Undetected type 2 diabetes in older adults

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Abstract

Background: early detection and prompt treatment of type 2 diabetes mellitus (T2D) may reduce the complications and burden associated with the disease.
Objective: to evaluate the rate of undetected T2D (UT2D) among older adults who were screened 25 years ago, identify the characteristics of UT2D patients and suggest a high-risk profile most suitable for screening.
Methods: a cross-sectional study of a group of 623 older adult survivors of 25-year cohort, 53.5% males, aged 58–93 years in a personal interview on lifestyle habits, morbidity and medication use. Self-administered measurement of subjective health perception. Anthropometric measurements, laboratory examinations of 12-h fasting venous blood and 2-h oral glucose tolerance tests were carried out.
Results: the prevalence of previously diagnosed diabetes was 18.9% and of UT2D 13.2%. The likelihood of having UT2D was higher for males, those with systolic blood pressure ≥130 mmHg, triglycerides ≥1.7 mmol/l (150 mg/dl) and large waist circumference; all are components of the metabolic syndrome. Compared to known diabetic patients, the undetected were predominantly males, slightly younger, rated their health status more favourably and had less comorbidities.
Conclusion: a large proportion of older adults with T2D were undiagnosed. Screening efforts for T2D should address those exhibiting characteristics of the metabolic syndrome in a seemingly healthy population of older adults.

Keywords: detection, type 2 diabetes, risk profile, screening, subjective health, elderly

Introduction

Type 2 diabetes mellitus (T2D) is becoming increasingly prevalent [1], yet it remains undiagnosed in a significant proportion of patients. Studies [2–4] indicate that the prevalence of T2D ranges between 10% and 20%, depending on the age group, and that approximately half of the patients were previously undiagnosed.

Accumulating evidence suggests that earlier detection and prompt treatment might reduce the complications and burden of T2D [5, 6]. Screening for diabetes may present an opportunity for prevention of subsequent complications [7]. Selective screening of high-risk groups in the community or in clinical settings has been advocated for identifying individuals at high risk of T2D [7–9].

Several population-based studies have demonstrated that metabolic syndrome is indicative of individuals having 3- to 6-fold increased risk of T2D [10–13]. The predictive value of the metabolic syndrome in detecting T2D without applying fasting blood glucose as a criterion was demonstrated [11, 14]. Another potential screening tool for identifying those at risk of T2D is the subjective health instrument, which is often derived from a self-rated single-item response of individuals asked about their health. This tool has been used extensively for the estimation of the general health status of populations, and a poorer rating of one’s health was found to be strongly associated with increased morbidity and mortality [15–19].

Our objective was to evaluate the prevalence of known and undetected type 2 diabetes (UT2D) in a long followed-up cohort of older adults, and to distinguish those with UT2D from patients with recognised diabetes and from diabetes-free individuals. We also wanted to examine the possibility of using components of the metabolic syndrome and subjective health perception for screening such a group for UT2D.

Methods

Design and study population

In a cross-sectional analysis, 623 older adults were evaluated for their T2D status. These individuals were survivors of a cohort drawn from the Israel Central Population Registry for the Israel Study of Glucose Intolerance, Obesity and Hypertension (the Israel GOH Study), an ongoing
nationwide longitudinal study in which a sample of non-diabetic individuals born between 1912 and 1941 was examined and underwent a 100 g OGGT during the early 1980s [20]. The Institutional Review Board of the Sheba Medical Center approved the study, and all individuals consented in writing.

During the recent 6 years, we have conducted the third follow-up of this cohort (N = 1281), of whom 317 (24.7%) had died and 263 (20.5%) were lost to follow-up or refused re-examination. Of the remaining 701, 78 were excluded from the analysis because they were only telephone interviewed and had no blood tests to support their claim of no T2D morbidity.

