Comparative assessment of the relationship between emotional factors and quality of life in a group of patients with type 1 and type 2 diabetes – preliminary report

Karina Badura-Brzoza[1], Patryk Główczyński[2], Magdalena Piegza[1],
Michał Błachut[1], Katarzyna Nabrdalik[3], Janusz Gumprecht[3],
Piotr Gorczyca[1]

[1] Department of Psychiatry, Faculty of Medical Sciences in Zabrze,
Medical University of Silesia in Katowice

[2] Students Scientific Association at the Department of Psychiatry Faculty of Medical Sciences
in Zabrze, Medical University of Silesia in Katowice

[3] Clinical Department of Internal Medicine, Diabetology and Nephrology,
Faculty of Medical Sciences in Zabrze, Medical University of Silesia in Katowice

Summary

Aim. To assess the relationship between selected parameters of the mental state and the quality of life of patients with diabetes.

Method. The study included 51 patients with type 1 diabetes and 52 patients with type 2 diabetes. The following scales were used in the study: quality of life SF-36, Acceptance of Illness Scale (AIS), Hospital Anxiety and Depression Scale (HADS) and Satisfaction with Life Scale (SWLS).

Results. Patients with type 2 diabetes achieved lower values than patients with type 1 diabetes only in the domain of physical functioning of the SF-36 scale (p = 0.001). Assessing the relationship between the studied parameters, it was shown that the duration of the disease was associated with a worse overall health rating (p = 0.036) among patients with type 1 diabetes. However, among patients with type 2 diabetes the duration of the disease correlated negatively with physical functioning (p = 0.002), physical functioning in social roles (p = 0.001) and physical pain (p = 0.047) as well as life satisfaction (p = 0.012) and positively with the results of glycated haemoglobin (p = 0.04). Among patients with type 1 diabetes, the level of depression negatively correlated with the level of acceptance of the disease (p = 0.0009) and life satisfaction (p = 0.006), while the level of anxiety only with the level of acceptance of the disease (p = 0.0004), and a greater severity of anxiety was associated with worse metabolic control (p = 0.02). In the group of patients with type 2 diabetes, the level of anxiety negatively correlated with the level of acceptance of the disease (p = 0.003).

Conclusions. Due to the numerous limitations of chronic disease, more attention should be paid to the quality of life and mental state of patients diagnosed with diabetes, and assessment of the above parameters should be included in the therapeutic process.

Key words: diabetes, quality of life, emotional state

Introduction

Diabetes is a serious, chronic and incurable disease characterized by hyperglycemia resulting from a defect in the production or action of insulin produced by pancreatic islet cells. According to modern knowledge, we distinguish two types of diabetes, characterized by different etiologies, the moment of the first symptoms and the course of the disease. Type 1 diabetes (sometimes called insulin-dependent, juvenile or pediatric diabetes) is diagnosed when the pancreas is unable to produce insulin. In a situation where the body is unable to effectively use the insulin it produces, we diagnose type 2 diabetes (also called non-insulin-dependent diabetes or adult diabetes). The number of people with diabetes in the world is constantly growing. According to estimates, more than 425 million adults were diagnosed in 2017. This is a significant four-fold increase compared to 1980, when the number of adults with diabetes was 108 million. At the same time, it is worth noting that the average, global incidence of diabetes in the adult population has doubled and increased from 4.7% to 8.8% in the last thirty years (from 1980 to 2017). Diabetes is the eighth leading cause of death in both sexes and the fifth cause of death in women. Particularly worrying is the fact that more and more children suffer from type 2 diabetes, until recently only diagnosed in adults.

