

EFFICACY OF HIGH INTENSITY INTERVAL TRAINING AND PROGRESSIVERESISTANCE EXERCISE FOR PREDIABETES INADULT POPULATION

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ABSTRACT

Diabetes is being a major health problem which affects the quality of life and leads to death. The prevalence rate of diabetes is high in India. In a state, prediabetes where blood glucose level is higher than normal but not enough high to diagnosed as diabetes. By managing the prediabetes, the diabetes can be prevented. High intensity interval training and progressive resistance exercise improves the blood glucose level.

AIM OF STUDY: To evaluate the efficacy of high intensity interval training and progressive resistance exercise for prediabetes in adult population.

MATERIALS AND METHODOLOGY: After fulfilling the selection criteria, 30 subjects were randomly allotted in High Intensity Interval Training Group A and Progressive Resistance Exercise Group B each group consists of 15 subjects. 3 minutes of warm up given followed by 20 minutes of Group A and Group B. Supervised training was given for 3 days a week totally 4 weeks. The outcome measure is HbA1c level, FGL and Quality of life.

RESULT: The mean value of HbA1c in group A (5.813) is more than the HbA1c in group B (5.633) and FGL value for group A (108.40) is more than the FGL in group B (104.13). The mean value of quality of life in group A (112.20) is less than the quality of life in group B (115.20).

CONCLUSION: This study concludes both exercise reduces the blood glucose level and increase the quality of life in prediabetes, but while comparing Group B shows more significant reduction in blood glucose level and increase in quality of life.

KEY WORDS: Prediabetes, High intensity interval training, Progressive resistance exercise, One repetition maximum, HbA1c, FGL.

INTRODUCTION:

A group of metabolic disease which is characterized by chronic disease in blood glucose level than normal is known as diabetes mellitus.[1] If the diabetes is untreated, it may lead to coma and even death due to ketoacidosis.[1]The control of blood glucose in diabetic individual is more vital in order to prevent complications such as coma or death.

Any defect in the beta cells of pancreas in the process of insulin secretion, defect in the action of insulin known as insulin resistance where the body cells are resisted to the insulin or both the defect will result in diabetes mellitus.[2]The most common risk factors that can lead to diabetes mellitus are obesity, hypertension and improper lifestyle.

The few classification of diabetes mellitus are type 1 diabetes mellitus, type 2 diabetes mellitus, gestational diabetes mellitus and prediabetes.[2][3]

Type 1 diabetes mellitus:

Type 1 diabetes mellitus is an auto immune disease, that the immune system attack the insulin producing cells (beta cells) in pancreas and the body fails to produce insulin.[2][3]Type 1 diabetes mellitus is also known as insulin dependent diabetes mellitus or juvenile diabetes.

Type 2 diabetes mellitus:

Type 2 diabetes mellitus occurs when the body cells become resistance to insulin or lack of insulin sensitivity. This type of diabetes affects the way of body uses the insulin.[2][3]Type 2 diabetes mellitus is also known as non-insulin dependent diabetes mellitus.

Gestational diabetes mellitus:

Gestational diabetes occurs when a blood glucose level is increased during pregnancy. The increase in blood glucose level during pregnancy is known as gestational diabetes.[2][3]

Prediabetes:

Prediabetes is a state in where an individual did not reach the diagnostic criteria of diabetes. Prediabetes have a high risk for developing diabetes.[2][3]It is a health condition that the blood glucose level is higher than the normal, but not high as enough to be diagnosed as diabetes mellitus.

A hormone that is released from the organ pancreas failed, the targeted tissues did not respond to the released hormone insulin or both leads to rise in blood glucose level abnormally high in prediabetes. The control of blood sugar level in prediabetes stage will prevent the diabetes and the diabetes related complications. A normal fasting blood glucose level range from 70-110 mg per dl (6.1 mmol per L) and normal postprandial glucose level after two hours range from 70-140 mg per dl (7.75 mmol per L). [3]

In this range fasting blood glucose level from 100-125 mg/dl (5.6-6.9 mmol/L) and postprandial glucose level after two hours range from 140-200 mg/dl (7.8-11.0 mmol/L) is considered as prediabetes. [3]

National urban diabetes survey estimated the prevalence of diabetes is 14% in India. [4] The prevalence of diabetes is rising by a combination of factors like rapid urbanization, sedentary lifestyle, unhealthy diets, obesity and overweight. Recent study in India estimated that a family with low income may devote 25% of family income to adult diabetes. [5] The treatment expenditure is high because it is a chronic disease where the diabetic individual needs to take medications for longer duration. It affects the economic status of family with a diabetic individual which indirectly affects the social status of the family.

The stage from prediabetes to diabetes can be prevented by behavioural changes, healthy diet, proper lifestyle and importantly regular physical activity. Mainly physical activity is mandatory for a diabetic individual to control the glycemic level in the body. [6] Studies stated that physical activity has beneficial effects on glycemic control. [7] Exercise capacity reduces the mortality of diabetes and maintains the health. [8]

Diabetes affects the quality of life which results in a negative impact of the individual. [9] Studies stated that quality of life is affected in diabetic individual when compared to normal individual. [10] The proper management of diabetes and prediabetes will increase the quality of life of diabetic individual. [11] The proper intervention of prediabetes will prevent further complications like hypertension, heart disease, stroke and diabetes.