The remaining 623 were included in the study. Of those, 505 reported they had no T2D and 118 were patients with diabetes. To assess information bias, we compared the 505 included participants to the 78 interviewees excluded from analysis. The excluded group was older than those included (73.5 ± 7.3 years versus 70.4 ± 6.9 years, respectively; \( P = 0.01 \)), had more females (64% versus 47%; \( P = 0.004 \)) and was more sedentary (56% versus 40%; \( P = 0.006 \)).

We also compared the group of 263 individuals lost to follow-up to the 623 included participants in order to assess selection bias. At baseline, the first were older (53 ± 7.9 versus 50 ± 7.0 years, respectively; \( P < 0.001 \)), had higher BMI (26.6 ± 4.2 versus 25.7 ± 3.7 kg/m²; \( P < 0.001 \)) and higher systolic blood pressure (125.0 ± 14.6 versus 120.8 ± 12.6 mmHg; \( P < 0.001 \)).

The prevalence of T2D in the 317 deceased cohort members was evaluated through an archival search in 14 major general hospitals (out of 23 in Israel), located in the relevant areas.

**Interview and laboratory examinations**

The included participants were interviewed by trained nurses in regional clinics and were asked about their lifestyle habits, medical history, use of medications and Health Maintenance Organization (HMO) affiliation. They were asked to rate their health as excellent, good, fair, not so good or bad. Height, weight, waist circumference and three blood pressure measurements were taken during the interview. Venous blood was drawn after a 12 h fast for glucose and lipids (total serum cholesterol, LDL and HDL cholesterol and triglycerides), albumin and creatinine. In the non-diabetic patients an OGGT was performed with 100 g of glucose, and blood glucose was determined after 2 h.

Plasma glucose was determined by hexokinase. Total serum cholesterol, triglycerides, HDL cholesterol and creatinine levels were determined by the Lipid and Metabolic Laboratory of Sheba Medical Center using an automated enzymatic technique (Boehringer Mannheim, Germany) and standardised against reference materials supplied by the Center for Disease Control and Prevention. HDL cholesterol was assayed after precipitation of the apolipoprotein B-containing lipoproteins with phosphotungstic acid; LDL-cholesterol levels were calculated using the Friedewald equation.

The following definitions were applied: diabetes free—not using hypoglycaemic medications and fasting blood glucose <7 mmol/l (126 mg/dl), and, when available, 2 h blood glucose <11.1 mmol/l (200 mg/dl); impaired glucose tolerance (IGT)—FPG 6.1–6.9 mmol/l (110–125 mg/dl), and/or, when available, 2 h blood glucose 7.8–11.0 mmol/l (140–199 mg/dl); diabetes—2 h blood glucose of ≥11.1 mmol/l (200 mg/dl) or fasting glucose ≥7 mmol/l (126 mg/dl), or reported diabetes (substantiated by documentation of prescriptions for oral hypoglycaemic medications or insulin, or medical reports); undetected diabetes—2 h blood glucose ≥11.1 mmol/l (200 mg/dl) or fasting glucose ≥7 mmol/l (126 mg/dl) in subjects unaware of having diabetes. Metabolic Syndrome was defined according to the NCEP/ATP-III classification [21], if two or more of the following risk factors were present: waist circumference >102 cm in men or >88 cm in women; mean blood pressure >129/84 mmHg or the use of antihypertensive drugs; triglycerides ≥1.7 mmol/l (150 mg/dl) and HDL cholesterol <2.2 mmol/l (40 mg/dl) in men and <2.8 mmol/l (50 mg/dl) in women. This definition does not include the later made modification to the treatment algorithm [22]. Fasting blood glucose was excluded as a criterion in this model because it is a component of both the metabolic syndrome and the outcome [11, 14]. CVD was considered with a reported history of myocardial infarction, stroke, transient ischaemic attack or peripheral vascular disease. Obesity was defined as BMI ≥30 kg/m².

