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Prevalence of depressive symptoms and diagnosed depression among subjects with longstanding type 1 diabetes and no serious chronic complications, hospitalized due to inadequate metabolic control of diabetes

ABSTRACT

Introduction. Depressive symptoms and depressive disorders are common comorbid problems in diabetes. Type 1 diabetes is a chronic disease requiring continuous insulin treatment. A demand for performing daily self-management tasks like blood glucose checks, insulin injections, following healthy diet and maintaining regular physical activity may result in diabetes-related distress and depression. That in turn may be a barrier in achieving therapeutic goals. The aim of this study was to assess the prevalence of depressive symptoms and diagnosed depressive disorder among subjects with long duration of type 1 diabetes and no chronic complications causing disability.

Material and methods. 283 subjects (151 women), aged 43.0 ± 10.7 years, type 1 diabetes duration 27.2 ± 6.1, HbA_{1c} 8.1 ± 1.4% (65 ± 8.2 mmol/mol) were included. Subjects diagnosed with chronic complications causing disability were excluded to avoid the presumable impact of irreversible disability condition on questionnaire answers. Participants were asked to complete the Beck Depression Inventory (BDI) to assess the incidence and intensity of depressive symptoms. The frequency of diagnosed depression disorder was assessed based on the patients' medical history and medical charts' review.

Results. 42.0% of subjects exhibited any of depressive symptoms, women two times more frequently. 10.9% of patients had been diagnosed with depressive disorder previously. Among 45 subjects with moderate or severe depressive symptoms, only 17 had been diagnosed with depressive disorder.

Conclusions. Depressive symptoms constitute a serious problem in chronic disease. The results of our study confirm the high prevalence of depressive symptoms among subjects with longstanding type 1 diabetes, although not frequently diagnosed. (Clin Diabetol 2016; 5, 6: 173–177)

Key words: type 1 diabetes, depression, depressive symptoms, Beck Depression Inventory, chronic disease

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Introduction

Diabetes and depression are both chronic diseases. Moreover, the prevalence of depression among patients with diabetes, both type 1 and type 2 is higher than in general population and thought to be at least double

[1–3]. Type 1 diabetes is a chronic disease requiring complex and demanding treatment based on insulin therapy. The treatment goals include appropriate glycated hemoglobin (HbA_{1c}) < 7% (< 53 mmol/mol), low glucose variability, prevention of acute and chronic complications such as microvascular retinopathy, nephropathy, neuropathy or macrovascular myocardial infarction or stroke [4]. Since the results of The Diabetes Control and Complications Trial have been published in 1993, a need for good metabolic control in terms of prevention of chronic complications is emphasized in diabetes management guidelines [5]. An intensive functional insulin therapy has been recommended as a method of choice for well-educated patients, when a premeal insulin dose is calculated on a basis of current glucose level, amount of carbohydrate in a meal and planned physical activity. Patient is thus obliged to perform daily diabetes self-management tasks, as performing regular glucose checks, exercising, following proper diet to maintain good metabolic control. The symptoms of depression in type 1 diabetes may appear due to various causative factors. They encompass those of physiological, psychological and environmental origin. [6]. High glucose variability, with frequent episodes of hypo- and hyperglycaemia is associated with the feeling of fatigue and depressive mood [7]. Some endocrine dysregulation and elevated levels of inflammation markers observed in diabetes may also play a role [8, 9]. Difficulties with adjusting the rules of demanding treatment to the existing lifestyle, development of chronic complications, long disease duration, inadequate family support, economic issues like unemployment and low income may as well be a source of emotional distress and depression [10, 11]. That in turn may affect motivation for the proper treatment. The result of poorer metabolic control is manifested by elevated risk for developing chronic complications. As the need for early diagnosing and treating comorbid depression in type 1 diabetes is well established, there is still insufficient data on prevalence of depressive disorders in this group of patients. The aim of this study was to assess the prevalence of depressive symptoms and diagnosed depression among subjects with long duration of type 1 diabetes.

