Prevalence of diabetic foot complications in the west of Ireland: A pilot study

Sarah Kelly, Catherine Dolan, Lorna Hurley, Laura Kelly, Adam Garrow, Eamonn O'Shea, Liam Glynn, Sean Dinneen

Article points

1. The present study is a cross-sectional pilot designed to identify the prevalence of diabetic foot complications in a primary care setting in the west of Ireland.
2. Neural and vascular dysfunction of the foot were detected in up to 30% and 17% of participants, respectively.
3. Based on this pilot, a protocol was developed for the West of Ireland Diabetes Foot Study, a 3-year prospective study on the incidence, cost and feasibility of screening for diabetic foot complications.

Key words:
- Diabetic foot complication incidence
- Foot screening
- West Ireland

Author details can be found on the last page of this article.

The incidence of diabetic foot complications in the Republic of Ireland is not known. A cross-sectional pilot study was undertaken to identify the prevalence of diabetic foot complications in a primary care setting in the west of Ireland, and to inform the design and feasibility of a larger community-based diabetic foot screening study in Ireland. Clinically important pedal neural dysfunction was detected in up to 30% of those screened, and vascular impairment was detected in some 17%.

Foot complications are considered to be the most costly diabetes-related complication, accounting for up to 20% of total healthcare resources available for diabetes in developed countries (International Diabetes Federation [IDF], 2009). A study carried out at St James Hospital, Dublin, reported that annual hospital expenditure on the treatment of diabetic foot ulceration amounted to €704 000 (Smith et al, 2004).

The prevalence of diabetes in the Republic of Ireland is estimated to be 4.7% of the population (Institute of Public Health in Ireland, 2006), but the condition's true prevalence is not known. Likewise, the true prevalence of diabetic foot complications in Ireland is not known.

Current national and international guidelines (NICE, 2004; IDF, 2009; SIGN, 2010) recommend that people with diabetes should receive a comprehensive annual foot examination. Diabetic foot screening in the primary care setting is not routinely undertaken in Ireland.

The present study is a cross-sectional pilot, designed to identify the prevalence of diabetic foot complications in a general practice population in the west of Ireland. This pilot study was undertaken to inform the design and feasibility of a large community-based diabetic foot screening study in the west of Ireland.

Methods

People (≥18 years of age; with type 1 or 2 diabetes) on the diabetes register of an urban

Table 1. Participant (*n*=30) demographic data.	
Age†	**64.2**
Diabetes	
Type 2 (*n*)	24
Type 1 (*n*)	6
Duration†	11.6

†Average years.

general practice in the west of Ireland were invited to attend a foot screening examination. A letter was sent by the research team inviting them to make a foot screening appointment at the Community Podiatry Department, Primary Community and Continuing Care, Health Services Executive West.

This study was approved by the Research Ethics Committee of the Irish College of General Practitioners. All participants provided written consent to undergo foot screening.

Screening

Screening was undertaken by two medical students under the supervision of a community podiatrist. Individual screening assessments took approximately 15 minutes.

The sensory and vascular tests used for screening were selected based on a review of the literature, international guidelines and consultation with experts in the field.

Sensory assessment

Tests performed to assess pedal sensory perception were: (i) a 10-g monofilament; (ii) the modified neuropathy disability score (mNDS); and (iii) a vibration perception threshold test. These tests, and the normal range for results, are described in *Box 1.*

Vascular assessment

Vascular assessment comprised bilateral palpation of dorsalis pedis and posterior tibial pulses and measurement of the ankle–brachial pressure index (ABPI). A participant history was taken to determine if the participant had experienced intermittent claudication, indicating vascular insufficiency.

If two of the four pedal pulses were impalpable, the result was deemed abnormal (Abbott et al, 2002). An ABPI <0.9 was considered abnormal, and >1.3 was considered significantly elevated and indicative of vascular calcification (Boulton et al, 2008).

Results

Of the 69 people who met the inclusion criteria and were invited, 30 attended for foot screening (response rate, 43%). Participant demographic data are summarised in *Table 1.*

Screening outcomes

Results of the screenings are shown in *Table 2.* Neuropathy was detected in between 19% (3/16, detected by the vibration perception threshold test) and 30% (9/30, detected by a 10-g monofilament) of participants. Evidence of vascular impairment, based on pedal pulse palpation, was found in 17% (5/29) of participants. The average ABPI among the participants in whom it was recorded (*n*=22) was 1.12 (range, 0.95–1.37).

Some technical difficulties were encountered during the screening process. While the 10-g monofilament, mNDS and pedal pulses were recorded for ≥97% (29–30/30) of participants, ABPI and vibration perception threshold tests were less uniformly carried out with success.

Problems encountered using the ABPI were possibly related to non-compressible vessels and the use of an automated sphygmomanometer. An ABPI was reported for only 73% (22/30) of participants. The

Box 1. Tests used to detect signs of neural dysfunction.