**Statistical analyses**

All analyses were performed using SAS software. Means ± SD were calculated for continuous variables, and absolute and relative frequencies were measured for discrete variables. Univariate analyses were performed to test for associations between UT2D status (dependent variable) and various covariates. The chi-squared test was applied to compare differences between discrete variables, and Student’s t-test was applied to compare differences between continuous variables. Covariates found to be associated with the dependent variable were candidates in the stepwise multivariate logistic regression analysis, performed to identify predictors of UT2D. Odds ratios (OR) and 95% confidence intervals (CI) were calculated in the final models. The two measures of adiposity, i.e. BMI and waist circumference, were each examined separately in the models. All tests of significance were two tailed. A value of \( P < 0.05 \) was considered statistically significant.

**Results**

Sociodemographic and clinical characteristics as well as lifestyle habits of the study sample are presented in Table 1. Of the 623 subjects included in the study, 423 (67.9%) were found to be diabetes free, 118 (18.9%) were previously recognised T2D patients and 82 (13.2%) had UT2D. The prevalence of T2D among the 317 deceased subjects (ICD-9 code 250.00) was 15%. The mean age of the study sample was 70.6 ± 6.9 years, similar across the three T2D status
Table 1. Demographic, lifestyle and clinical characteristics of the study group (prevalence rates or mean ± SD)