Material and methods

A total of 306 patients from our clinic were identified as eligible to participate in the study. All of them were admitted to the clinic due to inadequate metabolic control of diabetes. Of these, 2 refused participation because of lack of interest, 21 failed to complete baseline data. Finally, 283 subjects (151 women), among patients hospitalized in our Department were included in our study. The mean age was 43.0 ± 10.7 years, type 1 diabetes duration 27.2 ± 6.1 years, HbA_{1c} 8.1 ± 1.4% (65 ± 8.2 mmol/mol). We excluded patients with diagnosed chronic complications causing disability, like blindness, end stage renal disease manifested by estimated glomerular filtration rate (eGFR) < 15 ml/min/1.72 m^2 (eGFR was calculated using Modification of Diet in Renal Disease (MDRD) study equation), painful peripheral neuropathy or history of limb amputation, to avoid the presumable impact of irreversible disability condition on questionnaire answers. Participants were asked to complete the Beck Depression Inventory (BDI) to assess the incidence and intensity of depressive symptoms. BDI is a 21-question self-report tool used for screening for symptoms of depression, designed for individuals over the age of 13 years. It comprises the period of the last seven days and the items included relate to the emotional symptoms of depression like irritability, hopelessness, self-dislike as well as the somatic symptoms such as weight loss, insomnia or fatigue. Participants were then divided into four subgroups based on the inventory's standard cut-offs, according to gained scores. The frequency of previously diagnosed depression was based on the interview and the review of patients' medical records. We assumed that the patient was diagnosed with depression if the medical chart confirmed recurrent major depressive disorder, F33 according to the ICD-10, International Statistical Classification of Diseases and Related Health Problems, irrespective of currently implemented treatment and the diagnosis was determined by a psychiatrist. During hospitalization participants had taken blood samples to perform laboratory test. The glycemic control was expressed by measuring HbA_{1c} with the use of high-performance liquid chromatography (HPLC). Body mass index (BMI) was calculated among all participants. We assessed the presence of diabetic chronic complications. Diabetic retinopathy was diagnosed using direct ophthalmoscopy through dilated pupils by ophthalmologist. Diabetic nephropathy was detected via measurement of albumin-to-creatinine ratio and at the estimated glomerular filtration rate (eGFR). Peripheral neuropathy assessment was performed using pressure sensation (10 g monofilament perception), vibration perception (128-Hz tuning fork) and ankle reflex tests. Diabetic neuropathy was diagnosed in patients with two or more of the following four components: the presence of typical symptoms of neuropathy, the absence of ankle tendon reflexes, and/or abnormal scores for pressure and/or vibration perception. The characteristics of studied group are shown in Table 1.

Statistical analysis was performed using Statistica PL version 10.0 (StatSoft Inc., Tulsa, USA). The results of continuous variables are shown as means ± SD for

Table 1. The characteristics of studied group, n = 283

Age, years	43.0 ± 10.7
Sex (M/F)	132/151
Diabetes duration (years)	27.2 ± 6.1
HbA_{1c} (%)	8.1 ± 1.4
HbA_{1c} [mmol/mol]	65 ± 8.2
Body mass index — BMI [kg/m^2]	25.3 ± 3.8
Retinopathy, n (%)	217 (76.7)
Neuropathy, n (%)	116 (41.0)
Nephropathy, n (%)	60 (21.2)

Data are presented as means ± standard deviation or number and percentage

normally distributed data or as number and percentage of patients for categorical data. The Kolmogorov-Smirnov test with Lilliefors correction was used to test for normality. The analysis of variance (ANOVA) with the Levene's test were used to evaluate differences in HbA_{1c} between particular BDI groups. A p-value lower than 0.05 was accepted as statistically significant.

The study was conducted in accordance with the Declaration of Helsinki and the protocol was approved by the local Ethics Committee (decision No. 346/2010). All participants were adults and provided written informed consent after reading a description of the study.

Results

The mean BDI score in the study group was 8 (IQR 4–14) points. 31 participants (10.9%) had been previously diagnosed with depressive disorder. According to BDI, 42.0% presented any of depressive symptoms, women more frequently. Among 45 subjects with moderate or severe depressive symptoms as indicated in BDI, only 17 had been previously diagnosed with depressive disorder. The results are shown in Table 2. We analyzed the metabolic control of diabetes in four patient subgroups according to exhibited BDI score. The mean percentage of HbA_{1c} was higher among patients of higher BDI group, although the difference was not significant (p = 0.7; Tab. 3). There was no significant difference regarding HbA_{1c} between patients with no or mild depression and severe depression (p = 0.3; Student t-test). Also bivariate correlation indicated no significant association between BDI scores and HbA_{1c} (r = 0.76; p = 0.2).

