ORIGINAL ARTICLE

Evaluation of the quality of life of older people with diabetes

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◼ **Abstract**
Introduction and Objective. Diabetes is commonly classified as a chronic disease of affluence due to the frequency of its incidence and the rate of its spreading. The aim of the study was to evaluate the quality of life of geriatric patients with type 2 diabetes.
Materials and method. 294 seniors diagnosed with type 2 diabetes living in the Lower Silesian Province in south-western Poland took part in the study. The study used a self-developed questionnaire collecting clinical and socio-demographic data, the WHOQOL-Bref questionnaire, Acceptance of Illness Scale (AIS), Self-Care of Diabetes Inventory (SCODI) and the Geriatric Depression Scale (GDS).
Results. Significant relationships of QoL with BMI, level of education and place of residence, were observed. BMI was significantly negatively correlated with the psychological domain of functioning and the environmental functioning, the level of education was correlated with physical health, psychological and environmental functioning, while the place of residence was correlated with the perception of the QoL and environmental functioning. Acceptance of illness was positively correlated with the perception of QoL and one's physical health. The results of regression analyses in predicting QoL in all domains showed that all models were a good fit for the data (p < 0.001), and the single predictor was maintenance of self-care. The level of depression was negatively correlated to a statistically significant degree with the perception of QoL and one's health condition.
Conclusions. BMI, level of education and place of residence had the highest impact on the quality of life of the participants. The quality of life of the participants improved with the increase in the acceptance of their illness. The higher the level of depression exhibited by the participants, the poorer they evaluated their quality of life.

◼ **Key words**
quality of life, diabetes, older adults

INTRODUCTION

According to the World Health Organisation (WHO), an older person is someone aged 65 years or above. The percentage of people of geriatric age in the population continues to grow. In 2021, the number of elderly people was 1.1 billion, which is predicted to grow to 1.4 billion by 2030, and 2.1 billion by 2050. This growth is occurring at an unprecedented tempo which will only increase in pace in the coming years, especially in developing countries; therefore, issues related to this social group are becoming some of the most crucial as far as healthcare is concerned [1].

Chronic illnesses pose a challenge for 21st century healthcare and are a significant social issue in developed

countries as they are the primary cause of disabilities and deaths. They are illnesses characterized by slow development of disease lesions, most often have poor prognoses, they can be recurrent in nature, require hospitalization and may result in irreversible changes which cause permanent damage to human capacity and efficiency. Chronic conditions are a multidimensional phenomenon as they are related to any and all areas of human functioning, be it biological, psychological, social or spiritual. As a result, patients require not only physical care but also psychological support with the aim of better adapting to the new situation [2, 3, 4].

One of the most common and serious chronic illnesses is diabetes, which is a health, economic and social issue. It is estimated that more than 460 million people worldwide and 60 million in Europe suffer from diabetes. It is characterised by the presence of hyperglycaemia resulting from defects in the secretion and/or functioning of insulin. Recurrent incidence of hyperglycaemia is related to damage, disruption

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of functioning or failure of many organs. Diabetes has been declared by WHO as one of the four main non-communicable diseases, and the third largest premature mortality risk factor worldwide [5, 6].

Type 2 diabetes ranges from dominating insulin resistance with a relative insulin deficiency to a widespread secretion defect with insulin resistance. It is often related to other disorders such as the metabolic syndrome. It develops over a long period of time without showing symptoms, which is why early complications of the illness arise in some older people (retinopathy, microalbuminuria). Characteristic symptoms of diabetes include polyuria, polyphagia, polydipsia, unexplained weight loss, as well as fatigue and excessive somnolence. In people who developed complications. such as deteriorating sight, more commonly occurring infection, acanthosis, and impotence are observed [7, 8, 9].

Diabetes is related to long-lasting damage of large and small blood vessels in the body (macro- and microangiopathy), primarily in the kidneys, eyeballs and the nervous system (nephropathy, retinopathy, neuropathy). The main cause of death of those suffering from type 2 diabetes are lesions caused by hyperglycaemia in the microvascular system [5].