<table>
<thead>
<tr>
<th>Characteristic (N)</th>
<th>Total sample</th>
<th>T2D free</th>
<th>T2D</th>
<th>Recognised</th>
<th>Undetected</th>
<th>P**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender—male (333)</td>
<td>53.5</td>
<td>50.6</td>
<td>59.5</td>
<td>0.04</td>
<td>55.9</td>
<td>64.6</td>
</tr>
<tr>
<td>Age group (%)</td>
<td></td>
<td></td>
<td>4.0</td>
<td></td>
<td></td>
<td>0.6</td>
</tr>
<tr>
<td>58–64 (131)</td>
<td>21.0</td>
<td>22.5</td>
<td>18.0</td>
<td></td>
<td>15.3</td>
<td>21.9</td>
</tr>
<tr>
<td>65–74 (307)</td>
<td>49.3</td>
<td>48.0</td>
<td>52.0</td>
<td></td>
<td>54.2</td>
<td>48.8</td>
</tr>
<tr>
<td>75+ (185)</td>
<td>29.7</td>
<td>29.5</td>
<td>30.0</td>
<td></td>
<td>30.5</td>
<td>29.3</td>
</tr>
<tr>
<td>Ethnic origin (%)</td>
<td></td>
<td></td>
<td>0.5</td>
<td></td>
<td></td>
<td>0.9</td>
</tr>
<tr>
<td>Europe–America (231)</td>
<td>37.1</td>
<td>38.5</td>
<td>34.0</td>
<td></td>
<td>34.8</td>
<td>32.9</td>
</tr>
<tr>
<td>Asia (163)</td>
<td>26.2</td>
<td>25.8</td>
<td>27.0</td>
<td></td>
<td>26.3</td>
<td>28.1</td>
</tr>
<tr>
<td>Yemen (130)</td>
<td>20.9</td>
<td>19.4</td>
<td>24.0</td>
<td></td>
<td>22.9</td>
<td>25.6</td>
</tr>
<tr>
<td>North Africa (99)</td>
<td>15.9</td>
<td>16.3</td>
<td>15.0</td>
<td></td>
<td>16.1</td>
<td>13.4</td>
</tr>
<tr>
<td>Sedentary (261)</td>
<td>41.9</td>
<td>40.2</td>
<td>45.5</td>
<td>0.2</td>
<td>50.0</td>
<td>39.0</td>
</tr>
<tr>
<td>Smoking status</td>
<td></td>
<td></td>
<td>0.2</td>
<td></td>
<td></td>
<td>0.3</td>
</tr>
<tr>
<td>Never (329)</td>
<td>52.8</td>
<td>55.1</td>
<td>48.0</td>
<td></td>
<td>52.5</td>
<td>41.5</td>
</tr>
<tr>
<td>Past (227)</td>
<td>36.4</td>
<td>34.3</td>
<td>41.0</td>
<td></td>
<td>38.1</td>
<td>45.1</td>
</tr>
<tr>
<td>Current (67)</td>
<td>10.8</td>
<td>10.6</td>
<td>11.0</td>
<td></td>
<td>9.3</td>
<td>13.4</td>
</tr>
<tr>
<td>BMI ≥30 kg/m² (194)</td>
<td>32.3</td>
<td>28.4</td>
<td>41.3</td>
<td>0.002</td>
<td>40.8</td>
<td>42.0</td>
</tr>
<tr>
<td>Blood Pressure (mmHg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic</td>
<td>140.4 ± 21.8</td>
<td>138.2 ± 21.9</td>
<td>145.5 ± 20.6</td>
<td>&lt;0.001</td>
<td>145.1 ± 22.4</td>
<td>146.0 ± 18.1</td>
</tr>
<tr>
<td>Diastolic</td>
<td>79.3 ± 10.7</td>
<td>79.0 ± 10.8</td>
<td>79.9 ± 10.6</td>
<td>0.4</td>
<td>78.8 ± 11.1</td>
<td>81.2 ± 9.7</td>
</tr>
<tr>
<td>Waist circumference (cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>99.9 ± 10.6</td>
<td>98.9 ± 10.8</td>
<td>101.7 ± 10.7</td>
<td>0.03</td>
<td>101.4 ± 9.3</td>
<td>102.1 ± 10.8</td>
</tr>
<tr>
<td>Females</td>
<td>97.3 ± 11.6</td>
<td>95.5 ± 11.4</td>
<td>102.2 ± 10.7</td>
<td>&lt;0.001</td>
<td>103.1 ± 11.8</td>
<td>100.8 ± 8.5</td>
</tr>
<tr>
<td>Total cholesterol (mmol/l)</td>
<td>11.3 ± 2.1</td>
<td>11.4 ± 2.1</td>
<td>11.2 ± 2.0</td>
<td>0.3</td>
<td>10.9 ± 2.0</td>
<td>11.5 ± 2.1</td>
</tr>
<tr>
<td>LDL cholesterol (mmol/l)</td>
<td>7.1 ± 1.7</td>
<td>7.1 ± 1.7</td>
<td>6.7 ± 1.7</td>
<td>0.4</td>
<td>6.8 ± 1.8</td>
<td>7.2 ± 1.6</td>
</tr>
<tr>
<td>Triglycerides (mmol/l)</td>
<td>1.6 ± 0.9</td>
<td>1.5 ± 0.7</td>
<td>1.8 ± 1.1</td>
<td>&lt;0.001</td>
<td>1.7 ± 0.9</td>
<td>2.0 ± 1.4</td>
</tr>
<tr>
<td>HDL cholesterol (mmol/l)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>2.4 ± 0.6</td>
<td>2.5 ± 0.6</td>
<td>2.2 ± 0.6</td>
<td>0.001</td>
<td>2.3 ± 0.5</td>
<td>2.2 ± 0.6</td>
</tr>
<tr>
<td>Females</td>
<td>3.0 ± 0.8</td>
<td>3.1 ± 0.7</td>
<td>2.8 ± 0.9</td>
<td>0.02</td>
<td>2.7 ± 0.6</td>
<td>3.0 ± 1.1</td>
</tr>
<tr>
<td>Serum creatinine (mmol/l)</td>
<td>0.06 ± 0.02</td>
<td>0.06 ± 0.02</td>
<td>0.06 ± 0.02</td>
<td>0.9</td>
<td>0.06 ± 0.02</td>
<td>0.06 ± 0.01</td>
</tr>
<tr>
<td>Serum albumin (mmol/l)</td>
<td>0.3 ± 0.02</td>
<td>0.3 ± 0.02</td>
<td>0.3 ± 0.02</td>
<td>0.1</td>
<td>0.3 ± 0.02</td>
<td>0.3 ± 0.02</td>
</tr>
<tr>
<td>Hypertension (297)</td>
<td>48.2</td>
<td>43.7</td>
<td>57.8</td>
<td>0.001</td>
<td>65.0</td>
<td>47.6</td>
</tr>
<tr>
<td>CVA (38)</td>
<td>6.1</td>
<td>4.7</td>
<td>9.1</td>
<td>0.04</td>
<td>12.0</td>
<td>4.9</td>
</tr>
<tr>
<td>Tumours (99)</td>
<td>15.9</td>
<td>15.4</td>
<td>17.0</td>
<td>0.6</td>
<td>19.5</td>
<td>13.4</td>
</tr>
<tr>
<td>CVD (160)</td>
<td>25.7</td>
<td>23.2</td>
<td>31.0</td>
<td>0.04</td>
<td>37.3</td>
<td>22.0</td>
</tr>
<tr>
<td>Metabolic syndrome (318)</td>
<td>51.0</td>
<td>48.5</td>
<td>56.5</td>
<td>0.06</td>
<td>52.5</td>
<td>62.2</td>
</tr>
</tbody>
</table>

