Influence of diabetes-related knowledge on foot ulceration

Cynthia Formosa, Lourdes Vella

To investigate the relationship between diabetes-related knowledge and foot ulceration among people with type 2 diabetes, the authors assessed diabetes knowledge in groups with and without foot ulceration. There was no significant difference in diabetes-related knowledge between the two groups, although the mean level of knowledge in the group with foot ulceration was greater. The authors' question current approaches to diabetes education and suggest that a new approach to diabetes education programmes is needed.

Article points

1. This study aimed to explore the relationship between diabetes-related knowledge and foot ulceration in a Maltese population with type 2 diabetes.
2. No significant difference in diabetes-related knowledge was found to exist between those with and without foot ulceration.
3. Diabetic foot ulcers are a global concern leading to patient morbidity and mortality, and improvements in the approach to diabetes education may improve outcomes.

Key words:
- Diabetes-related knowledge
- Foot ulcer prevention
- Health behaviours

The incidence of diabetes is increasing worldwide and an estimated 1–4% of people with type 2 diabetes develop a foot ulcer each year (Boulton et al, 2005). This is of concern for both people with diabetic foot ulceration and healthcare providers, with episodes of ulceration strongly associated with lower-extremity amputations, reduced quality of life, long periods of hospitalisation and substantial healthcare costs (Boulton et al, 2005).

Research suggests that the complications of diabetes – including foot ulceration – could be prevented or ameliorated by long-term good glycaemic control (UK Prospective Diabetes Study Group, 1998; Jabbar et al, 2001). However, optimal long-term glycaemic control requires good self-management and, with less than a third of people with diabetes in Europe achieving good glycaemic control (HbA_{1c} level ≤6.5% [≤48 mmol/mol]; Liebl et al, 2002), it has been suggested that people with diabetes are not being effectively educated and supported to achieve good self-management.

Strine et al (2005) reported that 50–80% of people with diabetes worldwide have significant knowledge deficits in relation to the management of their condition. These data suggest that people are either not receiving diabetes education, or that the education offered is not effective. A fuller understanding of the factors that contribute to suboptimal self-management, leading ultimately to distressing and costly diabetic complications, is important if improvements in diabetes outcomes are to be achieved (Perrin et al, 2009).

Here, the authors explore the relationship between diabetes-related knowledge and foot ulceration in a Maltese cohort.

Background

Ten percent of the Maltese population has diabetes, compared with 2–5% of the population in its neighbouring European countries (Rocchiccioli et al, 2005). Expectably, foot ulceration, and ulcer recurrence, is common in the Maltese population with diabetes (Galea et al, 2009).

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Page points

1. Participants eligible for this study were Maltese, aged >45 years with type 2 diabetes
2. The outcome variable measured for both groups was diabetes-related knowledge, assessed by the Diabetes Knowledge Questionnaire, which was read to participants in one-to-one interviews in the Maltese language.
3. No significant difference was found between the Diabetes Knowledge Questionnaire scores of the two groups, however the mean score of the case group was higher than that of the controls.

Aim

To determine whether diabetes-related knowledge correlated with diabetic foot ulceration.

Methods

Individuals were recruited from the Diabetes Podiatry Clinic, Mater Dei Hospital, Malta (the only public hospital in Malta). An average of 5000 people attend the Diabetes Podiatry Clinic annually, with approximately 500 experiencing ulceration (Mater Dei Hospital, 2007).

Participants eligible for this study were Maltese, aged >45 years with type 2 diabetes (World Health Organization diagnostic criteria; WHO, 2011). People presenting with an active ulcer were invited to participate as the case group; people attending for routine podiatry care with no history of ulceration were invited to participate as the control group.

This study was approved by the Ethics Board of the University of Malta.

Outcome measure

The outcome variable measured for both groups was diabetes-related knowledge, assessed by the Diabetes Knowledge Questionnaire (DKQ-24; Garcia et al, 2001). This scale was developed for use in people with type 2 diabetes and is a reliable and valid measure that is easy to administer. Items include general diabetes information, urine and blood testing, diet and foot care. The DKQ-24 was read to participants in one-to-one interviews in the Maltese language (previously translated into Maltese by Formosa et al [2008]).

