



# Does gender affect health-related quality of life in patients with type 2 diabetes (ADDQoL) in Central European countries?

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## Abstract

**Objective.** The aim of this study was to compare the impact of type 2 diabetes on quality of life (QoL), taking into account gender differences in relation to individual domains of Diabetes-Related Quality of Life Audit (ADDQoL) in adult men and women in Poland, the Czech Republic and Republic of Slovakia.

**Materials and method.** The participants were 608 patients from the three countries, of whom 278 were women and 330 men with type 2 diabetes mellitus. The tool used was the Audit of Diabetes-Dependent Quality of Life (ADDQoL).

**Results.** The overall average QoL was slightly higher in men than in women. In ADDQoL scores, mean weighted impact scores were negative for all domains. The domain which was the most affected by type 2 diabetes in both men and women from all three countries was the 'freedom to eat', while the 'living conditions' domain was the least affected. Diabetes had a slightly negative average weighted impact on most men and women – AWI < -3.0. Except for the different AWI scores in men with type 2 diabetes depending on their education, neither men nor women revealed any significant changes in terms of the impact of education, residence, marital status, smoking, hypertension, or taking anti-hypertensive drugs.

**Conclusions.** Type 2 diabetes mellitus negatively affects all the domains of life, in both men and women in all three countries; however, this impact is insignificant. The participants assessed their quality of life as good and very good.

## Key words

quality of life, type 2 diabetes, Diabetes-Related Quality of Life Audit

## INTRODUCTION

Diabetes mellitus (DM), as a group of metabolic syndromes characterized by hyperglycaemia due to a defect in the secretion and/or activity of insulin [1], is a major global health threat. Unfortunately, diabetes leads to serious complications which might result in disability or even death. Diabetes is a concern for 463 million people globally and 60 million in Europe. In European countries, it affects 8.9% of the population aged between 20–79 years. In this population, type 2 diabetes accounts for 90% of all cases. The prevalence of diabetes increases with age, and it is estimated that there are more cases in the group of women in the population of DM patients, which may be related to their average life expectancy [2].

Diabetes mellitus requires specialized management in terms of education, therapy and self-care [3]. Restrictions

related to compliance with therapy rules based on diet, regular use of medications or insulin therapy, and optimal physical activity combined with blood glucose measurements, can result [4] in a negative impact of diabetes on the quality of life in patients [5].

Gender differences are an important factor in the assessment of the health-dependent quality of life because gender plays a major role in decisions concerning health, as well as in the perception of health in different countries and cultures [6]. Poland, the Czech Republic, and Republic of Slovakia are neighboring countries with similar economic status and cultural behaviour patterns, which is why it was decided to conduct this type of assessment in these countries.

In the literature, there are reports concerning gender differences in the perception of the quality of life with respect to selected population samples [6] or comorbidities: cardiovascular [7], HIV [8], or chronic diseases in relation to mental state [9], but studies on gender differences in the perception of the diabetes-dependent quality of life are scarce [10].

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## OBJECTIVE

The aim of the study was to compare the impact of type 2 diabetes mellitus (T2DM) on the quality of life (QoL), taking into account gender differences in relation to individual domains of the Audit of Diabetes-Dependent Quality of Life (ADDQoL), and relationships between QoL, selected socio-demographic factors or clinical parameters in adult men and women with diabetes in Poland, the Czech Republic and Republic of Slovakia.

## MATERIALS AND METHOD

This observational-correlational study was conducted between May 2016 – August 2019 among T2DM patients treated at specialized diabetes clinics in Poland, Slovakia, and the Czech Republic. The study procedure followed the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) recommendations. A total of 660 patients participated in the study, 220 from each country. The participants were enrolled for the study based on the following inclusion criteria: type 2 diabetes mellitus, age over 18 years, duration of the disease longer than five years, no cognitive impairment, the possibility to independently complete the questionnaire, and informed consent to participate in the study.

Due to the incompleteness of some of the questionnaires and patients resigning in the course of the study, the number of patients who were eventually enrolled was 608. There were 100 women and 114 men from Poland, 82 women and 114 men from the Czech Republic, and 96 women and 102 men from Slovakia. The duration of the disease was: for Polish women  $5.64 \pm 2.35$  years, Polish men  $6 \pm 2.92$  years, Czech women  $5.43 \pm 2$  years, Czech men  $5.32 \pm 2.66$  years, Slovak women  $5.92 \pm 1.7$  years and Slovak men  $6.08 \pm 2.67$  years. Socio-demographic data, such as age, gender, place of residence, education, marital status, professional activity; and clinical data, such as body weight, comorbidities, duration of DM, complications of DM, and medications, were obtained from patients' medical records. Diabetes complications and comorbidities were included only if confirmed by a specialist.

Before the start of the study, each patient was informed about its purpose. Each patient then completed the Audit of diabetes-dependent QoL (ADDQoL) questionnaire. The time needed for survey completion was 20–30 minutes. According to the data of the Polish National Health Fund (NFZ) and the Diabetes-Coalition in Poland, there are ca. 3.5 million patients with DM in Poland, which accounts for 9% of the total population. Type 2 diabetes has been diagnosed in 2 million people, which is 6% of the population. Considering that 6% of the Polish population has type 2 DM [11], with the maximum permissible error of 3% and confidence level of 90%, the minimum sample size can be estimated as 163 patients. For the Czech Republic, with a population of 10,650,000, with a stratum weight of 7.38% [12], a confidence level of 95%, and an estimation error of 4%, the minimum sample would be 164 patients. For Slovakia, with a population of 5,450,000, a stratum weight of 5.85% [13] confidence of 95%, and estimation error of 4%, the minimum sample would be 132 patients. Eventually, 214 participants from Poland, 196 from the Czech Republic, and 198 from Slovakia were qualified for the study; therefore, the sample size was considered representative.

**Instrument.** The Audit of Diabetes-Dependent Quality of Life (ADDQOL) consists of 2 overview items; one of them measures generic overall QoL and the remaining 19 items are concerned with the impact of diabetes on specific aspects of life. The 19 life domains are as follows: leisure activities, working life, local or long-distance journeys, holidays, physical health, family life, friendships and social life, close personal relationships, sex life, physical appearance, self-confidence, motivation to achieve things, people's reactions, feelings about the future, financial situation, living conditions, dependence on others, freedom to eat, and freedom to drink. With respect to these 19 domains, the respondents are asked to evaluate how their life would be if they did not have diabetes. The scales range from  $-3$  to  $+1$  for 19 life domains (impact rating) and from 0 to  $+3$  for attributed importance (importance rating). A weighted score for each domain is calculated as a multiplier of impact rating and importance rating (ranging from  $-9$  to  $+3$ ). Lower scores reflect poorer QoL. Finally, the average weighted impact score (ADDQOL score) is calculated for the entire scale across all applicable domains [14, 15].

The study in Poland relied on the Polish language version of the ADDQoL, as its psychometric properties, determined earlier, indicate that it is a reliable tool for the assessment of QoL in Polish adults with T1DM or T2DM [16]. Validation in the respective countries also confirmed the utility of the instrument for the evaluation of patients with T2DM in Slovakia and the Czech Republic [17]. The instrument is characterized by high consistency and reliability coefficients for all 3 countries. Cronbach's alpha values were 0.928 for Poland, 0.936 for the Czech Republic, and 0.932 for Slovakia.

