Gyneshwari Patel
Physiotherapist, Active Life
clinic, Ahmedabad, Gujarat,
India

Disha Sendhav
Student, Occupational Therapist,
Canada

Vaibhavi Prajapati
MPT Student, Shreemad
Rajchandra College of
Physiotherapy, Bardoli, Gujarat,
India

Salvi Shah
Ph.D. Scholar, Gujarat
University, Ahmedabad and
Assistant Professor, SPB
Physiotherapy College, Surat,
Gujarat, India

Physical activity and quality of life in the individuals with type 2 diabetes mellitius

Gyneshwari Patel, Disha Sendhav, Vaibhavi Prajapati and Salvi Shah

Abstract
Background and Purpose: Physical activity (PA) and regular exercise play an important role in glycemic control, which is considered an important part of the treatment of Type 2 Diabetes Mellitus (T2DM). Physical inactivity negatively affects the quality of life (QOL) of diabetic patients. So the present study was undertaken to find out the association of PA with QOL among T2DM patients.
Methodology: A cross sectional study evaluated 272 subjects with T2DM (age above 30 years), through a face-to-face interview using the long version of the International Physical Activity Questionnaire (IPAQ-L) to assess PA and World Health Organization-Quality Of Life- BREF (WHO-QOL-BREF) questionnaire to assess QOL. Information regarding the demographic data, duration of disease, glycemic status and anthropometric measures were also recorded.
Results: Results of the present study showed that PA has significant (p<0.05) moderate positive correlation with all 4 different domains (physical r=0.42, psychological r=0. 57, social r=0.53 and environmental r=0.51) and significant weak positive correlation with another 2 items (general health r=0.25 and general QOL r =0.37) of WHO-QOL-BREF questionnaire.
Conclusion: There is a positive association between PA and QOL among T2DM patients though this association differs across the domains and items. Thus it can be concluded that PA has a beneficial effect on all dimensions of the QOL among T2DM patients. Effort and awareness should be dedicated to encouraging the active lifestyle among T2DM patients. Further studies need to be conducted to garner a deeper understanding of the relationship between PA and QOL

Introduction

Diabetes mellitus (DM) is a disorder that affects the body's ability to make or use insulin. Insulin is a hormone produced in the pancreas that helps to transport glucose (blood sugar) from the bloodstream into the cells so they can break it down and use it for fuel. People cannot live without insulin. The World Health Organization (WHO, 2008) has estimated that more than 180 million people around the world suffer from DM. In DM patients, the pancreas makes insulin initially, but the body has trouble using this glucose-controlling hormone. Eventually the pancreas cannot produce enough insulin to respond to the body's need for it. Diabetes results in abnormal levels of glucose in the bloodstream**.**

Type 2 DM (T2DM) is by far the most common form of diabetes, accounting for 85 to 95% of cases in developed nations and an even higher percentage in developing nations, according to the International Diabetes Federation [1]. Research studies over the years, reported that the worldwide prevalence of DM appears to be increasing alarmingly. It is estimated that 5.4% of total population would be affected with the disease by the year 2025 as initial reports showed 4.0% in the year 1995 [2]. T2DM affects 366 billion people, and this number is estimated to increase to about 522 billion by the year 2030 [3]. DM caused 4.6 million deaths in 2011. The incidence of T2DM varies substantially from one geographical region to the other as a result of environmental and lifestyle risk factors.

Physical activity (PA) and regular exercise play an important role in glycemic control, which is considered essential in T2DM treatment. Regular PA improves blood glucose control, may prevent or delay T2DM, and enables better and more effective glucose utilization by reducing insulin resistance.

Corresponding Author:
Shah Salvi
Ph.D. Scholar, Gujarat
University, Ahmedabad and
Assistant Professor, SPB
Physiotherapy College, Surat,
Gujarat, India

Furthermore, it affects blood lipids, blood pressure, cardiovascular risk factors, mortality, and quality of life (QOL) in a positive way [3].

QOL in general is decreased in diabetic patients regardless of the gender. The patients with complications of DM suffer from a variety of lifestyle problems. In the end, it affects the renal system by causing nephropathy, vision loss, heart problems, erectile dysfunction, and peripheral neuropathies affecting the QOL. Diabetes is a chronic illness therefore there is a need for assessing the QoL of patients at regular intervals. The complications of diabetes affect the organ system and are responsible for the majority of morbidity and mortality associated with the disease [3].

The literature indicates a lower level of QOL in individuals with DM than in controls. Decreased QOL affects not only the happiness and satisfaction of individuals, but also their labor force participation rate, social functions, and treatment compliance [4]. Many factors affect the QOL of patients with T2DM, and these include clinical and lifestyle issues. Diabetes affects health-related QOL through macrovascular complications and associated non-vascular comorbidity, and also by adding to the total burden of disease [4].