There are several articles about high intensity training exercise and progressive resistance exercise in prediabetic control. But there is no evidence of comparing the high intensity interval training and progressive resistance exercise in prediabetes. So, the present study is designed to efficacy of high intensity interval training and progressive resistance exercise among adult population to prevent diabetes.

High intensity interval training also called as sprint interval training which is vigorous repeated exercise training. This exercise produce adaptation of cardiac activity and also improve the blood glucose level and also improve the muscle mass.[12]

High intensity interval training increase the metabolism of glucose and sensitivity of insulin.[12] Regular progressive resistance exercise can improve the management of prediabetic.

Progressive resistance exercise response better to insulin and it also improves the use of blood glucose.[13][14] Progressive resistance exercise improves the disposal of glucose by improving the skeletal muscle mass.

This reduce the level of glucose in the blood level.[15] The progressive resistance exercise reduce the blood glucose level and also increase the muscle strength.[16] In this study, high intensity interval training and progressive resistance exercise compared with each other to determine in which among these exercise more effective in preventing diabetes.

LITERATURE REVIEW:

Mary E. Jung et al (2015) concluded that “The exercise adherence is low in individuals with type 2 diabetes mellitus. But there are perceptions that high intensity interval training adhere to the vigorous physical activity and in the preliminary evidence of this study provides that there is a adherence to high intensity interval training for a short term. However the high intensity interval training is more potential in enhancing the health and in maintaining the control of blood glucose level than the moderate intensity continuous training in prediabetic adults”.

Nasim Azari et al (2018) concluded that “Meta-analysis of this study showed, the resistance exercise program have significant effect on controlling the blood glucose level in individuals with type 2 diabetes mellitus, so this shows the resistance exercise control the glucose level by reducing it in type 2 diabetes. Also this study recommends that resistance

exercise can be used as an intervention for sports medicine in a non-pharmacological method.

MATERIALS AND METHODS:

The total number of 30 subjects was selected using random sampling technique based on the inclusion and exclusion criteria. The study was explained to the subjects and written consent has been obtained from the participants. The participants were divided into two

groups – Group A and Group B. Randomly the participants were allotted in two groups containing 15 subjects each. Initially the subjects were taken according to the values obtained from HbA1c and fasting blood glucose level.

Group A consists of 15 participants and they included in the high intensity interval training. The Group A performed warm up and static bicycling exercise. Group B consists of 15 participants and they included in the progressive resistance exercise. Group B performed exercise with dumbbells and weight cuff

GROUP A:

15 participants in group A performed high intensity interval training by the total duration of 25 minutes which include warm up for 3 minutes, cool down for 2 minutes and the vigorous exercise performed for 20 minutes that is static bicycling[24].

GROUP B:

15 participants in group B performed progressive resistance exercise. The technique performed in group B participants was MACQUEEN STRENGTHENING PROTOCOL [18]

MACQUEEN TECHNIQUE

10 lifts with 10 RM

10 lifts with 10 RM

10 lifts with 10 RM

ONE-REPETITION MAXIMUM is a amount of weight that an individual can lift to their maximum extend.

The total duration of exercise was 25 minutes which include warm up for 3 minutes, cool down for 2 minutes and MACQUEEN PROTOCOL of 10 lifts with 10 RM for biceps, triceps, quadriceps and hamstring for about 20 minutes.

FINDING AND ANALYSIS:

The mean value of HbA1c in group A (High intensity interval training) (5.813) is more than the HbA1c in group B (Progressive resistance exercise) (5.633) and FGL value for group A (High intensity interval training) (108.40) is more than the FGL in group B (Progressive resistance exercise) (104.13). The mean value of quality of life in group A (High intensity interval training) (112.20) is less than the quality of life in group B (Progressive resistance exercise) (115.20)

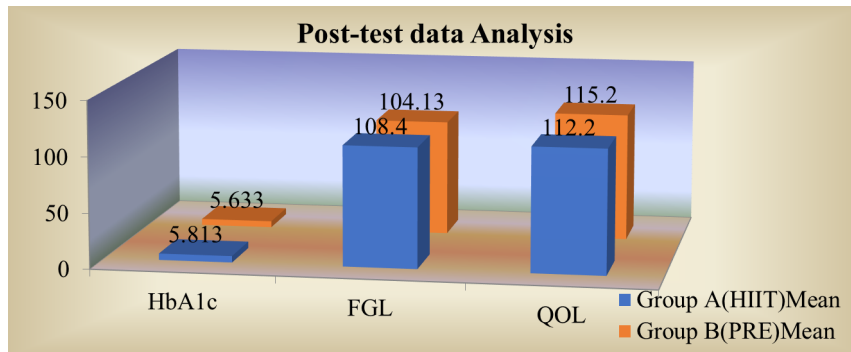


Figure : Post test analysis of Group A and B

RECOMMENDATIONS:

- The recommendation is to make more studies with larger sample which provides more accurate results.
- The study duration can be increased to improve the quality of life much better and to prevent diabetes.
- The long term effects of the study are recommended to be notes in upcoming study.
- It is recommended to give same intervention to diagnosed diabetes to see the reduction in blood glucose level.

CONCLUSION:

Exercise has the potential to reduce the blood glucose level in an individual with increased blood glucose in body. This study concludes that high intensity interval training and progressive resistance exercise both reduces the blood glucose level and increase the quality of life in prediabetes, but while comparing Group B (Progressive resistance exercise)

shows more significant reduction in blood glucose level and increase in quality of life than the Group A (High intensity interval training)

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