The analysis was performed in the R programme, version 3.6.2 [18]. The level of statistical significance assumed in all the calculations was  $\alpha = 0.05$ . The mean value and the standard deviation were calculated for the quantitative data. The Mann-Whitney U test was used to compare 2 independent groups characterized by non-normal distributions. The normality of distributions was verified using the Shapiro-Wilk test. The Chi-square test or the Yates-corrected Chi-square test was used to verify the occurrence of correlations between the analyzed variables. The reliability of the scale was determined by calculating Cronbach's alpha coefficient. A logistic regression model was created in order to determine the risk factors for the occurrence of lower AWI values (higher negative impact of diabetes on the QoL).

**Ethical Considerations.** The study was approved by the Bioethics Committee of the Beskidy Regional Chamber of Physicians in Bielsko Biala, Poland, on 11 February 2016 (Approval No. 2016/02/ 11/1), and the Bioethics Committee of the Wrocław Medical University (No. 621/2017). All participants were informed about the content of the study and gave their informed consent to participate. The study protocol was prepared in accordance with the Helsinki Declaration.

## RESULTS

The characteristics of the men and women by country are presented in Table 1. In the female group, the overall quality of life was slightly higher in Czech women ( $3.45 \pm 1.07$ ) than in Slovakian ( $3.44 \pm 1.02$ ) and Polish ( $3.33 \pm 0.95$ ) women. In the male group, the overall quality of life was slightly higher in Slovak men ( $3.51 \pm 0.94$ ) than in Polish ( $3.47 \pm 0.89$ ) and Czech

**Table 1.** Characteristics of studied patients

Parameter	Poland		p	Czech Republic		p	Slovakia		p	
	Female (N=100)	Male (N=114)		Female (N=82)	Male (N=114)		Female (N=96)	Male (N=102)		
Age [years]	mean±SD	61.45±8.29	61.61±7.31	p=0.774	58.71±6.46	59.48±7.38	p=0.767	58.31±6.27	59.26±7.67	p=0.942
	median	61.5	62		61	58		61	61	
	quartiles	54–65	58–65		52–65	56–62		52–65	58–62	
BMI [kg/m <sup>2</sup> ]	mean±SD	25.34±4.86	26.92±4.38	p=0.002 *	26.61±2.93	27.06±4.31	p=0.781	25.73±2.24	24.85±2.85	p=0.005 *
	median	24.45	27.6		24.84	25.25		24.84	23.89	
	quartiles	23.43–28.33	24.49–28.91		24.39–28.73	22.71–29.6		24.15–28.73	22.71–27.56	
Diabetes duration [years]	mean±SD	5.64±2.35	6±2.92	p=0.636	5.43±2	5.32±2.66	p=0.279	5.92±1.7	6.08±2.67	p=0.459
	median	6	6		6	5		7	6	
	quartiles	4–7	4–8		4–7	3–6		4–7	4–8	
Glucose fasting [mg/dL]	mean±SD	149.94±66.68	158.17±45.14	p=0.023 *	152.34±39.59	159.38±42.94	p=0.135	147.54±31.14	154.43±44.11	p=0.184
	median	132	143		132	145		132	145	
	quartiles	121–148	123.25–188.5		121–189	124–201		121–189	121–187	
HbA1c [%]	mean±SD	7.26±0.8	7.84±0.91	p<0.001 *	7.11±1.02	8.44±1.38	p<0.001 *	6.96±0.91	8.45±1.54	p<0.001 *
	median	7.1	7.8		6.8	8.9		6.8	8.9	
	quartiles	6.8–8	7.2–8.28		6.1–8.1	7.2–9.7		6.1–8.1	6.8–9.7	
Education	Vocational or primary	30 (30.00%)	65 (57.02%)	p<0.001 *	30 (36.59%)	56 (49.12%)	p=0.16	34 (35.42%)	53 (51.96%)	p=0.047 *
	Pre-university	52 (52.00%)	32 (28.07%)		45 (54.88%)	47 (41.23%)		55 (57.29%)	46 (45.10%)	
	Higher	18 (18.00%)	17 (14.91%)		7 (8.54%)	11 (9.65%)		7 (7.29%)	3 (2.94%)	
Place of residence	Rural	35 (35.00%)	39 (34.21%)	p=0.715	38 (46.34%)	50 (43.86%)	p=0.842	70 (72.92%)	53 (51.96%)	p=0.004 *
	Urban	64 (64.00%)	75 (65.79%)		44 (53.66%)	64 (56.14%)		26 (27.08%)	49 (48.04%)	
Marital status	Not in relationship	1 (1.00%)	0 (0.00%)		0 (0.00%)	50 (43.86%)	p<0.001 *	1 (1.04%)	53 (51.96%)	p<0.001 *
	In relationship	23 (23.00%)	45 (39.47%)	p=0.01 *	82 (100.00%)	64 (56.14%)		95 (98.96%)	49 (48.04%)	
Professional activity	Currently working	75 (75.00%)	69 (60.53%)		32 (39.02%)	64 (56.14%)	p=0.026 *	26 (27.08%)	49 (48.04%)	p=0.004 *
	Not working	2 (2.00%)	0 (0.00%)		50 (60.98%)	50 (43.86%)		70 (72.92%)	53 (51.96%)	
Smoking	Never	29 (29.00%)	35 (30.70%)	p=0.903	57 (69.51%)	44 (38.60%)	p<0.001 *	76 (79.17%)	58 (56.86%)	p<0.001 *
	Past	71 (71.00%)	79 (69.30%)		6 (7.32%)	34 (29.82%)		1 (1.04%)	33 (32.35%)	
	Present	65 (65.00%)	19 (16.67%)	p<0.001 *	19 (23.17%)	36 (31.58%)		19 (19.79%)	11 (10.78%)	
Alcohol	Drinking	18 (18.00%)	31 (27.19%)		6 (7.32%)	57 (50.00%)	p<0.001 *	0 (0.00%)	34 (33.33%)	p<0.001 *
	Not drinking	17 (17.00%)	62 (54.39%)		76 (92.68%)	57 (50.00%)		96 (100.00%)	68 (66.67%)	
Comorbidities	Coronary artery disease	0 (0.00%)	2 (1.75%)		30 (36.59%)	27 (23.68%)	p=0.026 *	34 (35.42%)	29 (28.43%)	p=0.201
	Hypertension	9 (9.00%)	67 (58.77%)	p<0.001 *	75 (91.46%)	108 (94.74%)	p=0.083	89 (92.71%)	102 (100.00%)	p=1
	Heart failure	91 (91.00%)	47 (41.23%)		6 (7.32%)	35 (30.70%)	p<0.001 *	0 (0.00%)	42 (41.18%)	p<0.001 *
	Renal failure	24 (24.00%)	40 (35.09%)	p=0.124	6 (7.32%)	28 (24.56%)	p=0.007 *	1 (1.04%)	33 (32.35%)	p<0.001 *
	Eye diseases	72 (72.00%)	100 (87.72%)	p=0.002 *	37 (45.12%)	34 (29.82%)	p=0.011 *	52 (54.17%)	38 (37.25%)	p=0.005 *
Drugs	Oral antidiabetic	25 (25.00%)	20 (17.54%)	p=0.2	38 (46.34%)	39 (34.21%)	p=0.117	37 (38.54%)	22 (21.57%)	p=0.014 *
	Insulin	10 (10.00%)	26 (22.81%)	p=0.024 *	26 (31.71%)	95 (83.33%)	p<0.001 *	27 (28.12%)	94 (92.16%)	p<0.001 *
	Antihypertensive	38 (38.00%)	31 (27.19%)	p=0.087	56 (68.29%)	108 (94.74%)	p<0.001 *	70 (72.92%)	102 (100.00%)	p<0.001 *
	Statins	44 (44.00%)	36 (31.58%)	p=0.083	31 (37.80%)	22 (19.30%)	p=0.007 *	53 (55.21%)	22 (21.57%)	p<0.001 *
	Retinopathy	56 (56.00%)	92 (80.70%)	p<0.001 *	56 (68.29%)	40 (35.09%)	p<0.001 *	71 (73.96%)	38 (37.25%)	p<0.001 *
Complications of diabetes	Nephropathy	73 (73.00%)	97 (85.09%)	p=0.044 *	6 (7.32%)	7 (6.14%)	p=0.944	1 (1.04%)	10 (9.80%)	p=0.001 *
	Polyneuropathy	34 (34.00%)	39 (34.21%)	p=1	6 (7.32%)	42 (36.84%)	p<0.001 *	1 (1.04%)	52 (50.98%)	p<0.001 *
	Diabetic foot	45 (45.00%)	32 (28.07%)	p=0.014 *	6 (7.32%)	35 (30.70%)	p<0.001 *	0 (0.00%)	42 (41.18%)	p<0.001 *

p - Mann-Whitney test for quantitative variables, chi-squared or Fisher's exact test for qualitative variables.