Table 3. The differences in HbA_{1c} between BDI groups. Analysis of variance (ANOVA)

Beck Depression Inventory (BDI) score	HbA_{1c} ± SD (%)	P-value
0–9 (minimal or no depression)	8.0 ± 1.3	0.7
10–18 (mild depression)	8.1 ± 1.6	
19–29 (moderate depression)	8.1 ± 1.4	
> 30 (severe depression)	8.5 ± 1.5	

Data are presented as means ± standard deviation (SD)

Discussion

The prevalence of major depressive episodes for lifetime in general population varies widely, according to demographic differences, with the majority in the range of 8% to 12% [12]. The prevalence of depression in comorbid type 1 diabetes is even several fold higher and usually ranges between 11% and 30% [13]. Depressive symptoms in type 1 diabetes may be of physiological, psychological and environmental origin. Rapid fluctuations of glucose levels, chronic hyperglycemia, acute hypo or hyperglycemia are associated with low grade inflammation, elevated cytokine levels and oxidative stress [14]. High variability of glucose levels may influence the function of brain areas responsible for mood and cognition and therefore precipitate depressive symptoms [15]. To emphasize, in our study, none of participants had symptoms of hypoglycemia or acute hyperglycemia during answering the questionnaire. Moreover, depressive symptoms may be perceived as the reaction for the diagnosis of the chronic disease and the demanding treatment of diabetes requiring implementation of many lifestyle modifications [16]. In our study, the percentage of patients with previously diagnosed depressive disorder was lower than expected and

Table 2. Prevalence of depressive symptoms and diagnosed depressive disorder in studied group, n = 283, n (female)

Beck Depression Inventory (BDI) score	Subjects with no previously diagnosed depressive disorder, n = 252 (130 female)	Subjects with previously diagnosed depressive disorder, n = 31 (21 female)	Female (%)
0–9 (minimal or no depression)	157 (67)	7 (4)	43.3
10–18 (mild depression)	67 (47)	7 (5)	70.3
19–29 (moderate depression)	23 (12)	11 (8)	58.8
> 30 (severe depression)	5 (4)	6 (4)	72.7

similar to general population. One explanation might be the fact of underdiagnosing depression among type 1 diabetes patients. According to the Pathways Study, about 49% of patients with major depression and diabetes were unrecognized by the primary health care system [17]. This observation is consistent with the study by Li et al. that showed 45% of adult diabetes patients with undiagnosed depression (either major or minor) [18]. Thereby it is important to underline the role of psychological or psychiatric consultation in our patients. When therapeutic goals for individuals with diabetes are depicted, a multidisciplinary approach should be performed by a therapeutic team including i.e. diabetologist, psychologist or dietitian. Once diagnosed and treated, the symptoms of depression alleviate. In our study, almost half of patients with diagnosed depression presented none or mild depressive symptoms according to BDI. This effect might be associated with proper psychiatric and psychological care.

When analyzing scores gained in BDI, approximately 40% of participants presented any of depressive symptoms. This remains consistent with previous studies [19]. However, we must note that subjects with disabling complications were excluded and thus the actual percentage of participants presenting with depressive symptoms might be higher. The prevalence of depressive symptoms was about two-fold higher in women than men. This observation has been widely described in literature. The explanation is complex and involves psychological, environmental and neuroendocrinological factors [20, 21].

The comorbidity of depression in people with diabetes is associated with poor metabolic control and higher complication rates [3]. Although the mean percentage of HbA_{1c} was higher among patients of higher BDI group in our study, the difference was not significant. One explanation may be the fact, that the group of subjects with severe depression was too small to reach statistical significance. Again, another explanation, that the study group was carefully selected and patients with serious complications were excluded.

The limitation of our study is the assessment of depressive symptoms based on self-report questionnaire which is considered less precise and overestimating the prevalence of symptoms [19]. Many environmental and personal factors can have an impact on the final score of BDI. Completing the inventory out in the clinic, in front of the doctor compared to doing it individually in home is only one example. Moreover, BDI is still a screening tool for depressive symptoms and cannot be used for diagnosing depressive disorders. The diagnostic psychiatric interview, although more time consuming allows for an accurate diagnosis. Nevertheless Beck Depression Inventory may be a useful tool for screening purposes and some advanced diagnostic steps may be taken subsequently as needed.

Conclusions

The results of our study confirm the high prevalence of depressive symptoms among subjects with longstanding type 1 diabetes. More studies are needed to assess the actual frequency of depressive disorder in type 1 diabetes based on the previous screening with the use of BDI.

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