

A Comparative Study Between the Effectiveness of Aerobic Training Versus Resistance Training on Glycemic Control and Serum Cholesterol Level in Older Adult with Type-2 Diabetes Mellitus

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ABSTRACT

BACKGROUND AND PURPOSE: Diabetes is a chronic disease that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces. Insulin is a hormone that regulates blood glucose. Hyperglycaemia, also called raised blood glucose or raised blood sugar, is a common effect of uncontrolled diabetes and overtime leads to serious damage to many of the body's system. The purpose of the study was to compare the effectiveness of aerobic exercise versus resistance exercise for glycaemic control and serum cholesterol level in older adults with type-2 diabetes mellitus.

METHODOLOGY: A sample of 30 patients within the age group of 60-75 years with type-2 diabetes mellitus were randomly divided into two groups, Group A(n= 15)and group B (n= 15). The subjects in group A are treated with (Aerobic exercise) and the subjects in group B is treated with (Resistance exercise) for duration of 12 wks. The subjects' glucose and blood lipid profile are assessed by HbA1c% and Total blood cholesterol level scales were used. The pre and Post test results were arranged and evaluated.

RESULTS: Analysis using Independent 't' test found that there is statistically significant difference ($p<0.05$) between aerobic and resistance exercise on reducing glycaemic and serum cholesterol level.

CONCLUSION: Based on the result, this study concluded that aerobic exercise was effective in reduction of glycaemic control and serum cholesterol level in type-2 diabetes mellitus.

KEY WORDS: Diabetes mellitus type-2, Aerobic exercise, Resistance exercise, HbA1c%, Total blood serum cholesterol level.

INTRODUCTION

Diabetes is a habitual complaint that occurs either when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin it produces^[1]. Insulin is a hormone that regulates blood glucose. Hyperglycaemia, also called raised blood glucose or raised blood sugar, is a common effect of unbridled diabetes and overtime leads to serious damage to

numerous of the body's system, especially the nerves and blood vessels.

The number of people with diabetes rose from 108 million in 1980 to 422 million in 2014.prevalance has been rising more fleetly in low and middle income countries than in high income countries. Between 2000-2019 there was 3% increase in diabetes mortality rates by age. In 2019, diabetes and order complaints of kidney

disease due to diabetes caused an estimated 2 million deaths^[2].

Type 1 diabetes-[insulin dependent, juvenile or childhood onset] is characterized by deficient insulin product and requires diurnal administration of insulin.

Type 2 diabetes-[non-insulin dependent or adult onset] results from the body's ineffective use of insulin. further than 95% of people with diabetes have type2 diabetes. WHO estimates that diabetes redounded in 1.5 million death. This type of diabetes is largely the results of redundant body weight and physical inactivity.

Type 2 diabetes is an impairment in the way the body regulates and uses sugar (glucose) as a energy. This long-term habitual condition results in too important sugar circulating in the blood slice. ultimately, high blood sugar situation can lead to disease of the circulatory, nervous and vulnerable immune system^[3].

In this type of diabetes, there are primarily 2 interrelated problems at work. Pancreas does not produce enough insulin-a hormone that regulates the movement of sugar into the cells- and cells respond inadequately to insulin and take in lower sugar.

Type2 diabetes is more common in aged grown ups, but the increase in the number of children with obesity has led to further cases of type 2 diabetes in youngish people^[4].

A healthy diet, regular physical exertion, maintaining a normal body weight and avoiding tobacco use are ways to help or delay the onset of type 2 diabetes^[5].

Exercise is considered as a foundation of treatment for the type2 diabetes alongside diet and drug of proven efficacy^[6]. Although the effectiveness of exercise is perfecting glycaemic control, blood lipid profile and other issues in this group is well documented^[7]. There is lower certainty about the relative goods of different type of exercise.

Aerobic exercise is traditionally the most studied exercise, which recruits large group of muscles and includes brisk walking, cycling, swimming and jogging^[8]. It is recommended for aged cases with type 2

diabetes and have been associated with bettered glucose tolerance and cardiovascular fitness.

still, 80% of people with type 2 diabetes are overweight, fat or obese and may have mobility problems, peripheral neuropathy, visual impairments and cardiovascular complaint^[9]. For these cases, it may be infeasible to achieve the needed volume and intensity of aerobic exercise and resistance exercise perhaps more feasible^[10].

Resistance exercise use muscular strength to move a weight or to work against a resistive load, causing isolated, brief exertion of single muscle groups and has entered adding attention in the last decade.

Current position statements for both the American diabetes, Association and American college of sports medicine recommends the uses of resistance training as a part of exercise program of aged individuals^[11].

MATERIALS AND METHODS

This study was conducted at outpatient department of JKK Munirajah Medical Research Foundation college of Physiotherapy, Komarapalayam under the supervision of concerned authorities. A Total number of 30 patients were selected by random sampling method after due consideration to the inclusion and exclusion criteria. They were divided into group A and group B with 15 subjects in each group. A total duration of 12 wks. The parameter used for this study was Blood glucose level and Total blood serum cholesterol level scale. Both male and female are included in this study. The glycaemic and lipid profile was measured by blood glucose level and serum cholesterol level.

PROCEDURE

Group A were receiving aerobic training exercise.

Group B were receiving resistance training exercise.

After 12 week of exercise programme the blood glucose level and Total serum cholesterol level were measured.

GROUP-A – AEROBIC EXERCISE

Aerobic exercise refers to the type of repetitive, structured physical activity that requires the body's metabolic system to use oxygen to produce energy.