As a surrogate measure of the application of diabetes-related knowledge, mean HbA_{1c} levels of the two groups were recorded and compared.

Statistical analysis

Data were analysed using SPSS version 14 (IBM, Chicago, IL). Normality of distribution was established using a Kolmogorov Smirnov test. One-way analysis of variance was used to determine differences in the mean.

Results

All those who met the inclusion criteria were invited verbally and in writing and all agreed to participate (30/30 [15 with foot ulcers; 15 with no history of foot ulceration]; 100% response rate). Both groups were matched for age, sex, education level, duration of diabetes, current medications and weight. No more than a 5-year difference was accepted for age or duration of diabetes for people matched in the two groups.

Diabetes knowledge scores

Table 1 shows the DKQ-24 scores for each group. When comparing knowledge scores between the two groups, no significant difference was found (P=0.671). However, the mean DKQ-24 score of the case group was higher than that of the controls (18.53 vs 18.07; *Table 2*).

HbA_{1c}

Mean HbA_{1c} levels are shown in *Table 3*. No significant difference between the HbA_{1c} levels of the two groups was found (P=0.312).

Table 1. Comparison of Diabetes Knowledge Questionnaire (DKQ-24) scores between the case and control groups.

Group	DKQ-24 score, mean (SD)*
Control (n=15)	18.07 (±0.76)
Case (n=15)	18.53 (±0.78)

*P=0.671. SD, standard deviation.

Table 2. Statistical analysis of the Diabetes Knowledge Questionnaire scores of the case and control groups.

	Between groups	Within groups	Total
Sum of squares	1.633	284.667	250.300
df	1	28	29
Mean square	1.633	8.881	
F	0.184		
***P*-value**	0.671		

df, degrees of freedom.

Table 3. Mean participant HbA_{1c} levels.

Group	HbA_{1c}, mean % (SD)
Control (n=15)	7.3† (±1.3)
Case (n=15)	7.8‡ (±1.3)

†56 mmol/mol; ‡62 mmol/mol. SD, standard deviation.

However, the mean HbA_{1c} in the case group was higher than in the controls (7.8% [62 mmol/mol] vs 7.3% [56 mmol/mol]).

Discussion

This is the first study to explore the relationship between diabetes-related knowledge and foot ulcer prevalence in a Maltese cohort. The evidence suggests that there is no significant difference in diabetes-related knowledge between people with foot ulceration and those with no history of ulceration.

Previous studies on the relationship between diabetes-related knowledge and diabetes outcomes have reported conflicting results (Norris et al, 2002; Tankova et al, 2004; Valk et al, 2005; Formosa et al, 2008; Dorresteijn et al; 2010). Few have demonstrated what might intuitively be expected; that greater diabetes-related knowledge translates into improved glycaemic control for greater than 3–6 months, and the prevention of diabetic complications (Sánchez et al, 2005; Valk et al, 2005; Mauldon et al, 2006; Adolfsson et al, 2007). In a systematic review, Dorresteijn et al (2010) concluded that there was insufficient evidence to show that knowledge acquired through health education interventions reduced the incidence of diabetic foot ulceration.

Many of the existing diabetes education programmes have been criticised for being centred on knowledge and physiological outcomes, and placing little importance on a person's beliefs and experience of living with their condition (Sigurdardottir et al, 2007). Furthermore, knowledge alone does not always lead to behavioural change (Rafique and Shaikh, 2006), while culture is known to strongly influence behaviour (Lifshitz, 2006).

Page points

1. Previous studies on the relationship between diabetes-related knowledge and diabetes outcomes have reported conflicting results.
2. In a systematic review, Dorresteijn et al (2010) concluded that there was insufficient evidence to show that knowledge acquired through health education interventions reduced the incidence of diabetic foot ulceration
3. Existing diabetes education programmes have been criticised for little importance on a person's beliefs and experience of living with their condition.

