

QUALITY OF LIFE IN PEOPLE WITH DIABETES TYPE II WITH RESPECT TO THEIR PHYSICAL ACTIVITY

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Abstract: *The term quality of life is used to assess the status and functioning of human being. Aim of the study is to assess the quality of life in patients with type II diabetes undertaking physical activity and to demonstrate correlations between quality of life and participation length in organized forms of PE. Two group of patients took part in the examination. In the first group there were twenty people suffering from type II diabetes who have been performing physical activity for two years. The second group consisted of 20 subjects performing physical activity for 2-4 years. The subjects answered the Questionnaire of quality of life SF - 36. The research revealed statistically significant differences in quality of life only on the level of phisycal functioning and emotional limits. Study results have also shown that the durationt of the disease did not have any influence on quality of life in both examined groups. It was hypothized that the reason for such results were coexisting diseases associated with diabetes. Regarding vital energy the reason for the insignificance could have been the age range.*

Key words: *Quality of life; patients with type II diabetes; physical activity; the Questionnaire of quality of life SF - 36.*

1 Introduction

Thanks to medical advances humans life became longer but more people suffer now from chronic diseases. Traditional treatment includes the reduction of mortality, the incidence of complications and improving body function. However, in chronic diseases, concentrating on these parameters only is insufficient. Chronic disease affects all levels of human functioning. It impairs the biological functions of human body, but mainly leads to lasting psychological changes. In patients suffering from this type of disease there is an increasing need to assess the quality of life (6,13,18).

The term quality of life is generally known and used to assess the status and functioning of human being. The term was established after World War II in the United States and meant "good life". World Health Organization in 1949 defined the quality of life as a state

of complete physical, mental and social well-being and not merely the absence of disease (12,15).

In recent years there was a lot of controversy around the question what is the quality of life and how to define it. The problem arose because the term is used to determine various factors. Despite the controversy associated with defining, most researchers assume that the quality of life is a term taking into account the subjective assessment of somebody's own life on the physical, psychological and social level (11.13).

Health is an important value of human life therefore in medical science there is a concept of quality of life in correlation with health (1).

Pasek et.al. (12), p. 4 - defined the term as "the functional effect of the disease and its treatment experienced by the patient. It covers such areas as physical mobility, mental state, social situation, economic conditions and somatic sensations". According Tylki (15), p. 51 - in order to assess the quality of life of a patient most the important are:

- more accurate knowledge of well-being of patients,
- assess the benefits and disadvantages arising from medical interventions,
- ability to anticipate the consequences of the current state of a sick person,
- to evaluate changes during disease
- selection of appropriate therapy".

One of the chronic diseases, which has a huge impact on human life is diabetes. From the perspective of the patient it is a disease, which can't be forgotten. To achieve a good control of glucose requires strong commitment and many sacrifices. In recent years there have been many studies on quality of life of people with type II diabetes. This problem is very common, is still growing and has an economic impact. International Diabetes Federation recognizes the quality of life as one of the main goals of diabetes treatment which is as important as the metabolic control and prevention of chronic complications (13.18).

According to World Health Organization diabetes is a widespread disease, which belongs to lifestyle diseases. Studies have shown that in 1985 there were 30 million people with diabetes, over time the number of cases was growing and 10 years later increased to 135 million. In 2000, statistics have shown that 171 million people are suffering from the disease. It is expected that in 2030 the number of diabetics will be within 366 million. International Diabetes Federation for the estimates that currently 230, 25 million in Europe, million people around the world suffer from diabetes (10).

The continuous increase of patients with type II diabetes allows to talk about the global epidemic of the disease. This disease is also widespread in Poland, where the incidence reaches about 2 million. These are people with diagnosed and undiagnosed overt diabetes. The number of people with milder disorder of carbohydrate metabolism, defined by WHO as abnormal glucose tolerance is about 1 million. The most common of all metabolic diseases is however type II diabetes – 80%. Every year about 3.8 million people die because of type II diabetes (9).

Type II diabetes, which is non - insulin - dependent diabetes mellitus occurs mostly in adults and elderly. Often this type of diabetes remains asymptomatic for many years and therefore is unrecognized. This is because hyperglycemia often is not sufficiently severe and develops gradually, and thus does not cause symptoms, which can be directly observed (5). Approximately 90% of all patients with diabetes are patients with type II diabetes. In this type the cause of increased blood sugar level is insulin deficiency, but also its inappropriate and ineffective function in human body. Probability of developing diabetes increases with age, obesity and lack of physical activity. Ketoacidosis occurs rarely in this case, if it appears mainly it is basically due to additional stress or illness (3). The pathogenesis of type II diabetes consists of two simultaneously ongoing mechanisms: insulin resistance and impaired function of pancreatic beta cells. It is still unclear which of them is primary (14).

