

The Impact of Diabetes Mellitus on the Physical Health and Physical Activity

Zivana Gavric^{1,2}, Dragana Grujic-Vujmilovic^{1,2} and Miodrag Marjanovic¹

¹The Public Health Institute Republic of Srpska, Jovan Ducic 1, Banja Luka, Bosnia and Herzegovina

²Department of Social Medicine, Faculty of Medicine University Banja Luka, Banja Luka, Bosnia and Herzegovina

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Abstract: Chronic diseases affect the quality of life and all components of the health, and they decrease physical activity. The aim of the research was to assess how diabetes mellitus affects the physical health component in relation to sex, age and level of education. For survey research at the Clinical Center of Banja Luka in the period from October 2011 to June 2012, which included 150 patients with diabetes mellitus, we used a questionnaire of the World Health Organization (WHOQOL-BREF). The mean score for physical domain of health were slightly higher in male patients (57.92), but without statistically significant difference ($t = 1.256$; $p > 0.05$) compared to female respondents. With a statistically significant difference ($p < 0.01$) the mean scores for the physical domain of health were higher among younger respondents and those with higher education and those mean scores declines with age and with lower levels of education. Mean score were highest in unmarried people, followed by married but without statistically significant difference ($p > 0.05$) compared to divorced and widower. In our patients, diabetes mellitus has an impact on the physical health component and restrict certain physical activities, especially in patients who are older and with lower education.

1 INTRODUCTION

Ancient scientific evidence and an increase in epidemiological facts suggest that "healthy eating habits and moderate exercise can reduce the incidence of heart attacks, diabetes and non-communicable diseases" (WHO, 2002, page 8). „Physical inactivity is a global health problem that causes more than two million deaths each year making it one of the top 10 leading causes of death and disability“ (WHO, 2002, page 2). „The increasing global problem of NCDs means that obesity, poor diet and inactivity are increasing problems for countries in the epidemiological transition“ (Waxman, 2004, page 1). "Chronic diseases are characterized by long duration and slow progression and they are the leading cause of death worldwide among which the most important are: heart diseases, stroke, cancer, chronic respiratory diseases and diabetes, making 63% of all deaths" (WHO, 2012, page 6). In 2004, in the world, diabetes mellitus, in the total burden of disease, occupied 19 place with a share of 1.3% DALY's, and it is anticipated that by 2030 the total burden of

disease occupy 10th place with a share of 2.3% DALY- a " (WHO, 2008, page 22-23). Chronic diseases affect the quality of life and all components of the health, and they decrease physical activity. According to Sigal et al. (2004): Adaptations to endurance exercise enable the muscle to use O₂ and blood-borne fuels, whereas those for resistance exercise lead to improved force generation (e.g., hypertrophy, contractile properties). Of specific interest to people with diabetes are those adaptations that directly affect the metabolism of glucose. (Page 2522) According to Sigal et al. (2004): Before beginning a program of physical activity more vigorous than brisk walking, people with diabetes should be assessed for conditions that might contraindicate certain types of exercise or predispose to injury (e.g., severe autonomic neuropathy, severe peripheral neuropathy, or preproliferative or proliferative retinopathy), which require treatment before beginning vigorous exercise, or that may be associated with increased likelihood of CVD. The patient's age and previous physical activity level should be considered (Page 2523). According to Guelfi KJ et al. (2005): Exercise in diabetes, particularly T1DM, can predispose patients to

