as it is family mandated. Sufficient time during education sessions to address this issue of wearing footwear in the house is therefore vital for situations where bony prominences or foot deformities are problematic as those will be the areas subjected to skin breakdown if not off-loaded sufficiently with an off-the-shelf or custom-made offloading device or inner sole that has to be positioned within shoe. This issue was easily corrected with the educational intervention, as was the importance of having corns and calluses looked after by a professional person rather than to try and do self-care (Figure 10).

In summary, patients may be reluctant at first to accept this kind of information but, with proper explanation and better understanding, self-assessment and foot care skills can be taught. Effective communication with patients and healthcare providers is a key process in safe and quality healthcare¹¹. This is applicable specifically in the West Asian region where most of the healthcare workers are expatriates whereas patients are first language Arabic speakers with limited proficiency in English. As such, group teaching and a demonstration style of intervention followed by patient feedback demonstrations has proven itself effective to overcome many of these challenges and to establish trust despite major language differences.

Overall, post-test scores revealed participants had a better understanding of the importance of preventative foot assessments and skin care and had increased their ability to conduct their own foot self-care or in conjunction with a family member or carer. Sufficient retention of the knowledge content was achieved for all patients who participated in this study.

CONCLUSION

Involving patients in their own plan of care is an integral part of disease awareness and prevention of complications. Most of the patients in this study were not implementing the principles and practices of basic foot care (Figures 4 & 5) into their daily care routine; this was most likely due to being unaware of the gravity of complications that follows over the longer term.

Cultural practices play a vital role and will remain a challenge to address in the Western Asian/Arabic cultural environment. Lack of knowledge on the other hand, can be addressed within a patient-centred approach based on their own identified needs. Despite all the challenges, patient-centred health education remains the responsibility of healthcare providers within a proactive patient care approach. This can be accomplished by using every patient visit as an opportunity to provide specific educational interventions in order to ensure mastery of all skills related to foot self-care, most importantly toenail clipping, skin care, and the wearing of approved footwear to prevent DFUs.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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