

Effects of eight weeks exercise program on physical activity for type 2 diabetes mellitus and hypertensive patients

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Abstract

Background: Diabetes mellitus is a chronic disease caused by inherited or acquired deficiency in production of insulin by the pancreas such a deficiency may results in increased concentrations of glucose in the blood which in turn damage of particular blood vessels and nerves .Regarding the classification of diabetes mellitus, two main categories are classified; (i.e) type 1 diabetes mellitus insulin dependent type and type 2 diabetes mellitus non- insulin dependent type. **Objective:** To compare the effects of eight weeks exercise program on physical activity in type 2 diabetes mellitus and hypertensive patients. **Method:** Total of 40 subjects was selected according to the inclusion and exclusion criteria Group A: PASE Questionnaire was done to the subjects and also the Blood Pressure, Blood Glucose level is measured but no exercise was given to them. Group B: PASE Questionnaire was done to the subjects and also the Blood Pressure, Blood Glucose level, is measured and recorded as pre and post of exercise program which was planned for 8 weeks. Every two weeks, exercise should progress under FIIT Principle. After eight weeks, post test was done and also the above mentioned measurements were recorded. **Conclusion:** The present study provides the comprehensive

view of the patients present with type 2 diabetes mellitus and hypertension and it is improved with physical exercises from the result, it has been concluded that Endurance exercise and High intensity intermittent training (HIIT) is effective in decreasing the levels of blood glucose and blood pressure and increases PASE score in patients with type 2 diabetes mellitus and hypertension.

Introduction: Diabetes mellitus is a chronic disease caused by inherited or acquired deficiency in production of insulin by the pancreas such a deficiency may results in increased concentrations of glucose in the blood which in turn damage of particular blood vessels and nerves .Regarding the classification of diabetes mellitus, two main categories are classified; (i.e) type 1 diabetes mellitus insulin dependent type and type 2 diabetes mellitus non- insulin dependent type. A total of 95% population presents with Type 2 diabetes mellitus whereas only 5% are reported to have Type 1 diabetes mellitus Type 2 diabetes mellitus is most common. Type 2 diabetes mellitus is a long term metabolic disorder that is characterized by high blood sugar, insulin resistance and relative lack of insulin. The patient usually complains of increased thirst, frequent urination, increased hunger and unexplained weight loss.¹² Usually onset is on middle or older age caused by obesity, lack of exercise and genetics. The pathophysiology of type 2 diabetes mellitus is due to insufficient insulin production from beta cells in the setting of insulin resistance and occurs primarily within the muscles, liver and fat tissue, it suppresses glucose release.¹³ Common complications are diabetic ketoacidosis, heart disease, stroke, diabetic retinopathy, renal failure. Prognosis is ten year shorter life expectancy. Hypertension also known as high blood pressure in which the blood pressure in the arteries is persistently elevated.¹⁴ It is caused by due to sedentary lifestyle and genetic factors like increased salt in the diet, obesity, smoking, alcohol.^{15,16} Some people with high blood pressure report headaches at the back of the head in the morning, vertigo, altered vision.¹⁷ It can be prevented by maintaining normal weight, exercising regularly, and eating properly. Regular physical activity has been recognized has a important tool for preventing and managing diabetes mellitus and its complications .High intensity intermittent training (HIIT), low intensity interval training, aerobic exercises, resistance training, continuous moderate intensity training act as a therapeutic tools for the prevention and treatment for Diabetes mellitus and hypertension patients .It may improve glycemic control,¹⁸ reduce fat¹⁹and blood pressure.²⁰ Physical activity have been considered as one of the cornerstones in the treatment of diabetes mellitus and hypertension along the nutrition and medication since

from the past 100 years ago. Physical activity and lifestyle modification is considered as a beneficial treatment regimen. Individuals who are more physically active appear to have lower rates of all-cause mortality. Due to physical inactivity, patients with type 2 diabetes mellitus and hypertension may have decreased functional ability. The plan of our study is to compare the ability of physical activity in patients with type 2 diabetes mellitus and hypertension before and after the eight weeks of exercise program.

Method: Total of 40 subjects was selected according to the inclusion and exclusion criteria and informed consent was obtained from the patient, they were explained about the safety and simplicity of the procedure. All the 40 subjects were selected using convenient sampling technique. All the 40 subjects were undergoing pre-test measures i.e. PASE questionnaire. Group A: PASE Questionnaire was done to the subjects and also the Blood Pressure, Blood Glucose level is measured but no exercise was given to them. Group B: PASE Questionnaire was done to the subjects and also the Blood Pressure, Blood Glucose level, is measured and recorded as pre and post of exercise program which is planned for 8 weeks. In the first 2 weeks all the subjects completed a brief questionnaire (record of last 7 days of physical activities) along with the following measurements, Blood Pressure, Blood Glucose level. In the third week, the subjects were summoned to begin the endurance exercise then progressed to High Intensity Intermittent Training (HIIT) program under 1 x 2 x 10 protocol. Every two weeks, exercise should progress under FIIT Principle. After eight weeks, post test was done and also the above mentioned measurements were recorded.

