

# Diabetes in Elderly

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## ABSTRACT

*Diabetes is a major public health problem in the world and one of the leading causes of morbidity and mortality from cardiovascular and chronic kidney disease. Aging of the population is expected to further increase the prevalence of type 2 diabetes, particularly in the age group over 65. According to the 2011 census, in Croatia, 17.7% of the population were elderly, and the estimated prevalence of diabetes in this age group is 15–20%. Taking care of elderly diabetics has its own characteristics compared to other age groups, and a particular challenge for the family physician due to comorbidity and polymedication, as well as more frequent complications of the disease and more common side effects of treatment. The aim of this article is to show the treatment of diabetes in elderly, in the light of new studies (ACCORD, ADVANCE and VADT), and to present revised professional societies (ADA, AHA, ACC) recommendations, focusing on the individualized approach.*

**Key words:** type 2 diabetes, elderly, family medicine, comorbidity, polymedication

## Introduction

According to the World Health Organization (WHO), more than 347 million people worldwide have diabetes<sup>1</sup>, and it is estimated that 40% of people with the disease are elderly, aged  $\geq 65$  years<sup>2</sup>. According to data from the International Diabetes Federation (IDF) prevalence of diabetes in the age group 20–79 years was in 2007, 6%, while the prevalence in the elderly is estimated at 15–20%<sup>3</sup>. Aging significantly increases the incidence of diabetes, and the highest is recorded in the subgroup of 60–74 years (17.6%)<sup>4</sup>. 80–95% of diabetics suffer from type 2 diabetes caused by increased peripheral insulin resistance and the consequent failure of  $\beta$ -cell function. The burden of macrovascular and microvascular complications of diabetes is enormous. Diabetics live 5–10 years less than their healthy peers, with 8 times higher cardiovascular risk, and the cause of death in more than 50% of cases is from cardiovascular disease. Diabetes is a significant cause of disability: the risk of amputations is 20 times higher in diabetics compared to non-diabetic general population of the same age. Diabetic retinopathy is the most common cause of blindness in developed countries, and diabetic nephropathy is the reason for permanent renal replacement therapy<sup>5,6</sup>. Rates of all the aforementioned complications are the most common in elderly diabetics.

Thus, diabetes is an important public health priority everywhere in the world, and one of the most important causes of morbidity and mortality, burdening individuals, communities and health systems of many countries, including Croatia. Croatian population ages, which is an advantageous cultural, civilizational and anthropological trend. Thus, according to 2011 census, 17.7% persons aged  $\geq 65$  years<sup>7</sup>, lived in Croatia, significantly more than in the previous census in 2001, when the figure was 15.6%. Population is aging rapidly, therefore, family doctors (FDs) can expect more and more elderly people with type 2 diabetes in their offices, in a continuous process of long-term care, monitoring and treatment. As the group of elderly is extremely heterogeneous, diabetes in the elderly is particularly challenging for FD.

The aim of this article is to present the specificity of diabetes in the elderly, therapeutic targets for this growing population group, as well as to present new professional societies recommendations based on the results of recent studies.

## Materials and Methods

Authors of the article searched bibliographic database Medline/Pubmed using keywords: type 2 diabetes, el-

derly. Limits of the search were set to: clinical studies, randomized clinical trials. Diabetic and geriatric guidelines published in the last 5 years were also included.

### Results

We found 176 studies and firstly check them by the titles and abstracts to see if they were fulfilling the criteria. Only 20 that fulfilled inclusion criteria were included, fully reviewed and summarized in this review article.

The elderly population is very heterogeneous, containing within itself a very large interindividual variations. Physiological process of aging depends on both genetic and environmental factors, as well as the presence of disease can significantly accelerate the aging process. One should distinguish the concept of chronological (calendar) and physiological (cellular) age. Biological age estimate is based on assessment of cardiovascular, respiratory system as well as renal function<sup>8</sup>. The population of elderly people are on one side of the »spectrum« »old youngsters« with preserved physiological function and functional capacity above expected levels for age and, on the other hand the same »spectrum« hard empowered seniors (frailty syndrome), which are weak, exhausted and dependent on the help of others<sup>9</sup>. The concept of population heterogeneity in older people with diabetes is the foundation of an individualized care for elderly diabetics.

