

EMILIA RYMKIEWICZ<sup>1</sup>, AGATA REKAS-WÓJCIK<sup>1</sup>, SYLWIA MILANIUK<sup>1</sup>,  
BARBARA MOSIEWICZ<sup>2</sup>, GRZEGORZ DZIDA<sup>1</sup>

## Diabetes mellitus type 2 in the elderly

### Abstract

The number of patients with type 2 diabetes increases along with civilizational development. Advanced treatment methods applied in diabetology and other branches of medicine increase the number of patients. The aim of this work is to present diagnostic and therapeutic problems in elderly people with diabetes. There is a number of other diseases coexisting with diabetes. These are: hypertension, hyperlipidemia and obesity. The risk of diabetes increases with age and it is related to lowered insulin secretion, worsened absorption and insulin resistance. Diabetes symptoms in older patients differ from those of other age groups. An early diagnosis can minimize the risk of any cardiovascular events, ranked as one of the leading causes of death in elderly patients. The choice of treatment should be adjusted to the particular patient's needs, avoid any sudden modifications of administered drugs and educating the patients. These are the most important elements of the therapy.

**Keywords:** diabetes mellitus type 2, geriatrics, elderly, hypoglycaemia.

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### INTRODUCTION

Improved diagnostics and treatment procedures, due to introduction of advanced technologies have caused an increase in life expectancy in Poland. This is a solution for the aging population. Cognitive disorders, increased risk of diabetes and cardiovascular diseases, as well as the growing disability problem, are issues affecting the elderly. The prevalence rate of diabetes is permanently increasing, the number of patients with diabetes is estimated to exceed 360 million people all over the world [1]. Around 90-95% of diabetic patients are diagnosed with diabetes mellitus type 2. Diabetes affects about 1.6 million people in Poland and its prevalence increases with age, so that 25-35% of people of 65 years of age are affected.

#### Pathogenesis

Diabetes is a disease of complex origin. Metabolic changes related to aging are one of the leading causes of diabetes. These metabolic changes are as follows: decreased insulin secretion, inadequate insulin level in response to hyperglycemia, insulin resistance affecting independent glucose uptake by the muscles and fat tissue as well as  $\beta$  cells sensitivity to glucose-dependent insulinotropic peptide (GIP) resulting in impaired glucose tolerance [2]. Changes in other hormones secretion (i.e. glucagon, somatotropin) and lowered insulin-independent glucose uptake are factors contributing to disorders of carbohydrate metabolism [2]. Increased body mass, along with a higher levels of visceral fat tissue, lack of physical activity, loss of muscle tissue and kidney

dysfunction can also exert a huge influence on the development of diabetes. Surplus visceral fat tissue, its irregular distribution in hepatocytes and myocytes, decreased secretion of leptin and adiponectin are the most important causes of insulin resistance among geriatric patients [2,3]. Coexisting diseases, such as inflammatory bowel diseases, neoplasms and gastroparesis, can also potentially have an impact on carbohydrate metabolism disorders.

It is worth noting that most elderly patients already suffer from various diseases which means that some pharmacological agents they take can influence the development of diabetes in them. Such complications might be observed in patients treated with loop diuretics, thiazides, sympathomimetic drugs, beta blockers, steroids administered orally or intravenously. Drugs used to treat mood disorders in elderly people, such as chlorprothixene, haloperidol, lithium carbonate, tricyclic antidepressants, also show significant diabetogenic activity [4].

#### Diabetes diagnostic process in elderly patients

Diabetes symptoms in elderly patients may either be less visible or differ from typical ones. Notwithstanding the complications patients develop, the disease might also be asymptomatic. Thus, any time an elderly patient is admitted, the potential risk of diabetes should be taken into consideration. Osmotic diuresis causing polyuria causes frequent urination, also at night, which may lead to urinary incontinence and sleep disorders. Polydipsia, a symptom characteristic for diabetes, does not occur in elderly patients and along with osmotic diuresis, it may cause serious dehydration

<sup>1</sup> Department of Internal Diseases, Medical University of Lublin, Poland

<sup>2</sup> Students Scientific Association, Department of Internal Diseases, Medical University of Lublin, Poland

often requiring hospitalization. The symptoms of diabetes may include: disturbed vision, recurrent urinary tract infections, impaired wound healing, and intermittent claudication. Increased pain tolerance, depression and weight loss may also suggest diabetes. In case of patients older than 70 years, life expectancy is a basic factor that helps to determine whether the treatment is reasonable. These events may be the first signs of diabetes. Seniors suffering from diabetes are twice at risk for cognitive disorders than those not affected by diabetes [5]. Age-associated diseases like memory disorders, general malaise, apathy, mental confusion, dysphoria, development of dementia may be perceived as symptoms of ageing are often misinterpreted as signs of age which leads to failure in correct diagnosis of diabetes. In extreme cases, diabetic coma may be the first symptom of this disease.