At the present state of knowledge, it is not possible to prevent type 1 diabetes because its etiology is not fully known (it is assumed that this type of diabetes is the result of a complex interaction between genes and environmental factors), effective methods are available worldwide prevention of type 2 diabetes, supporting patients in the fight against disease progression and related complications. The appearance of type 2 diabetes is determined both by factors independent of the patient, such as: family history, metabolic factors arising from genes, but also factors on which the patient is effected, such as: diet (especially in old age), overweight or obesity, unhealthy lifestyle and food, lack of exercise, and smoking (also passive). Nevertheless, both types of the disease are chronic and have a significant impact on patients' quality of life and satisfaction in various areas, including mental health [1–3]. Diagnosis of diabetes may be associated with the risk of depressive and anxiety symptoms, cognitive impairment [4]. The above-mentioned disorders may affect the quality of life and also modify the cooperation of patients during treatment. The very fact of accepting the disease also seems to be an important aspect. Acceptance of the disease means adopting a positive attitude towards the given situation, is associated with realizing its significance, promotes the mobilization of patient strength and facilitates the adaptation process, and as

a consequence prevents the reduction of quality of life [5]. Symptoms such as anger, anxiety and depression, which often accompany chronic illnesses, in the absence of acceptance of a new situation may lead to the appearance of chronic depression and anxiety. These disorders are probably most often adaptive in nature [6]. Nevertheless, studies show that patients with type 2 diabetes are almost twice as likely to suffer from depression than healthy people, and in patients with type 1 diabetes it is up to three times more often [7].

Both types of disease are characterized by the chronic course, however, a different moment of appearance of the first symptoms of the disease, occurring at different stages of patients' lives, can affect their quality of life and determine various types of mental disorders in different ways.

Aim of the study

The aim of the study was to comparatively assess the relationship of symptoms such as anxiety and depression, and the fact of accepting the disease with the quality of life in patients with type 1 and type 2 diabetes. In addition, the relationship between disease duration and metabolic control and quality of life parameters was also assessed.

Material

103 consecutive patients enrolled to the Diabetes Clinic of Clinical Hospital No. 1 in Zabrze were qualified for the study, of which 51 (including 26 men) had type 1 diabetes (the mean age of patients was 39.5 ± 16.4) and 52 (including 27 men) had type 2 diabetes (mean age 52.7 ± 16.2).

The criteria for inclusion in the study were: at least one year of the underlying disease, absence of mental disorders (including cognitive disorders that disturb collaboration during the study) and diabetic complications. All patients agreed to take part in the study.

Methods

The following psychometric questionnaires were used in the study:

1. The SF-36 Quality of Life Scale by J.E. Ware in the Polish language version. This is a generic scale that allows you to compare the quality of life of patients with various diseases. This scale contains 36 questions regarding 8 areas of life: physical pain (BP), physical functioning (PF), physical limitations in performing roles (RP), emotional limitations in performing roles (RE), mental health (MH), social functioning (SF)), vitality (VT), general health (GH), and two summary subscales comprehensively covering functioning in the physical dimension (PCS) and the mental dimension (MCS). After using the appropriate conversion formula, a score

ranges from 0 to 100 points in each of the domains. The higher the obtained result, the better the state of health [8, 9].

2. The HADS (Hospital Anxiety and Depression Scale) was used to assess anxiety and depression. The scale consists of two independent subscales containing 7 statements, one of which evaluates anxiety (HADS-A) and the other depression (HADS-D). Achieving 0–7 points in each of the subscales is considered normal, 8–10 is a mild disorder, 11–14 – moderate, 15–21 – severe [10].

3. The Acceptance of Illness Scale (AIS) by Felton et al., adapted by Z. Jurczyński. The scale consists of 8 statements expressing specific difficulties and limitations caused by the disease, its range is from 8 to 40 points. The general measure of the degree of acceptance of a disease is the sum of the obtained points. The results can be grouped in three point ranges: 8–19 (low) 20–35 (medium) and 36–40 (high). A low score means a lack of acceptance and adaptation to the disease and a strong sense of mental discomfort. On the other hand, a high score indicates acceptance of one's medical condition, which is manifested by the lack of negative emotions associated with the disease [11].

4. The Satisfaction with Life Scale (SWLS) by E. Diener, R. A. Emmons, R. J. Larson, S. Griffin in the Polish adaptation by Z. Jurczyński. The scale examines the sense of satisfaction with life understood as a subjective assessment of the quality of functioning. It contains five items. The respondent is asked to respond to each of the statements by determining to what extent each of them relates to his/her current life, from strongly agree (7 points) to strongly disagree (1 point). The points are added together and the obtained result determines the degree of satisfaction with life. The results range from 5 to 35 points [11].