Insulin resistance is a condition of inadequate blood glucose level relative to secreted or administered insulin. There is a reduced metabolic responses in peripheral tissues to normal levels of this hormone. We distinguish primary and secondary insulin resistance. The first results from a mutation of the insulin receptor, transport proteins, or proteins transmitting the insulin signal. The second type is a secondary insulin resistance. It develops as a result of obesity, aging, physical inactivity, chronic hyperglycaemia and free fatty acids in the blood. Consumption of glucose by peripheral tissues in healthy individuals is 6, 5 - 8, 0 mg per 1 kg / min, whereas in people with type II diabetes it is reduced to 2, 5 - 5, 0 mg glucose per 1 kg / min (9.14).

Diabetes has a very complex etiologic character. It is a genetic disease, conditioned multigenetic. Disorders affect many different tissues - the islands of the pancreas, muscles, and others. Predisposition to this disease is the result of interaction of many genes that regulate the metabolism of a person. Hereditary factor plays an important role. Diabetes can be passed from generation to generation, however it doesn't mean, that all family members become ill. First-degree relatives of people with type II diabetes have an increased risk of

illness. They must be aware of this and should periodically measure glycaemia. It was found that in people with type II diabetes, more often mothers than fathers were sick (3).

Environmental factor also play an important role – they may cause deficiency or malfunction of the effects of insulin on cells and tissues. The main environmental factors are (9): aging, improper diet, obesity and overweight, lack of physical activity, infections, certain medications.

2 Purpose of the study

Aim of the present study is to assess the quality of life in patients with type II diabetes undertaking physical activity as well as to demonstrate the difference of the level of their quality of life depending on participation length in organized forms of physical activity.

3 Methods

The study was conducted in January and February 2010. 40 subjects with type II diabetes, participating in physical activity classes were examined. The subjects suffered from the disease from 2 to 23 years (mean of 8.5 years). The subjects were divided into two groups, depending on the length of participation in organized physical activity classes. In the first group there were 20 patients (age 58 to 77; mean 67, 5 years old) with type II diabetes, participating in a systematic physical activity class for 2 years. The second group also included 20 (age 57 to 81; mean 68, 6 years old) people with the participation history from 2 to 4 years.

At the beginning of the study each patient was interviewed in order to obtain the case history. All participants were retired. Patients with type II diabetes participated in physical activity classes 2 times a week for 60 minutes at the Rehabilitation Center "Salluber" and the University School of Physical Education in Wroclaw. The classes were run by physiotherapists and included a variety of exercises.

3.1 Method

To assess the quality of life in subjects with type II diabetes a shortend version of the SF-36th was used. However, in the present study a Polish version of this scale was used. SF-36 questionnaire is a tool for assessment quality of life dependent on the state of health. Over the last few years it was recognized by patients with different types of somatic and mental diseases. It contains 36 questions divided by the authors to 8 scales (13, 28):

1. Physical Functioning-PF - 10 questions: 2a, 2b, 2c, 2d, 2e, 2f, 2g, 2h, 2i, 2j,
2. RP Role-Physical - 4 questions: 3a, 3b, 3c, 3d,
3. Bodily Pain-BP - 2 questions 6 and 7,
4. General Health-GH - 5 questions: 1, 10a, 10b, 10c, 10d,
5. Vitality-V - 4 questions: 8a, 8e, 8g, 8i,
6. Social Functioning-SF - 2 questions: 5 and 9,
7. Role Emotional-RE - 3 questions: 4a, 4b, 4c,
8. Mental Health-MH - 5 questions 8b, 8c, 8d, 8f, 8h.

After completing the questionnaire the accuracy was evaluated. Then a "result of the scale" for each of the eight scales individually for each subject was calculated. A numerical value was assigned to each answer. These values were from 1 to 6, depending on the response. Characteristic of questions for each of the scales are listed in table 1. After summing of these figures, "result obtained" was substituted into the following formula (17).

RESULT OBTAINED - LOWEST POSSIBLE SCORE

$$\text{SCALE SCORE} = \frac{\text{RESULT OBTAINED}}{\text{PROBABLE OUTCOME}} \times 100$$

To obtain the "scale score" also the "lowest possible score," and the "probable outcome" should be substituted to the formula. These values were established for each of the scales by the authors of the questionnaire.