### Complications

Diabetes is a chronic disease leading to various complications. Being affected with diabetes increases the risk of cardiovascular problems. Diabetic patients often suffer from myocardial infarction, stroke and other angiopathies, such as retinopathy, nephropathy and neuropathy. Diabetes is one of the leading causes of limb amputation, because of the diabetic foot syndrome it causes. Diabetes is also the main cause of end-stage kidney disease requiring dialysis treatment in Poland and all over the world. Unregulated glycemia and autonomic nervous system neuropathy is particularly dangerous for elderly people, since it may cause fainting, falling and lead to bone fractures or other traumas [5-7]. Immobilization of the patients undergoing therapy increases its costs and causes a rise in disability levels which, in turn, leads to increased dependence of the elderly. Long-lasting diabetes causes vision disturbances and may eventually lead to vision loss, which limits the everyday activity, increases disability levels and induces depressive disorders. Furthermore, long-lasting diabetes causes acceleration of atherosclerotic process, contributes to the development of cognitive impairment and dementia and eventually leads to inability to function in the society. The course of the disease is more severe in the elderly, due to its acute complications. Hyperglycemia and decreased thirst sensation in elderly people may cause dehydration and coma – common causes of death in these patients. To sum up, diabetes and its complications exert significant influence on quality of life, level of dependence and disability of the elderly and as a result increased cost of the therapy and necessity of long term care.

### Diabetes treatment in elderly patients

In case of patients older than 70 years, life expectancy is a basic factor that helps to determine whether the treatment is reasonable. Preventive measures, like intensive control of glycemia, should be taken to save young people from diabetes complications or even delay its occurrence. Polish Diabetes Association guidelines advise that if a patient's life expectancy exceeds 10 years of age, they have to be treated in the same way as younger patients. On the other hand, therapy of elderly people with coexisting diseases and their complications, who often present symptoms of neurological diseases or cognitive disorders, should be less intensive and criteria of glycemic control are less restric-

tive for these patients. In this group, strict glycemic control is not the main goal of the treatment. Increasing the quality of life and comfort, as well as preventing from side effects of the therapy present greater value for these patients. For this reason, Polish Diabetes Association (PL: PTD – Polskie Towarzystwo Diabetologiczne) specifies different targets of glycated hemoglobin for particular groups of patients. Recommended level of glycated hemoglobin for patients over 70 years-old is 8%, whereas for the immobilized, dependent patients this target is set below 8.5% [8]. Aside from pharmacological treatment, both healthy diet and physical activity hugely facilitate the therapeutic process. However, in case of the elderly, the influence of diet on glycemic control is not as proportional as in other groups. Introducing new dietary habits is often a difficult task, sometimes it turns out to be impossible because of financial problems, lack of proper care or appetite disorders.

Body mass reduction has proved to be ineffective for patients over 70-years-old. However, in these patients their body mass should be maintained on the same level. Patients should be encouraged to engage in moderate physical activity, appropriate to their condition, as it has beneficial influence on their functioning. Pharmacological treatment includes oral agents and insulin. Administering simple treatment schedule plays a key role, as it prevents potential mistakes of the patients and therapy-related complications. Patients, their families and care assistants have to learn how to provide help to the patient in case of hypoglycemia, which is the most dangerous complication of the treatment in this group.

The treatment regimen should be individually adjusted to each patient's needs. A number of conditions, for example, renal failures, as well as a number of coexisting diseases and cognitive disorders should be taken into consideration while applying particular pharmacological agents. Metformin is a drug of first choice in this group of patients also, mainly because it is well tolerated and the renal function is not affected. According to the rule "start low and go slow", treatment should be started with small doses of drugs and its intensification should be introduced after 3 months in case of insufficient effects occur [9]. Taking into consideration the changes in the metabolism in the elderly, drugs with long half-life time should be avoided. Hypoglycemia may be caused by sulfonylureas, especially glibenclamide. Gliclazide and glipizide are safer for elderly patients. Dipeptidyl peptidase-4 (DPP-4) inhibitors and glucagon-like peptide-1 receptor (GLP-1R) agonists constitute an alternative for sulfonylureas. These drugs are well tolerated and risk of hypoglycemia as their side effect is estimated to be lower than it is the case with sulfonylureas. When insulin treatment is needed, implementing a simple therapy schedule and choosing some user-friendly insulin pen plays a significant role. Among available agents, insulin analogues are preferred to human insulin [10]. Insulin analogues may be taken right before the meal, which reduces the risk of hypoglycemia. Therapy with insulin analogues is simple and safe, facilitates treatment intensification and improves glycemic control. Patients suffering from memory disorders and depression or those lacking proper care should be treated with special attention. If there is a risk that the patient might

take double dose or skip a meal, the treatment should be administered carefully. Hypoglycemia is the main obstacle to intensifying the treatment in elderly patients. While administering the treatment in elderly patients with diabetes type 2, the risk of hypoglycemia should be taken into consideration. As hypoglycemia increases the risk of death, applied therapy should minimize the possibility of sudden falls in blood glucose concentration [11]. It is worth noticing that in case of this group of patients life expectancy depends on proper treatment of coexisting diseases, especially hypertension, rather than glycemic control.

