


Effects of Nutrition and Exercise Habits in Patients with Type 2 Diabetes

Tomris Duymaz 

Department of Physiotherapy and Rehabilitation, İstanbul Bilgi University, Health Science Faculty, İstanbul, Turkey

ABSTRACT

Objective: Diet and exercise therapy form the basis of treatment of type 2 diabetes mellitus (T2DM). The objective of the present study was to evaluate the effects of diet and physical activity interventions for patients with T2DM.

Methods: We assessed the prospective association between levels of physical activity, diet, and quality of life (QOL) in patients with T2DM. We measured body mass index (BMI), waist-to-hip ratio, and QOL index (36-item Short Form Health Survey). A total of 300 patients (169 women and 131 men) were enrolled in the study.

Results: The mean age and BMI of the patients were 53.50±8.58 years, 30.39±3.97 kg/m² in women and 56.32±8.80 years, 30.28±1.79 kg/m² in men, respectively. QOL was significantly increased in patients with T2DM with regular exercise and diet (p=0.001, 0.024, and 0.012).

Conclusion: Our findings show that combined diet and physical activity interventions achieved clinically meaningful increase in the QOL. Especially, aerobic exercise program improved the QOL in women with T2DM.

Keywords: Type 2 diabetes mellitus, exercise, nutrition

INTRODUCTION

Diabetes is a chronic condition that occurs when the pancreas does not produce sufficient amounts of insulin or when the body cannot effectively use the insulin it produces. If endocrine disease is the origin, metabolic disease is seen as the main finding. It is chronic and progressive. Diabetes is a common disease, and this frequency is increasing dramatically worldwide. According to the World Health Organization, in 2000, 171 million individuals with diabetes were reported to be >2 times more likely to have diabetes in 2030. Diabetes is an endocrine disorder that is accompanied by hyperglycemia, which is life-threatening and can be seen at any age, increasing in incidence in developing countries and in our country. If uncontrolled, it is an important health problem that will increase mortality and morbidity due to microvascular and macrovascular complications.

Non-insulin-dependent diabetes is frequently encountered due to type 2 diabetes mellitus (T2DM) obesity and physical inactivity, also called adult diabetes. It covers 90%–95% of all individuals with diabetes (1).

There is an increasing incidence of diabetes today. Nutrition and exercise are two very important components to control and prevent possible complications. Three components of an effective diabetes treatment are defined as exercise, diet, and medication. Exercise is considered as the main building block of T2DM treatment (2).

The purpose of the present study was to evaluate the nutritional and exercise habits of patients with T2DM and how they affect their quality of life (QOL).

METHODS

This was a survey of 300 patients with T2DM conducted in Florence Nightingale Hospital Internal Medicine and Physical Medicine and Rehabilitation departments. In the study, quota sampling method was used as a possibility sampling method. Patients with T2DM aged 25–65 years were included in the study. Exclusion criteria include gestational diabetes, prediabetes, paralysis, patients with cancer, physical handicaps, and pregnant women. The ethics committee of İstanbul Bilim University approved the study.

Data regarding patients were given a regular diet, whether they were doing physical activity or not (mild, moderate, and severe), age, height, weight, body mass index (BMI), marital status, educational levels, measurements of waist/hip circumference, and accompanied chronic illness were noted. The 36-item Short Form Health Survey (SF-36) questionnaire was completed to assess the QOL.

Statistical Analysis

Data were analyzed using Statistical Package for the Social Sciences 22.0 program (SPSS IBM Corp.; Armonk, NY, USA). Mann-Whitney U and Chi-square tests were used for non-parametric tests, and Spearman correlation test was used for correlation analysis. A p value <0.05 was considered significant.

ORCID ID of the author: T.D. 0000-0003-0917-2098

Corresponding Author: Tomris Duymaz E-mail: tomrisduymaz@gmail.com

Received: 25.12.2017 • Accepted: 20.02.2018

RESULTS

The demographic characteristics of the patients are shown in Table 1. Of the patients, 141 were high school graduates, 254 were married, and 165 were working. Of the participating patients, 158 use insulin and antidiabetic drugs, 135 use only antidiabetic drugs, and seven do not use insulin or antidiabetic drugs. Of the patients, 128 were cigarette smokers, nine were using alcohol, and 139 were hypertensive. Among our patients, 140 reported regular exercise. Of those, 125 reported mild aerobic exercise for 30 to 90 min per week, and 15 for 2 to 4 h per week for mild aerobic exercise.

Compared with the SF-36 health profile parameters of our patients who did or did not exercise, physical function, general health perception, energy level, social functioning, and emotional role difficulties were found to be statistically higher than those who did not exercise (Table 2).

