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# Depression in the elderly with type 2 diabetes mellitus

## ABSTRACT

**Background:** The aim of this work was to explore the association of depression in elderly patients with type 2 diabetes mellitus (T2DM) with disease duration, microvascular complications and level of diabetes education.

**Methods:** Patients were divided into three main groups: group 1 aged 37–58 years, group 2 aged 70–79, group 3 aged  $\geq 80$  years. On the basis of collected medical records mean diabetes duration, microvascular complications, diabetes education level and depression severity were determined in particular age groups.

**Results:** Microvascular complications occurred more frequently in older groups of patients with lower diabetes education level. In the oldest group moderately severe and severe depression was most frequent, while in the youngest group 50% of patients did not have any signs of depression, 43.4% presented mild depression, moderate and moderately severe depression was the least frequent (3.3%). Differences were statistically significant ( $p < 0.00001$ ).

**Conclusions:** In patients with T2DM depression is more common in older age groups with longer average diabetes duration, lower diabetes education level and greater severity of microvascular disease complications. (Clin Diabetol 2022, 11; 1: 15–19)

**Keywords:** diabetes mellitus type 2, depression, health education, age factors

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## Introduction

Diabetes mellitus is described in the literature as a factor increasing the risk of depression, eating disorders, and anxiety disorders [1–3]. The depression incidence rate is 37% higher in the elderly diabetic patients in comparison with the healthy overall population [3]. Main risk factors for depressive disorders include low socioeconomic status, low educational level, lack of social support, being single and female gender [4–6]. What is more, social isolation, solitude as a result of physical disability, and cognitive disorders may also contribute to an increased risk of depression in the elderly population.

Diabetes has a great impact on the occurrence of concomitant diseases leading to diminishing the quality of life, especially in the elderly population. British research conducted on geriatric patients showed that diabetes had a significant influence both on physical and intellectual abilities [7]. Another prospective cohort study indicated that the risk of cognitive disorders in diabetic patients increases with age to a greater extent than in the non-diabetic population [8]. According to Spanish research, diabetes is one of three chronic diseases (together with cerebrovascular disease and depression) connected the most with disability at age of 65 [9].

These data are exceedingly important taking into consideration the fact that depression in the course of diabetes increases the risk of metabolic decompensation. Depression coexisting with diabetes is associated with poor glycemic control, a higher incidence rate of diabetic complications, and a higher disability level [10, 11]. It is also connected to higher healthcare resource utilization [12] and therapy costs according to the recent German DiaDec study [13].

## Material and methods

Patients included in the study were admitted to the Department of Internal Diseases, Medical University of Lublin in the years 2016–2018. On basis of medical records patients with type 2 diabetes mellitus (T2DM) were divided into three study groups:

Study group 1: patients aged 37–58 years — 30 patients

Study group 2: patients aged 70–79 years — 50 patients

Study group 3: patients aged 80 years and more — 50 patients

130 patients with documented T2DM duration took part in the study. Diabetic microvascular complications as well the pattern of diabetes education in the previous year were assessed on the basis of patients' medical history and medical records. Depression severity scoring was performed with Patient Health Questionnaire-9 (PHQ-9). This diagnostic tool contains 9 simple questions, in which the patient is supposed to define the severity of particular symptoms. PHQ-9 total score allows to divide patients into the following groups:

Minimal or no depression: 0–4 points

Mild depression: 5–9 points

Moderate depression: 10–14 points

Moderately severe depression: 15–19 points

Severe depression: 20–27 points

More information on PHQ-9 interpretation is available on the website: <http://www.med.umich.edu/1info/FHP/practiceguides/depress/score.pdf>. The PHQ-9. This questionnaire is recommended by the Polish Diabetes Association as a screening tool for depression in diabetic individuals [14].

The Katz Activities of Daily Living (ADL) Scale was used in order to assess self-reliance and physical ability in geriatric patients (aged 65 or more) as it is routinely

used in the Department. Patients who scored less than 3 points were excluded from the study.