It is well known that the addition of an exercise regimen to treatment programs in order to increase and pursue QOL is of utmost importance. PA might be effective in increasing QOL and healthy life expectancy in the treatment of diabetes. There is still a paucity of published studies to determine the relationship between PA and QOL among patients with T2DM in India so the present study was undertaken and aimed to investigate physical activity level, QOL and their association among the T2DM patients.

Methodology

A convenient sample of 272 subjects aged above 30 years diagnosed with T2DM from the physician at least 1 year prior to study [4] were recruited from various physician's OPD and seniors citizens club of Surat city. Subjects were selected for the study based on inclusion and exclusion criteria. All subjects were asked to give and sign the consent form prior to participate in research study. Information about demographic data, education of head of family, Income of head of family, occupation of head of family, associated conditions, smoking history, duration of diabetes, treatment approach for diabetes, glycemic status were obtained from all eligible participants. Anthropometry measurements such as weight, height and Body Mass Index (BMI) were taken.

Instruments

International Physical Activity Questionnaire-Long version (IPAQ-L): The IPAQ-L was used to assess PA. For estimating the level of PA, the original English version of IPAQ-L was used. English version of IPAQ-L was administered by in a face- to-face interview. The reliability and validity of the test is good [5]. The long-IPAQ consists of 27 items that identify the frequency (times per week) and duration (minutes or hours per day) of PA performed in the activity domains of occupation (7 items), transportation (6 items), housework, house maintenance, and family care (6 items), recreation, sport and leisure (6 items), and time spent sitting as an indicator of sedentary behaviour (minutes or hours per day) in a weekday and in a weekend day (2 items).

World Health Organization Quality Of Life-BREF (WHO-QOL-BREF) questionnaire: The WHOQOL-BREF is an international cross-culturally comparable QOL assessment instrument. It is available in different languages for both developed and developing countries, and it is a generic QOL instrument developed by WHO, and is composed of 26 items. The reliability and validity of the test is good [6]. The response options range from 1 (very dissatisfied/very poor) to 5 (very satisfied/very good). It emphasizes the subjective responses rather than the objective life conditions, with assessments made over four weeks. The questionnaire includes four domains: physical health, psychological health, social relations, and environment. Raw domain scores for the WHO-QOL were transformed to a 4-20 score according to guidelines. Domain scores are scaled in a positive direction (i.e., higher scores denote higher QOL). The mean score of items within each domain is used to calculate the domain score. After computed the scores, they transformed linearly to a 0-100-scale [7].

Data analysis was performed using the SPSS version 20. In all the statistical analyses. Level of significance was kept as 5%.Descriptive statistical parameters (mean, standard deviation, Inter quartile range, median) were calculated and Spearman's correlation analysis was performed to find the correlation between PA and domains of QOL as the data was not normally distributed.

Results

A total of 272 patients with T2DM were recruited for the study. The age of subjects were 30-65 years. Details of participants' characteristics are given in table 1. Table 2 gives information about classification of PA among participants of T2DM patients. It is classified into 4 domains, work, transportation, domestic and leisure. Median and interquartile range of participants were noted according to the domain. Total score for all domain is also mentioned. Table 3 represents the no. of participants in each PA level (low, moderate and high) among all the T2DM patients. Table 4 represents domain vise mean value of WHO-QOL BREF questionnaire among all the patients. Results of the present study showed that PA has significant ($P<0.05$) moderate positive correlation with all 4 different domains of QOL (physical $r=0.42$, psychological $r=0.57$, social $r=0.53$ and environmental $r=0.51$) and significant weak positive correlation with another 2 items (general health $r=0.25$ and general QOL $r=0.37$) with general health and general QOL questionnaire. (Table 5).

Table 1: Participants' characteristics (n=272)

Variable	Category	Frequency(n)
Age	30-40 years	88
	40-50 years	73
	50-60 years	83
	Above 60 years	28
Gender	Male	165
	Female	107
Marital status	Married	234

	Unmarried	22
	Widow/widower	16
Smoking	Non-smoking	176
	Current smoker	23
	Ex-smoker	73
Body mass index (BMI)	<18.5	01
	18.5-24.9	92
	25.0-29.9	148
	30.0-34.9	24
	35.0-39.9	06
	>40	01
Comorbidities	Hypertension	32
	Hyperlipidemia	46
	Heart disease	12
	Vascular disease	10
	none	172
Duration of diabetes	Less than 5yrs	121
	5-10yrs	78
	10-20yrs	44
	More than 20 years	29
Glycemic status (HbA1c ,% category)	<7	241
	≥ 7	31