Table 1. Demographic characteristics of the patients

	Women (n=169) Mean±SD (min-max)	Men (n=131) Mean±SD (min-max)	z	p
Age (year)	53.50±8.58 (33-65)	56.32±8.80 (33-65)	-1.707	0.088
BMI	30.39±3.97 (20.40-38.59)	30.28±1.79 (26.51-34.72)	-0.652	0.514

Mann-Whitney U test

BMI: body mass index; SD: standard deviation

Table 2. Comparison of SF-36 health profile parameters of exercising and non-exercising patients

SF-36 parameters	Exercising Mean±SD (min-max)	Non-exercising Mean±SD (min-max)	z	p
Physical function	81.62±11.00 (50-100)	58.08±20.62 (25-100)	-5.451	0.000**
Physical role limitation	79.37±24.60 (25-100)	69.58±33.85 (0-100)	-1.240	0.215
Pain	71.87±18.22 (32.50-100)	75.79±35.05 (32.50-100)	-0.064	0.949
General medical health	53.62±9.19 (35-75)	48.91±9.74 (30-70)	-2.253	0.011*
Vitality	52.90±13.96 (30-85)	45.91±12.16 (20-75)	-2.253	0.024*
Social functioning	69.56±20.51 (25-100)	60.37±15.76 (10-87.50)	-2.124	0.034*
Emotional role limitation	74.04±25.38 (33-100)	56.25±34.50 (0-100)	-2.507	0.012*
Mental health	62.85±16.05 (28-92)	62.60±18.93 (28-140)	-0.629	0.529

*p<0.05; **p<0.001; Mann-Whitney U test

Compared with the SF-36 health profile parameters of patients who did not apply regular diet, emotional role and pain parameters were found to be statistically significantly higher than those who did not regularly administer the diet. The physical function parameter was found to be higher in patients who regularly administered the diet than in those who did not (Table 3).

When the correlation analysis of the waist and hip measurements with the QOL were examined, it was found that the correlation between waist circumference and physical function, energy level, and emotional role strength parameters was a negative correlation (p=0.001, 0.018, and 0.000). According to this result, as the waist circumference decreases, the physical function, energy level, and emotional role of the patients increase. The hip circumference was also found to correlate negatively with the physical function and the emotional role strong parameters (p=0.026 and 0.000). As a result, it has been found that as the hip circumference decreases, the physical function and emotional role of the patients increase (Table 4).

DISCUSSION

Diabetes continues to be the most important health problem in our country and in the world every year. In the long term, it affects the QOL because of its complications. According to the atlas of diabetes, approximately half of adults with diabetes are in the 40-59 age range.

This number is expected to increase in the following years. In 2013, the number of men with diabetes is 14 million more than women, and in 2035, the difference is expected to increase to 15

Table 3. Comparison of SF-36 health profile parameters of patients who do and do not practice regular diet

SF-36 parameters	Applying regular diet Mean±SD (min-max)	Not applicable regular diet Mean±SD (min-max)	z	p
Physical function	70.47±19.20 (25-100)	59.44±23.34 (30-100)	-2.257	0.024*
Physical role limitation	69.17±33.46 (0-100)	85.18±17.34 (50-100)	-1.915	0.056
Pain	72.73±33.20 (32.50-100)	78.24±15.02 (55-100)	-2.122	0.034*
General medical health	50.20±9.84 (30-75)	52.40±9.54 (35-70)	-1.153	0.249
Vitality	49.05±12.67 (25-85)	47.77±15.08 (20-75)	-0.020	0.984
Social functioning	63.76±19.07 (10-100)	64.81±16.27 (25-100)	-0.556	0.578
Emotional role limitation	59.29±33.79 (0-100)	74.38±24.99 (33-100)	-1.966	0.049*
Mental health	62.60±19.31 (28-140)	62.96±12.91 (44-88)	-0.246	0.806

*p<0.05; **p<0.001; Mann-Whitney U test

Table 4. Correlation of SF-36 parameters with waist and hip circumference

SF-36 parameters	Spearman	Waist circumference (cm)	Hip circumference (cm)
Physical function	r	-0.336	-0.223
	p	0.001**	0.026*
Physical role limitation	r	-0.100	-0.097
	p	0.320	0.339
Pain	r	-0.179	-0.180
	p	0.075	0.073
General medical health	r	-0.004	0.114
	p	0.968	0.260
Vitality	r	-0.237	-0.126
	p	0.018*	0.212
Social functioning	r	-0.018	0.069
	p	0.856	0.493
Emotional role limitation	r	-0.361	-0.389
	p	0.000**	0.000**
Mental health	r	0.096	0.075
	p	0.344	0.457

*p<0.05; **p<0.001; Spearman's correlation

million (3). Of the patients who participated in our study, 56.3% were female, and 43.7% were male.