In treating this type of diabetes, pathogenetic mechanisms have to be taken into account. The first phase involves orally-administered medication. However, with the duration of the illness, the defect of the β cells of the pancreatic islets increases, which is why the administration of various hypoglycaemic agents becomes necessary, followed by the onset of insulin therapy. Behavioural treatment should be implemented from the moment of diagnosis and includes dietary education and increased physical activity adjusted to the patient's abilities. Diabetes education plays a key role in supporting patients in modifying their lifestyle and autonomous conduct during the illness [8].

According to the WHO, quality of life (QoL) is defined as 'an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns'. Its components include the ability to play societal roles, psychological well-being, ability to adapt and functioning within social groups [1, 10]. While there exist many definitions of that term, all of them involve being satisfied with life and the feeling of happiness related to any and all domains of human functioning: physical, psychological, social and spiritual, rather than simply lack of illness. For medical purposes, the term *Health Related Quality of Life (QoL)* was coined, concentrating on the impact of health and illness on human well-being [11]. Analyzing QoL includes assessing health criteria and non-health related implications, evaluating the current method of treatment, the patient's own expectations, satisfaction with the care they are given, the level of the service provided, as well as clinical issues and the opinions of those who take care of the patient [12]. Understanding the QoL unveils the patients' problems, may help in modifying treatment and care, or indicate the effectiveness of the treatment. Assessing the quality of life is important in the undertaking of medical decisions, as it is a predictor of treatment success and has prognostic significance, and should be carried out on the basis of objective and subjective factors [13].

Illness significantly impacts human life and its quality in many dimensions. It is often related to suffering and pain, disrupting the sense of safety, causes isolation, changes the hitherto played social roles, causes a necessity to resign from professional work, and often limits social contact. In the case of severe illnesses, the QoL is impacted by the awareness of leaving things unfinished, which may cause lower mood and, as a result – depression. Evaluating the QoL enables a holistic view of the patient and adjusting methods of treatment and care to improve their QoL [12].

OBJECTIVE

The aim of the study was evaluation of the quality of life of geriatric patients with type 2 diabetes, and the factors that influence it.

MATERIALS AND METHOD

294 seniors diagnosed with type 2 diabetes living in the Lower Silesia Province in south-east Poland took part in the study. The research was carried out between June 2019 and January 2021. Voluntary and anonymous questionnaires were administered to participants granting informant consent as per the Helsinki Declaration [14]. Permission to carry out the research was granted by the Bioethical Commission of the Wrocław Medical University (No. KB – 484/2018). Analysis involved a collection of socio-demographic and clinical data (the latter including the incidence of comorbid conditions, duration of the illness, number of pharmaceutical drugs taken, frequency of diabetologist visits, incidence of diabetes complications, smoking habits, receiving diabetes education, keeping a self-monitoring diary, information about sleep), as well as the use of the WHOQOL-Bref questionnaire [15], Acceptance of Illness Scale (AIS) [16, 17], Self-Care of Diabetes Inventory (SCODI) [18] and the Geriatric Depression Scale (GDS) [19].

Statistical analysis methodology application. Statistical analysis was conducted using the IBM SPSS Statistics 28 software package which was used to carry out the basic descriptive statistics analysis, including the Shapiro-Wilk test of normality, student's *t*-test, Spearman's *rho* correlation analysis and linear regression analysis using the enter method. The significance level was set at α=0,05. The first step of the analysis was evaluation of the quantitative data distribution. For this purpose, basic descriptive statistics and Shapiro-Wilk's test for normality were calculated. The results of the analysis are presented in Table 2. The result of the Shapiro-Wilk test for most of the examined variables proved to be statistically significant, signifying that their distributions significantly differed from the normal curve. However, it has to be noted that the skewness of the distribution of all of the variables did not exceed the absolute value of 2, which means that the distributions were asymmetric to an insignificant degree. For this reason, it was justified to continue the analysis using parametric tests, as long as their other assumptions were met.

