Fear of falling is common in patients with type 2 diabetes and is associated with increased risk of falls

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Abstract

Aims: fear of falling is an important falls-related symptom that has received little attention in studies of falls risk in older adults with type 2 diabetes.

Methods: matched pairs of participants with diabetes or with normoglycaemia (n = 186 per group) recruited from a community-based survey underwent an assessment of fear of falling and associated falls risk factors. Multivariate methods examined associations between fear of falling and risk factors for history of recent falls.

Results: compared with the normoglycaemic participants, those with diabetes had worse mobility (slow timed Up and Go test times: 16.2 versus 4.9%, P < 0.01), more fear of falling (24.2 versus 15.1%, P < 0.05) and more activity restriction from fear of falling (indoors: 14.0 versus 4.8%, P = 0.006), but there was no increase in reported recent falls. In the combined sample, a history of recent falls was negatively associated with fear-related limitation of outdoor activities (odds ratio (95% confidence interval): 0.30 (0.15–0.58), P < 0.001) and positively associated with age (1.65 (1.20–2.28) per 10-year increase, P = 0.002) and use of antidepressants (2.14 (1.02–4.50, P = 0.044). The frequency of falls in those with recurrent falls was negatively associated with measures of balance.

Conclusions: type 2 diabetes is associated with increased fear of falling and fear-associated activity restriction, and this modifies the risk of falls even in the face of increased falls risk factors including worse mobility. Future studies of falls in diabetes need to consider that fear of falling is an important modifier of the relationship between risk factors and falls.

Keywords: falls, diabetes, mobility, older people

Introduction

Type 2 diabetes is associated with balance and gait abnormalities [1, 2] and an increased risk of falls and injury [3, 4]. Possible diabetes-associated risk factors for falls include neuropathy, polypharmacy, cognitive impairment, peripheral arterial disease, vision loss, hypoglycaemia and insulin therapy [5–10].

Fear of falling is an important psychological symptom that has been little studied in diabetes. Fear of falling is a risk factor for falls and injury, probably because it leads to activity restriction and subsequent deconditioning [11–13]. In most individuals, the presence of fear of falling accurately reflects self-perceived difficulties with balance or gait [14], and resulting activity restriction is related to avoidance of hazardous activities. Fear of falling can be improved, and this may lessen the risk of falls [15]. Fear of falling could be more common in diabetes given the high rate of balance and gait impairments [1, 10], but, to our knowledge, no studies have addressed this. In the present study, we assessed fear of falling and associated falls risk factors in patients with type 2 diabetes and a matched control group to determine whether fear of falling is more common in diabetes and whether it modifies or mediates the relationship between risk factors and falls.
Patients and methods

The Busselton Diabetes Study (BDS) is an observational study of known diabetes and age- and sex-matched normoglycaemic residents from the rural shire of Busselton (population 31,000) in south-west Western Australia. The present study is based on cross-sectional baseline data collected in 2009. Study participants were identified from prior involvement with the Busselton Health Survey (BHS), a series of community-based health studies that commenced in 1966. A survey of surviving BHS participants was conducted in 1994/95 and a further survey conducted in 2005–07. In 2009, residents diagnosed with diabetes in the 1994/95 and 2005–07 surveys were invited to participate in this study and a control group randomly selected from age- and sex-matched residents identified as not having diabetes was recruited as a comparison group (ratio 1:1). Recruitment of participants with diabetes was supplemented through health professional referral, word of mouth and advertising. World Health Organisation/Iriinternational Diabetes Federation recommendations [16] were used to confirm diabetes/normoglycaemia classifications (originally based on self-reports and fasting glucose levels). Several BHS-identified participants with diabetes were reclassified as normoglycaemic (no antidiabetic medications, fasting serum glucose <6.1 mmol/l), and several previously considered normoglycaemic were re-classified as having diabetes (fasting glucose ≥7.0 mmol/l); impaired fasting glucose cases were excluded.

Clinical assessment

Study participants underwent a comprehensive assessment (questionnaires, clinical examination, fasting blood and urine samples) that included measures of control, complications, macrovascular disease, co-morbid conditions and medications. Neuropathy was defined using the clinical portion of the Michigan Neuropathy Screening Instrument as previously described [17–20]. Supine and erect blood pressure was measured using standard sphygmomanometry, and systolic pressure measured in posterior tibial and dorsalis pedis arteries using a Doppler probe. The ankle: brachial index (ABI) was calculated and peripheral arterial disease (PAD) defined as ABI ≤ 0.90 or any PAD-related amputation [21]. Cardiovascular disease was defined by self-reported history of myocardial infarction, angina, coronary surgery/angioplasty and stroke/TIA. Low vision was defined as acuity worse than 6/19 in the best eye with correction (logMAR chart). Depression assessment used the 9-item Patient Health Questionnaire (PHQ-9) [22].