5. Sociodemographic data was collected using a sociodemographic data questionnaire constructed by the authors, obtaining, among others, information on the last result of glycated hemoglobin (HbA1c), duration of chronic disease and absence of disease complications.

The Bioethics Committee of the Medical University of Silesia has agreed to conduct the research.

Data statistical analysis

The following statistical tests were used in the analysis – the Mann-Whitney U test; Spearman's rank correlation test was used to assess the relationships between the data. A significance level of $p < 0.05$ was assumed as statistically significant.

Results

Description of the study group

In the group of patients with type 1 diabetes, the duration of the disease was 15.50 ± 11.95 years, and in the group of patients with type 2 diabetes – 8.40 ± 7.42 years, the groups differed statistically significantly (p = 0.00034). The HbA1c value in the group with type 1 diabetes was 7.93 ± 1.5, and in the group with type 2 diabetes it was 7.33 ± 6.48 with no statistically significant differences between the groups.

Quality of life

In the conducted studies comparing the quality of life of patients diagnosed with type 1 and type 2 diabetes, statistically significantly lower level (p = 0.0012) of physical functioning was noted in the group of patients with type 2 diabetes (Table 1).

Table 1. **Values of individual quality of life parameters in the study groups**

S F-36	D1			D2			
	M SD	MD	MR	M SD	MD	MR	p
Duration of the disease	15.5 ± 11.95	13.00	7.00–22.0	8.4 ± 7.4	5.5	3.50–10.0	0.000034
MH	49.0 ± 9.4	48.00	44.0–56.0	47.6 ± 8.5	48.00	40.0–52.0	ns
VT	54.5 ± 11.2	55.00	50.0–60.0	52.7 ± 15.1	55.00	45.0–62.5	ns
GH	45.2 ± 17.7	45.00	30.0–55.0	51.1 ± 18.0	55.00	40.0–65.0	ns
PF	86.4 ± 19.2	95.00	85.0–100.0	72.9 ± 22.7	80.00	55.0–92.5	0.0012
RP	67.1 ± 39.2	75.00	25.0–100.0	67.3 ± 40.4	100.0	25.0–100.0	ns
RE	73.8 ± 38.5	100.0	33.3–1000.0	73.7 ± 38.1	100.0	50.0–100.0	ns
SF	71.6 ± 27.2	62.5	50.0–100.0	72.1 ± 26.8	62.00	50.0–100.0	ns
BP	71.7 ± 29.9	80.00	45.0–100.0	64.3 ± 29.7	67.5	16.0–24.0	ns

D1 – subjects with type 1 diabetes; D2 – subjects with type 2 diabetes; M – mean value; SD – standard deviation; M – median; MR – midrange (25%–75%); SF-36 – Quality of Life Scale and its domains (MH – mental health; VT – vitality; GH – general health; PF – physical functioning; RP – physical limitations in performing roles; RE – emotional limitations in performing roles; SF – social functioning; BP – physical pain)

Anxiety and depression assessment

Patients with type 1 diabetes obtained mean values of 4.23 ± 3.52 points on the depression scale and 6.32 ± 3.94 points on the anxiety scale. Subjects with type 2 diabetes obtained 3.53 ± 2.98 points on the depression scale and 4.92 ± 3.03 points on the anxiety scale. The groups did not differ statistically significantly in the tested parameters (Table 2).

Table 2. **Values of parameters tested among patients with type 1 and type 2 diabetes**

	D1			D2			p
	M / SD	MD	MR	M / SD	MD	MR	
HADS–A	6.32 ± 3.94	6.00	3.00–9.00	4.92 ± 3.03	4.00	3.00–6.00	0.158
HADS–D	4.24 ± 3.52	4.00	1.00–6.00	3.53 ± 2.98	3.00	1.00–5.00	0.128
AIS	31.0 ± 7.64	32.00	26.0–38.0	32.0 ± 6.69	32.00	28.0–37.0	0.95
SWSL	21.9 ± 5.69	22.00	18.0–26.0	19.9 ± 5.15	19.00	16.00–24.00	0.09
HbA1c	7.93 ± 1.50	7.70	6.84–8.70	7.33 ± 6.48	6.70	6.04–7.60	0.08