10-g monofilament test

The 10-g monofilament is used to assess light-touch sensation, and failure to perceive the pressure of the monofilament indicates profound neuropathy and is associated with increased risk of ulceration (Young et al, 1986; Young, 2008). Recommendations on the number of sites on the foot to be tested vary, but most consider a lack of perception at any site to be abnormal (Singh et al, 2005). In the present study, the 10-g monofilament was applied to five standardised points on each foot (ten in total). The absence of sensation in two or more of the ten sites was considered abnormal.

Modified neuropathy disability score (Young et al, 1993)

The modified neuropathy disability score is a composite assessment of pinprick, temperature, vibration perception and the presence or absence of ankle reflexes. Scores range from 0–10, with higher scores signifying more severe sensorimotor dysfunction. A score of ≥6 is associated with an increased risk of foot ulceration (Abbot et al, 2002) and was considered abnormal in the present study.

Vibration perception threshold test (Garrow and Boulton, 2006)

Using a neurothesiometer, a vibration perception threshold of >25 V in one or both feet is associated with a high cumulative risk of ulceration (Abbott et al, 1998). Values between 16 V and 24 V indicate intermediate ulcer risk, and values <15 V indicate low ulcer risk (Young et al, 1994). A result ≥25 V was considered abnormal in the present study.

neurothesiometer was not available to the clinicians carrying out the screening at all times, resulting in only 53% (16/30) of participants being scored for the vibration perception threshold test.

Discussion

Data from this pilot study indicate that a sizeable number of people with diabetes attending an urban general practice in the west of Ireland have vascular insufficiency and abnormal measures of neural function in their feet. These findings are of concern given the associations between lower-limb vascular insufficiency, neuropathy and increased risk of ulceration (Nather et al, 2008).

Prevalence comparison

It is interesting to compare the data presented here, with those of a large UK-based cohort – the North-West Diabetes Foot Care Study (Abbott et al, 2002). Abbott et al report foot screening of 9700 people with diabetes.

The North-West Diabetes Foot Care Study found that 21% of participants were insensitive to a 10-g monofilament at one or more sites out of eight. The present study found that 30% of participants were insensitive to a 10-g monofilament at two or more sites out of ten. Twenty-two percent of the North-West cohort had abnormal mNDS', while 13% in the present study returned an abnormal score for this measure.

Vascular insufficiency was detected in 17% of the present cohort using pedal pulses. Twenty-one percent of the North-West cohort were recorded as having abnormal pedal pulses.

Discrepancies between the results reported by Abbott et al (2002) and those in the present study may reflect a number of population, sampling and instrument variations. The present cohort was smaller than that reported by Abbott et al (2002). There may have been differences in the techniques used by the screening clinicians, or measurement errors may have occurred. Results from the present study suggest that estimates of vascular and neurological dysfunction are likely to vary depending on the methods of screening used.

The West of Ireland Diabetes Foot Study

Although the present cohort was small, this pilot proved informative for the development of a larger foot screening study. Based on this pilot, a protocol has been developed for the West of Ireland Diabetes Foot Study, a 3-year prospective study on the incidence, cost and feasibility of screening for diabetic foot complications in this population. Funded by the Diabetes Federation of Ireland and the Health Research Board, this study aims to recruit 560 people with diabetes from approximately 12 general practices in Counties Galway and North Clare to be involved in a foot screening programme.

Practice and public health nurses from participating practices will be invited to attend a foot-screening workshop on vascular and neurological assessment of the foot. With the support of a podiatrist, people with diabetes from these practices will be invited

Page points

1. The neurothesiometer for vibration perception threshold testing was not available to the clinicians carrying out the screening at all times.
3. The North-West Diabetes Foot Care Study found that 21% of participants were insensitive to a 10-g monofilament, in the present study the figure was 30%.
4. Based on this pilot, a protocol was developed for the West of Ireland Diabetes Foot Study, a 3-year prospective study on the incidence, cost and feasibility of screening for diabetic foot complications in this population.

Table 2. Results of foot screening assessments of the study participants (*n*=30).

	Participants *n* (%)	Normal *n* (%)	Abnormal *n* (%)	
10-g monofilament†	30 (100)	21 (70)	9 (30)	
Vibration perception threshold‡	16 (53)*	13 (81)	3 (19)	
Modified neuropathy disability Score¶	30 (100)	26 (87)	4 (13)	
Pedal pulses§	29 (97)	24 (83)	5 (17)	
Ankle–brachial pressure index††,‡‡	22 (73)**	20 (91)	Abnormal 0 (0)	Significantly elevated 2 (9.1)

†Abnormality defined as insensate at ≥2 of 10 sites. ‡Abnormality defined as ≥25 V. ¶Abnormality defined as a score ≥6. §Abnormality defined as lack of two of the four dorsalis pedis or posterior tibial pulses. ††Abnormality defined as <0.9. ‡‡Significantly elevated defined as >1.3. *The neurothesiometer was not available for all measurements. **Some technical problems were encountered with ankle–brachial pressure index measurement, possibly related to non-compressible vessels and the use of an automated sphygmomamometer.