Assessment of fear of falling, falls and mobility

The questionnaire included validated questions on falls and fear of falling [12, 23]: ‘We want to ask you about the problem of falls that can affect some people (these are often due to slips, trips or balance problems): have you ever fallen over (yes/no)? If yes, how many times have you fallen over in the last 3 months? Are you afraid of falling (yes/no)? Do you limit any household activities because you are frightened you may fall (yes/no)? Do you limit any outdoor activities because you are frightened you may fall (yes/no)? The data were dichotomised to define history of recent falls, the presence of fear of falling and associated activity limitation (indoors or outdoors). The timed Up and Go (TUG) test assessed mobility using a standardised approach [24, 25]. Based on a recent meta-analysis that defined normal ranges [26], abnormal TUG was defined by a TUG time ≥10 s in 50–69 years, ≥11 s in 70–79 year olds and ≥13 s in 80–99 year olds. The sharpened Romberg test assessed standing balance [27, 28]; normal balance was defined as the ability to maintain tandem stance for 10 s.

Statistics

The computer packages IBM SPSS Statistics 19 (IBM Corporation, Armonk, NY, USA) and STATA IC 11.2 (StataCorp, College Station, TX, USA) were used for statistical analyses. Multivariate logistic regression was used to investigate independent associates of falls history and zero-inflated negative binomial regression (ZINB) to investigate fall frequency. This work was supported by a grant from Perpetual Trustees; the funders took no role in the study conception, analysis or manuscript preparation.

Results

A total of 186 residents with type 2 diabetes were age and sex matched (50% men) with 186 normoglycaemic residents, mean age 70.3 ± 10.1 years (see Table 1). The median diabetes duration was 8.6 [IQR: 5.0–13.8] years; 38.4% were diet controlled, 45.9% were taking oral antidiabetic agents and 15.7% were taking insulin. The groups were matched in educational attainment and income, but more participants with diabetes were born overseas and fewer had a European ethnic background. The participants with diabetes had more obesity, neuropathy and microalbuminuria; more were taking antihypertensive medications; they had a lower median alcohol intake and worse performance on the TUG test. Both fear of falling and fear-associated restriction of indoor activity were significantly more common in those with diabetes. There was no difference in the rate of falls or recurrent falls between the groups.

Associations with falls

As falls rates were similar between the groups, we combined them for further analyses. In bivariate analyses, variables significantly associated with recent falls were older age, peripheral neuropathy, use of antidepressants, fear of falling, fear-related limitation of indoor and outdoor activities and slower TUG times (all \( P \leq 0.044 \)). Orthostatic hypotension was uncommon (4.0%) and not associated with falls (\( P = 0.66 \)). With multiple logistic regression in which clinically plausible variables with
bivariate $P < 0.20$ were considered for entry, history of recent falls was independently associated with age (odds ratio (95% confidence interval (CI)): $1.65$ (1.20–2.28) per 10-year increase, $P = 0.002$), use of antidepressants ($2.14$ (1.02–4.50), $P = 0.044$) and (negatively) with fear-related limitation of outdoor activities ($0.30$ (0.15–0.58), $P < 0.001$). With ZINB regression, after adjustment for the above factors (age, antidepressant use, outdoors limitation), fall frequency was increased in those with poor standing balance (incident rate ratio (95% CI): $2.32$ (1.15–4.70), $P = 0.019$).

Discussion

In this cross-sectional, matched case-cohort study, fear of falling and fear-associated activity restriction were more common in participants with type 2 diabetes with indoor activity restriction being reported at almost three times the rate seen in the normoglycaemic participants. Despite this and their having worse performance on the TUG test, the participants with diabetes did not report more recent falls than the normoglycaemic participants. This apparent paradox appeared to be explained, at least in part, by fear-related activity restriction that was negatively associated with falls history in the combined sample. Fear-related activity restriction may provide short-term protection against falls, and it is more common in type 2 diabetes mainly because of the associated mobility limitation. This may explain a previous finding where the increased risk of falls due to diabetes only became evident after follow-up [4]. As fear of falling leads to functional decline and increases falls in the long term [13], any protective effect is likely to be short lived until the consequences of activity restriction lead to harmful reductions in mobility and balance.

The increased prevalence of fear of falling in diabetes is probably explained by the excess balance and mobility impairments, but may also be related to other relevant variables including obesity, depression and diabetes-related complications. There was no evidence to implicate diabetic neuropathy as a cause of falls or fear of falling in our sample, consistent with some previous studies [3, 4]. Although neuropathy was more common in the diabetic participants in our study, it was also present in over 40% of the control sample, consistent with the only large population-based study in older adults [29].

The strengths of the study are the matched study design, recruitment from a community-based survey, the comprehensive assessment and the use of validated fear-related questions. The limitations include the cross-sectional design, relatively small sample size and the use of falls questions that only asked about the previous 3 months, chosen to minimise errors due to memory. Simple questions on fear of falling, practical for epidemiological studies [12, 23], may provide limited information compared with other methods.

In summary, fear of falling and associated activity restriction modify the relationship between risk factors and falls and are more prevalent in diabetes. The assessment and management of fear of falling are indicated in studies of falls risk in diabetes.

Key points

- Fear of falling is more common in type 2 diabetes.
- Associated with activity restriction.
- May modify the short-term risk of falls.
- Should be assessed in comparative studies of falls in diabetes.

Conflicts of interest

None declared.

References


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