\* Statistically significant (p&lt;0.05).

(3.32±0.81) men. It can be noted that the generally perceived quality of life in the study group is higher in men than in women.

The average score for the item 'If I did not have diabetes, my quality of life would be ...' was slightly higher in the group of Polish women (2.66±0.93) than in Slovak (2.57±0.86) and Czech (2.49±0.96) women. In the male group, it was the highest for Poles (2.64±0.9), then for Czechs and Slovaks (2.62±0.92).

In general, women from all three countries assessed their quality of life as good and very good: 64% of Polish, 55.15% of Slovak, and 50% of Czech women. Only one woman from Poland assessed her quality of life as excellent. Men similarly assessed their overall quality of life as good and very good: 65.79% of Polish, 55.88% of Slovak, and 53.51% of Czech men. It can be noted that the quality of life received the highest scores from Polish patients, both men and women.

When responding to the item 'If I did not have diabetes, my quality of life would be ...', women in all three countries claimed that it would be better – 85.42% of Slovak, 84.15% of Czech, and 81% of Polish women. Again, only one woman from Poland claimed that her quality of life would be worse without diabetes. Men also claimed that their quality of life would be better – 84.32% of Slovak, 81.58% of Polish, and 81.57% of Czech men. There were also no significant differences between women from Poland, the Czech Republic, and Slovakia, and between men from Poland, the Czech Republic, and Slovakia ( $p$ -value>0.05 in both cases) (Tab. 2).

**Weighted impact score.** Table 3 presents weighted impact scores by gender for each country. In the study group, weighted scores were negative for all the domains. In all three groups of women, the lowest scores were given to 'freedom to eat', and were:  $-4.15 \pm 2.7$  for Polish,  $-4.17 \pm 2.53$  for Czech, and  $-4.06 \pm 2.26$  for Slovak women. Similarly, in the

male group, the lowest scores were given to 'freedom to eat', but in a different order:  $-4.32 \pm 2.7$  for Polish,  $-4.31 \pm 2.61$  for Slovak, and  $4.15 \pm 2.47$  for Czech men (Tab. 3). This means that these aspects of life were the most affected by diabetes.

**Ranks.** In all the study groups of women, the domain on which DM had the highest impact was the patients' 'freedom to eat'. For Poles, the second-most affected sphere was 'feelings about the future', and for Czech and Slovak women it was 'freedom to drink'. The third most affected domain for Polish women was their 'working life', while for Czech and Slovak women – 'feelings about the future'. Also, for all the male participants, it was 'freedom to eat' that was the most affected by DM. The second-most affected domain for Poles and Czechs was 'feelings about the future', while for Slovaks – 'freedom to drink'. The third-most affected area for Poles and Czechs was 'freedom to drink', and for Slovaks – 'feelings about the future' (Tab. 4). The least affected domains of life in all of the groups of men and women were 'living conditions', followed by 'people's reactions' for Polish and Czech men and women, and Slovak men, and 'leisure activities' for Slovak women (Tab. 4). The impact of diabetes on 'sex life' was almost in the middle, although it was greater in women than in men; and among the female group, it was the strongest in Czech women (Tab. 4).

**Average Weighted Impact (AWI).** In the assessment of AWI, the impact of diabetes on particular items pertaining to the domains of quality of life can be divided into: high negative impact (score from  $-9$  to  $-6.1$ ), moderate negative impact (score from  $-6$  to  $-3.1$ ), small negative impact (score from  $-3$  to  $0$ ), and the absence of a negative or a positive impact (score from  $0$  to  $3$ ). The average weighted impact (AWI) score in the

**Table 2.** General quality of life of men and women and with diabetes

Parameter	Poland		p	Czech Republic		p	Slovakia		p	
	Female (N=100)	Male (N=114)		Female (N=82)	Male (N=114)		Female (N=96)	Male (N=102)		
In general, my present quality of life is	mean±SD	3.33±0.95	3.47±0.89	p=0.188	3.45±1.07	3.32±0.81	p=0.363	3.44±1.02	3.51±0.94	p=0.513
	median	3	3		3.5	3		3	3	
	quartiles	3 - 4	3 - 4		3 - 4	3 - 4		3 - 4	3 - 4	
If I did not have diabetes, my quality of life would be	mean±SD	2.66±0.93	2.64±0.9	p=0.905	2.49±0.96	2.62±0.92	p=0.339	2.57±0.86	2.62±0.9	p=0.6
	median	3	3		2.5	3		3	3	
	quartiles	2 - 3	2 - 3		2 - 3	2 - 3		2 - 3	2 - 3	
In general, my present quality of life is	Excellent (+3)	1 (1.00%)	0 (0.00%)		0 (0.00%)	0 (0.00%)		0 (0.00%)	0 (0.00%)	
	Very good (+2)	15 (15.00%)	13 (11.40%)		17 (20.73%)	13 (11.40%)		15 (15.62%)	9 (8.82%)	
	Good (+1)	49 (49.00%)	48 (42.11%)		24 (29.27%)	62 (54.39%)		42 (43.75%)	48 (47.06%)	
	Neither good or bad (0)	21 (21.00%)	42 (36.84%)		33 (40.24%)	29 (25.44%)		25 (26.04%)	34 (33.33%)	
	Bad (-1)	13 (13.00%)	9 (7.89%)		4 (4.88%)	9 (7.89%)		11 (11.46%)	8 (7.84%)	
	Very bad (-2)	1 (1.00%)	1 (0.88%)		3 (3.66%)	1 (0.88%)		2 (2.08%)	1 (0.98%)	
	Extremely bad (-3)	0 (0.00%)	1 (0.88%)		1 (1.22%)	0 (0.00%)		1 (1.04%)	2 (1.96%)	
Very much better (-3)	11 (11.00%)	12 (10.53%)		14 (17.07%)	13 (11.40%)		9 (9.38%)	13 (12.75%)		
If I did not have diabetes, my quality of life would be	Much better (-2)	32 (32.00%)	38 (33.33%)		27 (32.93%)	38 (33.33%)		37 (38.54%)	29 (28.43%)	
	A little better (-1)	38 (38.00%)	43 (37.72%)		28 (34.15%)	42 (36.84%)		36 (37.50%)	44 (43.14%)	
	The same (0)	18 (18.00%)	21 (18.42%)		13 (15.85%)	21 (18.42%)		14 (14.58%)	16 (15.69%)	
	Worse (1)	1 (1.00%)	0 (0.00%)		0 (0.00%)	0 (0.00%)		0 (0.00%)	0 (0.00%)	

p - Mann-Whitney test for quantitative variables, chi-squared or Fisher's exact test for qualitative variables; \* Statistically significant ( $p < 0.05$ )