Table 1 Formula for calculating the mean values of the SF-36

SF-36 scale	The sum of the values after transformation	The lowest and highest possible score	Probable outcome (for transformation)
Physical Functioning-PF	$2a+2b+2c+2d+2e+2f+2g+2h+2i+2j$	10, 30	20
RP Role-Physical	$3a+3b+3c+3d$	4, 8	4
Bodily Pain-BP	$6+7$	2, 12	10
General Health-GH	$1+10a+10b+10c+10d$	5, 25	20
Vitality-V	$8a+8e+8g+8i$	4, 24	20
Social Functioning-SF	$5+9$	2, 10	8
Role Emotional-RE	$4a+4b+4c$	3, 6	3
Mental Health-MH	$8b+8c+8d+8f+8h$	5, 30	25

4 Results, Statistic Analyses

SF-36 questionnaire assesses the quality of life within the eight domains on a 1 - 100 scale. Shapiro-Wilk test was used to assess the normal distribution. Nonparametric statistics were used to assess the quality of life depending on physical activity. In comparative statistics the Mann-Whitney U test, which is non-parametric equivalent of t-test for independent samples, was used, the Spearman rank correlation coefficient was used to evaluate the correlation. From all analysed parameters only age had a normal distribution. Therefore a parametric t-test for independent samples was used to compare age distribution in the two examined groups (4). The result of these calculations was a numerical value from 1 to 100 for each scale for each patient. The values of these calculations are presented in Tab. 2 and 3 The higher value indicates higher quality of life.

Table 2 *The values of the scales in patients participating in physical activity classes for 2 years*

	PF	RP	BP	GH	V	SF	RE	MH
1	85	50	50	55	60	50	33	56
2	70	50	30	55	55	50	67	60
3	80	75	30	50	50	37	60	56
4	65	75	60	60	50	25	33	48
5	80	75	20	60	50	50	33	64
6	65	60	60	65	50	37	67	60
7	95	75	40	50	55	50	67	56
8	100	100	40	55	60	50	100	60
9	75	50	40	65	65	50	67	60
10	60	50	40	35	45	37	33	60
11	100	75	50	50	55	25	67	64
12	90	75	30	50	55	37	100	64
13	65	75	30	55	60	50	67	56
14	70	50	40	60	45	50	33	64
15	80	25	20	50	65	37	67	52
16	65	75	30	55	60	50	67	56
17	75	100	20	65	50	25	60	48
18	65	50	60	60	65	50	33	64
19	70	50	30	55	55	50	67	60
20	85	50	40	55	55	50	67	56

Table 3 *The values of the scales in patients participating in physical activity classes for 2-4 years*

L.p	PF	RP	BP	GH	V	SF	RE	MH
1	85	25	60	70	50	50	100	64
2	75	100	10	55	60	50	67	56
3	60	25	90	60	50	37	33	56
4	90	100	10	65	60	37	100	60
5	80	75	40	70	80	50	100	60
6	85	25	60	70	50	50	100	60
7	85	100	10	60	55	50	67	64
8	100	100	30	50	55	37	100	64
9	95	100	10	50	55	37	100	64
10	65	75	30	55	60	50	67	56
11	85	25	50	60	50	50	33	48
12	80	25	20	55	60	37	67	56
13	95	100	50	40	50	25	100	56
14	95	100	20	50	50	50	100	56
15	90	100	10	65	80	37	100	60
16	85	100	60	60	55	50	67	64
17	80	75	40	70	60	50	67	60
18	100	75	40	65	50	50	100	64
19	85	7	60	50	60	25	33	48
20	100	100	60	70	80	37	67	60

Study results

It was assessed whether factors such as disease duration didn't have influence on differences between groups (Table 4 and 5).

Table 4 *Used terms*

Group 1	Subjects performing physical activity for 2 years	N = 20
Group 2	Subjects performing physical activity for 2-4 years	N = 20

Table 5 *Distribution ranks for physical activity experience in two groups*

Physical activity (years)	Number of	
	Group 1	Group 2
1	3	
1,5	11	
2	6	
2,5		3
3		5
3,5		5
4		7

Age distribution in Group 2 was shifted slightly towards higher values, which resulted in slightly higher average age in this group. But this shift was not statistically significant (Table 6 and 7).

Table 6 *The ranks of age distribution in the compared groups*

Age rank (years)	Group 1.	Group 2.
55 – 59	2	2
60 – 64	3	1
65 – 69	9	8
70 – 74	3	7
75 – 79	3	1
80 -		1

Table 7 *Comparison of age distribution in the two groups*

	\bar{x}	sd	range of variation		t-test	
			Min	Max	t	P
Group 1.	67,5	5,3	58	77	0,611	0,545
Group 2.	68,6	6,0	57	81		

Distribution of disease duration in group 2 was clearly shifted towards higher values. The difference of this parameter was statistically significant. The nonparametric test (Mann-WhitneyU), was used because the abnormal distribution of the analysed parameter (Table 8 and 9).