hypoglycaemia. The most rapid drop in blood glucose usually occurs during aerobic or endurance exercise, when circulating insulin suppresses metabolic fuel production and increases glucose uptake into muscles, but an attenuated drop in blood glucose is also seen with intermittent high-intensity exercise (which is a mixture of both aerobic and anaerobic exercise, characteristic of team sports and children's play) (Page 1289). "Hypoglycaemia can also occur after all types of exercise, often overnight, most likely because of a combination of increased insulin sensitivity and the need to replenish depleted energy stores"(McMahon SK, 2007, page 260). Graveling and Frier (2010): An extreme case is hypoglycaemia-associated autonomic failure, where a vicious cycle of recurrent hypoglycaemia develops. This occurs because exercise blunts the endocrine response to hypoglycaemia, but hypoglycaemia also blunts the endocrine response to exercise, and in extreme cases can result in significant morbidity (Page 587). According to WHO (1998): Quality of life is defined by the WHO as "individuals' perceptions 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". This definition reflects the view that quality of life refers to a subjective evaluation, which is embedded in a cultural, social and environmental context. The physical domain of quality of life includes: the aspect of pain and discomfort, energy and fatigue, sleep and rest, activities of daily living, dependence on medication or treatment and work capacity (Pages 7, 48).

Objective: Assess how diabetes mellitus affects the component of physical health in relation to sex, age and level of education.

2 METHODS

With survey research at the Clinical Center of Banja Luka in the period from October 2011 to June 2012, we have covered 150 patients with diabetes mellitus. For the assessment of quality of life, we used a questionnaire of the World Health Organization (WHOQOL-BREF). WHOQOL User Manual (1998): Assessing the quality of life was within the last 2 weeks. Answers were given on a Likert scale of 1-5, with 1 being the least and 5 being the highest agreement, and then the answers were transformed into points, in two steps, within the 0-100 scale. A higher score represents greater ("better"), and a smaller number of points represent a lower

("worse") level of functioning. The questionnaire contained a number of questions on socio-demographic condition (age, sex, level of education).

3 RESULTS

From a total of 150 patients with diabetes mellitus, 58.0% were male and 42.0% female, with average age of 56 (\pm 12.4) years, most were aged 30 to 59 years (53.3%) and over 60 years (41.3%). In relation to the level of education the highest percentage of respondents had secondary (48%) and primary (20%) level of education. According to marital status 2/3 (66.7%) were married, and 1/5 (20%) were divorced/widower. (Table 1)

Table 1: Sociodemographic characteristics of the sample.

Variables	Respondents (N=150)	
	n	%
Gender		
Male	87	58.0
Female	63	42.0
Age		
<30	8	5.3
30-59	80	53.3
\geq 60	62	41.3
Min- Max Me (\pm SD)	21-75 55.95 \pm 12.4	
Level of education		
Unfinished primary	20	13.3
Primary	30	20.0
Secondary	72	48.0
High/college	28	18.7
Marital status		
Single	20	13.3
Married	100	66.7
Divorced/Widowed	30	20.0

The higher percent of women but without statistically significant difference compared to male patients feel that physical pain prevents them from doing what they need to do; that they need medical treatment to function in everyday life; that they do not have enough energy for everyday life; assessed their ability to get around poor and very poor, and they were very dissatisfied and dissatisfied with sleep. Male patients were more satisfied and very satisfied with their ability to perform daily activities and very dissatisfied and dissatisfied with their capacity for work, but without statistically significant differences compared to female patients. (Table 2)

Table 2: Answers of questions* in relation to gender.