**Table 3.** Weighted impact score in group

Weighted impact score	Poland			p	Czech Republic			p	Slovakia			p
	Female	Male			Female	Male			Female	Male		
Leisure activities	mean±SD	-1.61±1.7	-1.72±1.74	p=0.562	-1.75±1.84	-1.62±1.65	p=0.839	-2.02±1.85	-1.63±1.66	p=0.139		
	median	-2	-2		-2	-2		-2	-2			
	quartiles	-2 - 0	-3 - 0		-2 - 0	-3 - 0		-3 - 0	-2 - 0			
Working life	mean±SD	-2.71±2.74	-2.64±2.95	p=0.711	-2.53±2.52	-2.79±2.9	p=0.798	-2.85±2.66	-2.63±3.1	p=0.318		
	median	-2	-2		-2	-2		-2	-2			
	quartiles	-4 - 0	-4 - 0		-4 - 0	-4 - 0		-4 - 0	-4 - 0			
Journeys	mean±SD	-2.07±2.23	-2.18±2.51	p=0.947	-1.68±1.99	-2.44±2.41	p=0.019 *	-2.33±2.42	-2.29±2.52	p=0.78		
	median	-2	-2		-1	-2		-2	-2			
	quartiles	-4 - 0	-3 - 0		-2 - 0	-4 - 0		-4 - 0	-4 - 0			
Holidays	mean±SD	-2.57±2.64	-2.28±2.46	p=0.518	-2.56±2.76	-2.32±2.56	p=0.572	-2.74±2.7	-2.62±2.8	p=0.686		
	median	-2	-2		-2	-2		-2	-2			
	quartiles	-4 - 0	-3 - 0		-3.5 - 0	-4 - 0		-4 - 0	-4 - 0			
Physical health	mean±SD	-2.64±2.43	-2.42±2.38	p=0.483	-2.39±2.31	-2.84±2.7	p=0.374	-2.69±2.31	-2.55±2.56	p=0.374		
	median	-2	-2		-2	-2		-2	-2			
	quartiles	-4 - -1	-4 - -1		-4 - -1	-4 - -1		-4 - -1	-4 - 0			
Family life	mean±SD	-2.06±2.55	-1.79±2.4	p=0.558	-2.11±2.48	-1.94±2.62	p=0.381	-2.09±2.4	-2.04±2.6	p=0.629		
	median	-1	-1		-2	0		-2	-1			
	quartiles	-4 - 0	-3 - 0		-3 - 0	-3 - 0		-4 - 0	-3 - 0			
Friendship & social life	mean±SD	-2.05±2.29	-1.79±2.19	p=0.365	-1.85±2.14	-2.08±2.23	p=0.5	-1.89±2.32	-1.68±2.1	p=0.645		
	median	-2	-1		-2	-2		-1	-1			
	quartiles	-3 - 0	-3 - 0		-2 - 0	-4 - 0		-4 - 0	-3 - 0			
Personal relationship	mean±SD	-2.26±2.58	-2.11±2.79	p=0.522	-1.76±2.33	-1.87±2.62	p=0.899	-2.42±2.63	-2.3±2.94	p=0.424		
	median	-2	-1		0	0		-2	-1			
	quartiles	-4 - 0	-4 - 0		-3 - 0	-3.75 - 0		-4 - 0	-4 - 0			
Sex life	mean±SD	-2.48±2.86	-2.36±2.58	p=0.942	-1.97±2.6	-2.5±2.69	p=0.149	-2.44±2.48	-2.75±2.9	p=0.717		
	median	-2	-2		-1	-2		-2	-2			
	quartiles	-4 - 0	-4 - 0		-3 - 0	-4 - 0		-4 - 0	-4 - 0			
Physical appearance	mean±SD	-2.32±2.87	-2.35±2.76	p=0.814	-2.58±2.95	-2.61±3.1	p=0.9	-2.44±3.01	-2.56±2.99	p=0.817		
	median	-2	-2		-2	-2		-2	-1			
	quartiles	-4 - 0	-4 - 0		-4.5 - 0	-4 - 0		-4 - 0	-4 - 0			
Self-confidence	mean±SD	-2.33±2.62	-2.19±2.55	p=0.696	-2.37±2.58	-2.08±2.45	p=0.415	-2.73±2.81	-2.14±2.51	p=0.135		
	median	-2	-2		-2	-2		-2	-2			
	quartiles	-4 - 0	-4 - 0		-4 - 0	-4 - 0		-4 - 0	-3 - 0			
Motivation	mean±SD	-2.59±2.5	-2.39±2.3	p=0.623	-2.42±2.19	-2.41±2.4	p=0.688	-2.66±2.32	-2.41±2.35	p=0.355		
	median	-2	-2		-2	-2		-2	-2			
	quartiles	-4 - 0	-4 - 0		-4 - -1	-4 - 0		-4 - -1	-3 - 0			
People's reaction	mean±SD	-1.7±2.33	-1.31±1.93	p=0.204	-1.34±2.03	-1.31±1.95	p=0.903	-1.49±2.02	-1.32±2.01	p=0.39		
	median	-1	0		0	0		0	0			
	quartiles	-2 - 0	-2 - 0		-2 - 0	-2 - 0		-2 - 0	-2 - 0			
Feelings about the future	mean±SD	-3.01±2.7	-2.68±2.5	p=0.392	-2.72±2.52	-2.88±2.56	p=0.629	-3.21±2.53	-2.94±2.54	p=0.338		
	median	-2.5	-2		-2	-2		-3	-2			
	quartiles	-4 - -1	-4 - -0.25		-4 - -1	-4 - 0		-4 - -2	-4 - -1			
Financial situation	mean±SD	-2.62±2.45	-2.29±2.34	p=0.329	-2.65±2.41	-2.5±2.4	p=0.642	-2.76±2.46	-2.14±2.14	p=0.087		
	median	-2	-2		-2	-2		-2	-2			
	quartiles	-4 - 0	-4 - 0		-4 - 0	-4 - 0		-6 - 0	-4 - 0			

**Table 3.** Weighted impact score in group (continuation)

Weighted impact score	Poland			p	Czech Republic			p	Slovakia			p
	Female	Male			Female	Male			Female	Male		
Living conditions	mean±SD	-1.36±2.24	-1.09±1.75	p=0.711	-1.33±2.01	-1.26±2.06	p=0.696	-1.45±2.01	-1.18±2.04	p=0.155		
	median	0	0		0	0		0	0			
	quartiles	-2 - 0	-2 - 0		-2 - 0	-2 - 0		-2 - 0	-2 - 0			
Dependence on others	mean±SD	-2.26±2.57	-1.59±2.33	p=0.022 *	-1.92±2.37	-1.89±2.41	p=0.838	-1.97±2.36	-1.96±2.5	p=0.844		
	median	-2	0		-2	-1		-2	-1.5			
	quartiles	-4 - 0	-2 - 0		-3 - 0	-3 - 0		-3 - 0	-3 - 0			
Freedom to eat	mean±SD	-4.12±2.7	-4.32±2.7	p=0.559	-4.17±2.53	-4.15±2.47	p=0.941	-4.06±2.26	-4.31±2.61	p=0.454		
	median	-4	-4		-4	-4		-4	-4			
	quartiles	-6 - -2	-6 - -2		-6 - -2	-6 - -2		-4 - -2	-6 - -2.75			
Freedom to drink	mean±SD	-3.2±2.89	-2.81±2.25	p=0.627	-3.08±2.43	-2.88±2.41	p=0.616	-2.83±2.51	-2.86±2.51	p=0.967		
	median	-2	-2		-2	-2		-2	-2			
	quartiles	-4 - -1	-4 - -1		-4 - -2	-4 - -1		-4 - -1	-4 - -1			

p - Mann-Whitney test; \* statistically significant (p&lt;0.05)

study group was the lowest for Slovak women (-2.46±1.62), then for Polish (-2.41±1.71) and Czech (-2.27±1.66) women. The results indicate a small negative impact of diabetes on the female part of the study group. The lowest weighted impact score was for Czech men (-2.33±1.61), then for Slovak (-2.31±1.67) and Polish (-2.21±1.51) men, which also points to a small negative impact of diabetes on the participants. It can be noted that the average weighted impact (AWI) score was higher for men than for women; however, no correlation was statistically significant (p> 0.05). In general, it can be concluded that diabetes has a small negative impact on all the study groups, regardless of gender.