D1 – subjects with type 1 diabetes; D2 – subjects with type 2 diabetes; M – mean value; SD – standard deviation, MD – median, MR – midrange (25%–75%); HADS–A – subscale of anxiety; HADS-D – subscale of depression; AIS – Acceptance of Illness Scale; SWLS – Satisfaction with Life Scale; HbA1c – result of glycated hemoglobin

Acceptance of Illness Scale (AIS)

On the AIS scale, patients with type 1 diabetes obtained scores from 8 points up to 40 points, mean score 31.00 ± 7.64 points, among people with type 2 diabetes the results were from 32 points to 40 points, the mean result was 31.35 ± 6.69 points. No statistically significant differences were observed in the comparative assessment of parameters (Table 2).

Satisfaction with Life Scale (SWLS)

On the SWLS scale, patients with type 1 diabetes obtained scores from 10 points to 34 points, mean score 21.93 ± 5.69 points, among people with type 2 diabetes the results were from 10 points up to 30 points, mean score 19.90 ± 5.15 points. No statistically significant differences were observed in the tested values (Table 2).

Relationship between the studied parameters and quality of life assessment

In the group of patients with type 1 diabetes, negative correlations of disease duration with general health condition and positive correlations of physical functioning with disease acceptance were found. In the assessment of depressive symptoms, there was a negative correlation between its level and life satisfaction assessed by the SWLS and acceptance of the disease assessed by the AIS. The level of anxiety measured by the HADS-A showed a negative relationship with the acceptance of the disease and a positive one with the level of glycated hemoglobin.

In the group of patients with type 2 diabetes, positive correlations of general health (GH) with life satisfaction assessed using the SWLS and disease acceptance (AIS), as well as negative correlations of physical functioning (PF), physical limitation in roles (RP)

and physical pain (BP) with the duration of the disease were observed. In addition, the SWLS values correlated negatively with the duration of the disease and positively with the level of social (SF) and emotional (RE) functioning. In the assessment of the relationship between depressive and anxiety symptoms, only negative correlations between disease acceptance (AIS) and anxiety (HADS-A) were found. In addition, a positive relationship between glycated hemoglobin value and disease duration was demonstrated (Table 3, 4, 5).

Table 3. **Spearman's rank correlation coefficient R values in the group of patients with type 1 diabetes in the case of relationships for which statistical significance was found (p < 0.05)**

SF-36	Duration of the disease	HADS-A	HADS-D	AIS	SWLS	HbA1c
MH	NS	NS	NS	NS	NS	NS
VT	NS	NS	NS	NS	NS	NS
GH	-0.293	NS	NS	NS	NS	NS
PF	NS	NS	NS	0.376	NS	NS
RP	NS	NS	NS	NS	NS	NS
RE	NS	NS	NS	NS	NS	NS
SF	NS	NS	NS	NS	NS	NS
BP	NS	NS	NS	NS	NS	NS
Duration of the disease	NA	NS	NS	NS	NS	NS

HADS–A – subscale of anxiety; HADS-D – subscale of depression; AIS – Acceptance of Illness Scale; SWLS – Satisfaction with Life Scale; HbA1c – result of glycated hemoglobin; SF-36 – Quality of Life Scale and its domains (MH – mental health; VT – vitality; GH – general health; PF – physical functioning; RP – physical limitations in performing roles; RE – emotional limitations in performing roles; SF – social functioning; BP – physical pain)

Table 4. **Spearman's rank correlation coefficient R values in the type 2 diabetic group in the case of relationships for which statistical significance was found (p < 0.05)**

SF-36	Duration of the disease	HADS-A	HADS-D	AIS	SWLS	HbA1c
MH	NS	NS	NS	NS	NS	NS
VT	NS	NS	NS	NS	NS	NS
GH	NS	NS	NS	0.325	0.312	NS
PF	-0.308	NS	NS	NS	NS	NS
RP	-0.438	NS	NS	NS	NS	NS
RE	NS	NS	NS	NS	0.402	NS
SF	NS	NS	NS	NS	0.294	NS
BP	-0.276	NS	NS	NS	NS	NS
Duration of the disease	NA	NS	NS	NS	-0.3386	0.284

Karina Badura-Brzoza et al.