Studies have shown that low levels of education are effective in the development of T2DM.

Although the level of education is not directly related to the incidence of T2DM, it is an effective factor in terms of good diabetes management (4). When we look at the level of education of the individuals participating in our study, it is seen that 47% of them have graduated from high school.

Smoking is another risk factor for the development of T2DM. The risk of diabetes in smokers and females is approximately 50%. Patients with diabetes are at risk for many microvascular and macrovascular diseases. Smoking increases this risk through diabetic nephropathy, increased inflammation for retinopathy and neuropathy, and metabolic effects along with endothelial dysfunction. T2DM is very important in terms of quitting smoking, facilitating glycemic control, and limiting the development of diabetic complications (5). Of the patients in our study, 42.66% were using diabetes to trigger diabetes.

Studies conducted on alcohol use have shown that moderate alcohol consumption may reduce the risk of T2DM. Studies have

shown that alcohol increases insulin sensitivity. On the other hand, excessive alcohol consumption increases the risk of T2DM in women (6, 7). In the population we examined, a small number of patients (3%) reported using alcohol. Diabetes often accompanies chronic disease hypertension. Hypertension risk was 1.5–2 times higher in people with diabetes than in those without diabetes (8). In the present study, 46.33% of the patients also had hypertension at the same time.

In a planned and conducted study to evaluate eating behavior disorders, QOL, nutritional status, biochemical findings, and anthropometric measurements of patients with T2DM, 112 patients aged between 35 and 87 years with a diagnosis of T2DM were studied. When the QOL was compared according to the BMI values, it was found that there was no significant difference in the QOL among patients with normal BMI and patients with high BMI. There was a negative correlation between duration of diabetes and physical function, physical role limitation, energy, social functioning, and mental health scores. Some studies using the SF-36 QOL scale have shown that fat individuals have lower physical function scores than normal individuals. In a study of patients with T2DM, patients with T2DM who were second-degree obese were found to have lower QOL than those who were overweight and obese at first (9). In our study, patients with high BMI were found to have lower energy levels, emotional role, and social functioning.

Another study of patients with T2DM found that patients with attention to their diet had higher physical functions, energy levels, and emotional role (10). In our study, patients' physical function and emotional role difficulties were found to be higher, and pain levels were lower. The benefits of exercise have been proven in studies (11). Exercise with insulin therapy has been reported to lower blood glucose levels, decrease insulin requirement, and increase glucose tolerance (12). For individuals with T2DM, combined exercise with exercise should be applied together with an appropriate diet program. This treatment approach provides optimal blood glucose control with other positive health effects. Regular exercise appears to improve glucose tolerance; increase muscle and liver insulin sensitivity; decrease glycated hemoglobin levels; cardiovascular risk factors, such as lipid profile, blood pressure, and body weight; and functional capacity in patients with T2DM (13, 14). In the present study, we also found that patients who exercise regularly have higher QOL similar to the literature.

In a study of physical activity and QOL in patients with T2DM, sedentary patients were found to have lower functional capacity, physical limitations, pain, general health status, and emotional limitation. In a study conducted, 39% of adults with diabetes were reported to be physically active, and 59% of those without diabetes were active. It has been found that being physically active is related to the level of income, physical function limitations, depression, and obesity (15). It is not known why individuals with diabetes are less active, but it is assumed to be due to a lack of interest. It is also thought that people with diabetes frequently have decreased exercise capacities and are uncomfortable during exercise (15). Another researcher investigated the effect

of different exercise programs on functional performance and QOL in patients with T2DM (16). We found that the 12-week exercise program affected the QOL, depression level, energy consumption, fatigue, and balance in a positive way (16). In parallel to the literature, we also found that exercise patients had better physical functions, energy levels, emotional states, and general health perceptions than non-exercise patients. In a planned study with the aim of evaluating the effects of an exercise program consisting of aerobic and refractory exercises on metabolic control, depression, and QOL in patients with diabetes, 36 patients with T2DM were included in the study. Resistive exercises, calisthenic exercises, and walk-in supervised exercise programs were found to have positive effects on metabolic control, QOL, and depression in patients with T2DM (17).

Smutok and colleagues compared the effects of augmentation and aerobic exercise program for 5 months in controlled trials involving T2DM and impaired glucose tolerance patients. Positive changes in insulin function were more pronounced in the group receiving boosting training (18). In our study, 40% of the patients were also found to have regular aerobic exercise, and those who exercise had higher QOL.

The limitations of our study are that the number of patients is low, the nutritional consumption is not recorded, and the laboratory analysis results are unknown.