RESULTS

Males constituted a slight majority (165; 56.12%) among the 294 senior participants, most of whom were aged 65–69 years (109; 37.07%), followed by 70–74-year-olds (103; 35.03%), 75–79-year-olds (50; 17.0%) and finally, 80 and above (32;

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10.9%). The group with the most participants were people with professional education (94; 31.97%), followed by those with elementary (82; 27.89%), secondary (74; 25.17%) and higher education (44; 14.97%). The participating seniors were usually widows/widowers (118; 40.13%), who lived in cities (208; 70.74%) with their families (164; 55.78%), and lived primarily off their pension (218; 74.14%).

The mean height of the participants was 173 cm (min=156; max=188; SD=0.08;), weight – 88.65 kg (min=66.00; max=127.00; SD= 12.68), and – BMI 30.16 (min=21.89; max=42.98; SD=4.45). The majority of the participants were people with overweight (135; 45.91%), followed by those with obesity (126; 42.85%), and proper body mass (33; 11.24%). The participants were diagnosed with various comorbid conditions and multimorbidities (Tab. 1).

Table 1. Comorbid conditions

Disease entity	N*	%*
Hypertension	59	20.06
Atherosclerosis	56	19.04
Kidney diseases	53	18.02
Hyperthyroidism	47	15.98
Hypothyroidism	38	12.92
RA	35	11.90
Arrhythmia	32	10.88
Asthma	26	8.84
COPD	26	8.84

*Percentages and numbers do not add up

Among the participating seniors, 112 (38.09%) declared the presence of one condition comorbid to type 2 diabetes, 78 (26.53%) had no additional diagnoses, 65 (22.10%) had 2 comorbid conditions, 35 (11.90%) had 3 comorbid conditions, and 4 (1.38%) reported 5 comorbid disease entities.

Half of the participants (147; 50.00%) declared the incidence of at least one diabetes complication. The most common was a diabetic foot (59; 20.06%), followed by nephropathy (41; 13.94%), retinopathy (32; 10.88%), neuropathy (29; 9.86%5%), or other types of complications (162; 55.10%).

Seniors mostly sought help in diabetes clinics (138; 46.93%), 85 (28.91%) of them visited a diabetologist only in case of necessity, 54 (18.36%) declared attending such visits 2–5 times a year, while 17 (5.80%) visited a diabetologist once a year. Additionally, 188 (63.94%) of respondents claimed receiving diabetes education, and 168 (57.14%) kept a self-monitoring diary.

The majority of the participating seniors (144; 48.97%) stated that they monitor their blood glucose level only when necessary, 76 (25.85%) measures their blood glucose levels once or twice a day, 41 (13.94%) do so 2–3 times a week, and the remaining 33 (11.24%) measures it 3 or more times a day.

The respondents declared a similar number of hours sleeping – 108 (36.73%) people slept over 9h a day, 97 (32.99%) slept 9h, and 89 slept 7h each day 89 (30.28%).

Standardised measures SCODI, AIS, GSOD and WHOQOL-Bref were administered to the respondents. The basic descriptive statistics of the examined variables are demonstrated in Table 2.

The first step of the analysis involved checking which demographic and clinical variables had an effect on the QoL of the participating geriatric patients with diabetes. The dependent variables were the results of the WHOQOL questionnaire subscales and the answers to 2 questions regarding the perception of one's quality of life and one's health. Gender differences between the measured QoL indicators were investigated. For this purpose, tests examining the significance of mean differences between the groups were conducted. In order to test the difference in the area of own life and health perception, the non-parametric Mann-Whitney U test was performed due to the ordinal nature of these variables. The results for the 4 scales of the WHOQOL were tested using the parametric student t-test (Tab. 3 and 4).

Testing the differences of means yielded no statistically significant results for any of the 6 QoL measures. This means that the participating men and women did not differ in terms of their QoL.

The relationships between the QoL and select demographic and clinical variables were also examined: age, number of comorbid conditions, level of education, place of residence, quantity of sleep, duration of illness and the number of complications. Due to the ordinal nature of the variables, Spearman's rho correlation analysis was conducted (Tab. 5).

The majority of the examined correlation coefficients were not statistically significant. Relationships between QoL with 3 variables: Body Mass Index (BMI), level of education, and place of residence, were observed. The BMI was significantly negatively related to the psychological ($r=-0.22$) and environmental ($r=-0.26$) domains of functioning. The level of education was positively correlated with functioning in the physical health ($r=0.25$), psychological ($r=0.22$) and environmental ($r=0.26$) domains. The place of residence was positively correlated with the perception of one's quality of life ($r=0.20$), as well as functioning in the environmental domain ($r=0.21$). All the above correlations were weak ($r<|0.3|$).