**Table 4.** Ranks

Weighted impact score	Poland		Czech Republic		Slovakia	
	Female	Male	Female	Male	Female	Male
Leisure activities	15	16.0	16	17.0	18	16.0
Working life	3	4.0	7	5.0	4	4.0
Journeys	13	12.0	17	9.0	14	12.0
Holidays	6	10.0	6	11.0	8	10.0
Physical health	8	5.0	9	4.0	5	5.0
Family life	14	14.5	11	14.0	15	14.5
Friendship & social life	17	14.5	14	12.5	16	14.5
Personal relationship	12	13.0	15	16.0	13	13.0
Sex life	10	7.0	12	8.0	9	7.0
Physical appearance	11	8.0	5	6.0	11	8.0
Self-confidence	7	11.0	10	12.5	10	11.0
Motivation	9	6.0	8	10.0	7	6.0
People's reaction	18	18.0	18	18.0	17	18.0
Feelings about future	2	3.0	3	2.0	3	3.0
Financial situation	5	9.0	4	7.0	6	9.0
Living conditions	19	19.0	19	19.0	19	19.0
Dependence on others	16	17.0	13	15.0	12	17.0
Freedom to eat	1	1.0	1	1.0	1	1.0
Freedom to drink	4	3	2	3.0	2	2.0

**Regression analysis.** The linear regression model was used to verify whether the selected social and demographic factors (gender, education, residence, marital status) or clinical parameters (smoking, alcohol consumption, hypertension, and anti-hypertensive drugs), or parameters that were statistically significant in individual groups, could affect the quality of life by lowering the AWI score. Additionally, the groups were divided into men and women, and within these groups, into subgroups with a lower (<-3.0) and with a higher (>-3.0) AWI score. Women with AWI >-3.0 predominated in all three countries. In the female group, no statistically significant differences between the groups with AWI < -3.0 and > -3.0 were observed depending on the selected demographic and clinical factors (all p-values higher than 0.05) (Tab. 5). Men with AWI >-3.0 predominated in all three countries. In the group with AWI >-3.0, men from Poland were better educated (p=0.07). The remaining correlations were not statistically significant (Tab. 5). Except for the different AWI scores in men with type 2 diabetes depending on their education, neither men nor women revealed any significant changes in terms of the impact of education, residence, marital status, smoking, hypertension, or taking anti-hypertensive drugs.

## DISCUSSION

The study provides information about diabetes-related QoL and its assessment by men and women with T2DM in Poland, Slovakia, and the Czech Republic utilizing the widely-used DM-specific ADDQoL scale [16, 19, 20, 21].

The issue of the QoL is also addressed by the International Diabetes Federation which considers the quality of life as one of the fundamental goals of diabetes care, along with metabolic control and prevention. This is because it has been proven that laboratory results which are so important for physicians, are important for patients with DM only to the extent that they affect their physical, emotional and social well-being, namely the quality of life [22].

Currently, there are few studies presenting gender differences with regard to the quality of life of DM patients, and studies that assess the quality of life of men and women using the ADDQoL tool are very rare.

**Table 5.** Linear regression results in the female and male groups

FEMALE Parameter	AWI Poland			AWI Czech Republic			AWI Slovakia			
	< -3.0 (N=29)	> -3.0 (N=71)	p	< -3.0 (N=21)	> -3.0 (N=61)	p	< -3.0 (N=29)	> -3.0 (N=67)	p	
Education	Vocational or primary	8 (27.59%)	22 (30.99%)	p=0.594	7 (33.33%)	23 (37.70%)	p=0.586	6 (20.69%)	28 (41.79%)	p=0.062
	Pre-university	14 (48.28%)	38 (53.52%)		11 (52.38%)	34 (55.74%)		19 (65.52%)	36 (53.73%)	
	Higher	7 (24.14%)	11 (15.49%)		3 (14.29%)	4 (6.56%)		4 (13.79%)	3 (4.48%)	
Place of residence	Rural	8 (27.59%)	27 (38.03%)	p=0.546	9 (42.86%)	29 (47.54%)	p=0.906	18 (62.07%)	52 (77.61%)	p=0.186
	Urban	21 (72.41%)	43 (60.56%)		12 (57.14%)	32 (52.46%)		11 (37.93%)	15 (22.39%)	
	Unknown	0 (0.00%)	1 (1.41%)		0 (0.00%)	0 (0.00%)	p=1	1 (3.45%)	0 (0.00%)	p=0.302
Marital status	Not in relationship	5 (17.24%)	18 (25.35%)	p=0.551	21 (100.00%)	61 (100.00%)		28 (96.55%)	67 (100.00%)	
	In relationship	24 (82.76%)	51 (71.83%)		13 (61.90%)	44 (72.13%)	p=0.631	21 (72.41%)	55 (82.09%)	p=0.241
	Unknown	0 (0.00%)	2 (2.82%)		2 (9.52%)	4 (6.56%)		1 (3.45%)	0 (0.00%)	
Smoking	Never	17 (58.62%)	48 (67.61%)	p=0.587	6 (28.57%)	13 (21.31%)		7 (24.14%)	12 (17.91%)	
	Past	7 (24.14%)	11 (15.49%)		1 (4.76%)	5 (8.20%)	p=1	0 (0.00%)	0 (0.00%)	p=1
	Present	5 (17.24%)	12 (16.90%)		20 (95.24%)	56 (91.80%)		29 (100.00%)	67 (100.00%)	
Alcohol	Drinking	2 (6.90%)	7 (9.86%)	p=1	18 (85.71%)	57 (93.44%)	p=1	25 (86.21%)	64 (95.52%)	p=1
	Not drinking	27 (93.10%)	64 (90.14%)		12 (57.14%)	44 (72.13%)	p=0.317	18 (62.07%)	52 (77.61%)	p=0.186
Hypertension	Yes	18 (62.07%)	54 (76.06%)	p=0.381	9 (42.86%)	17 (27.87%)		11 (37.93%)	15 (22.39%)	
Anti-hypertensive drugs	Yes	18 (62.07%)	55 (77.46%)	p=0.185	7 (33.33%)	23 (37.70%)	p=0.586	6 (20.69%)	28 (41.79%)	p=0.062
	No	11 (37.93%)	16 (22.54%)		11 (52.38%)	34 (55.74%)		19 (65.52%)	36 (53.73%)	
MALE Parameter	AWI Poland			AWI Czech Republic			AWI Slovakia			
	< -3.0 (N=29)	> -3.0 (N=85)	p	< -3.0 (N=34)	> -3.0 (N=80)	p	< -3.0 (N=27)	> -3.0 (N=75)	p	
Education	Vocational or primary	19 (65.52%)	46 (54.12%)	p=0.017*	16 (47.06%)	40 (50.00%)	p=0.87	13 (48.15%)	40 (53.33%)	p=0.921
	Pre-university	10 (34.48%)	22 (25.88%)		14 (41.18%)	33 (41.25%)		13 (48.15%)	33 (44.00%)	
	Higher	0 (0.00%)	17 (20.00%)		4 (11.76%)	7 (8.75%)		1 (3.70%)	2 (2.67%)	
Place of residence	Rural	9 (31.03%)	30 (35.29%)	p=0.849	14 (41.18%)	36 (45.00%)	p=0.865	13 (48.15%)	40 (53.33%)	p=0.812
	Urban	20 (68.97%)	55 (64.71%)		20 (58.82%)	44 (55.00%)		14 (51.85%)	35 (46.67%)	
	Unknown	0 (0.00%)	0 (0.00%)		14 (41.18%)	36 (45.00%)	p=0.865	13 (48.15%)	40 (53.33%)	p=0.812
Marital status	Not in relationship	16 (55.17%)	29 (34.12%)	p=0.075	20 (58.82%)	44 (55.00%)		14 (51.85%)	35 (46.67%)	
	In relationship	13 (44.83%)	56 (65.88%)		12 (35.29%)	32 (40.00%)	p=0.607	15 (55.56%)	43 (57.33%)	p=0.804
	Unknown	0 (0.00%)	0 (0.00%)		9 (26.47%)	25 (31.25%)		10 (37.04%)	23 (30.67%)	
Smoking	Never	6 (20.69%)	13 (15.29%)	p=0.188	13 (38.24%)	23 (28.75%)		2 (7.41%)	9 (12.00%)	
	Past	10 (34.48%)	21 (24.71%)		18 (52.94%)	39 (48.75%)	p=0.838	7 (25.93%)	27 (36.00%)	p=0.475
	Present	11 (37.93%)	51 (60.00%)		16 (47.06%)	41 (51.25%)		20 (74.07%)	48 (64.00%)	
Alcohol	Drinking	2 (6.90%)	0 (0.00%)		32 (94.12%)	76 (95.00%)	p=1	27 (100.00%)	75 (100.00%)	p=1
	Not drinking	14 (48.28%)	53 (62.35%)	p=0.266	32 (94.12%)	76 (95.00%)	p=1	27 (100.00%)	75 (100.00%)	p=1
Hypertension	Yes	15 (51.72%)	32 (37.65%)		2 (5.88%)	4 (5.00%)		0 (0.00%)	0 (0.00%)	
Anti-hypertensive drugs	Yes	28 (96.55%)	72 (84.71%)	p=1	16 (47.06%)	40 (50.00%)	p=0.87	13 (48.15%)	40 (53.33%)	p=0.921
	No	28 (96.55%)	69 (81.18%)	p=0.067	14 (41.18%)	33 (41.25%)		13 (48.15%)	33 (44.00%)	