CONCLUSION

As a result, it has been found that patients with T2DM who regularly exercise have higher QOL. It is emphasized that patients with diabetes for this result are effective in regularly implementing aerobic exercise as well as regular practice of diet programs in reducing blood glucose levels.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of İstanbul Bilim University.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Conflict of Interest: No conflict of interest was declared by the author.

Financial Disclosure: The author declared that this study has received no financial support.

REFERENCES

- Genuth S, Alberty KG, Bennett P, Buse J, Defronzo R, Kahn R, et al. Follow-up report on the diagnosis of diabetes mellitus. *Diabetes Care* 2003; 26: 3160-7.
- Praet SFE, vanRooij ESJ, Wijtvlief A, Boonman-de WJM, Enneking T, Kuipers H et al. Walking compared with an individualised medical fitness programme for patients with type 2 diabetes: a randomised controlled trial. *Diabetologia* 2008; 51: 736-46.
- Yahia N, Khoury M, Salloum T, Younes R, Saleh M, Myers E. Implementing Evidence-Based Nutrition Practice Guidelines for Type 2 Diabetes Mellitus in Lebanon. *Top Clin Nutr* 2017; 32: 316-29.
- Evans JM, Newton RW, Ruta DA, MacDonald TM, Morris AD. Socio-economic status, obesity and prevalence of Type 1 and Type 2 diabetes mellitus. *Diabet Med* 2000; 17: 478-80.
- Eliasson B. Cigarette smoking and diabetes. *Prog Cardiovasc Dis* 2003; 45: 405-13.
- Evert AB1, Boucher JL, Cypress M, Dunbar SA, Franz MJ, Mayer-Davis EJ, et al. Nutrition therapy recommendations for the management of adults with diabetes. *Diabetes Care* 2014; 37: 121-34.
- Carlsson S, Hammar N, Grill V. Alcohol consumption and type 2 diabetes. *Diabetologia* 2005; 48: 1051-4.
- Haffner SM. Syndrome X: Insulin resistance-hyperinsulinemia. Hanefeld M, Leonhardt W, editors. *The Metabolic Syndrome*. Stuttgart Gustav Fisher Verlag; 1997. p.25.
- Akohoue SA, Wallston KA, Schlundt DG, Rothman RL. Psychometric evaluation of the short version of the Personal Diabetes Questionnaire to assess dietary behaviors and exercise in patients with type 2 diabetes. *Eat Behav* 2017; 26: 182-8.
- Miyauchi M, Toyoda M, Kaneyama N, Miyatake H, Tanaka E, Kimura M, et al. Exercise Therapy for Management of Type 2 Diabetes Mellitus: Superior Efficacy of Activity Monitors over Pedometers. *J Diabetes Res* 2016; 2016: 5043964.
- Zinman B, Ruderman N, Campaigne BN, Devlin JT, Schneider H, American Diabetes Association. Physical activity/exercise and diabetes. *Diabetes Care* 2004; 27: 58-62.
- Boden G. Pathogenesis of type 2 diabetes: insulin resistance. *Endocrinol Metab Clin North Am* 2001; 30: 801-15.
- Hordern M, Cooney L, Beller E, Prins J, Marwick T, Coombes J. Determinants of changes in blood glucose response to short-term exercise training in patients with type 2 diabetes. *Clin Sci (Lond)* 2008; 115: 273-81.
- Colberg SR, Sigal RJ, Fernhall B, Regensteiner JG, Blissmer BJ, Rubin RR, et al. Exercise and type 2 diabetes: the American College of Sports Medicine and the American Diabetes Association: joint position statement. *Diabetes Care* 2010; 33: 147-67.
- Morrato EH, Hill JO, Wyatt HR, Ghushchyan V, Sullivan PW. Physical activity in U.S adults with diabetes and at risk for developing diabetes. *Diabetes Care* 2007; 30: 203-9.
- Wen J, Lin T, Cai Y, Chen Q, Chen Y, Ren Y, et al. Baduanjin Exercise for Type 2 Diabetes Mellitus: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. *Evid Based Complement Alternat Med* 2017; 83: 7-19.
- Sijie Tan, WeiLi, Jianxiong Wang. Effects Of Six Months Of Combined Aerobic And Resistance Training For Elderly Patients With A Long History Of Type 2 Diabetes. *J Sports Sci Med* 2012; 11: 495-501.
- Smutok MA, Reece C, Kokkinos PF, Farmer CM, Dawson PK, DeVane J, et al. Effects of exercise training modality on glucose tolerance in men with abnormal glucose regulation. *Int J Sports Med* 1994; 15: 283-9.

How to cite:

Duyamaz T. Effects of Nutrition and Exercise Habits in Patients with Type 2 Diabetes. *Eur J Ther* 2018; 24(4): 220–3.