HADS–A – subscale of anxiety; HADS-D – subscale of depression; AIS – Acceptance of Illness Scale; SWLS – Satisfaction with Life Scale; HbA1c – result of glycated hemoglobin; SF-36 – Quality of Life Scale and its domains (MH – mental health; VT – vitality; GH – general health; PF – physical functioning; RP – physical limitations in performing roles; RE – emotional limitations in performing roles; SF – social functioning; BP – physical pain)

Table 5. **Spearman's rank correlation coefficient R values and p value in type 1 and type 2 diabetes patients**

	D1				D2			
	HADS – A		HADS-D		HADS – A			HADS-D
	R	p	R	p	R	p	R	p
AIS	-0.477	0.00005*	-0.458	0.0009*	-0.265	0.059	-0.0398	0.0037*
SWLS	-0.160	0.269	-0.383	0.006*	0.012	0.933	0.0189	0.806
HbA1c	0.326	0.020*	0.176	0.218	0.051	0.719	-0.147	0.297

D1 – subjects with type 1 diabetes; D2 – subjects with type 2 diabetes; HADS–A – subscale of anxiety; HADS-D – subscale of depression; AIS – Acceptance of Illness Scale; SWLS – Satisfaction with Life Scale; HbA1c – result of glycated hemoglobin

Discussion

Diabetes is a chronic disease that has a significant impact on the functioning of patients in various areas of life. The study showed no differences in the seven quality-of-life domains assessed using the SF-36 between patients diagnosed with type 1 and type 2 diabetes. Only in the domain of physical functioning (PF) patients diagnosed with type 2 diabetes obtained lower values compared to patients diagnosed with type 1 diabetes mellitus. Other researchers also obtained similar results [12, 13]. This difference may be due to the fact that patients with type 2 diabetes are older in age, hence their physical fitness may be worse.

Similarly, a comparative assessment of anxiety and depressive symptoms in both groups did not show statistically significant differences. Despite the existence of many reports on the more frequent occurrence of depressive symptoms in patients diagnosed with diabetes compared to healthy people [6, 14, 15], the patients in our study did not obtain mean values in the HADS allowing to suspect the occurrence of depression or anxiety. Studies show that patients with type 1 diabetes suffer from depression three times more often and patients with type 2 diabetes almost twice as often as healthy people [7]. The vast majority of them are probably reactive states, as the causal relationship of type 2 diabetes with endogenous depression has not been confirmed, while the inverse relationship is likely [6]. Diagnosis of depression is associated with a 60% risk of developing type 2 diabetes [16–18]. As shown by a study of Arroyo, where there was a clear relationship between depression and the risk of type 2 diabetes in a group of women [19].

In this study, we also did not note the relationship between depressive symptoms and the quality of life, which probably may be caused by a low severity of the above symptoms. Similar results were obtained in the studies of Nasser [20], although most researchers indicate in their analyzes the impact of both depressive and anxiety symptoms on the quality of life of patients diagnosed with diabetes [21–23]. Anxiety is also more often present in patients diagnosed with diabetes compared to the general population. In his studies, Bener showed that a significant severity of anxiety was present in 35.3% of patients diagnosed with diabetes versus 16.3% in the control group [24]. In our study, there was no relationship between anxiety symptoms and quality of life, while in people with type 1 diabetes the level of anxiety positively correlated with the level of glycated hemoglobin. This relationship may have two-fold justification. The presence of anxiety symptoms that causes tension and stress can, by stimulating the sympathetic nervous system and secretion of hormones acting opposite to insulin, increase blood glucose levels and impede glycemic control. In addition, strong anxiety can modulate the course of the disease itself by taking medication incorrectly or not following a diet. Failure to comply with dietary restrictions may also be a way of coping with stress [25]. On the other hand, a high level of anxiety positively correlating with high glycated hemoglobin values suggests that poorer disease control may contribute to anxiety symptoms. Similar results were achieved by other researchers, showing a relationship between anxiety symptoms and high levels of glycated hemoglobin [26–28]. On the other hand, Sendela, while examining children with type 1 diabetes, noted abnormal HbA1C values in people with greater severity of depressive symptoms [29, 30]. This study did not show such a relationship. However, among patients with type 1 diabetes, the degree of acceptance of the disease showed a positive relationship with physical functioning (PF) and a negative one with symptoms of anxiety and depression. People who showed fewer depressive symptoms also reported greater satisfaction with life. Similarly, in the group of patients diagnosed with type 2 diabetes, anxiety symptoms were less severe in the group of people who accepted their disease more [31]. What seems understandable, when we come to terms with certain facts, we feel less tension and anxiety. In the group of patients with type 2 diabetes, better acceptance of the disease also correlated with better overall health (GH) and greater life satisfaction [32]. This also seems to be understandable: the better general health, the easier it is to live with a chronic disease and accept it more easily.