p - chi-squared or Fisher's exact test for qualitative variables; \* Statistically significant (p<0.05).

This study focuses on identifying features that differentiated female groups from the male in individual countries, and on examining the quality of life of DM patients with regard to gender in the individual countries.

The subjective assessment of the patients' quality of life is affected by clinical, as well as social and demographic factors [22], which is also indicated by other researchers from Central Europe [23].

In the analyzed group of women, the overall average quality of life was slightly higher in Czech women than in women from Slovakia and Poland. In general, women from all three countries assessed their quality of life as good and very good. Men also rated their overall quality of life as good and very good. In the group of men, the average quality of life was slightly higher in Slovaks than in Poles and Czechs. In this study, it can be noted, however, that the generally

perceived quality of life in the study group is slightly higher in men than in women.

Similar results were obtained in a study by Abedini et al. Although the study used a different research tool for assessing the level of QoL, men from the study group obtained definitely higher scores than women in the domain of psychology [24], which can also be interpreted in line with other studies that conclude that men have higher self-confidence in terms of their ability of self-care and management of diabetes, and they are less frequently anxious due to their illness, or experience depressive disorders. Hence, the good knowledge and a positive attitude that are the predictors of adherence to self-care rules and are conducive to good QoL [25, 26, 27].

In studies by Tramat et al. [28] and in a work by Lewko and Krajewska-Kulak [29], as well as by Glasgow [30], gender also differentiated participants in terms of satisfaction with the quality of life. The authors claim that women had lower scores because of their lower self-reported quality of life compared to men. They referred the results to a higher propensity of women to depressive states. Also, the results of studies by Polish authors indicate that the quality of life is significantly reduced by the female gender, and by the symptoms of depression [31] and anxiety.

Quite the opposite results, pointing to a lower quality of life in a group of men, were obtained by D'Souza et al. [32] who concluded that in general, women cope better with compliance with therapy rules, and therefore have better results for HbA1c levels and a lower BMI; hence, their quality of life, in general, is higher. These findings are consistent with other studies which have proven that the duration of diabetes, fasting blood glucose and a positive attitude to treatment, are conducive to a better perception of the quality of life by women [33].

Szcześniak and Źmurowska [34] concluded in their study that gender does not constitute a factor differentiating the participants in terms of the assessment of the quality of life.

In the current study, it can be seen that the quality of life was similarly assessed by all respondents, both men and women. There were also no significant differences, neither between women from Poland, the Czech Republic, and Slovakia, nor between men from Poland, the Czech Republic, and Slovakia.

About 50% of women (most of them from Poland) and men (most of them from the Czech Republic) participating with type 2 diabetes declared at least a good level of QoL. On the other hand, more than 80% of participants (both men and women) in each country stated that their quality of life would be better without DM. Similar results were obtained by Golińska et al. in a study in which the majority of participants of both genders assessed their quality of life as good, but no statistically significant correlation was found between gender and QoL [35]. Chudiak et al. also obtained similar results in a study in which participants unanimously stated that their quality of life would be much better had it not been for their diabetes [36]. In the study group, the weighted impact scores were negative for all the domains. The lowest scores in all three groups of women and in all three groups of men were obtained for 'freedom to eat'.

The current study demonstrates that for both men and women, diabetes has the greatest impact on 'freedom to eat' and 'freedom to drink', which confirms that dietary restrictions related to the non-pharmacological control of diabetes are burdensome to them. The need for adherence to

a dietary regime affects the presence of early complications of diabetes, such as hypoglycaemia and hyperglycaemia, the levels of HbA1C, as well as the occurrence of a variety of complications and overweight present in the large group of men and women in the study group.

This study confirms the results of previous studies carried out in Poland [16, 37], as well as in other countries, such as Argentina [38], Greece, or cross-sectional studies with the participation of patients from nine European [21] countries.

In a study by Bradley conducted with the use of ADDQoL among patients with type 1 and type 2 diabetes mellitus, the negative impact of diabetes on the quality of life in all domains was confirmed for almost all cases, despite a high level of satisfaction with treatment observed in the patients. Adherence to the diet had a dominant impact on the quality of life, and was perceived by the participants as very restrictive [14].

The least affected domains of life in all of the groups of women and men were 'living conditions', followed by 'people's reactions' for Polish and Czech men and women, and Slovak men, and 'leisure activities' for Slovak women.