This individualized approach involves synergism of nonpharmacologic and pharmacologic measures. Non-pharmacological counseling aims for lifestyle changes (diet, exercise, self-control), and pharmacological means prescribing medications. When choosing medications for elderly diabetics, one should take into account side effects of some (hypoglycemia, weight gain, fluid retention, gastrointestinal disorders, flatulence), contraindications or appropriate dose adjustment for individual patients

(hypoxia, congestive heart failure, renal impairment)<sup>10</sup> but also adjust prescription to the patient’s personal choice, prognosis and comorbidity, always taking into account the quality of life. In »biologically younger« elderly, with longer life expectancy goals of glyceemic control are equal as in adults aged <65 years, and the same recommendations for nonsmoking, regular exercise, maintaining a normal BMI, target blood pressure and hyperlipidemia apply<sup>11</sup>. But in those »biologically older« target HbA1c is shifted towards higher proportionally with increasing age, reduced functional abilities, cognitive capacities and ability for self-care.

The therapeutic goals of glyceemic control, blood pressure, and hyperlipidemia in elderly diabetics according to Kirkman MS and colleagues<sup>12</sup> are shown in Table 1.

### Discussion

It seems that the goals of glyceemic control in elderly patients are similar to those of younger age groups, but recently appeared some doubt on the need for vigorous glyceemic control. Those doubts appeared in light of the results of recent studies ACCORD (Action to Control Cardiovascular Risk in Diabetes), ADVANCE (Action in Diabetes and vascular Disease) and VADT (Veterans Affairs Diabetes Trial)<sup>13–15</sup>.

Specifically, the studies ACCORD was discontinued earlier because it demonstrated increased mortality in the intervention group subjects (with strict glyceemic control, with the goal of HbA1c <6%) compared to the control group (with standard care with the goal of HbA1c 7.0–7.9%), and that in subsequent analyzes could not be attributed only to hypoglycemic incidents. However, the number of myocardial infarction, stroke, and total CV mortality in a post hoc analysis was indeed lower in the intervention group, but not statistically significant, which was the reason for mentioned dilemma<sup>13</sup>.

**TABLE 1**  
A FRAMEWORK FOR CONSIDERING TREATMENT GOALS FOR GLYCEMIA, BLOOD PRESSURE AND DYSLIPIDEMIA IN OLDER ADULTS WITH DIABETES

Health status	Rationale	*HbA1c	**FG	Bed time glyceemia (mmol/L)	Blood pressure (mm Hg)	Lipidemia
Healthy (scarce comorbidity, good cognition and functional status)	Significant Life expectancy	<7.5%	5.0–7.2	5.0–8.3	<140/80	Statin (if no contraindications or side effects)
Complex with multiple comorbidity, poor functional ability, mild to moderate cognitive impairment)	The burden of chronic diseases The tendency of hypoglycemia The risk of falls and fractures	<8.0%	5.0–8.3	5.6–10.0	<140/80	Statin (if no contraindications or side effects)
Weak functionally incapable of moderate to severe cognitive impairment	Short life expectancy The benefit of the treatment questionable	<8.5%	5.6–10.0	6.2–11.1	<150/90	Statin? Assess the potential benefit (more in secondary than primary ***CVD prevention)

\*Target value of HbA1c, \*\*Fasting glyceemia (mmol/L), \*\*\*CVD – cardiovascular disease

In ADVANCE study conducted in Europe, Canada, Asia, New Zealand and Australia in more than 1,000 patients, intensified glycemic control resulted in a significant reduction in microvascular complications, while the impact on those macrovascular did not<sup>14</sup>. VADT study showed that in the group with intensified glucoregulation the number of cardiovascular events (myocardial infarction, stroke) or amputations was not lower compared to standard care group. Mortality in intensively treated was even slightly higher, but not statistically significant<sup>15</sup>.