Treatment procedure: GROUP A (Control group): PASE Questionnaire was done to the subjects and also the Blood Pressure, Blood Glucose level is measured but no exercise was given to them. GROUP B (Experimental group): The subjects were treated with endurance exercise and high intensity intermittent training (HIIT). Experimental Group: Endurance exercise: Endurance is the ability to remain active for long period of time. Endurance Training is the act of exercising to increase endurance. The term Endurance Training refers to train the aerobic system. Endurance Exercise is of low intensity and long duration, Exercises like walking and jogging were suggested to the respective subjects initially for about 15 minutes then gradually progressed to about 45 minutes to improve the Glycemic control and to reduce Blood pressure. High Intensity Interval Training (HIIT): High Intensity Interval Training is also called High Intensity Intermittent Training. HIIT is a form of interval training, a cardiovascular exercise strategy alternating short periods of intense anaerobic exercise with less intense recovery period, until too exhausted to continue. HIIT

workout provides to improve glucose metabolism. HIIT exercise sessions generally consist of warm up period, then several repetitions of high intensity exercise, then a cool down period. The exercise program is initially started with 5 minutes of beginner HIIT workouts then progressed to cycling using resistance under 1 x 2 x 10 protocol.

Results: From statistical analysis made with the quantitative data revealed statistically significant between pre and post test values. The post test mean value of blood glucose level of group A is 139.00 and group B is 103.10 shows that blood glucose level in post test were comparatively less, $p < 0.0001$. The post test mean value of systolic blood pressure level of group A is 127.35 and group B is 115.80 shows that systolic blood pressure level in post test were comparatively less, $p < 0.0001$. The post test mean value of diastolic blood pressure level of group A is 82.30 and group B is 75.85 shows that diastolic blood pressure level in post test were comparatively less, $p < 0.0001$. The post test mean value of PASE questionnaire score of group A is 84.8555 and group B is 166.4880 shows that PASE questionnaire score in post test were comparatively high, $p < 0.0001$. Statistical analysis of post test value of blood glucose level, blood pressure level and PASE score revealed that there is high statistical difference between pre and post test values. Discussion: Diabetes is a group of metabolic disorders characterized by hyperglycemia resulting from defects in insulin secretion, insulin action (hepatic and peripheral glucose uptake) or both. The type 2 form of disease is associated with obesity²¹ and physical inactivity.²² Hypertension is still the common and major risk factor for developing cardio vascular disease. Regular aerobic exercise can reduce blood pressure and is recommended as part of the life style modification to reduce high blood pressure and cardio vascular risk.²³ Although continuous moderate intensity aerobic exercises have great improvements in some cardio metabolic risk factors (fasting insulin, glucose, systolic and diastolic blood pressure)^{24,25} High intensity interval training (HIIT) has increased greatly in popularity.²⁶ Several studies in adults have reported advantages of HIIT over continuous aerobic exercises at improving aerobic capacity and health in healthy people.²⁷ The aim of this study was to determine the effects of eight weeks exercise program on physical activity for type 2 diabetes mellitus and hypertensive patients using Endurance exercises and High intensity interval training. 40 individuals with type 2 diabetes mellitus and hypertensive patients was selected based on inclusion and exclusion criteria. Group allocation was conveniently divided in to two groups: Group A (n=20) subjects are assessed with PASE questionnaire and also the blood pressure and blood glucose level is measured but no exercise was given to

them. Group B(n=20) subjects are assessed with PASE questionnaire and also the blood pressure and blood glucose level is measured along with that Endurance exercises and High intensity interval training is performed. In the present study, the subjects were chosen from age group 45 to 65 years the data obtained from the study was statistically analysed using unpaired t - test.

The result of the study revealed that there was decreased in blood pressure and blood glucose level in Group A and improvement in PASE questionnaire scores in Group B after the respective protocol. Hence, the result of the study proves that there is a beneficial effects of eight weeks exercise program on physical activity for type 2 diabetes mellitus and hypertensive patients.

Conclusion: The present study provides the comprehensive view of the patients present with type 2 diabetes mellitus and hypertension and it is improved with physical exercises from the result, it has been concluded that Endurance exercise and High intensity intermittent training (HIIT) is effective in decreasing the levels of blood glucose and blood pressure and increases PASE score in patients with type 2 diabetes mellitus and hypertension.

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Figure 1: Shows the Comparison of Control Group and Experimental group