The aerobic training was given in alternate days in a week for 12 weeks as two sessions per day. Blood glucose level and total blood cholesterol level are measured before and after the training.

The training includes

- Warm up phase – 10 mins
- Aerobic exercise phase – 30 mins
- Cool down phase – 10 mins

Warm up phase:

Stretching of upper limb, trunk, lower limb muscles.

Aerobic exercise phase:

- Aerobic training has various sustained training as
- Walking
- Static cycle
- Treadmill
- calisthenics
- Sit ups

Cool down phase:

After the training session cool down period was given for 5-10 mins.

GROUP-B - RESISTANCE EXERCISE

Strength training (also known as resistance exercise) increases muscle strength by making muscles work against a weight or force. Resistance exercise is an anaerobic exercise. Resistance training program was given in alternative days in a week for 12

weeks as 2 sessions per day. In resistance training four sets and 10 repetitions was performed by the subject.

The training includes

- Warm up phase – 10 mins
- Resistance exercise phase – 30 mins
- Cool down phase – 10 mins

Warm up phase:

Stretching of upper limb, trunk, lower limb muscles.

Resistance exercise phase:

Different type of training was

- Weight lifting [3 kg]
- sand bag
- theraband exercise
- Squat exercise
- Trunk rotation with dumbbells(3-6kg)

Cool down phase:

After the training session cool down period was given for 5-10

The blood glucose level and total blood cholesterol level in response to resistance training depends on the number of factors including

- Amount of resistance training
- Number of repetitions
- Rest between sets

STATISTICAL ANALYSIS

Comparison of HbA1c% between group-A and Group-B. The comparative Mean values, Mean difference, Standard deviation and unpaired t value obtained using post and post-test for Group-A and Group-B evaluated with scale of HbA1c% value.

HbA1c%	Mean	Mean Difference	Standard Deviation	Unpaired "t" Value
Group A	6.800	0.793	0.424	3.8430
Group B	7.593			

The unpaired t-value of 3.8 was greater than the tabulated paired t- value of 2.05 which shows statistically significant difference at 0.05 level between Group A and Group B. The pre Vs post-test mean of group A was 6.8 and the pre Vs post-test mean of group B was 7.593 and the mean difference of

Group A and Group B was 0.793 which showed that there was significant reduction in Group A than Group B.

Comparison of TBC level between group-A and Group-B. The comparative Mean values, Mean difference, Standard deviation and unpaired t value obtained using post and

post-test for Group-A and Group-B evaluated with scale of TBC level value.

TBCL	Mean	Mean Difference	Standard Deviation	Unpaired "t" Value
Group A	208.47	8.40	9.51	2.53
Group B	216.87			

The unpaired "t" value 2.53 is greater than the tabulated t value 2.05 which shows statistically significant difference 0.05 level between mean difference Group A and Group B. The pre Vs post-test mean of Group A was 208.47 and the pre Vs post-test mean of Group B was 216.87 and mean difference of Group A and Group B was 9.51 which showed that there was statistically significant reduction in Group A than Group B.

DISCUSSION

The aim of study was to compare the efficacy of aerobic training and resistance training on glycaemic control and serum cholesterol level in older adult with type -2 diabetes mellitus.

American Diabetes Association (ADA) and American College Of Sports Medicine recommends the use of aerobic exercise for diabetes as this increase insulin sensitivity and helps restore normal glucose metabolism by decreasing body fat^[12]. ADA also recommends the use of resistance training as a part of exercise program for older individuals since aging is associated with a reduction in muscle strength and metabolic control. Resistance training benefits by increasing glucose uptake by the muscle and enhancing the ability to store glucose and also decrease the body fat by raising the metabolism^[13]. Above reason were the motives for my study selection.

Based on the studies of Ronald J Sigal, Emma Hit & Timothy S.Church the present study has taken HbA1C and total blood cholesterol as parameter for this study.

Based on the studies of Ronald J Sigal, Emma Hit & Timothy S.Church, the present study has taken aerobic training and resistance training as a treatment program for older adults with type 2 diabetes^[14].

ANALYSIS AND INTEPRETATION OF HbA1C % LEVEL IN GROUP A AND GROUP B

The unpaired "t" value of 3.84 was greater than the tabulated "t" value of 2.05 which showed a statistically significant difference at 0.05 level between mean differences of group A and group B .The mean difference in group A is 0.79 which was greater than group B.

The study results of RONALD J SINAL, ENNA HITT and other supported the present study result which showed marked reduction in HAb1C % level following aerobic training for older adult with type 2 diabetes.

ANALYSIS AND INTEPRETATION OF TOTAL BLOOD CHOLESTROL LEVEL IN GROUP A AND GROUP B

The unpaired "t" value of 2.53 was greater than the tabulated "t" value of 2.05 which showed a statistically significant difference at 0.05 level between mean differences of group A and group B .The mean difference in group A is 8.40 which was greater than group B.

The study results of Debre Boardiey, Juliac C Orri and other supported the present study result which showed marked reduction in TBCL level following aerobic training than resistance training for older adult with type 2 diabetes.

CONCLUSION

The result showed that the subject who participated in group A showed greater reduction in HbA1C % and total blood cholesterol level the study concluded that aerobic training is more beneficial for glycaemic control and total serum cholesterol level in older patient with type 2 diabetes mellitus.^[15]

Declaration by Authors

Ethical Approval: Approved

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