Two large controlled studies, which are considered the cornerstone of modern diabetology, the Diabetes Control and Complications Trial (DCCT) and the UK Prospective Diabetes Study (UKPDS)<sup>16,17</sup> showed significant and continuous reduction of microvascular complications in intensively treated type 1 diabetics (DCCT) as well as type 2 (UKPDS) compared to the control group of standard care. In DCCT reduction of microvascular complications in intensified treatment group was 60%, (25% in the UKPDS), while in macrovascular the figures were 42% and 18%<sup>16,17</sup>. Results of DCCT and UKPDS studies have prompted the American Diabetes Association (ADA) in 2008 to recommend target HbA1c <7% for most adults with diabetes as the standard of care<sup>18</sup>. But studies ACCORD, ADVANCE and VADT, prompted three American expert of the American Diabetes Association (ADA), the American Heart Association (AHA) and American College of Cardiology (ACC) to revisit and revise their earlier recommendations for goals of glucoregulation. ADA has announced these changes in its executive summary in 2013<sup>19</sup>.

How can significant differences in the results of the DCCT and UKPDS studies and three newer ADVANCE, ACCORD and VADT be explained? ADVANCE, ACCORD and VADT studies were carried out on a sample of patients with already established diagnosis of diabetes and a relatively long history of the existence of the disease of 8–10 years, while respondents from the DCCT and UKPDS were newly diagnosed, without atherosclerotic complications, thus »caught« at an earlier stage development of their disease. From this we can conclude that early intensified glycemic control (as being undertaken in the DCCT and UKPDS) gives much better results and greater benefits for patients in terms of reducing microvascular and macrovascular complications of diabetes than »delayed«

intensified interventions undertaken in patients with advanced disease (ACCORD, ADVANCE) or older (VADT).

So, one should think carefully when treating with advanced diabetes, which is almost the case in elderly, and take into account possible adverse effects (hypoglycemia, weight gain, metabolic changes)<sup>20</sup>. In such patients individualized goals of glycemic control should be set, as follows:

In patients with a short history of diabetes, without significant CV disease, and with life expectancy more than 10 years, targeted HbA1c can be less than 7%, but taking into account the risk of hypoglycaemia. The risk of hypoglycemia is increased in the elderly, can cause postural instability, falls and fractures, and cause permanent cognitive impairment. Elderly are more vulnerable to hypoglycemia, and its occurrence is a warning sign that a doctor should take »step down« in glycemic control

In patients prone to hypoglycemia, with a long history of diabetes, advanced microvascular or macrovascular complications, life expectancy <10 years, as well as severe comorbid diseases, target HbA1c should be slightly higher, HbA1c <8%.

These recommendations were adopted by American Geriatric Society and the European Diabetes Working Party in its guidelines, stressing the importance of individualized goals in glycemic control of the elderly<sup>12,21,22</sup>.

## Conclusion

In everyday care for an older person with diabetes, FDs must approach them individually, taking into account reliable evidence in the field of diabetology and relevant professional societies guidelines. It is crucial to assess patient's biological age, functional capacity, comorbidities, polymedication but also his/her needs, biopsychosocial context, personal choices and quality of life.

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## DIJABETES KOD STARIJIH OSOBA

### SAŽETAK

Dijabetes je veliki javnozdravstveni problem u svijetu i jedan od vodećih uzroka morbiditeta i mortaliteta kod kardiovaskularnih bolesti i kronične bubrežne bolesti. Starenjem populacije očekuje se daljnji porast prevalencije dijabetesa tipa 2, posebno kod starijih od 65 godina. Prema popisu stanovništva iz 2011. godine, 17,7% stanovništva je bilo starije od 65 godina a procjenjuje se da je prevalencija dijabetesa u toj dobnoj skupini 15–20%. Zbrinjavanje starijih dijabetičara u odnosu na druge dobne skupine je specifično i predstavlja poseban izazov za obiteljske liječnike zbog čestog komorbiditeta i polimedikacije, češćih komplikacija bolesti i učestalih nuspojava liječenja. Cilj ovog članka je prikazati liječenje starijih dijabetičara, u svjetlu novih studija (ACCORD, ADVANCE and VADT) te prikazati preporuke profesionalnih društava (ADA, AHA, ACC) fokusirajući se na individualan pristup pacijentu.