Patients not meeting the age criteria or not fully alert and oriented (due to lack of possibility of medical history taking) were excluded from the study.

Statistical analysis was performed with Statistica v. 10.0 software (StatSoft, Poland). The probability value for statistically significant differences was set at  $p < 0.05$ . Obtained results are presented in the tables and on the graph below.

## Results

There were statistically significant differences in T2DM duration between particular groups. The shortest diabetes duration was documented in study group 1 — mean disease duration was  $5 \pm 6.4$  years (median 3 years). In study group 2 this parameter reached  $16.1 \pm 8.6$  years (median 15 years) and in study group 3 —  $14.6 \pm 9$  years (median 15 years). These data are presented in Table 1.

Diabetes microvascular complications including nephropathy, retinopathy, and neuropathy were most frequent in the elderly patients with the longest diabetes history. These data are presented in Table 2.

Diabetes education was performed less frequently in elderly patients in comparison with younger groups ( $p < 0.00001$ ). Data are presented in Figure 1.

PHQ-9 results analysis showed that severe and moderately severe depression was more common in elderly patients. This group also presented with more frequent microvascular complications and received poorer diabetes education ( $p < 0.00001$ ). These data are presented in Table 3.

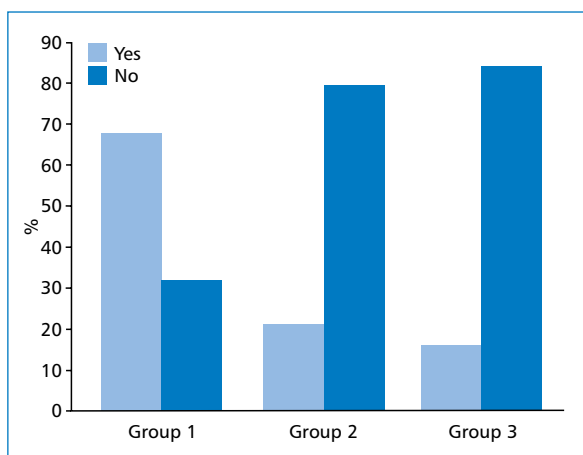
**Table 1. Mean type 2 diabetes mellitus duration in study participants**

Variable	Group 1 (37–58 years) n = 30 Mean $\pm$ SD	Group 2 (70–79 years) n = 50 Mean $\pm$ SD	Group 3 ( $\geq$ 80 years) n = 50 Mean $\pm$ SD	p
Diabetes duration (years)	$5 \pm 6.4$	$16.1 \pm 8.6$	$14.6 \pm 9$	$< 0.001$

SD — standard deviation

**Table 2. Diabetes microvascular complications in particular study groups**

Microangiopathic complications	Group 1 (37–58 years) n = 30	Group 2 (70–79 years) n = 50	Group 3 ( $\geq$ 80 years) n = 50	Chi <sup>2</sup>	p
Nephropathy (n/%)	9/30	35/70	28/56	12.15	0.002
Retinopathy (n/%)	5/16.7	38/76	43/86	55.35	$< 0.00001$
Neuropathy (n/%)	5/16.7	41/82	39/78	41.07	$< 0.00001$



**Figure 1.** Diabetes education performed in the year preceding the study participation in particular groups

## Discussion

PHQ-9 questionnaire is a simple, reliable, and understandable tool for depression screening [15, 16]. It was well validated for the Polish population thus it is highly recommended by the Polish Diabetes Association [14, 15].

