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Original Article

Association between the physical activity level and the quality of life of patients with type 2 diabetes mellitus

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Abstract. [Purpose] Physical activity and regular exercise play an important role in glycemic control, which is considered an important part of the treatment of type 2 diabetes mellitus. This study evaluated physical activity level and its relationship with quality of life in patients with type 2 diabetes mellitus. [Subjects and Methods] We evaluated 129 subjects with type 2 diabetes mellitus through a face-to-face interview using the short version of the International Physical Activity Questionnaire and Diabetes-39. Demographic data, diabetes symptoms, time of initial diagnosis, and treatment procedure/approaches were recorded. [Results] Of the study subjects, 51 (39.5%) had low, 67 had moderate (51.9%), and 11 (8.5%) had high activity levels. The mean weekly sitting duration was 302 minutes. The mean weekly walking time was 231.7 minutes. Except for the "diabetes control" domain, scores for all the subgroups and the total score in the quality-of-life assessment had a statistically significant negative correlation with physical activity level. [Discussion] Physical inactivity negatively affects the quality of life of diabetic patients. A planned exercise education program and incorporation of exercise into the lifestyle can improve the quality of life of patients with type 2 diabetes mellitus.

Key words: Diabetes mellitus, Physical activity, Quality of life

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INTRODUCTION

Diabetes mellitus is a major health problem worldwide that increases morbidity and mortality ratios because of the development of various complications mostly related to the cardiovascular system[1)]. Type 2 diabetes mellitus (T2DM) is characterized by insulin resistance and deterioration of β-cell function[2)]. The prevalence of T2DM is increasing in relation to the rapidly changing lifestyles in developed and developing countries[3)]. T2DM affects 366 billion people, and this number is estimated to increase to about 522 billion by the year 2030[4)].

Physical activity and regular exercise play an important role in glycemic control, which is considered essential in T2DM treatment. Regular physical activity improves blood glucose control, may prevent or delay T2DM, and enables better and more effective glucose utilization by reducing insulin resistance. Furthermore, it affects blood lipids, blood pressure, cardiovascular risk factors, mortality, and quality of life in a positive way[5–12)].

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Coronary heart disease, cerebrovascular disease, and peripheral vascular disease may occur at an earlier age and may progress more aggressively when comorbid with diabetes mellitus. This may lead to decreased life expectancy in addition to decreased quality of life[13]. According to the World Health Organization, the quality-of-life concept is how individuals perceive their lives in relation to their personal goals, expectations, standards, and worries in the system of culture and values that they live in[14]. Individuals with diabetes expend additional effort on a daily basis in using their medication or insulin, monitoring their dietary routine, and controlling their blood glucose levels throughout the day. This is a difficult psychosocial situation that affects their quality of life negatively[15, 16]. The literature indicates a lower level of quality of life in individuals with diabetes mellitus than in controls[16, 17]. Decreased quality of life affects not only the happiness and satisfaction of individuals, but also their labor force participation rate, social functions, and treatment compliance[15].

It is well known that the addition of an exercise regimen to treatment programs in order to increase and pursue quality of life is of utmost importance[15, 18, 19]. Physical activity might be effective in increasing quality of life and healthylife expectancy in the treatment of diabetes[6, 7, 13, 20]. This study aimed to investigate physical activity level, and its relationship with quality of life in patients with T2DM.

SUBJECTS AND METHODS

Patients with T2DM who attended the Diabetes and Internal Medicine outpatient clinics at Haydarpaşa Education and Research Hospital between December 2013 and June 2014 participated in this study. The study was approved by the ethics committee of Istanbul Medipol University and conducted according to the principles of the Declaration of Helsinki (1975, revised 1983). A suitable informed consent form was signed by the patients.

The study sample consisted of 129 subjects aged 18 years or older who were diagnosed with T2DM at least 1 year prior to this study. Patients who met any of the following criteria were excluded from the study: mental, communication, and behavioral disorders that may cause problems in understanding or answering the questions; psychiatric disorders; severe visual and hearing impairments; malignant neoplasms; and pregnancy.

Demographic data, diabetes symptoms, time of initial diagnosis, and treatment approaches were recorded on an assessment form prepared by the authors. Physical activity level was assessed by using the short version of the International Physical Activity Questionnaire (IPAQ-SF). Diabetes-related quality of life was assessed by using the Diabetes-39 (D-39) Questionnaire. The questionnaires were filled out by the patients themselves. Subjects who were not literate were assisted by a researcher, and completed the questionnaires at a face-to-face interview.