Page points

1. The West of Ireland Diabetes Foot Study will look at aspects of health economics related to the diabetic foot.
2. It is hoped that the findings of the West of Ireland Diabetes Foot Study will support the development of an evidence-based protocol and integrated care pathway for the management of diabetic foot disease.
3. Podiatry input is critical to proper management of the diabetic foot and it is hoped that the new NUI Galway podiatry honours degree programme will ensure a regular supply of podiatrists for the Irish Health Service.
4. This pilot highlights the need for diabetic foot screening in the community setting.

to attend a foot screening, with appropriate follow-up and specialist referral as necessary.

The study will determine the prevalence of diabetic foot complications in this population. In addition, the effectiveness of commonly used screening tools – assessed both as individual items and in combinations – will be assessed to develop a standardised, effective method of foot screening.

An additional aim of the West of Ireland Diabetes Foot Study will be to look at aspects of health economics relating to the diabetic foot. The cost of new episodes of diabetic foot ulceration in the study population will be calculated prospectively.

It is hoped that the findings of the West of Ireland Diabetes Foot Study will support the development of an evidence-based protocol and integrated care pathway for the management of diabetic foot disease. From a service development standpoint, the study should equip participating practice staff with the knowledge and skills to perform diabetic foot screening within their practice. The study will have implications for the delivery of routine diabetes care in the west of Ireland.

Service development

In the absence of a formal foot screening initiative, it is likely that people at risk of foot ulceration go unrecognised. Yet, the clinical skills for diabetic foot screening are not elaborate, and are likely to be within the scope of a well-informed and well-trained practice team. Prerequisites for such a programme are the development of a diabetes register in the practice (not all practices in Ireland have such a register [Evans et al, 2009]), training of practice staff in foot screening and remuneration for the delivery of preventive services within the GP contract.

The Department of Health and Children, the Irish College of General Practitioners and the Irish Endocrine Society have published joint guidance on type 2 diabetes care (Harkins, 2008). The importance of diabetic foot screening was highlighted and a useful protocol for the classification and management of the diabetic foot provided. The guidance recommends that foot screening be undertaken by members of the practice team.

Podiatry input is critical to proper management of the diabetic foot. The *Diabetes Expert Advisory Group First Report* (Health Service Executive, 2008) reveals that Ireland has the lowest manpower in podiatry for diabetes in Europe, with only two full-time posts in the whole country. In 2002, the Diabetes Federation of Ireland published region-by-region data on the manpower deficit and estimated that two full-time diabetes podiatrists are needed per 100 000 head of population in Ireland. Thus, some 90–100 full-time podiatrists are required to assess and manage diabetes-related foot complications.

In September 2008, the NUI Galway opened its doors to its first cohort of podiatry students undertaking a 4-year honours degree programme. Until the graduation of this class, Ireland will – as it has in the past – rely on UK-trained podiatrists. It is hoped that NUI Galway's School of Podiatry programme will ensure a regular supply of podiatrists for the Irish Health Service. It is incumbent on the Irish Health Service Executive to develop a podiatry manpower plan so that these new podiatry graduates can support the formation of multidisciplinary diabetic foot care teams in Ireland.

Conclusion

This pilot highlights the need for diabetic foot screening in the community setting. Results from the forthcoming West of Ireland Diabetes Foot Study will provide further data on the incidence of diabetic foot complications in this population, and the role of primary care clinicians in screening and risk assignment. It is hoped that diabetic foot screening in the primary care setting in Ireland will shift the burden of diabetic foot care away from episodes of end-stage, complex, expensive ulceration and amputation, and towards early intervention and prevention. ■

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Contributors

Sarah Kelly and Catherine Dolan are Junior Doctors, both are based at the Department of Medicine, NUI Glaway, Galway; Lorna Hurley is a Community Diabetes Facilitator and Laura Kelly is a Senior Podiatrist, both are based at the Diabetes Day Centre, University Hospital Galway and the Primary Community and Continuing Care, Health Services Executive West, Galway; Adam Garrow is a Research Podiatrist and Epidemiologist, Centre for Social Justice Research, University of Salford, Salford; Eamonn O'Shea is a GP, Department of General Practice, NUI Galway, Galway; Liam Glynn is a Lecturer in Primary Care, Department of General Practice, NUI Galway, Galway; Sean Dinneen is a Consultant Endocrinologist and Senior Lecturer in Medicine, Department of Medicine, NUI Glaway and Diabetes Day Centre, University Hospital Galway, Galway.

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