Questions	Gender ^o	Answers (%)					Kruskal Wallis Test*
		Not at all	A little	A moderate amount	Very much	An extreme amount	
1	M	25.3	25.3	28.7	9.2	11.5	2496.6 P=0.34
	F	19.0	27.0	27.0	11.1	15.9	
	T	22.6	26.0	28.0	10.0	13.3	
2	M	8.0	9.2	33.3	41.4	8.0	2618.5 P=0.63
	F	1.6	17.5	30.2	36.5	14.3	
	T	5.3	12.7	32.0	39.3	10.7	
3	Gender	Answers (%)					2527.5 P=0.39
		Not at all	A little	Moderately	Mostly	Completely	
	M	4.6	13.8	19.5	40.2	21.0	
	F	9.5	12.7	23.8	33.3	20.6	
	T	6.7	13.3	21.3	37.3	21.3	
4	Gender	Answers (%)					2322.0 P=0.09
		Very poor	Poor	Neither poor nor good	Good	Very good	
	M	3.4	13.8	31.0	35.6	16.1	
	F	3.2	22.2	36.5	27.0	11.1	
	T	3.2	17.3	33.3	32.0	14.0	
5	Gender	Answers (%)					2390.0 P=0.17
		Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied	
	M	1.1	31.0	21.8	32.2	13.8	
	F	9.5	27.0	27.0	28.6	7.9	
	T	4.7	29.3	24.0	30.6	11.3	
6	M	2.2	13.8	24.1	50.6	10.3	2584.5 P=0.52
	F	3.2	12.7	25.4	54.0	4.8	
	T	2.0	13.3	24.7	52.0	8.0	
7	M	4.6	24.1	26.4	35.6	9.2	2670.0 P=0.78
	F	3.2	23.8	20.6	50.8	1.6	
	T	4.0	24.0	24.0	42.0	6.0	

^oM-men; F-females; T-total

*Questions of the physical domain of quality of life:

1. To what extent do you feel that physical pain prevents you from doing what you need to do?
2. How much do you need any medical treatment to function in your daily life?
3. Do you have enough energy for everyday life?
4. How well are you able to get around?
5. How satisfied are you with your sleep?
6. How satisfied are you with your ability to perform your daily living activities?
7. How satisfied are you with your capacity for work?

Without statistically significant differences more than half of the patients of in all age groups said they need any medical treatment to function in everyday life, and that they are satisfied and very satisfied with the ability to perform daily activities. With a statistically significant difference with the increase of age very much and an extreme amount feel that pain (physical) prevents them to do what they want to do (p = 0.037); that not at all and a little have enough energy for daily living (p = 0.005); that their ability to get around is very poor and poor (p = 0.000); that they are very dissatisfied and dissatisfied with their sleep (p = 0.025) and that they were very dissatisfied and dissatisfied with their capacity for work (p = 0.004). (Table 3)

Half of the respondents (50%) with unfinished primary school said that physical pain prevents them from doing what they need to do, but without statistically significant difference in relation to persons with secondary (19.4%) and high education (14.2%). With the increase of the level of education decreases dissatisfaction among patients, so with statistically significant difference in higher percentage patients without primary education said they very much (20%) and an extreme amount (30%) need medical treatment to function in everyday life, and that they not at all (25%) have enough energy for everyday life, that they have poor (40%) ability to get around and that they are dissatisfied with sleep (60%); with ability to perform daily living activities (30%) and with a capacity for work (60%) compared to patients with secondary and higher education. (Table 4)

Mean score for the physical domain of health in patients with diabetes mellitus were slightly higher in male patients (57.92), but without statistically significant difference (t = 1.256; p > 0.05) compared to female respondents. With a statistically significant difference (p < 0.01) the mean scores for the physical domain of health were higher among younger respondents and the mean score declines with age. Mean score with a statistically significant difference (p < 0.01) decrease with decrease of the level of education so that the highest value is for those with higher education and the lowest in patients without primary education. Mean score for the physical domain of health in patients with diabetes mellitus were highest in unmarried people followed by married but without statistically significant difference (p > 0.05) compared to divorced/widowed. (Table 5)

Table 3: Answers of questions* in relation to age.