*Comparing diabetes free and total T2D patients; ** comparing previously recognised and UT2D patients; T2D—type 2 diabetes mellitus; CVA—cerebrovascular accident; CVD—cardiovascular disease.

The HMO affiliation was similar to that of the general population with all participants affiliated to one of the four HMOs.

When T2D patients were compared to subjects without diabetes (Table 1), the former were of significantly higher male ratio (P = 0.04), more obese (P = 0.002), had lower levels of HDL cholesterol in both males (P = 0.001) and females (P = 0.02), and higher prevalence of hypertension, cerebrovascular accident (CVA), CVD and metabolic syndrome (respectively, P = 0.001, P = 0.04, P = 0.04 and P = 0.06).

Comparing UT2D patients to those with previously recognised diabetes demonstrated that the UT2D group was male predominant (64.6%), somewhat younger and had significantly fewer comorbidities (hypertension P = 0.01; CVD P = 0.02; Table 1). The proportion of UT2D patients who reported sedentary lifestyle was somewhat smaller than that of known T2D patients (39% versus 50%), and the proportion of smokers was higher among the UT2D compared to the recognised group, but the difference did not reach significance (P > 0.05). Total serum cholesterol was higher among undetected compared to known T2D (P = 0.08—borderline significance), but LDL cholesterol, triglycerides, creatinine and albumin were not related to the status of diabetes (Table 1).

Figure 1 depicts the self-rated health status of the groups. Nearly half (48.8%) of the diabetes-free group rated their health as ‘good’ or ‘excellent’, more than the UT2D patients (43.9%). However, only 23.3% of the recognised T2D patients rated their health in positive terms (P < 0.001). On the other hand, a health rating of ‘not so good’ or ‘bad’ was given by approximately one-third (35.3%) of the recognised T2D patients, one-quarter (24.4%) of the undetected group and 16.3% of the diabetes-free individuals.

Logistic regression analysis was applied to the previously recognised and the UT2D patients (n = 200), to find
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Figure 1. Distribution of self-perceived health status according to the T2D status; percent (%). T2D = type 2 diabetes mellitus.

Figure 2. Logistic regression models for predicting undetected T2D. (a) Health rating = ‘excellent’ or ‘good’ (OR = 2.55, 95% CI [1.38–4.72]; P = 0.003); male gender (OR = 1.43, 95% CI [0.79–2.61]; P = 0.24); age >65 (OR = 0.92, 95% CI [0.75–1.13]; P = 0.44. (b) SBP = systolic blood pressure > 129 mmHg (OR = 2.60, 95% CI [1.36–4.96]; P = 0.004); Trig = triglycerides >17 mmol/l (OR = 1.99, 95% CI [1.19–3.33]; P = 0.008); male gender (OR = 1.76, 95% CI [1.04–2.97]; P = 0.04); waist circumference (OR = 1.003, 95% CI [1.0005–1.01]; P = 0.02).

Factors that could identify unrecognised T2D (Figure 2a). Patients who rated their health as ‘excellent’ or ‘good’ were more likely to have UT2D compared to individuals who rated their health as ‘reasonable’, ‘not so good’ or ‘bad’. Neither age nor gender was significantly related to UT2D. HMO affiliation, physical activity, BMI or waist circumference, were each examined separately in the model, but none systolic blood pressure, serum creatinine, albumin, total and HDL cholesterol and other morbidities, entered the model.