Page points

1. Health behaviour is complex and there are numerous models designed to help understand its processes.
2. Diabetic foot health education programmes must adopt appropriate approaches, which may require a combination of concepts from more than one of the health behaviour theories.
3. Innovative approaches to diabetes education are needed in order to translate investment in self-management skills into long-term improvements in the quality of life of people with diabetes, and decrease the incidence of costly complications, including foot ulceration.

Several studies have looked specifically at how culture affects the interpretation and experience of diabetes and its management (Lai et al, 2005; Carbone et al, 2007; Sowattanangoon et al, 2009). These studies highlight the need to recognise the importance of culture, beliefs, lifestyle and priorities when developing educational strategies, if they are to translate into effective self-management (Formosa et al, 2008). To improve outcomes – and returns on investments in education – the educational approach adopted must be relevant to the population it serves and address cultural aspects of health beliefs.

The higher incidence of type 2 diabetes and its complications in Malta, as compared with broadly similar surrounding populations, suggests the contribution of uniquely Maltese traditions and cultural habits to the pathophysiology of this condition. Mitchell (2002) describes Maltese people as particularly reluctant to relinquish certain long-standing traditions (e.g. festivals), which often centre on food. Many of the culturally valued foods in Malta are not among those that could be recommended as part of diet for the good management of diabetes, yet failing to participate in food traditions may interfere with social relationships. Thus, achieving change in health behaviour in the Maltese population will require an understanding of, and strategies for addressing, aspects of culture that impact diabetes self-management.

Health behaviour is complex and there are numerous models designed to help understand its processes (Cockburn, 2004). Most of the prominent health behaviour theories (i.e. health belief model [Becker, 1974]; theories of reasoned action and planned behaviour [Ajzen and Fishbein, 1980]; social cognitive theory [Bandura 1986]; transtheoretical model [Prochaska and Di Clemente, 1986]) emphasise self-efficacy, that is, the development of self-management skills and self-confidence by the person with the condition. They also highlight the importance of social role models (family and peer groups), and the importance of recognising that individuals in a population may be at different stages of change.

Diabetic foot health education programmes – if they are to translate into positive behavioural changes and improve outcomes for people with diabetes – must adopt appropriate approaches, which may require a combination of concepts from more than one of the health behaviour theories. The authors suggest that the time has come to move away from traditional diabetes-related education, which has failed in a number of settings to translate into sustained, positive outcomes. Innovative approaches to diabetes education are needed in order to translate investment in self-management skills into long-term improvements in the quality of life of people with diabetes, and decrease the incidence of costly complications, including foot ulceration.

One example of a diabetes education programme that has been demonstrated to achieve measurable improvements in outcomes is DESMOND (Diabetes Education and Self-Management for Ongoing and Newly Diagnosed; www.desmond-project.org.uk). This programme aims to support participants in making sustained, positive lifestyle choices to improve their diabetes control, emphasising both education at the time of diagnosis and "toping-up" diabetes knowledge at later stages (Lucas and Walker, 2004). In an uncontrolled pilot study, the DESMOND programme changed key illness beliefs, and these changes predicted improved quality of life and metabolic control at 3-month follow-up (Skinner et al, 2006). In a cohort reported on by Davies et al (2008), participation in the programme resulted in greater improvements in weight loss, smoking cessation and beliefs about illness, however no difference in HbA_{1c} levels up to 12 months after diagnosis.

Study limitations

It is acknowledged that the present study is limited by the size of the recruited cohort and statistical significance for the outcomes measured may not have been reached for this reason.

Conclusion

Previous studies have investigated the relationship between diabetes-related

knowledge and foot ulcer prevalence. This is the first study to explore the question in a Maltese cohort, and the results were largely consistent with those of previous authors. The evidence suggests that there is no significant difference in diabetes-related knowledge between people with and without foot ulceration. Improvements in the approach to diabetes education – with attention given to local cultural differences and the application of health behaviour theories – may improve outcomes for people with diabetes. ■

Acknowledgements

The authors are grateful to Alexandra A Garcia for permission to use the DKQ-24 questionnaire. The authors would also like to thank the podiatrists at Mater Dei Hospital for their help during data collection for this study.

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