Table 2: The IPAQ (median and interquartile range for different domain and total) score among T2DM patients (n=272)

Domain	Median	interquartile range	
Work (MET-min/week)	1194.00	693	1386
Transportation(MET-min/week)	693.00	346.5	1386
Domestic and garden activities (MET-min/week)	630.00	225	1260
Leisure (MET-min/week)	693.00	693	1386
Total score (MET –min/week)	1415	693	2573

Table 3: No. of participants in each category of physical activity among T2DM patients

N=272		Frequency
Level of physical activity	Low	49
	Moderate	185
	High	38

Table 4: Domain vise mean value of WHO-QOL BREF questionnaire among T2DM patients

Domain N=272	Mean	SD
Domain 1- Physical QOL	74.27	13.06
Domain 2 - Psychological QOL	75.45	12.85
Domain 3 - Social relationship QOL	76.84	24.69
Domain 4 - Environmental QOL	76.56	14.07
Question -1 - General QOL	4.02	0.49
Question -2 - General health	3.88	0.70

Table 5: Correlation between physical activity and quality of life among T2DM patients (n=272)

	WHO-QOL-BREF	r value	P value
Physical activity (total score) MET min/week	Physical QOL	0.42	<0.05
	Psychological QOL	0.57	
	Social relationship QOL	0.53	
	Environmental QOL	0.51	
	General QOL	0.25	
	General Health	0.37	

Discussion

In the present study, the PA levels and QOL of the patients with T2DM were evaluated. Results showed a statistically significant positive correlation was obtained between the PA and QOL scores. The PA level of the 272 patients with T2DM was evaluated with the IPAQ-L in the present study, and the IPAQ scores showed that 185 patients had moderate PA, 49 patients had low PA and only 38 patients had high PA level. Results of the present study were consistent with previous study done by Tuğba Kuru Çolak et al. [3] reported that in their study, 62% of 100 patients with T2DM had low PA level and only 4% had high PA level. Another study reported that high activity level decreased in DM patients [8]. In the present study, the median for the weekly total energy was 1415 MET-min/week. Moderate activity represents 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 [5]. Our study population had moderate PA level. Similarly, Mynarski et al. reported the total energy expenditure of the declared weekly PA level in 31 T2DM patients was calculated as 2,513 ± 1,349 MET min/week for males and2,428 ± 1,348 MET-min/week for females [9]. Tuğba Kuru Çolak et al. also reported the similar result with mean weekly total energy was 1,186.4 ± 1,372.5 MET- min/ week [3].

The mean value for each four domain in WHO QOL BREF questionnaire was 74.27, 75.45, 76.84 and 76.56 (physical, psychological, social relationship and environmental respectively) out of 100 score. Higher score indicates better QOL [10]. The literature indicates that the QOL of T2DM patients is lower than that of controls [11, 12]. Rubin and Peyrot reported that patients with DM had worse QOL than people with no chronic illnesses, but had better QOL than patients with most other serious chronic diseases [3, 13].

The results of the present study showed a positive association between PA level and QOL among T2DM patients. Similar results were found with previous studies [3, 13, 14, 15]. PA and regular exercise are important elements that should be considered for delaying the onset of and treating T2DM, and for improving the QOL and long-term life expectancy of T2DM patients [16, 17, 18, 19]. A previous study found that T2DM patients with low PA level had shorter life expectancy by about 0.1–0.5 years compared to patients with moderate-to-high activity levels [16]. Awareness on increasing PA and lifestyle modifications should be raised in patients in the early phase of DM and in individuals with risk of DM.

It was observed that people with moderate to high PA had significantly reduced risk of low QOL. A previous study had reported that the level of self-reported exercise was the only significant self-management behavior to predict QOL after

controlling for demographic and medical variables [20]. The reason why PA enhances QOL may be connected with the possibility of PA influencing many aspects of the life of patients, including the enhancement of glycemic control in diabetic patients, which is at the very foundation of all the QOL problems. In a previous study, it was reported that having better glycemic control is associated with better QOL [21]. Improved glycemic control in type 2 diabetes patients is associated with substantial short-term symptomatic, QOL, and health economic benefits [14].

The present study has certain limitations .It was a cross-sectional design does not allow the determination of a cause and effect relationship. It is possible that people that practice PA have better QOL, but it is also possible that QOL influences the practice of PA. The study has relatively small sample size and gender differences in the results were not determined. QOL is also influenced by socio demographic characteristics and other clinical variables which were not addressed in the present study.

Conclusion
The present study concluded that positive association between PA and QOL among T2DM patients. PA has a beneficial effect on all dimensions of the QOL among T2DM patients. Effort and awareness should be dedicated to encouraging the active lifestyle among different population especially T2DM patients.

Conflict of interest: None

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