The results of the analysis suggest that the higher the body mass index of the participants, the worse they felt mentally, and the poorer their quality of life. Hoswever, place of residence and level of education worked for the benefit of their QoL.

It was also examined whether the level of acceptance of illness was in any way correlated with the QoL of the participants. The Spearman's rho correlation analysis was conducted on the ordinal variables, while the quantitative variables were examined by means of linear regression using the enter method. The correlation analysis showed that acceptance of illness was positively correlated with both the perception of one's quality of life ($r=0.42$) and of one's health ($r=0.41$). Those were moderate correlations at a statistically significant level of $p<0.001$. This means that the more the participants accepted their illness, the higher they evaluated their quality of life and their health. Subsequently, analyses of regression were conducted for the 4 remaining indicators of the dependent variable (Tab. 6).

All 4 of the tested models were a good fit for the data ($p<0.001$), and the dependent variable could have been predicted by the constant variable and the predictor alike. The positive values of the $Beta$ coefficient indicate that with the increase of the acceptance of illness, the QoL of the participants also improved. This effect was the strongest for functioning in the physical health domain, the variance of which was explained in 35% by acceptance of illness ($R^2=0.35$, $Beta=0.61$), and weakest for social relationships functioning,

Table 2. Basic descriptive statistics values and Shapiro-Wilk test results for the examined variables

	M	Me	SD	Sk	Kurt.	Min.	Max.	W	p
Self-Care of Diabetes Inventory SCODI									
Self-care maintenance	228.32	229.00	9.35	-0.41	1.24	132.00	294.00	0.98	0.088
Self-care monitoring	213.09	212.00	10.77	-0.34	0.56	112.00	279.00	0.98	0.167
Self-care management	182.45	179.00	12.00	0.12	-0.97	106.00	253.00	0.97	0.018
Self-care confidence	218.70	220.00	14.11	-0.44	-0.31	106.00	288.00	0.97	0.031
Acceptance of Illness Scale (AIS)									
Acceptance of Illness	26.13	26.00	4.46	0.07	0.94	11.00	37.00	0.97	0.007
Geriatric Depression Scale GDS									
GSOD	13.82	14.00	3.13	0.06	0.76	7.00	25.00	0.96	0.002
Abbreviated Quality of Life Instrument WHOQOL - Bref									
Quality of life perception	3.55	3.50	0.64	0.32	-0.29	2.00	5.00	0.79	<0001
Health perception	3.41	3.00	0.64	-0.82	0.82	1.00	4.00	0.74	<0.001
Physical health domain	13.60	13.50	2.40	-0.83	1.96	5.00	18.00	0.91	<0.001
Psychological domain	14.33	14.00	2.20	-0.34	0.93	8.00	19.00	0.95	<0.001
Social relations domain	14.84	15.00	1.82	-1.11	3.22	8.00	19.00	0.89	<0.001
Environmental domain	13.85	14.00	1.62	-0.20	2.54	8.00	19.00	0.91	<0.001

Table 3. Perception of quality of life and health in women and men

	Female (n=129)				Male (n=165)							
	Mean rank	M	Me	SD	Mean rank	M	Me	SD	Z	p	r	η2
Quality of life perception	49.51	3.50	3.50	0.67	51.29	3.56	3.50	0.62	-0.34	0.732	0.03	0.0
Health perception	51.06	3.38	3.50	0.71	50.05	3.42	3.00	0.55	-0.21	0.844	0.02	0.0

Table 4. Quality of life domains in women and men

	Female (n=129)		Male (n=165)				95% CI		
	M	SD	M	SD	t	p	LL	UL	Cohen's d
Physical health domain	13.42	2.72	13.74	2.15	-0.61	0.27	0.48	-1.25	0.11
Psychological domain	14.22	2.33	14.43	2.11	-0.45	0.33	0.44	-1.07	0.09
Social relationships domain	14.72	2.00	14.94	1.65	-0.54	0.29	0.38	-0.93	0.10
Environmental domain	13.93	1.77	13.78	1.50	0.46	0.33	0.33	-0.52	0.09