Almost in the middle of the scale, there is the impact of diabetes on 'sex life'. Diabetes has a higher impact on this aspect of life in men (in all groups), and a slightly lower impact in women (the highest in Slovak women, then in Polish and Czech women). Sexual dysfunctions in women with diabetes are primarily an impaired libido and pain during intercourse, mainly due to vaginal dryness [39, 40, 41]. Sexual problems in men with diabetes involve erectile dysfunction, with the problem increasing with the duration of diabetes [42, 43]. This common, increasing, and embarrassing problem poses a challenge for contemporary diabetes care, as confirmed by the authors' own study, although their analyses pointed to a higher intensity of this problem in men. The results of a study by Bąk et al. [31] also confirmed that diabetes has a negative impact on the quality of life of patients with diabetes in Poland, especially in terms of 'freedom to eat', 'freedom to drink' and 'sex life' in both genders of patients with T1DM, 'freedom to eat', 'freedom to drink' and 'feelings about the future' in both genders, and 'working life' and 'sex life' in men with T2DM.

The average weighted impact (AWI) score in the authors' own study was the lowest for Slovak women, then for Polish and Czech women. This was slightly different in the male group. The lowest weighted impact scores were obtained for Czech men, then for Slovak and Polish men. It can be noted that the average weighted impact (AWI) was higher for men. In general, it can be concluded that diabetes has a small negative impact on all the study groups, regardless of gender. Authors from Poland [34, 37] and from other countries obtained similar results [21].

Glasgow et al., in a study involving DM patients conducted with the use of the SF-20 questionnaire, demonstrated that a lower quality of life was influenced by such factors as a low level of education, older age, female gender, type of social insurance, number of complications of diabetes, number of comorbidities, and low level of physical activity during the activities of daily living [30].

Functional capacity is also a significant factor determining the quality of life of patients with diabetes mellitus. What is more, the quality of life is significantly reduced by the female gender, autonomic or peripheral neuropathy, lack of physical activity, high BMI, and symptoms of depression and anxiety [31].



The current study did not reveal any statistically significant impact of the selected social and demographic factors on the extent to which diabetes affects men and women. However, it was noted that in the study group, both men and women were characterized by the small negative impact of diabetes on the overall quality of life.

## CONCLUSIONS

Type 2 diabetes mellitus negatively affects all the domains of life, both in men and women; however, this impact is insignificant. The most affected domains were 'freedom to eat' and 'feelings about the future'. The generally perceived quality of life in the study group was higher in men than in women, and received similar scores from all patients, in both genders. Most of men and women in the study group assessed their quality of life as 'good' and 'very good'.

To the best of the authors' knowledge, there no similar studies on such an internationally selected group of patients by gender. The study reveals that type 2 diabetes has a negative impact on the health and perceived quality of life, especially in women who are prone to suffer from diabetes-related emotional and depressive disorders.

**Strengths and limitations of the study.** Nonetheless, the study does not illustrate the entire issue, or all problems experienced by patients with type 2 diabetes in the analyzed countries. It seems reasonable to extend the research on the quality of life and correlate it with additional parameters, such as, for example, the level of anxiety, depression or diabetes-related stress; and perhaps also with adherence to therapeutic recommendations or level of self-care.

## REFERENCES

1. Araszkiwicz A, Bandurska-Stankiewicz E, Budzyński A, Cypriak K, Czech A, Czupryniak L, et al. 2021 Guidelines on the management of patients with diabetes. A position of Diabetes Poland. *Clin Diabetol*. 2021;10(1):1–113.
2. Life expectancy at birth in the EU: men vs. women. <https://ec.europa.eu/eurostat/>...
3. Rokicka D, Wróbel M, Szymorska-Kajaneck A, Bożek A, Strojek K. Assessment of compliance to self monitoring of blood glucose in type 2 diabetic patients and level of implementation of Polish Diabetes Association Recommendation for general practitioners — results of multicenter, prospective educational health programme — DIABCON study. *Clin Diabetol*. 2018;7(3):129–135. doi:10.5603/DK.2018.0008
4. American Diabetes Association. Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Medical Care in Diabetes-2019. *Diabetes Care*. 2019;42(Suppl 1):S34–S45. doi:10.2337/dc19-S004
5. Krzemińska S, Bąk E, Šátéková L, Polanská A, Hašová K, Laurinc M. Comparison of Diabetes-Dependent Quality of Life (ADDQoL) in Patients with T2DM in Poland, The Czech Republic, and Slovakia. *Diabetes Metab Syndr Obes*. 2020; 13:3773–3786. <https://doi.org/10.2147/DMSO.S...>
6. Lee KH, Xu H, Wu B. Gender differences in quality of life among community-dwelling older adults in low- and middle-income countries: results from the Study on global AGEing and adult health (SAGE). *BMC Public Health* 20, 114 (2020). <https://doi.org/10.1186/s12889...>
7. Oreel TH, Nieuwkerk PT, Hartog ID, Netjes JE, Vonk ABA, Lemkes J, van Laarhoven HWM, Scherer-Rath M, Sprangers MAG, Henriques JPS. Gender differences in quality of life in coronary artery disease patients with comorbidities undergoing coronary revascularization. *PLoS One*. 2020;15(6):e0234543. doi: 10.1371/journal.pone.0234543. PMID: 32555617; PMCID: PMC7299316.
8. Tesfay A, Gebremariam A, Gerbaba M, Abrha H. Gender differences in health related quality of life among people living with HIV on highly active antiretroviral therapy in Mekelle Town, Northern Ethiopia. *Biomed Res Int*. 2015;2015:516369. doi:10.1155/2015/516369
9. da Rocha NS, Schuch FB, Fleck MP. Gender differences in perception of quality of life in adults with and without chronic health conditions: the role of depressive symptoms. *J Health Psychol*. 2014;19(6):721–729. doi:10.1177/1359105313478644
10. Castellano-Guerrero AM, Guerrero R, Ruiz-Aranda D, et al. Gender differences in quality of life in adults with long-standing type 1 diabetes mellitus. *Diabetol Metab Syndr*. 2020;12:64. Published 2020 Jul 17. doi:10.1186/s13098-020-00571-x
11. Statistical report: diabetes statistics in Poland and in the world. [in Polish]. Available from: <http://cukrzycapolska.pl/cukrz...> Accessed 03.02.2021
12. Available from: <https://www.uzis.cz/sites/defa...> Accessed 03.02.2021
13. Available from: <http://www.nczisk.sk/Documents...> Accessed 03.02.2021
14. Bradley C, Speight J. Patient perceptions of diabetes and diabetes therapy: assessing quality of life. *Diabetes Metab Res Rev*. 2002;18 Suppl 3:S64–S69. doi:10.1002/dmrr.279
15. Bradley C, Todd C, Gorton T, Symonds E, Martin A, Plowright R. The development of an individualized questionnaire measure of perceived impact of diabetes on quality of life: the ADDQoL. *Qual Life Res*. 1999;8(1–2):79–91. doi:10.1023/a:1026485130100
16. Bak E, Marcisz C, Nowak-Kapusta Z, Dobrzyn-Matusiak D, Marcisz E, Krzemińska S. Psychometric properties of the Audit of Diabetes-Dependent Quality of Life (ADDQoL) in a population-based sample of Polish adults with type 1 and 2 diabetes. *Health Qual Life Outcomes*. 2018;16(1):53. Published 2018 Mar 27. doi:10.1186/s12955-018-0878-y
17. Brož J, Janickova Zdarska D, Urbanova J, et al. An international, multicenter, observational survey to evaluate diabetes control in subjects using insulin for the treatment of type 1 and type 2 diabetes mellitus in the Czech Republic and Slovak Republic: study protocol for a cross-sectional survey. *Open Access J Clin Trials*. 2016;8:13–20. doi:10.2147/OAJCT.S103459
18. R Core Team (2019). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.
19. Daher AM, AlMashoor SHA, Winn T. Performance of the Malay Audit of Diabetes Dependent Quality of Life-18 and Associates of Quality of Life among Patients with Type 2 Diabetes Mellitus from Major Ethnic Groups of Malaysia. *PLOS ONE*. 2016;11(10):e0163701. <https://doi.org/10.1371/journal...>
20. Levterova B, Orbetzova M, Levterov G, Dimitrova D, Todorov P. Assessment of the impact of type 2 diabetes on the quality of life by Audit of Diabetes-Dependent Quality-of-Life (ADDQoL-19). *Biotechnol Biotechnol Equipment*. 2018;32:6, 1627–1634, doi: 10.1080/13102818.2018.1532319
21. Bradley C, Eschwège E, de Pablos-Velasco P, et al. Predictors of Quality of Life and Other Patient-Reported Outcomes in the PANORAMA Multinational Study of People With Type 2 Diabetes. *Diabetes Care*. 2018;41(2):267–276. doi:10.2337/dc16-2655
22. Badura Brzoza K, Głowczyński P, Piegza M, Błachut M, Sedlaczek K, Nabrdalik K, Gumprecht J, Gorczyca P. Acceptance of the disease and quality of life in patients with type 1 and type 2 diabetes. *Eur J Psychiatry*. 2022;36:114–119. doi: 10.1016/j.ejpsy.2021.12.001
23. Nemcova J, Hlinkova E, Farsky I, Ziakova K, Jarosova D, Zelenikova R, Buzgova R, Janikova E, Zdziebło K, Wiraszka G, Stepień R, Nowak-Starz G, Csernus M, Balogh Z. Quality of life in patients with diabetic foot ulcer in Visegrad coun-tries. *J Clin Nursing* 2017;26(9–10):1245–1256.
24. Abedini MR, Bijari B, Miri Z, et al. The quality of life of the patients with diabetes type 2 using EQ-5D-5L in Birjand. *Health Qual Life Outcomes*. 2020;18:18. <https://doi.org/10.1186/s12955...>
25. Arifin B, Idrus LR, van Asselt AD, Purba FD, Perwitasari DA, Thobari JA, Cao Q, Krabbe PF, Postma MJ. Health-related quality of life in Indonesian T2DM outpatients measured with the Bahasa version of EQ-5D. *Qual. Life Res*. 2019;28:1179–1190. doi:10.1007/s11136-019-02105-z
26. Bujang MA, Adnan TH, Mohd Hatta NKB, Ismail M, Lim CJ. A Revised Version of Diabetes Quality of Life Instrument Maintaining Domains for Satisfaction, Impact, and Worry. *J Diabetes Res*. 2018;2018:5804687. doi: 10.1155/2018/5804687
27. Alaofè H, Hounkpatin WA, Djrolo F, Ehiri J, Rosales C. Knowledge, attitude, practice and associated factors among patients with type 2 diabetes in Cotonou, Southern Benin. *BMC Public Health*. 2021;21:339. doi: 10.1186/s12889-021-10289-8
28. Tramunt B, Smati S, Grandgeorge N, Lenfant F, Arnal JF, Montagner A, Gourdy P. Sex differences in metabolic regulation and diabetes