Results obtained with the use of PHQ-9 showed that depression was significantly more frequent in patients aged 70 years and older. Depression in the elderly was also more severe than in younger patients. On the basis of PHQ-9 depression was diagnosed in 78% of patients in study group 2 (39 patients), 84% of group 3 (42 patients), and only 33.3% of group 1 (10 patients). Depression incidence rate differences between the groups were statistically significant ( $p < 0.00001$ ). Similar results were obtained in a multicenter Spanish study [17]. In our study, there was a correlation between depression occurrence and patients' age, diabetes duration, and diabetes microvascular complications. Some studies indicated the association between depression and level of glycemic control measured with glycosylated hemoglobin (HbA1c). Our study population was very well controlled as

mean HbA1c was 7.3% and 6.9% in groups 2 and 3 respectively [18]. Interestingly there were no serious hypoglycemic episodes documented and even reported by study participants one year prior to the study. In another Polish study, similar HbA1c levels were observed among the elderly with type 2 diabetes [19]. The study results published recently in *JAMA Psychiatry* linked the depression severity with the level of insulin resistance [20]. In fact, insulin resistance is increasing with age as a consequence of sarcopenia and the rise of body fat content.

There is also a possible link between poor diabetes education and depression — elderly patients, in whom depression was more frequent, received fewer education sessions in comparison with younger study participants.

In many studies, diabetes education was proven to exert a positive influence on both physical and mental well-being in the elderly [21–23]. A negative correlation between depression and diabetes education frequency in older patients was also described in the literature [21]. Research conducted on rest home boarders showed a positive influence of diabetes education on patients' well-being as well as a decrease of depression symptoms and less frequent hypoglycemia occurrence [24]. It is worth mentioning that patients' physical and mental well-being, concomitant diseases as well as vision and hearing impairment should be taken into consideration in the diabetes education process [23]. Elderly patients taking part in diabetes education are more motivated and systematic in everyday treatment and keen on making sacrifices, e.g. following a diabetes diet [24]. Properly conducted education allows improving glycemic control measured with HbA1c level [25]. Memory and cognitive disorders, which are more common in the elderly population, may be the factor influencing poorer diabetes education in this group. Elderly diabetic patients require more time and attention to memorize complicated data and learn everyday treatment activities [23, 26, 27, 28]. Lack of proper diabetes education in the elderly is also caused

**Table 3.** The incidence rate and severity of depression were assessed with PHQ-9 in particular study groups

PHQ Total Score	Group 1 (37–58 years) n = 30	Group 2 (70–79 years) n = 50	Group 3 (≥ 80 years) n = 50	$\chi^2$	p
Normal (n/%)	20/66,7	11/22	8/16	89.68	< 0.00001
Mild (n/%)	13/43,3	11/22	2/4		
Moderate (n/%)	1/3,3	17/34	9/18		
Moderately severe (n/%)	1/3,3	16/32	25/50		
Severe (n/%)	0/0	4/8	14/28		

by deficiency of properly trained medical personnel and poor involvement in the organization of education sessions for geriatric patients [23, 29].

Chronic T2DM complications' influence on depression occurrence was also intensively studied in the literature. In a study from Łódź, Poland, conducted on type 2 diabetic patients aged above 65 years depression was found to be significantly correlated with diabetes duration and a higher number of complications (especially diabetic neuropathy) [30]. Meta-analysis of the link between microangiopathic complications and depressive disorders showed that there is a strict correlation between diabetic nephropathy, retinopathy, neuropathy, and depression occurrence in adult diabetic patients [31]. Polyneuropathy is an extremely important factor in depression pathogenesis as it limits diabetic patients' self-reliance and everyday activity. A positive correlation between depression and diabetic foot in the course of neuropathy was also described in the literature.

To sum up, lack of proper education and microangiopathic diabetes complications increase the incidence rate and severity of depression. The consequence of this fact is a lower quality of life of individuals with T2DM, especially in the elderly population. Better therapeutic education seems to meet the needs of our older patients with diabetes in order to achieve better well-being and mitigate the consequences of depression. Therefore in everyday clinical practice, health care providers should put a special impact on diabetes educational programs adjusted to older patients' capability and requirements. It is of particular importance in COVID-19 pandemic times of social and digital isolation affecting older individuals mainly.

## Conclusions

1. Depression severity in T2DM patients increases with age and diabetes duration.
2. Lack of diabetes education and microangiopathic complications increase depression incidence rate and severity.
3. Elderly patients need special attention in terms of diabetes education.

## Conflict of interest

None declared.

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