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## Original research

# Glycemic control and health-related quality of life among older home-dwelling primary care patients with diabetes

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## ABSTRACT

**Aims:** To evaluate the health-related quality of life (HRQoL) and functional capacity in relation to glycemic control among older home-dwelling primary care patients.

**Methods:** Electronic patient records were used to identify 527 people over 65 years with diabetes. Of these, 259 randomly selected subjects were invited to a health examination and 172 of them attended and provided complete data. The participants were divided into three groups based on the HbA1c: good (HbA1c < 48 mmol/mol (N = 95)), intermediate (HbA1c 48–57 mmol/mol (N = 48)) and poor (HbA1c > 57 mmol/mol (N = 29)) glycemic control. HRQoL was measured with the EuroQol EQ-5D questionnaire. Functional and cognitive capacity and mental well-being were assessed with the Lawton Instrumental Activities of Daily Living (IADL) scale, Mini-Mental State Examination (MMSE) and Geriatric Depression Scale (GDS-15).

**Results:** EQ-5D scores for good, intermediate and poor glycemic control were 0.78; 0.74 and 0.70,  $p = 0.037$ . Sub-items of mobility ( $p = 0.002$ ) and self-care were the most affected ( $p = 0.031$ ). Corresponding trend was found for IADL,  $p = 0.008$ . A significant correlation was found between MMSE scores and HbA1c.

**Conclusion:** Older primary care home-dwelling patients with diabetes and poorer glycemic control have lower functional capacity and HRQoL, especially in regard to mobility and self-care.

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## 1. Introduction

Diabetes is a growing health problem worldwide, and especially among older patients diabetes is a major burden. The number of adults with diabetes was estimated to be 422 million globally in 2014 and its prevalence is constantly rising [1]. Treatment of diabetes aims at good glycemic control without hypoglycemia, thereby seeking to prevent micro- and macrovascular complications. Good quality of life is also an important goal of diabetes treatment, especially among older patients [2]. The general HbA1c target in the Finnish diabetes guidelines [3] is <7%, but individually it can be lower (<6.5%) if it can be achieved with simple regimens that do not increase the risk of hypoglycemia, which has to be avoided especially with older patients. The HbA1c target can be 7.5% if there are problems with hypoglycemia [3]. The recent recommendation by the American Association of Clinical Endocrinologists and American College of Endocrinology (AACE) considers an A1C level of  $\leq 6.5\%$  optimal if it can be achieved safely, but higher targets may be appropriate for e.g. older individuals with multimorbidity [4].

Compared with people without diabetes, people with diabetes have poorer health-related quality of life (HRQoL) in general [5] and particularly if they are older patients [6]. HRQoL is affected, for example, by the duration of diabetes [7], co-morbidities [8] and depression [9]. However, study results concerning the relationship between HRQoL and glycemic control are somewhat inconsistent. In some studies, improved glycemic control has been connected with short-term improvement in HRQoL [10]. Not all studies have been able to establish this association [9,11].

Most of the previous studies have focused on a younger diabetic population and little is known about how glycemic control affects the quality of life in older patients with diabetes, although the burden of diabetes increasingly cumulates in older age groups. Therefore, the aim of this study was to evaluate health-related quality of life and functional capacity in relation to glycemic control among older home-dwelling primary care patients.

## 2. Methods

### 2.1. Study population

This cross-sectional study is a part of the Inner-Savo DM65+ study. The basic population (N=3093) was formed from home-dwelling people at least 65 years of age living in the communities of Suonenjoki and Rautalampi in Eastern Finland. People with a diagnosis of diabetes were identified from primary care electronic patient records; they had diagnostic codes E10 and E11 according to the International Classifications of Diseases (ICD-10) [12]. People living permanently in institutional care were excluded from the study group. A health questionnaire was posted to 527 people with diabetes in 2015 and it was answered by 430 (81.6%) of them. Of these persons with diabetes, 259 persons were randomly selected to participate in a health examination. Of these, 180 persons with diabetes attended the health examination conducted by one member of the research group (MK) over a

period of 3.5 months in 2015. The health examination included questionnaires, a clinical investigation and laboratory tests. Complete data were available from 172 patients with diabetes (66% of the invited patients, 33% of the original patient sample based on the electronic patient records). The participants were categorized into three groups based on their HbA1c level according to the Finnish Guidelines [3] and the AACE recommendation [4]. In the good glycemic control group the HbA1c level was less than 48 mmol/mol, in the intermediate glycemic control group it was between 48–57 mmol/mol (6.5–7.4%) and in the poor glycemic control group it was more than 57 mmol/mol (7.4%).

### 2.2. Measurements and tools

Health-related quality of life was measured with the Euro-Qol (EQ-5D) questionnaire [13]. It is a generic measure that includes two parts: a descriptive system and a visual analogue scale (EQ VAS). The descriptive system defines HRQoL in five dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. In addition, mental well-being was assessed with the Geriatric Depression Scale (GDS-15) [14]. Higher scores indicate more symptoms. The Lawton Instrumental Activities of Daily Living (IADL) Scale [15] was used to assess the patient's ability to function. Higher IADL scores indicate lower functional capacity. The Mini-Mental State Examination (MMSE) [16] was used to assess cognitive functioning, with higher scores indicating better cognitive functioning.

In the physical examination the patient's state of health was evaluated and measured standardly by a doctor. Blood pressure was measured twice in a sitting position at five-minute intervals after 10 min of rest and average systolic and diastolic pressures were calculated and used as the patient's blood pressure. Body mass index (BMI) was calculated as weight (kg)/height (m<sup>2</sup>). Comorbidities were recorded by the physician according to a list including the most common chronic diseases. The sum of the comorbidities was calculated.

Laboratory tests were done according to the protocol of the Kuopio University Hospital's medical laboratory. All the values are based on fasting samples. Hemoglobin-A1c (b-HbA1c) was measured by turbidimetric inhibition immunoassay with a Cobas 6000 analyzer (Hitachi High Technology, Tokyo, Japan) using Roche Diagnostics reagents (Mannheim, Germany). The reference intervals are 20–42 mmol/mol, corresponding to 4–6% (DCCT/NGSP). The Cobas 6000 analyzer was also used to measure plasma cholesterol, plasma low-density lipoprotein (LDL) cholesterol, plasma high-density-lipoprotein (HDL) cholesterol and triglycerides.

### 2.3. Ethical considerations

All the participants signed an informed consent form. This study was carried out in compliance with the Helsinki Declaration. Ethical permission for the study was granted by the Ethics Committee of the Kuopio University Hospital.

### 2.4. Statistical analysis

Descriptive statistics include means and SDs for continuous variables and numbers and percentages for categorical vari-

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