- susceptibility. *Diabetologia*. 2020;63:453–461. doi: 10.1007/s00125-019-05040-3
29. Lewko J, Krajewska-Kułak E. Multidimensional assessment of quality of life of patients with diabetes. *Pol Merk Lek*. 2010;28:486–489.
30. Glasgow RE, Ruggiero L, Eakin EG, Dryfoos J, Chobanian L. Quality of life and associated characteristics in a large national sample of adults with diabetes. *Diabetes Care*. 1997;20(4):562–7. doi: 10.2337/diacare.20.4.562. PMID: 9096981
31. Bąk E, Nowak-Kapusta Z, Dobrzyn-Matusiak D, Marcisz-Dyla E, Marcisz C, Krzemińska SA. An assessment of diabetes-dependent quality of life (ADDQoL) in women and men in Poland with type 1 and type 2 diabetes. *Ann Agric Environ Med*. 2019;26(3):429–438. doi:10.26444/aaem/99959
32. D'Souza MS, Venkatesaperumal R, Ruppert SD, Karkada SN, Jacob D. Health Related Quality of Life among Omani Men and Women with Type 2 Diabetes. *J Diabetes Res*. 2016;2016:8293579. doi:10.1155/2016/8293579
33. Chew BH, Mohd-Sidik S, Shariff-Ghazali S. Negative effects of diabetes-related distress on health-related quality of life: an evaluation among the adult patients with type 2 diabetes mellitus in three primary healthcare clinics in Malaysia. *Health Qual Life Outcomes*. 2015;13:187. doi: 10.1186/s12955-015-0384-4
34. Szcześniak G, Żmurowska B. Comparing the impact of type 2 diabetes mellitus on the quality of life in men and women. *Fam Med Prim Care Rev*. 2009;11:517–520.
35. Glińska J, Skupińska A, Lewandowska M, Brosowska B, Kunikowska B. Demographic factors and the quality of life of patients with diabetes mellitus. *Nursing Topics*. 2012;20(3):279–288.
36. Chudiak A, Lomper K, Jankowska-Polańska B, Uchmanowicz I. The impact of diabetes education on the assessment of the quality of life of patients type 2 diabetes. *Probl Pielęgniarstwa*. 2015;23:1–6. 10.5603/PP.2015.0001
37. Ptaśński A, Pączek L. Influence of diabetes on quality of life - assessment with the use of ADDQL questionnaire in general practice. *Med Metab*. 2008;4:45–48.
38. Pichon-Riviere A, Irazola V, Beratarrechea A, Alcaraz A, Carrara C. Quality of life in type 2 diabetes mellitus patients requiring insulin treatment in Buenos Aires, Argentina: a cross-sectional study. *Int J Health Policy Manag*. 2015;4:475–480. doi:10.15171/ijhpm.2015.80
39. Zamponi V, Mazzilli R, Bitterman O, Olana S, Iorio C, Festa C, Giuliani C, Mazzilli F, Napoli A. Association between type 1 diabetes and female sexual dysfunction. *BMC Womens Health*. 2020;20:73. doi: 10.1186/s12905-020-00939-1
40. Celik S, Golbası Z, Kelleci M, et al. Sexual Dysfunction and Sexual Quality of Life in Women with Diabetes: The Study Based on a Diabetic Center. *Sex Disabil*. 2015;33:233–241. doi.org/10.1007/s11195-014-9383-3
41. Bąk E, Marcisz C, Krzemińska S, Dobrzyn-Matusiak D, Foltyn A, Drosdzol-Cop A. Relationships of Sexual Dysfunction with Depression and Acceptance of Illness in Women and Men with Type 2 Diabetes Mellitus. *Int J Environ Res Public Health*. 2017;14(9):1073. doi:10.3390/ijerph14091073
42. Bąk E, Młynarska A, Sternal D, Kadłubowska M, Marcisz-Dyla E, Marcisz C. Sexual Function and Sexual Quality of Life in Premenopausal Women with Controlled Type 1 and 2 Diabetes-Preliminary Study. *Int J Environ Res Public Health*. 2021;18(5):2536. doi:10.3390/ijerph18052536
43. Flotyńska J, Uruska A, Michalska A, Araszkiwicz A, Zozulinska-Ziolkiewicz D. Sexual Dysfunction Is a More Common Problem in Young Women with Type 1 Diabetes than in Healthy Women. *J Sex Marital Ther*. 2019;45:643–651. doi:10.1080/0092623X.2019.1610121