In the second logistic regression model (Figure 2b), we included only those who reported no T2D prior to the study (n = 505). The model showed that gender, systolic blood pressure, triglyceride levels and waist circumference were significantly associated with UT2D. HMO affiliation, physical activity, serum creatinine, albumin, HDL cholesterol, smoking status, other morbidities and subjective health did not enter the model.

Discussion

In this study, we have identified 82 undetected cases of T2D, increasing the prevalence of the disease in the studied cohort 1.7-fold. Approximately one-sixth of the seemingly non-diabetic older adults (19.9% of males and 12.2% of females) had UT2D, a rate higher than that reported in the FINDRISK study (11.6% of males and 6.4% of...
females) [1]. The higher proportion of UT2D in our study may be explained by the older age of our study group (58–93 years compared to 45–74 years old in the FIND-RISK study). An increase in the prevalence of T2D with older age has been recognised previously [23, 24]. Considering all T2D patients, a proportion of 41% UT2D is consistent with that of the DECODE study group for the equivalent age group [2].

Our study showed a high rate of UT2D among individuals with other cardiovascular diseases. Approximately one-third of T2D patients with known hypertension had UT2D, and so was nearly one-quarter of the T2D patients with a history of CVA and 29% of T2D patients with a history of CVD. One goal in treating patients with such risk factors is to prevent recurrence of cardiovascular episodes or other related disease, and it is expected that these patients be monitored regularly. However, our data demonstrate that in reality this goal was not met for a significant proportion of patients, and this could not be blamed on deficiencies in health insurance.

We found that the subjective health measure was the only discriminatory parameter between known and UT2D patients. The UT2D patients were more likely to perceive their health as excellent or good while those aware of their diabetes were more likely to have a poorer perception of their health. This suggests that it is not the disease per se that influences one’s self-rating of health status, but rather the mere awareness of having the condition. However, it is conceivable that individuals with UT2D had recognised minor sensations or symptoms such as weight loss, polyphagia associated with diabetes, and this led to their less than best assessment. It is possible that self-assessed health might also reflect a judgment based on existing risk factors [25]. Indeed, the UT2D group had a larger cluster of risk factors for diabetes than their diabetes-free counterparts. It is also possible that there was an interaction between illness duration of UT2D and self-rated health such that the longer a person lives with UT2D the worse their self-rated health becomes, which leads to seeking medical help and hence to a diagnosis of T2D. However, our data did not permit this type of analysis at present as it would necessitate some biomarker by which illness duration could be calculated retrospectively.

One objective of the present study was to suggest a high-risk profile most suitable for screening. We found that the strongest predictors for having UT2D were high systolic blood pressure, high triglycerides and large waist circumference. BMI was also a significant predictor for UT2D when interchanged with waist circumference in the model. However, the decision to use waist circumference rather than BMI as a measure of adiposity was informed by the findings that central adiposity represents a risk factor for T2D more accurately [26] and hence should be measured in primary care setting to identify high-risk individuals. Our findings agree with those of Franse et al. [4] that in elderly aged 70–79 years, gender of male, a history of hypertension, high BMI and large waist circumference increase the risk of having undiagnosed diabetes. We identified a similar risk profile even in a wider age range, 58–93 years. We also found blood triglycerides important in this UT2D profile, and found a positive association between components of the metabolic syndrome and UT2D status in a seemingly healthy population. This link highlights the importance of developing methods for identifying high-risk individuals in the effort to minimise the incidence [27] as well as the complications associated with T2D. However, it should be noted that the value of early detection of diabetes in the oldest old population may still be debatable.

It is remarkable that the UT2D patients did not differ from their non-diabetic counterparts in lifestyle habits or in the perception of their health. They were not more sedentary, had no more smokers or more comorbidities. Their HMO affiliation was also similar, and because all Israelis must have medical insurance by one of four public, rather similar, HMO-like organisations, the high rate of UT2D could not be attributed to the lack of medical coverage or varying quality of care.