Table 8 *Ranks of disease duration distribution in examined groups*

Disease duration (years)	Group 1.	Group 2.
< 5	4	0
5 – 9	13	11
10 – 14	3	6
15 – 19	0	2
20 -	0	1

Table 9 Comparison of disease duration in the two groups

	\bar{x}	sd	Range of variation		Manna-Whitney U test		
			Min	Max	U	Z	P
Group 1.	6,7	3,1	2	13	103,5	2,610	0,009
Group 2.	10,4	4,8	5	23			

Applied Shapiro-Wilk test shows that for all domains, the hypothesis of normal distribution should be rejected (Table 10).

Table 10 Verification of the hypothesis of normal distribution of values in individual domains of the questionnaire.

Domain	Shapiro-Wilk test	
	W	significance
PF	0,9383	0,0304
RP	0,8624	0,0002
BP	0,9362	0,0257
GH	0,9317	0,0183
V	0,8325	<0,0001
SF	0,7217	<0,0001
RE	0,8207	<0,0001
MH	0,8567	0,0001

In most domains of the questionnaire the group exercising more than 2 years was characterized by a higher mean value of quality of life. Only in such domains as physical pain and social functioning mean values of quality of life were very similar. However, only in two domains (physical function and importance of emotional limitations), the observed difference between groups was statistically significant. Highly significant ($p < 0.01$) was the difference of global assessment of the quality of life (the sum of all domains) (Table 11).

Table 11 Comparison assessment of quality of life within individual domains in two study groups with different levels of physical activity.

Domain	Gr.	\bar{x}	sd	Range of variation		Difference of mean values	Manna-Whitney test			Statistical significance
				min.	max.		U	Z	p	
PF	1	77,00	12,29	60	100	8,75	116,0	2,272	0,023	*
	2	85,75	10,79	60	100					
RP	1	64,25	18,73	25	100	10,75	137,5	1,691	0,091	(*)
	2	75,00	31,41	25	100					
BP	1	38,00	12,81	20	60	0,00	195,5	0,122	0,903	
	2	38,00	23,08	10	90					
GH	1	55,25	6,97	35	65	4,25	141,0	1,596	0,110	
	2	59,50	8,72	40	70					
V	1	55,25	6,17	45	65	3,25	178,5	0,582	0,561	
	2	58,50	10,14	50	80					
SF	1	43,00	9,57	25	50	-0,05	195,5	0,122	0,903	
	2	42,95	8,70	25	50					
RE	1	59,40	20,59	33	100	19,00	110,0	2,435	0,015	*
	2	78,40	24,88	33	100					
MH	1	58,20	4,94	48	64	0,60	185,0	0,406	0,685	
	2	58,80	4,87	48	64					
Domain sum	1	450,35	42,32	360	565	46,55	95,5	2,827	0,005	**

* - statistical significance $p < 0,05$; ** - statistical significance $p < 0,01$; (*) - statistical significance $p < 0,10$.

All the designated correlations were very low and statistically insignificant. Thus, duration of illness did not affect the assessment of quality of life (Table 12).

Table 12 The correlation coefficients Spearman's rank ordering between disease duration and values of each domain throughout the test material ($N = 40$).

Domain	Correlation coefficient	t-test	
	R	T	P
PF	0,061	0,375	0,710
RP	-0,024	0,149	0,882
BP	0,079	0,491	0,626
GH	0,244	1,550	0,129
V	0,029	0,181	0,858
SF	0,102	0,629	0,533
RE	0,068	0,419	0,677
MH	0,030	0,188	0,852
sum	0,078	0,480	0,634

5 Discussion

The study revealed that patients with type II diabetes participating in physical activity classes more than 2 years assessed their quality of life higher, but just in terms of physical functioning and the importance of emotional limitations, in comparison to those practicing physical activity less than 2 years. The physical pain level and social functioning level were similar in both groups. Based on the fact that physical activity had no effect on these domains. It could be hypothesized that the reason for such results were coexisting diseases associated with diabetes. In other domains, such as vital energy, general mental health, importance of physical limitations - the group of patients exercising more than 2 years had higher mean value of quality assessment in comparison to the other group. Regarding vital energy the reason for the insignificance could have been the age range. Results have also shown that the duration of the disease had no impact on quality of life in both groups.

In the literature, the authors didn't find any similar research project. Most of the studies were associated with the assessment of quality of life in patients with type II diabetes, but in relationship to late complications. Currently, studies comparing quality of life in patients with type I and II diabetes are conducted.