At the same time, the longer duration of the disease negatively correlated with physical functioning (PF) of the subjects with the diagnosis of type 2 diabetes, physical pain (BP), physical limitation in performing social roles (RP), and life satisfaction, while positively with glycated hemoglobin values reflecting metabolic control [33, 34]. A longer duration of the disease among patients with type 2 diabetes is also usually associated with older age, more additional diseases and more medications, which affects the assessment of quality of life. Similar results were obtained by Spasić, who

observed the best quality of life in all domains of the SF-36 questionnaire in subjects who had been ill for less than 10 years [35].

In studies conducted by Martino, PCS (functioning in the physical dimension), which is a domain related to physical condition, positively correlated with the duration of the disease, while MCS (functioning in the mental dimension), determining mental state, with anxiety and depressive symptoms [36]. The presence of a positive correlation between the duration of the disease and the results of glycated hemoglobin in patients with type 2 diabetes may be attempted to explain by the fact that worse metabolic control in patients with longer disease duration may be associated with burn-out syndrome associated with aversion to glycemic control observed after several years of disease [29].

Many studies show a greater severity of anxiety and depressive symptoms and their impact on the quality of life among patients diagnosed with diabetes. People who have anxiety or depressive symptoms have more frequent emotional problems, greater difficulty following dietary recommendations, use of drugs and taking physical activity, as well as more serious health problems, which undoubtedly affects the quality of life [6, 37, 38]. In our study, we did not observe such a relationship, which may be due to the small number of subjects in study groups and the used questionnaire, which is a screening questionnaire (HADS), which is a limitation of our study and is also a motivating factor for further analysis.

Nevertheless, the negative relationship between the severity of depressive symptoms and life satisfaction in the group of patients diagnosed with type 1 diabetes and between anxiety symptoms and the acceptance of the disease in both examined groups observed in our study may suggest the impact of emotional factors on the course of the underlying disease, which requires further research.

Considering the wide range of factors influencing the course of a chronic disease, the assessment of mental state should be one of the important aspects in the therapy of patients diagnosed with diabetes.

Conclusions

1. Patients with type 2 diabetes show poorer physical functioning compared to patients with type 1 diabetes..
2. Patients with type 1 diabetes who have problems with acceptance of the disease may be more predisposed to anxiety and depression. Anxiety symptoms also have a negative relationship with metabolic control in this patient group.
3. The longer duration of the disease is negatively related to the assessment of physical quality of life parameters, life satisfaction and metabolic control of disease symptoms in a group of patients diagnosed with type 2 diabetes.

References

1. Sieradzki J. *Cukrzyca*. In: Gajewski P, Szczeklik A, editors. *Interna Szczeklika*. MP. Krakow: Practical Medicine Publishing House; 2018, p. 1457–1506.

2. Sobierajski T. *Społeczny obraz cukrzycy–raport*. http://diabetyk.org.pl/wp-content/uploads/2017/12/Spo%C5%82eczny-obraz-cukrzycy_raport.pdf.

3. GBD 2013 Risk Factors Collaborators *Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or cluster risks in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study*, 2013. Lancet 2015; 386: 2287–23234. Doi:10.1016/S0140-6736(15)00128-2.

4. Young-Hyman D, de Groot M, Hill-Briggs F, Gonzalez JS, Hood K, Peyrot M. *Psychosocial care for people with diabetes: a position statement of the American Diabetes Association*. Diabetes Care 2016; 39: 2126–2140.

5. Pantlinowska D, Antczak A. *Wpływ akceptacji choroby na jakość życia pacjentów z cukrzycą typu 2*. Innowacje w Pielęgniarstwie 2016; 1: 32–39.

