Effects of Six-Minute Walk Test on Cardiovascular Variables among Type 2 Diabetics

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ABSTRACT

The study investigated the effects of six-minute walk test on functional capacity, cardiac workload, rate of perceived exertion and selected cardiovascular variables among type 2 diabetic patients.

A total of forty (40) patients who had been diagnosed of type 2 diabetes mellitus and are attending the medical outpatient clinic of the Ekiti State University Teaching Hospital Ado-Ekiti were recruited through purposive sampling technique in which twenty (20) formed the experimental group and the remaining twenty (20) were control group. The pretest responses were obtained from both groups while the experimental group was subjected to eight (8) weeks of walking exercise, thereafter, the posttest responses were taken.

The results from the study revealed that there was significant effect of six-minute walk test on functional capacity, rate of perceived exertion, systolic blood pressure and heart rate of type 2 diabetic patients but found no significant effect on cardiac workload and diastolic blood pressure. These changes were significant at $p < 0.05$.

Therefore it was recommended that six-minute walk test could be used as home based exercise training designed on a long term basis to constitute a potent exercise therapy for enhancing health related quality of life among Type 2 diabetic patients as well as improve functional capacity, promote independence, and reduces exertion among Type 2 diabetic patients.

INTRODUCTION

Diabetes mellitus is a disease marked by expansion over the decade and is becoming a real public health emergency, more particularly with the cardiovascular implications it causes. It is not a single disease entity; rather it is a group of metabolic diseases in which a person has high blood sugar, either because the pancreas does not produce enough insulin, or because cells do not respond to the insulin that is produced. Diabetes mellitus type 2 is a metabolic disorder that is characterized by high blood glucose in the context of insulin resistant and relative insulin deficiency and accounts for about ninety per cent of all diabetes cases which occurs mostly in adults over the age of 40 years (WHO, 2002).

The goal of treatment in type 2 diabetes is to achieve and maintain an optimal blood pressure level, healthy resting heart rate, reduce exertion and to prevent or delay chronic complications of diabetes (American Thoracic Society, 2002). Many people with type 2 diabetes can achieve blood pressure control following exercise program, losing excess weight and aids quality of life. Physical activity and or exercise play a significant role in the prevention and management of chronic diseases such as type 2 diabetes mellitus, stroke, hypertension, cancer and obesity (Willey& Singh, 2003).

However, physical inactivity is one of the deadly triad along with type 2 diabetes mellitus and hypertension that require public health concern in the society (Sigal et al, 2004). This physical inactivity is an

independent risk factor for chronic diseases, and overall is estimated to cause about 1.9 million deaths globally (WHO, 2010). Physical activity lower blood pressure, resting heart rate, lower the risk of developing cardiovascular diseases and enhances skeletal muscle mass in type 2 diabetic individuals.

Six-minute walk test (6MWT) has been widely reported to be a good method of assessing functional capacity in a variety of chronic diseases including diabetes mellitus and other populations as well as in healthy adults (Jehn, Schmidht & Schuster, 2009). It was observed that six-minute walk test evaluates the global and integrated responses of all the systems involved during exercise including cardiovascular system. Therefore, the effects of six-minute walk test on cardiac workload, blood pressure and heart rate among type 2 diabetic patients is been sought with the aim of improving their quality of life and participation in functional tasks.

METHODOLOGY

The study adopted pretest-posttest control group experimental research design. Samples of forty participants were recruited in all through purposive sampling techniques and were randomly assigned equally into experimental and control groups. They were patients who have been diagnosed of type 2 diabetes mellitus and attending the medical outpatient clinic of Ekiti State University Teaching Hospital, Ado Ekiti, Ekiti State, Nigeria for a period not less than three (3) months. Detailed medical history was taken and physical examination performed to ensure they were patients who have not undergone any form of surgical procedure in the past two years and are within the age range of 40-65 years. Patients with unstable angina or myocardial infarction, severe hypertension and diabetic retinopathy (blind patients) were excluded from participating in the exercise.

Pretest responses were taken for all categories of the participants in the experimental and control group. Thereafter the experimental group performed the six-minute walk test (6MWT) while the control group did not and were closely monitored through phone calls. The six- minute walk test was done three (3) times per week for period of eight (8) weeks as well as home-based walking programme for thirty (30) minutes per day. At the end of the eight week, posttest responses were taken as was done during the pretest measurement and the data obtained were subjected to both descriptive and interferential statistics with the hypotheses tested at 0.05 level of significance.