Hakkinen et.al. (8) compared the quality of life of people with high risk of type II diabetes in Finnish population. The authors used a quality of life questionnaire SF-36. They also determined how often subjects participated in physical activity classes (2 times a week, 1 per week, less than 1 per week). It was shown that the quality of life in patients with high risk of type II diabetes differed significantly from the quality of life in the whole population. Subjects with high risk of type II diabetes had lower mean values of general health and pain, but higher in the sphere of emotional limitations and mental health. Among people with high risk of type II diabetes those more active were less susceptible to depression and had lower body weight. These studies revealed that benefits of physical activity were evident in all spheres of life dependent on health. It was observed that regular physical exercises and weight control can improve subjective health and reduce the risk of type II diabetes and its consequences.

Chyun et al (2) also evaluated quality of life with the SF-36 questionnaire. These studies revealed that different complication had a great impact on quality of life in patients with diabetes. Visual impairment due to retinopathy, chronic leg pain and sensory deficits resulting from peripheral neuropathy, limb amputations due to diabetic foot. The more severe were the diabetic complications, the lower was the quality. The aim of the study was to show

the correlation between psychological factors, neuropathy, body mass index and physical inactivity.

It is known that low physical activity level contributes to the development of chronic complications in subjects with type II diabetes. As a result, the patient may become unable or partially unable to perform housework or professional duties. What can cause the lost of sense of freedom and independence. Physical activity is associated with lower risk of late complications, and thus a better level of quality of life. Probably not the participation in physical activities had an impact on quality of life, but the regularity of exercises and compliance with contraindications.

De Visser et.al. (15) conducted a similar study assessing the effects of type II diabetes on the patient's functioning in everyday life as one of the components of the quality of life. It was observed that the functional status of subjects with type II diabetes was reduced, particularly when other diseases such as - cardiovascular, musculoskeletal diseases coexisted. The study results revealed that cardiovascular disease - were not only the cause of premature death, but also had a great influence on the decreasing functional status.

In 1998, in UK results of studies on the relationship between intensive treatment of diabetes and the change in quality of life in patients with type II diabetes were presented. The authors sought to answer the question whether better glyceemic control and blood pressure control improves the quality of life. This study included two large groups of patients. The first included 2431 patients treated for 8 years (mean age 60 years old). The second group consisted of 3104 patients (mean age 62 years old). The first group answered a questionnaire on four aspects of quality of life, the second one the quality of life questionnaire (shortened version). The studies did not reveal that better glycaemic control or lower blood pressure had any influence on those aspects of quality of life. During the test it was observed that patients with coronary artery disease and cardiac failure complained of worse overall health than patients without such complications. Based on the results the authors concluded that the late complications of type II diabetes have an impact on quality of life (7).

Systematic and reliable evaluation of the quality of life with diabetes can deliver valuable information about different areas of functioning. The impact of diabetes on quality of life manifests itself on every plane - physical, mental and social. Diabetic patients are aware of diet, insulin or other drugs as these factors may prevent from acute and chronic complications. Current medical protocols demand not only strict diet, but also medications on a regular basis and frequent blood glucose checks. Adherence to these guidelines helps to

reduce the risk of complications. It would be good if the offered treatment would improve the quality of life at the same time (13).

According Pietrzykowska et.al. (13), p. 313 - "Diabetes is a chronic disease, which undoubtedly has a huge impact on life. However, this interaction doesn't have to be negative. Effective education and therapeutic activities designed to develop effective ways of coping with the disease, are factors that may positively influence the outcome of treatment and subjective assessment of quality of life of patients with diabetes. The study of quality of life of patients with diabetes, should be a regular part of routine diabetes care".

According Żmurowska (18), p. 516 - "Comparison the subjective evaluations of health status of patients with type II diabetes and those without any chronic disease, revealed that people with diabetes, assess their health much lower, than people without chronic diseases. However, compared with those patients with potentially more life-threatening illness, diabetics assess their quality of life better. "

6 Conclusions

In patients with type II diabetes participating for 2-4 years in physical activity classes age distribution was slightly shifted towards higher values, which resulted in a greater mean age in this group, but this was not statistically significant.

Patients with type II diabetes, performing physical activity more than 2 years showed a higher quality of life in the area of physical functioning and the importance of emotional limitations than patients who practiced for 2 years.

The fact how long patients with type II diabetes performed physical activity on a regular basis, had no effect on the quality of life in the sphere of social functioning and physical pain.

Duration of illness did not affect the assessment of quality of life any of the groups.

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