Table 5. Correlations between select demographic and clinical variables and the quality of life

	Age	Comorbid conditions	BMI	Level of education	Place of residence	Sleep	Duration of the illness	No. of complications
Quality of life perception	-0.05	-0.02	-0.15	0.07	0.20*	0.04	0.03	0.04
Health perception	0.10	-0.05	-0.10	0.12	0.01	-0.12	0.04	0.08
Physical health domain	-0.04	0.00	-0.18	0.25**	0.06	-0.07	0.03	0.12
Psychological domain	-0.04	-0.05	-0.22*	0.22*	0.10	0.03	0.04	-0.02
Social relationships domain	-0.08	0.04	-0.16	0.18	0.09	-0.08	0.08	0.11
Environmental domain	-0.11	-0.12	-0.26**	0.26**	0.21*	-0.06	-0.06	-0.06

** -p<0.01; -p<0.05. Comorbid conditions - number of comorbid conditions

explained in 23% by the level of acceptance of illness (R^2=0.23, *Beta*=0.48). Subsequently, relationships between the 4 self-care scales and the QoL domains were examined. Spearman's *rho* analysis of correlation and regression analysis were repeated, with the self-care subscales used as predictors.

The correlation analysis showed that all the tested relationships were statistically significant. Their positive coefficients indicated that the more self-maintenance behaviours in which the participants took part and the higher their self-care confidence, the better they evaluated their quality of life and health. In the majority, these correlations were weak ($r<0.3$), with the expectation of self-care management, in which the correlation to the perception of quality of life and health was moderate ($r > 0.3$).

For the following quality of life domains, a series of regression analyses were conducted (Tab. 7).

In the case of the physical health domain, regression analysis showed that the model was a good fit for the data,

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Table 6. Results of regression analysis in the prediction of the 4 domains of the quality of life, based on acceptance of the illness

Dependent variable		B	SE	Beta	t	p
Physical health domain	F (1; 97)=55.74; p<0.001 R²=0.35					
	(Constant)	5.11	11.16		4.42	< 0.001
	Acceptance of illness	0.32	0.03	0.61	7.46	< 0.001
Psychological domain	F (1; 97)=42.64; p<0.001 R²=0.31					
	(Constant)	7.24	1,11		6.53	< 0.001
	Acceptance of illness	0.27	0.04	0.54	6.53	< 0.001
Social relationships domain	F (1; 97)=30.97; p<0.001 R²=0.23					
	(Constant)	9.63	0.94		10.15	< 0.001
	Acceptance of illness	0.21	0.04	0.48	5.56	< 0.001
Environmental domain	F (1; 97)=49.12; p<0.001 R²=0.33					
	(Constant)	8.33	0.81		10.46	< 0.001
	Acceptance of illness	0.22	0.03	0.59	7.02	< 0.001

Table 7. Results of regression analysis in the prediction of quality of life in all its domains based on the four self-care scales

Physical health domain	B	SE	Beta	t	p
F (4; 95)=7.73; p=0.001; Adj.. R²=0.22					
Constant	3.62	1.89		1.92	0.057
Self-care maintenance	0.12	0.04	0.51	2.58	**0.012**
Self-care monitoring	0.01	0.05	0.03	0.16	0.878
Self-care management	0.02	0.04	0.10	0.59	0.557
Self-care confidence	-0.03	0.03	-0.17	-0.92	0.353
Psychological health domain					
F(4; 95)=5.97; p=0.001; Adj. R²=0.18					
Constant	6.13	1.78		3.48	**<0.001**
Self-care maintenance	0.12	0.04	0.48	2.34	**0.021**
Self-care monitoring	-0.01	0.05	-0.06	-0.26	0.793
Self-care management	0.01	0.03	0.05	0.34	0.726
Self-care confidence	-0.01	0.03	-0.06	-0.33	0.745
Social relationships domain					
F(4; 95)=5.66; p=0.001; Adj. R²=0.16					
Constant	8.04	1.47		5.52	**<0.001**
Self-care maintenance	0.11	0.03	0.58	2.81	**0.006**
Self-care monitoring	0.02	0.04	0.08	0.46	0.646
Self-care management	-0.01	0.03	-0.09	-0.42	0.681
Self-care confidence	-0.03	0.03	-0.27	-1.35	0.177
Environmental domain					
F(4; 95)=8.68; p=0.001; Adj. R²=0.25					
Constant	6.88	1.24		5.52	**<0.001**
Self-care maintenance	0.09	0.03	0.52	2.56	**0.012**
Self-care monitoring	0.00	0.02	0.00	0.01	0.988
Self-care management	0.01	0.03	0.04	0.22	0.822
Self-care confidence	0.00	0.02	-0.03	-0.20	0.842