### Hypoglycemia in elderly patients

Hypoglycemia is a serious threat for elderly patients. It is the main factor which limits intensification of the treatment in this group. Blood glucose level lower than 6 mmol/l (110 mg/dl) should be avoided in clinical settings, whereas level of glycated hemoglobin lower than 7% may be the sign of too intensive a treatment [9]. Recurrent episodes of hypoglycemia lower the quality of life and may cause falling and dangerous traumas [5-7]. Optimal treatment should prevent the patient from hypoglycemia. Risk of severe episode of hypoglycemia increases with patients' age and it does not differ in groups taking oral agents or insulin. This phenomenon is mainly related to disturbed glucagon secretion in older patients [12,13]. Higher prevalence of hypoglycemia is observed in patients with gastrointestinal diseases, eating disorders and alcohol abuse leading to malnutrition [14]. Risk of hypoglycemia is increased in some endocrine disorders, e.g. hypothyroidism, and liver and renal failure [14]. In case of long lasting diabetes with coexisting neuropathy symptoms of hypoglycemia may be difficult to recognize. Hypoglycemia in elderly patients is mainly manifested by neuroglycopenic symptoms, signs of sympathetic nervous system stimulation are less frequently observed [5]. Symptoms of hypoglycemia may include those characteristic for other diseases, i.e. acute confusional state, transient ischemic attack, stroke and epilepsy [5]. Therapy with sulfonylureas, insulin, tranquilizers and combinations of drugs increase the risk of hypoglycemia.

### CONCLUSIONS

Diabetes in the elderly is a challenge because of its diagnostic and therapeutic nature. Taking into consideration frequent asymptomatic course of the disease, less visible or nonspecific symptoms, diabetes should be suspected in every elderly patient. Cognitive disorders significantly increase the risk of hypoglycemia and make glycaemic control harder to achieve. The practitioner needs to adjust the treatment method to the psychosomatic requirements of the patient.

### REFERENCES

1. Wild S, Roglic G, Green A, et al. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. *Diabetes Care*. 2004;27(5):1047-53.
2. Gambert S, Pinkstaff S. Emerging Epidemic: Diabetes in Older Adults: Demography, Economic Impact, and Pathophysiology. *Diabetes Spectr*. 2006;19:221-8.
3. Imbeault P, Prins JB, Stolic M, et al. Ageing per se does not influence glucose hemostasis: in vivo and in vitro evidence. *Diabetes Care*. 2003;26(2):480-4.
4. Cohen D. Atypical Antipsychotics and New Onset Diabetes Mellitus: An Overview of the Literature. *Pharmacopsychiatry*. 2004;37(1):1-11.
5. Sinclair A. Special Considerations in Older Adults with Diabetes: Meeting the Challenge. *Diabetes Spectr*. 2006;19:229-33.
6. Inouye S, Studenski S, Tinetti M, Kuchel G. Geriatric Syndromes: Clinical, Research and Policy Implications of a Core Geriatric Concept. *J Am Geriatr Soc*. 2007;55(5):780-91.
7. Cowie C, Rust K, Byrd-Holt D, et al. Prevalence of Diabetes and Impaired Fasting Glucose in Adults in the U.S. Population. *Diabetes Care*. 2006;29:1263.
8. Zalecenia kliniczne dotyczące postępowania u chorych na cukrzycę 2014. Stanowisko Polskiego Towarzystwa Diabetologicznego. *Diabetol Prakt*. 2014;10 (Suppl. A)
9. International Diabetes Federation Global Guideline for Managing Older People with Type 2 Diabetes 2013.
10. Holman R, Farmer A, Davies M, et al. Three-Year Efficacy of Complex Insulin Regimens in Type 2 Diabetes. *N Engl J Med*. 2009;361:1736-47.
11. Kagansky N, Levy J, Rimon E, et al. Hypoglycemia as a predictor of mortality in hospitalized elderly patients. *Arch Intern Med*. 2003;163(15):1825-9.
12. Bremer JP, Jauch-Chara K, Hallschmid M, et al. Hypoglycemia unawareness in older compared with middle-aged patients with type 2 diabetes. *Diabetes Care*. 2009;32(8):1513-7.
13. Alagiakrishnan K, Mereu L. Approach to managing hypoglycemia in elderly patients with diabetes. *Postgrad Med*. 2010;122(3):129-37.
14. Chelliah A, Burge M. Hypoglycaemia in elderly patients with diabetes mellitus: causes and strategies for prevention. *Drugs Aging*. 2004;21(8):511-30.

### Corresponding author

Grzegorz Dzida

Department of Internal Diseases, Medical University of Lublin

16 Staszica Str., 20-081 Lublin

Tel/fax 81 5327717

E-mail: grzegorz.dzida@wp.pl