The IPAQ-SF was developed to assess physical activity during the past week among adults[21, 22]. Turkish adaptation and reliability of the scale was reported[22]. The IPAQ-SF contains 7 items and assesses the frequency of activity (days) and duration (minutes and/or hours) in vigorous- and moderate-intensity activities, walking, and sitting activities. Physical activity scores are classified into three categories, namely "inactive," "moderately active," and "highly active"[21]. Metabolic equivalent (MET)-minute is computed by multiplying the MET score of an activity duration (minute). One MET is defined as the resting metabolic rate. The following values were used for scoring: walking × 3.3 METs, moderate physical activity × 4.0 METs, vigorous physical activity × 8.0 METs, and total physical activity − MET-min/wk = sum of walking + moderate + high MET-min/wk scores[21, 22].

The Diabetes-39 (D-39) instrument is specific to diabetes mellitus types I and II, includes dimensions to assess diabetes control (12 items), anxiety/worry (4 items), social burden (5 items), sexual function (3 items), energy/mobility (15 items), and overall QOL. The answers for each item ranged from 1 (not affected at all) to 7 (extremely affected). The possible score ranges at a scale of 39 to 273, and a high score represents poor quality of life[23]. The questionnaire was translated to the Turkish language by the authors.

Data analysis was performed using the Statistical Package for Social Science (SPSS) version 16. In all the statistical analyses, p values < 0.05 were considered significant. Descriptive statistical parameters (mean, standard deviation, range, min, and max) were calculated and Spearman's correlation analysis was performed.

RESULTS

All demographic and clinical findings of the patients are presented (Table 1). The mean age of the cases was 57.7 years, and the mean duration of diabetes was 10.3 years.

In this study, 66 patients (51.1%) were using insulin as medical therapy and 89 (68.9%) were monitoring their blood glucose levels with a glucometer at home. Of the subjects, 28 (21.7%) regularly performed exercise based on their own perception of performing exercise, that is, regardless of whether exercise was a regular habit for them. Ninety-six patients (74.4%) reported the presence of comorbidities (Table 1).

The results of the IPAQ-SF and D-39 questionnaire surveys are presented in Table 2 as total and subgroup scores. Of the patients, 51 (39.5%) had low, 67 had moderate (51.9%), and 11 (8.5%) had high activity levels. The mean sitting duration was 302 minutes. The mean weekly walking time was 231.7 minutes.

The correlation analysis of quality of life with total and subgroup scores of physical activity level showed that the total and all the subgroup (except for diabetes control) scores of quality of life had a statistically significant negative correlation with

Table 1. The demographic and clinical characteristics of the patients

Variables		Mean ± SD range or n (%)
Age (years)		56.4 ± 11.1 (20–79)
Duration of diabetes (years)		10.3 ± 6.5 (1–30)
Gender	Female	83 (64%)
	Male	46 (35%)
Use of insulin		66 (51.1%)
Use of a glucometer at home		89 (68.9%)
Regular exercise		28 (21.7%)
Comorbidities	Hypertension	49 (37.9%)
	Hyperlipidemia	35 (27.1%)
	Heart failure	10 (7.7%)
	Vascular disease	2 (1.5%)
Menopause		42 (50.6%)
Education	Illiterate	3 (2.3%)
	Primary education	94 (72.8%)
	High school	24 (18.6%)
	University	8 (6.2%)

Table 2. The IPAQ-SF and D-39 scores (mean of the total and subgroup scores)

Variables		Mean ± SD Median (range)
IPAQ-SF (MET-min/week)	Total score	1,186.4 ± 1,372.5 714 (0–6,237)
IPAQ-SF Levels of physical activity (MET-min/week)	Low activity	187.2 ± 122 148.5 (0–448.5)
	Moderate activity	1,320.3 ± 625.2 1,115 (462–2,844)
	High activity	4,560.1 ± 1,448.3 4,812 (1,588–6,237)
IPAQ-SF	Sitting time (min)	302.3 ± 244.1 (0–1,200)
D-39	Total score	154.4 ± 4.7 151 (60–266)
D-39 subgroup scores	Diabetes control	48.9 ± 16.3 50 (15–129)
	Anxiety	16.2 ± 5 17 (4–27)
	Social life	19 ± 6.9 18 (5–34)
	Sexual life	9.21 ± 5.7 7 (3–20)
	Energy mobility	61 ± 18.23 63 (22–99)

physical activity level (Table 3). When the physical activity intensity and sitting duration were related with the quality-of-life scores, a statistically significant negative correlation was obtained only between the intense activity and social life subgroups.