with $F_{(4; 95)}=7.73$; $p <0.001$), explaining 22% of the dependent variable's variance (Adj. $R^2=0.22$). The only significant predictor was self-care maintenance behaviours, in which the number increased with the level of functioning in the physical health domain ($Beta=0.51$).

In the case of the psychological domain, the regression model predicting the psychological functioning on the basis

of self-care behaviours was also well fit for the data, with $F_{(4; 95)}=5.97$; $p <0.001$, explaining 18% of the dependent variable variance (Adj. $R^2=0.18$). Once again, the only significant predictor was self-care maintenance behaviour, the number of which increased with the level of functioning in the psychological domain ($Beta=0.48$). The change in the dependent variable could also be predicted based on the constant value.

The next model tested was for the social relationships domain which was also well fit for the data, with $F_{(4; 95)}=5.66$; $p <0.001$ and it explained 16% of the variance of the dependent variable (Adj. $R^2=0.16$). Again, the only significant predictor was self-care maintenance behaviour, in which the number increased with the level of functioning in the social relationships domain ($Beta=0.58$). The change in the dependent variable could also be predicted based on the constant value.

The final of the tested models was for the environmental domain, which was also a good fit for the data, with $F_{(4;95)}=8.68$; $p <0.001$; and predicted the highest percentage of the dependent variable variance, namely 25% (Adj. $R^2=0.25$). Once again, the only significant predictor was the self-care maintenance behavior, the number of which increased with the level of functioning in the environmental domain ($Beta=0.52$). The change in the dependent variable could also be predicted based on the constant value.

The results of the analyses indicate that self-care maintenance behaviours were the single significant factor that repeated in all of the models which affected all the domains of the quality of life of geriatric patients with diabetes. This influence was not found for any of the other self-care indicators.

Finally, geriatric depression was tested as a factor influencing the QoL of the patients with diabetes. The Spearman's *rho* correlation analysis and a series of regression analyses were conducted once again. The results of the correlation analysis showed that the level of depression was significantly negatively correlated with both of the perception components of the QoL. This effect was weak for the quality of life perception ($r=-0.24$) and moderate for the perception of one's own health ($r=-0.32$). This means that the higher the level of depression exhibited by the patients, the poorer they evaluated the quality of life and health, with this effect being slightly stronger for the perception of health. Subsequently, a series of regression analyses were conducted (Tab. 8).

Table 8. Results of regression analysis in the prediction of the 4 domains of the quality of life, based on the presence of depression

Dependent variable		B	SE	Beta	t	p
Physical health domain	F(1; 98)=24.61; p<0.001 R²=0.18					
	(Constant)	18.33	0.99		18.70	< 0.001
	GDS	-0.34	0.07	-0.44	-4.76	< 0.001
Psychological domain	F(1; 98)=9.62; p=0.003 R²=0.09					
	(Constant)	17.22	0.97		18.02	< 0.001
	GDS	-0.20	0.07	-0.31	-3.10	0.003
Social relationships domain	F(1; 98)=9.59; p=0.003 R²=0.09					
	(Constant)	17.21	0.78		21.89	< 0.001
	GDS	-0.17	0.06	-0.31	-3.10	0.003
Environmental domain	F(1; 98)=19.29; p<0.001 R²=0.17					
	(Constant)	16.76	0.69		24.77	< 0.001
	GDS	-0.21	0.05	-0.42	-4.39	< 0.001