RESULTS

The study was made up of forty (40) type 2 diabetic patients, in which the experimental group comprising of twenty (20) participants were subjected to eight weeks of six-minute walk test. At the end of the eighth week, the results obtained showed a reduction in blood pressure with mean difference of 14.20mmHg and 0.70mmHg in the systolic blood pressure of the experimental and control group respectively while the diastolic mean differences were 0.45mmHg for experimental group and 0.90 for the control.

On the other hand, the mean resting heart rate for the experimental group reduced from 70.50 – 70.20 beats per minute while the control group mean resting heart rate increased from 67.90 – 73.60 beats per minute. This is presented in the table 1 below;

Table 1: Pretest and Posttest mean values of the cardiovascular variables of the control and experimental groups

Variable	Group	Pre-test values			Post-test values			Mean Difference
		Mean	SD	Range	Mean	SD	Range	
Systolic Blood Pressure	Cont.	129.9	18.3	96.00-160.00	129.2	15.66	100.00-156.00	-0.7

	Exp.	139.2	12.76	120.00-160.00	125	10.15	110.00-140.00	-14.2
Diastolic Blood Pressure	Cont.	85.1	10.85	70.00-100.00	84.2	9.56	60.00-100.00	-0.9
	Exp.	84.95	9.14	62.00-100.00	84.5	7.65	70.00-94.00	-0.45
Resting Heart Rate	Cont.	67.9	4.92	58.00-78.00	73.6	6.14	62.00-86.00	5.7
	Exp.	70.5	10.82	56.00-102.00	70.2	9.08	60.00-94.00	-0.3

However, the statistical test showed that at the end of the eighth week, six-minute walk test produced a significant effect on systolic blood pressure of both groups of type 2 diabetic ($p < 0.05$) and no significant effect on diastolic blood pressure ($p > 0.05$). Similarly, six-minute walk test was found to have a significant effect on the resting heart rate of type 2 diabetic patients in this study. This is presented in the table 2 below.

Table 2: ANCOVA Showing effect of 6MWT on blood pressure and resting heart rate.

Pretest – posttest Variable	N	F_{cal}	F_{table}	p-value
Diastolic blood pressure	40	0.038	4.08	0.846
Systolic blood pressure	40	26.009	4.08	0.000*
Resting heart rate	40	2.336*	3.89	0.001
*p<0.05 (Significant Result)				

DISCUSSION

The result of the study indicated that six-minute walk exercise programme had significant effect on the resting heart rate of type 2 diabetic patients. The mean scores of type 2 diabetic patients on resting heart rate showed that F_{cal} (12.336) was greater than F_{table} (3.89) at 0.05 level of significance. This study justified the claim of Stone et al, (1991) that where a slight difference occurs, there appears to be a reduction in heart rate from aerobic exercise training which is considered beneficial. This implies that the decrease in heart rate is effective enough to produce a desired physiological response among Type 2 diabetics.

Also, findings from this study revealed that six-minute walk test exercise had no significant effect on the diastolic blood pressure of type 2 diabetes mellitus but was found to have a significant effect on systolic blood pressure. This implies that 6-minute walk test was an effective therapy for enhancing the systolic blood pressure of type 2 diabetic patients with no apparent change on the diastolic blood pressure. On the contrary, the findings of this study disagree with the work of George, Kristi &Zung (2007) who recorded a decrease in both systolic and diastolic blood pressure in adult type 2 diabetes mellitus patients. This may be because the environment and period for conducting this later study is different unlike this present study.

CONCLUSION AND RECOMMENDATION

This study shows that six-minute walk test (6MWT) can be employed as a tool to effectively enhance glycemic control as well as improve exercise tolerance level. It also showed beneficial effects on health status as well as reduce the risk profile for cardiovascular and metabolic disorder by lowering blood pressure and prevent the risk of developing cardiovascular disease.

In the view of the fact that six-minute walk test (6MWT) produced desirable effects on blood pressure control, it can be recommended as home programme and used on a long term basis among type 2 diabetic patients particularly in rural communities.

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