Four limitations of the study should be noted. The exclusion of 78 individuals who were only telephone interviewed might have introduced a selection bias. Indeed, we found that the excluded were older and more sedentary, and with a higher female proportion than the study group. Nevertheless, because this group probably had some UT2D, the excluded individuals were unlikely to influence the true proportion of UT2D.

A 100 g oral glucose load was used instead of the recommended 75 g for its greater stimulation of an insulin response [28]. This protocol was applied for comparability with tests performed in previous time points of this 25 year follow-up. The difference between loads has little effect on blood glucose levels [28]. Nevertheless, data from the DECODE study group using standard 75 g glucose OGTT protocols were similar to ours [2].

This study is based on a cohort of 25 years for the reporting of newly diagnosed T2D in a sample of survivors. It could be argued that the ideal study design for learning about factors associated with the detection of new cases, as well as their prevalence, would be a random or representative sample of the population. However, we found a rate of 13.2% undetected diabetics among the whole sample. This figure would most likely be higher in the general population, which was not screened for T2D like the GOH study cohort.

Persons with UT2D may have one or more of the metabolic syndrome risk factors, yet they probably refer to their physician as often as the general population of similar age. Nevertheless, the primary care provider should be alerted when encountering an apparently healthy older adult with the above profile.

More work is clearly needed to establish the profile of groups at high risk of UT2D in order to develop effective targeted screening programs. However, this study emphasises the need to consider the appropriate secondary prevention approach for a seemingly healthy non-diabetic population of older adults. Furthermore, a higher rate of UT2D was found among the relatively younger subjects, and therefore screening programs should be developed to identify these individuals and offer them treatment.
Key points

- A large proportion of older adults with T2D are undetected.
- Individuals with undetected T2D tend to exhibit characteristics of the metabolic syndrome including larger waist circumference, higher blood pressure and higher levels of blood triglycerides, yet they have a good perception of their subjective health status.
- The primary care provider should offer further assessment for the diagnosis of T2D when encountering an apparently healthy older adult with the above profile.
- This could improve screening efforts and enhance prevention of T2D.

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Conflicts of interests

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References

The effects of usual footwear on balance amongst elderly women attending a day hospital

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Abstract

Objective: to examine the effects of footwear on balance in a sample of older women attending a day hospital.
Design: this was a crossover trial with a quasi-randomised allocation.
Setting: assessments took place in the geriatric day hospital.
Subjects: a cohort of 100 older women aged 60 years and over attending a day hospital.
Methods: demographic data and a brief falls history were recorded. Participant’s footwear was assessed using a footwear assessment form. A Berg Balance Scale (BBS) was completed under two conditions—shoes on and shoes off with order counter-balanced.
Results: the mean BBS was 39.07 (SD 9.14) with shoes on and 36.54 (SD 10.39) with shoes off ($P < 0.0001$). Balance scores were significantly higher with shoes on for 10 of the 14 Berg subcategories. Lower barefoot BBS scores were associated with a greater beneficial effect of footwear on balance ($P < 0.001$). Shoe characteristics were not associated with change in the BBS score.
Conclusions: Wearing their own footwear significantly improved participants’ balance compared to being barefoot. The greatest benefit of footwear was seen in those with the poorest balance. Further studies should investigate whether particular types of footwear are associated with greater benefit.

Keywords: elderly, shoes, balance, day hospital

Introduction

Around one in three older people falls each year with one-third of over 65s and half of over 80s falling each year [1]. Some authors have suggested that poorly fitting footwear and slippers or shoes with inadequate fixation may increase the risk of trip-related falls [2–6]. The slip resistance of shoes has not been extensively evaluated although it has been suggested that older people at risk of falls should wear textured slip-resistant soles [2, 7] and some laboratory mechanical tests to simulate heel contact suggest that a bevelled heel may increase slip resistance [8–10].