Questions	Age**	Answers (%)					Kruskal Wallis test
		Not at all	A little	a moderate amount	Very much	An extreme amount	
1	1	37.5	62.5	0.0	0.0	0.0	10.245 p=0.037
	2	17.5	32.5	33.8	6.3	10.0	
	3	27.4	12.9	24.2	16.1	19.4	
2	1	12.5	25.0	12.5	12.5	37.5	8.185 p=0.085
	2	5.0	17.5	32.5	33.8	11.3	
	3	4.8	4.8	33.9	50.0	6.5	
3	Age	Answers (%)					14.821 p=0.005
		Not at all	A little	Moderately	Mostly	Completely	
	1	0.0	0.0	0.0	50.0	50.0	
	2	3.8	13.8	21.3	40.0	21.3	
	3	11.3	14.5	24.2	32.3	17.7	
4	Age	Answers (%)					31.821 p=0.000
		Very poor	Poor	Neither poor nor good	Good	Very good	
	1	0.0	0.0	0.0	37.5	62.5	
	2	3.8	10.0	32.5	36.3	17.5	
	3	3.2	29.0	38.7	25.8	3.2	
5	Age	Answers (%)					11.187 p=0.025
		Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied	
	1	12.5	0.0	12.5	50.0	25.0	
	2	1.3	25.0	27.5	32.5	13.8	
	3	8.1	38.7	21.0	25.8	6.5	
6	1	0.0	0.0	12.5	62.5	25.0	7.873 p=0.096
	2	1.3	10.0	28.8	48.8	11.3	
	3	3.2	19.4	21.0	54.8	1.6	
7	1	0.0	0.0	0.0	100	0.0	15.099 p=0.004
	2	2.5	18.8	26.3	42.5	10.0	
	3	6.5	33.9	24.2	33.9	1.6	

**Age: 1. <30; 2. 30-59; 3. ≥60

Table 4: Answers of questions* in relation to education.

Questions	***Education	Answers (%)					Kruskal Wallis test
		Not at all	A little	A moderate amount	Very much	An extreme amount	
1	1	20.0	10.0	20.0	20.0	30.0	5.943 p=0.114
	2	30.0	26.7	20.0	6.7	16.7	
	3	19.4	26.4	34.7	9.7	9.7	
	4	25.0	35.7	25.0	7.1	7.1	
2	1	5.0	5.0	0.0	90.0	0.0	12.136 p=0.007
	2	0.0	10.0	30.0	40.0	20.0	
	3	6.9	9.7	43.1	29.2	11.1	
	4	7.1	28.6	28.6	28.6	7.1	
3	Age	Answers (%)					16.295 p=0.001
		Not at all	A little	Moderately	Mostly	Completely	
	1	25.0	25.0	30.0	10.0	10.0	
	2	6.7	13.3	30.0	30.0	20.0	
	3	2.8	12.5	20.8	37.5	26.4	
4	3.6	7.1	7.1	64.3	17.9		
4	Age	Answers (%)					25.669 p=0.000
		Very poor	Poor	Neither poor nor good	Good	Very good	
	1	15.0	40.0	30.0	15.0	0.0	
	2	6.7	20.0	40.0	26.7	6.7	
	3	0.0	12.5	38.9	31.9	16.7	
4	0.0	10.7	14.3	50.0	25.0		
5	Age	Answers (%)					13.918 p=0.003
		Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied	
	1	5.0	60.0	10.0	25.0	0.0	
	2	10.0	36.7	23.3	26.7	3.3	
	3	4.2	20.8	25.0	29.2	20.8	
4	0.0	21.4	32.1	42.9	3.6		
6	1	10.0	30.0	25.0	35.0	0.0	10.971 p=0.012
	2	0.0	13.3	26.7	60.0	0.0	
	3	0.0	11.1	27.8	45.8	15.3	
	4	3.6	7.1	14.3	71.4	3.6	
7	1	10.0	60.0	0.0	30.0	0.0	14.266 p=0.003
	2	6.7	30.0	23.3	36.7	3.3	
	3	2.8	15.3	30.6	41.7	9.7	
	4	0.0	14.3	25.0	57.1	3.6	

***Level of education 1-unfinished primary; 2-primary; 3-secondary; 4-high/college

Table 5: Mean scores for the physical domain of health relation to sociodemographic characteristics.