All 4 of the tested models were a good fit for the data ($p<0.01$), and the dependent variable could have been predicted on the basis of the constant value as well as the predictor. The negative values of the *Beta* coefficients indicate that with the increase on the Geriatric Depression Scale score, the QoL of the participants worsened. This effect was stronger for physical health functioning, in which the variance was explained by the acceptance of illness in 19% ($R^2=0.18$, *Beta*=-0.44) and for functioning in the environment, which was explained by the level of depression in 17% ($R^2=0.17$, *Beta*=-0.42). The models predicted psychological and social relationship functioning to a lesser degree (in both cases, $R^2=0.09$, *Beta*=-0.31).

DISCUSSION

Primary analysis of the results obtained from the data collected in the present study from the WHOQOL questionnaire, indicated that there were no significant differences in QoL evaluation between men and women (p > 0.05). Analysis of the relationship between gender and the QoL is a subject undertaken by a multitude of researchers, some of whom found proof of this relationship, such as in the case of rheumatoid arthritis [6, 20]. However, others did not observe an effect of gender on the QoL of elderly people suffering from diabetes or chronic obstructive pulmonary disease [21, 22]. On the basis of research and literature analysis, it can be stated that the presence or lack thereof of this effect is primarily dependent on the disease entity suffered by the participants.

The relationship between the QoL of the seniors and their age, height and body weight, comorbid conditions, level of education, place of residence, quantity of sleep, duration of illness, and the number of occurring complications, were also analyzed. In the conducted analysis, 3 variables, namely, BMI, level of education and place of residence, proved to be statistically significant. The results of the analysis indicated that the higher the BMI of the participants, the worse they felt mentally and the poorer were their living conditions.

The majority of respondents were overweight or were even obese. Patients with a proper body mass showed a higher level of QoL. The obtained results are also reflected in the analyses of other researchers who proved that a higher BMI and low physical activity significantly worsened the QoL of patients suffering not just from diabetes, but also from other conditions, as well as those after medical procedures, such as the bariatric kind [23, 24, 25]. At the same time, drastic changes to the body weight of those with old age should not be undertaken, but rather they should be encouraged to change current improper nutrition habits. A suitable solution, especially for those with overweight or obesity, would be measuring their body composition, which is regarded as the best measure of the patient's actual condition [26]. On the basis of the obtained data, it can be stated that because excessive body weight of older people lowers their quality of life, actions aiming at reducing it should be undertaken, which should improve their autonomy, and thereby their comfort of living. However, this process should take place under strict medical supervision and be based on detailed education [27].

The place of residence and level of education of the older people had an effect on their QoL. In the current study, the size of the place of residence was positively correlated with the perception of the quality of life and functioning in the environmental domain. Similar results were obtained by Nemcova et al. in their international study [28] dealing with the evaluation of QoL in patients with diabetic foot ulcers in the Visegrad Group countries. Significant differences in QoL between patients from different countries were observed. Additionally, significant negative correlations between demographic data, such as age, duration of diabetes, duration of diabetic ulcer treatment, and lower QoL were reported. The authors also showed statistically significant differences in the assessment of QoL depending on clinical features, including the Wagner classification, incidence of foot ulcers, and the presence of peripheral vascular disease or pain [28].

Meanwhile, the level of education was positively correlated with functioning in the physical health, psychological and environmental domains. Similar results were obtained by other researchers who showed that various factors, including place of residence, affect the quality of life [22, 29]. Living in a larger agglomeration enables better and easier access to healthcare, and increases the number of people included in their so-called "friend network", which is relevant to the number of interpersonal connections. These, in turn, improve well-being and ensure the maintenance and creation of new connections which are very important for ill and lonely people, who constitute the majority of seniors as a social group [30].

It seems, therefore, that living in a larger agglomeration improves functioning in the sphere of mental and social health, and thus improves QoL. In bigger cities, it is also easier to conduct targeted education which plays an important role in the seniors' lives. As research shows, expanding the knowledge and skills of students on healthy aging significantly contributes to increasing health activity, improving the quality and length of life, and reducing the costs of care. Inclusion of patients in active participation in pro-health and socio-cultural events organized directly in their environment allows application of the Hippocratic principle that 'prevention is better than cure' in practice [31, 32].