6. Kalka D. *The quality of life, symptoms of depression and coping with stress among individuals with type 2 diabetes – preliminary study*. Psychiatr. Pol. 2014; 48(5): 931–940.

7. Roy T, Lloyd C. *Epidemiology of depression and diabetes: A systematic review*. J. Affect. Disord. 2012; 142: 8–21.

8. Ware JE Jr., Snow KS, Kosinski M, Gandek B. *SF-36 Health survey. Manual and interpretation guide*. Boston: The Health Institute, New England Medical Center; 1993.

9. Ware JE, Kosinski M. *SF-36 Physical and Mental Health Summary Scales: A manual for users of version 1, second edition.* Lincoln, RI: QualityMetric; 2001.

10. Karakuła H, Grzywa A, Śpila B et al. *Zastosowanie Skali Lęku i Depresji –HADS w chorobach psychosomatycznych.* Psychiatr. Pol. 1996; 30 (4): 653–668.

11. Jurczyński Z. *Narzędzia pomiaru w promocji i psychologii zdrowia*. Warsaw: Psychological Test Laboratory of the Polish Psychological Association; 2001.

12. Sepúlveda E, Poínhos R, Constant M, Pais-Ribeiro J, Freitas P, Carvalho D. *Health-related quality of life in type 1 and type 2 diabetic patients in a Portuguese central public hospital.* Metab. Syndr. Obes. Targets Ther. 2015; 8: 219–226.

13. Bąk E, Nowak-Kapusta Z, Dobrzyń-Matusiak D, Marcisz-Dyla E, Marcisz CZ, Krzemińska S. *An assessment of diabetes-dependent quality of life (ADDQoL) in women and men in Poland with type 1 and type 2 diabetes*. Ann. Agricult. Environ. Med. 2019; 26, 3: 429–438.

14. Potyralska M, Krawczyk A. *Depresja u osób z cukrzycą typu 2 – współwystępowanie, implikacje kliniczne i terapeutyczne*. Wiad. Lek. 2007; 60: 449–453.

15. Makara-Studzińska M, Partyka I, Ziemecki P, Ziemecka A, Andrzejewska D. *Występowanie lęku i depresji w cukrzycy – przegląd literatury*. Curr. Probl. Psychiatry 2013; 14(2): 98–102.

16. Mezuk B, Eaton WW, Albrecht S, Golden SH. *Depression and type 2 diabetes over the lifespan: a meta-analysis.* Diabetes Care 2008; 31(12): 2383–2390.

17. Eaton W, Armenian H, Gallo J, Pratt L, Ford D. *Depression and risk for onset of type II diabetes*. Diabetes Care 1996; 19: 1097–1102.

18. Witek L, Kowalska I, Adamska A. *The association between depression and diabetes — the role of the hypothalamo-pituitary-adrenal axis and chronic inflammation*. Clin. Diabetol. 2019; 8, 2: 127–131.

19. Arroyo C, Hu F, Ryan L, Kawachi I, Coltidz G, Speizer F, Manson J. *Depressive symptoms and risk of type 2 diabetes in women*. Diabetes Care 2004; 27: 129–133.

20. Nasser J, Habib F, Hasan M, Khalil N. *Prevalence of depression among people with diabetes attending diabetes clinics at primary health settings*. Bahrain Med. Bull. 2009; 31(3).

21. Okwaraji FE, Onyebueke GC, Nduanya CU,Nwokpoku EN. *Life satisfaction, self esteem and mental health in a sample of diabetic out-patients attending a Nigerian tertiary health institution*. JMR 2017; 3(2): 60–65

22. Gómez-Pimienta E, González-Castro T, Fresan A, Juárez-Rojop I, Martínez-López, M, Barjau-Madrigal H et al. *Decreased quality of life in individuals with type 2 diabetes mellitus is associated with emotional distress*. Int. J. Environ. Res. Public Health 2019; 16: 2652. Doi: 10.3390/ijerph16152652.

23. Rathmann W, Kuß O, Anderson D, Busch S, Hahn M, Engelhard J et al. *Increased depression symptom score in newly diagnosed type 2 diabetes patients*. Psychiatry Res. 2018; 261: 259–263.