Table 3. Correlation analysis between the IPAQ-SF and D-39 scores

IPAQ-SF	D-39 Total score	Diabetes control	Anxiety	Social life	Sexual life	Energy mobility
Total score	−0.291*	−0.181	−0.224*	−0.319*	−0.229*	−0.336**
Low activity	−0.127	−0.038	−0.138	−0.125	−0.070	−0.184
Moderate activity	−0.078	−0.117	−0.033	−0.055	−0.034	−0.053
High activity	−0.175	−0.114	−0.133	−0.237*	−0.123	−0.179
Sitting time (min)	−0.056	−0.013	−0.101	−0.072	−0.183	−0.019

*Spearman correlation test, *$p < 0.05$, **$p < 0.001$

DISCUSSION

In this study, the physical activity levels and quality of life of the patients with T2DM were evaluated. A statistically significant negative correlation was obtained between the total IPAQ-SF and D-39 scores. Lower D-39 scores indicate better quality of life that could explain the negative correlation. Our results show that physical activity has a positive impact on quality of life.

IPAQ is a questionnaire for physical activity assessment with no further special techniques[24]. The physical activity level of the 129 patients with T2DM was evaluated with the IPAQ-SF in this study, and the IPAQ-SF scores showed that 51 patients (39.5%) were inactive and only 11 patients (8.5%) had high physical activity level. Oguntibeju et al. reported that in their study, 62% of 100 patients with T2DM had low physical activity level and only 4% had high activity level[25]. Another study reported that high activity level decreased in diabetes mellitus patients[26].

In the present study, the mean weekly total energy was 1,186.4 ± 1,372.5 MET-min/week. Moderate activity represents moderate- or vigorous-intensity activities, achieving a minimum of at least 600 MET-min/week, and high activity represents achieving a minimum of at least 3,000 MET-min/week (21). Our study population had moderate physical activity level. Similarly, Mynarski et al. reported the total energy expenditure of the declared weekly physical activity level in 31 T2DM patients was calculated as 2,513 ± 1,349 METmin/week for males and 2,428 ± 1,348 MET-min/week for females[24].

In our study, the mean weekly walking time was 231.7 minutes. In the research by Gibson and colleagues, the mean walking time of the intervention group was reported as 182.9 minutes and that of the control group was 203.5 minutes before the treatment[27].

Physical activity and regular exercise are important elements that should be considered for delaying the onset of and treating T2DM, and for improving the quality of life and long-term life expectancy of T2DM patients[5–11, 18, 28]. A previous study found that T2DM patients with low activity level had shorter life expectancy by about 0.1–0.5 years compared to patients with moderate-to-high activity levels[18]. Awareness on increasing physical activity and lifestyle modifications should be raised in patients in the early phase of diabetes mellitus and in individuals with risk of diabetes mellitus.

Patients with chronic diseases have to make important and various lifestyle modifications to control the disease. These conditions affect quality of life. The literature indicates that the quality of life of T2DM patients is lower than that of controls[15, 17]. Rubin and Peyrot reported that patients with diabetes mellitus had worse quality of life than people with no chronic illnesses, but had better quality of life than patients with most other serious chronic diseases[16]. The D-39 scale is a diabetes-specific quality of life questionnaire. This questionnaire is sensitive to changes in health status[23, 29, 30]. In the present study, health-related quality of life was assessed by using the D-39 questionnaire. The mean D-39 score was 154.4 and estimated to range from 60 to 266. Lower scores indicate better quality of life[23].

The results of the present study showed an association between physical activity level and health-related quality of life. Statistically significant negative correlations were found between the IPAQ-SF total score and the D-39 total and subgroup scores, except for the diabetes control subgroup. A significant negative correlation was found between the high-activity and social-life subgroup scores. In the literature, adding an exercise program to patients' diet plan was reported to provide better quality of life[15, 18]. Two hundred patients with T2DM were evaluated by Daniele et al. by using another quality-of-life questionnaire and the IPAQ-SF[31]. They reported that patients with sedentary lifestyles had low quality of life, and that functional capacity and general state of health subscales of the quality-of-life questionnaire were independently associated with physical activity[31].

Physical inactivity negatively affects the quality of life of diabetic patients. Increasing the consciousness about this subject in patients diagnosed with diabetes or with the risk of diabetes is highly important. Patients with chronic diseases who received sufficient information and education are known to have better quality of life and physical activity level. Planned exercise educational program and making exercise a part of lifestyle can improve the quality of life in patients with T2DM.

Due to the cross-sectional nature of the study design, our results cannot accurately reflect the characteristics of all patients with diabetes mellitus in the population. This can be considered as a limitation of our study. However, the age our study sample ranged from 20 to 79 years, and the diabetes duration ranged from 1 to 30 years. Thus, we believe that our results may

provide additional information in the literature. We observed no statistically significant relationship between the physical activity level classifications and D-39 total and subgroup scores. The small sample size may be a reason for this result. Studies with larger sample sizes and various assessment methods and that include educational and exercise programs to improve the quality of life should be addressed in the future research studies. The efficacies of different types, duration, and frequency of exercises in protecting and promoting the quality of life of T2DM patients need to be investigated as well.

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