Variables	Physical domain		t-test F-test
	Me	±SD	
Gender			
Male	57.92	19.57	T=1.256
Female	53.85	19.59	P=0.211
Age			
<30	75.00	11.29	F=6.306
30-59	62.65	17.65	P=0.000
≥60	49.94	19.84	
Level of education			
Unfinished primary	38.75	19.84	F=9.397
Primary	51.79	17.91	P=0.000
Secondary	60.02	18.09	
High/college	63.63	17.25	
Marital status			
Single	60.89	19.65	F=0.743
Married	55.89	20.27	P=0.477
Divorced/Widowed	54.17	17.37	

4 DISCUSSION

People with diabetes mellitus in our sample had a mean score for the physical domain of quality of life (mean score 56.21 ± 19.62) lower than patients with diabetes mellitus in Denmark (mean score 76.6) (Nørholm, 2001, page 234.), in Iran (mean score 63.75 ± 15.59) (Aghamollaei, 2003, page 56), in Maryland (mean score 61 ± 29) (Hill-Briggs, 2002, page 414), in Emirates (mean score 61.8 ± 14.3) (Bani-Issa, 2011, page 827), and higher value in relation to the mean score (mean score 51.31 ± 19.087) of respondents in the study in Serbia (Bosić-Živanović, 2012, page 860).

Without statistically significant difference in our study female had a lower mean score compared to male patients. In a study in Tokat in Turkey mean score were significantly lower in women for physical health domain (Saatcioglu, 2008, page 108), as well as in a study of Bandar Abbas clinic in Iran (Aghamollaei, 2003, page 56) in study in Greece (Papadopoulos, 2007, page 4). Statistically significant lower mean score in the area of physical functioning in women were in the study conducted in Estonia (Kalda, 2008, page 24), and in a study in Japan, women have reported a significantly higher percentage of problems in the dimension of mobility than men (Sakamaki, 2006, page 50).

In our study, the mean score statistically significant declined with age, as well as in a study in the United States (Glasgow, 1997, page 564). As well in Study in the Netherlands older age was

associated with statistically significantly greater frequency of problems in dimension of mobility (Redekop 2002, page 461). In 240 patients with type I and type II diabetes mellitus, both groups of patients had statistically significant worse physical functioning with increase of age in a study in Boston (Jacobson, 1994, page 270). People with diabetes mellitus aged with and over 70 years in study in Japan reported statistically significantly more problems in the dimension of mobility and the dimension of everyday activities than people in other age groups (Sakamaki, 2006, Page 50). There was no association between age and assessment of quality of life in the study in Bandar Abbas clinic (Aghamollaei, 2003, page 56) as well as in study in Ile -Ifa in Nigeria (Kolawole, 2009, page 163).

The association between level of education and quality of life assessment was also found in a study in Bandar Abbas in Iran in which educated patients had a better quality of life at all scales. Illiterate patients had poorer estimation of the quality of life on all scales in relation to patients who were literate (Aghamollaei, 2003, page 56). Contrary to the findings of these studies are the findings in Ile-Ifa (Kolawole, 2009, page 163) and Gaza (Eljedi, 2006, page 5) in which there was no significant correlation between the assessment of quality of life and level of education. Exercise has many health benefits, and these are important in both T1DM and T2DM.

It is important to be aware that both hypoglycaemia and hyperglycaemia can occur during exercise, but strategies are available to deal with these challenges. (Lumb, 2014, page 675)

5 CONCLUSION

In our patients, diabetes mellitus has an impact on the physical health component and restrict certain physical activities, especially in patients who are older and with lower education. A more complete picture would be if we have studied the level of physical activity that was present before the disease and restrictions that have resulted from these chronic diseases, because the physical activity is essential for the regulation of blood glucose levels as well as for the functioning of the insulin. What is evident in our patients is that the level of education affects the quality of life of the patient in the physical component of health, and that people with higher education have better mean score for the physical component of quality of life.

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