24. Bener A, Al-Hamaq A, Dafeeah E. *High prevalence of depression, anxiety, and stress symptoms among diabetes mellitus patients*. Open Psych. J. 2011; 5: 5–12.

25. Zellner DA, Loaiza S, Gonzalez Z, Pita J, Morales J, Pecora D. et al. *Food selection changes under stress*. Physiol. Behav. 2006; 87(4): 789–793.

26. Buchberger B, Huppertz H, Krabbe L, Lux B, Mattivi JT, Siafarikas A. *Symptoms of depression and anxiety in youth with type 1 diabetes: A systematic review and meta-analysis*. Psychoneuroendocrinology 2016; 70: 70–84.

27. Rechenberg K, Whittemore R, Grey M. *Anxiety in youth with type 1 diabetes*. J. Pediatr. Nurs. 2017; 32: 64–71.

28. Ahmad A, Abujbara M, Jaddou H, Younes NA, Ajlouni K. *Anxiety and depression among adult patients with diabetic foot: prevalence and associated factors*. J. Clin. Med. Res. 2018; 10(5): 411–418.

29. Sendela J, Zduńczyk B, Trippenbach-Dulska H, Szypowska A. *Prevalence of depressive symptoms in school-aged children with type 1 diabetes – a questionnaire study*. Psychiatr. Pol. 2015; 49(5): 1005–1016.

30. Hood K, Rausch J, Dolan L. *Depressive symptoms predict change in glycemic control in adolescents with type 1 diabetes: rates, magnitude, and moderators of change*. Pediatr. Diabetes 2011; 12(8): 718–723.

31. Ebrahem S, Masry S. *Psychiatric effect of relaxation therapy on depression, anxiety, stress and quality of life among diabetic patients*. Clin. Nurs. Studies 2017; 5(1): 35–44. Doi: 10.5430/cns.v5n1p35.

32. Rosiek A, Kornatowski T, Frąckowiak-Maciejewska N, Rosiek-Kryszewska A, Wyżgowski P, Leksowski K. *Health behaviours of patients diagnosed with type 2 diabetes mellitus and their influence on the patients' satisfaction with life*. Ther. Clin. Risk Manag. 2016;12: 1783–1792.

33. Rogon I, Kasprzak Z, Szcześniak Ł. *Perceived quality of life and acceptance of illness in people with type 2 diabetes mellitus*. Przegl. Menopauzalny 2017; 16(3): 79–85.

34. de Waard EAC, de Jong JJA, Koster A, Savelberg H van Geel T, Houben A et al. *The association between diabetes status, HbA1c, diabetes duration, microvascular disease, and bone quality of the distal radius and tibia as measured with high-resolution peripheral quantitative computed tomography –The Maastricht Study*. Osteoporos. Int. 2018; 29(12): 2725–2738.

35. Spasić A, Veličković Radovanović R, Catić Dordević A, Stefanovic N, Cvetkovic T. *Quality of life in type 2 diabetic patients*. Sci. J. Faculty Med. Niš 2014; 31(3):193–200.

36. Martino G, Catalano A, Bellone F, Russo GT, Vicario CM, Lasco A et al. *As time goes by: anxiety negatively affects the perceived quality of life in patients with type 2 diabetes of long duration.* Front Psychol. 2019; 10: 1779. Doi:10.3389/fpsyg.2019.01779.

37. Kokoszka A, Pouwer F, Jodko A, Radzio R, Mućko P, Bieńkowska J. et al. *Serious diabetes-specific emotional problems in patients with type 2 diabetes who have different levels of comorbid depression: a Polish study from the European Depression in Diabetes (EDID) Research Consortium*. Eur. Psychiatry 2009; 24(7): 425–430.

38. Duda-Sobczak A, Wierusz-Wysocka B. *Cukrzyca a choroby psychiczne*. Psychiatr. Pol. 2011; 45(4): 589–598.

Address: Karina Agnieszka Badura-Brzoza
Department of Psychiatry
Medical University of Silesia in Katowice
42-612 Tarnowskie Góry, Pyskowicka Street 49
e-mail: kbbrzoza@sum.edu.pl