The current study shows that participants assessed their health on an average level. The seniors exhibited the highest QoL in the social relationships domain and the lowest in the physical health domain. Similar results were obtained by other research concerning the QoL of elderly people with diabetes, and analysing the effect of various socio-demographic factors. Seniors most often exhibited the highest levels of QoL in the social domain, and the lowest in the psychological domain [33, 34, 35]. Slightly different results were obtained by Juzwiszyn in his analysis, wherein he proved that the lowest levels are observed in the environmental domain. A common conclusion by all researchers is that the majority of the participating patients are not satisfied with their life, and do not accept their illness [24].

Acceptance of the illness has a significant effect on the therapeutic process of the patients [36] who suffer from chronically the disease throughout their entire lives; therefore, their approach to their illness is particularly important. Based on the results obtained in the current study, it can be concluded that the higher the level of acceptance of the illness, the higher the level of the QoL in all its domains. The same results were obtained by researchers analyzing the QoL of patients with chronic obstructive pulmonary disease [21],

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enteric stoma [37], multiple sclerosis [38], or chemodialysis [39]. On the basis of the present study and the available literature, it can be stated that the hypothesis regarding a strong, positive relationship between the acceptance of illness and the QoL is correct.

A factor that plays an integral part in maintaining a good QoL is self-care. This term is understood as any and all behaviours undertaken by the patient with the aim of keeping their health, life and good well-being at the highest possible level. In a disease entity like diabetes, such behaviours are essential, because maintaining proper blood glucose levels or regularly taking medicines helps lessen the risk of complications related to the illness. Analysis of the obtained data shows that the more the self-care maintenance behaviours undertaken by the participants, and the higher their self-care confidence, the better they evaluated the quality of life and health. The results of the analysis indicate that self-care maintenance behaviours were the single significant factor, repeated in all the models affecting the QoL of geriatric patients with diabetes in all its domains. Patients did the poorest with blood glucose control. Similar results were obtained by other researchers in their studies which proved that the patient group in question eagerly partake in self-care maintenance behaviours while performing the worst as far as blood glucose control is concerned [40]. Assessing the level of self-care enables pinpointing the deficits exhibited by the patient, and eliminating the deficite. The higher the level of self-care exhibited by the patients, the better their QoL. Xu, Han et al., in their study investigating the impact of self-care on the QoL of older people with hip joint fractures, showed that assessing the level of self-care improves their quality of life, and significantly decreases the complications related to the disease [41]. Tok Yildiz and Kasikci came to similar conclusions [42]. Therefore, it turns out that diabetes education is an incredibly significant factor that prepares the patient for self-care and self-observation from the moment they receive the diagnosis, which in turn leads to the improvement of their QoL.

For the purpose of the current study, the incidence of depression symptoms in the responding seniors was also examined as it is the most common mental health problem in old age. The collection of negative experiences may lead to the occurrence of a lower mood, and may be a natural reaction to a multitude of losses suffered by the senior throughout life, such as the loss of a loved one, by their health or through their occupation. These factors are regarded as having a high impact on the emergence of depression [43]. The conducted analyses proved that a majority of the participants had symptoms of mild depression. Statistical analysis of the obtained results confirmed the correlation between the high level of depression and poor evaluation of the quality of life and health, with this effect slightly lower for the quality of health perception. The are many studies which prove that the presence of depression significantly affects the decrease in the patients' QoL – a problem that affects seniors with various disease entities [44]. Furthermore, the study proves that early identification and the right approach to depression emerging in people of old age, contributes not only to the improvement of the quality of life, but also helps its prolongation, while additionally reducing treatment costs [45, 46].

CONCLUSIONS

A high level of BMI and depression leads to a poorer QoL in patients with of type 2 diabetes, especially in the psychological and environmental domains of functioning.

Higher education and residing in cities were among the socio-demographic factors increasing the QoL of the participants.

The study indicated that a high QoL in seniors with type 2 diabetes remains related to a high level of acceptance of the illness, high self-confidence, and proper self-care maintenance behaviours.

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