



# EFFECTIVENESS OF AEROBIC WITH HIGH FORCE ECCENTRIC RESISTANCE EXERCISES ON GLYCEMIC CONTROL AND PHYSICAL PERFORMANCE IN TYPE-2 DIABETIC POPULATION

C. ARCHANA, Clinical Physiotherapist, SVIMS, College of Physiotherapy, Tirupati.

## INTRODUCTION

Type-2 diabetes mellitus is a chronic illness marked by decreased insulin sensitivity and overall poor glucose control. Diabetes has emerged as a major health care problem in India. We Indians are more prone for diabetes than almost any other population in the world.

Currently 40.9 million Indians are affected by diabetes and is expected to rise 69.9 millions of people by 2025. Every year 3.8 million deaths are attributable to diabetes. WHO health report stated the prevalence of diabetes ranks 4<sup>th</sup> in the world. Because of changes in the life style, environment and food habits the problems of diabetes is increasing 4 folds.

## CAUSES AND RISK FACTORS

**Age:** the risk of type-2 diabetes increases in very young age at least 10-15 years earlier than western population. **Weight:** Being overweight is the primary risk factors for type-2 diabetes due to more fatty tissue more resistance of cells to insulin. **Inactivity:** Sedentary life style and less active due to availability of motorized transport, well equipped system leads to greater risk of type-2 diabetes. **Family History:** The risk of type-2 diabetes increases if a parent or siblings is more prone for type-2. **Insulin resistance:** It means body cells do not respond appropriately, post receptor. **Stress:** Impact of stress both physical and mental plays major role in developing diabetes.

## SIGNS and SYMPTOMS

Polydipsia, Polyuria, Polyphagia, increased fatigue & weight fluctuations.

## COMPLICATIONS

Diabetic Nephropathy. Visual Problems – Cataracts, Glaucoma, Delayed wound healing, Arterial disease – Coronary Artery diseases. Most common in middle age and later life. Neuropathy.

## MANAGEMENT

Majority of patients felt modern allopathic treatment is the favor of indigenous treatments. But universally accepted component of the non pharmacologic treatment for type-2 diabetes is “EXERCISES”. Historically aerobic exercises has been advocated for improving glucose control. Current consensus statement from several professional stated that resistance exercise training also have effect on improving glucose control, improvement in muscular strength, endurance and power. Eccentric muscle contractions can results in 2 to 3 times greater force production than more traditional isometric or concentric muscle contraction.

Eccentric exercises induce negative work, less effort for individuals to perform this is especially advantageous for individuals whose aerobic abilities are limited due to cardiac insufficiency.

## AIMS AND OBJECTIVES

To study the effectiveness of aerobic exercise with high force eccentric resistance exercise on glycemic control in type-2 diabetic population.

1. To evaluate effectiveness of aerobic exercise on glycemic control, body mass index and physical performance in control group.
2. To evaluate effectiveness of aerobic with high force eccentric resistance exercises on glycemic control, body mass index and physical performance in experimental group.
3. To compare glycemic control, body mass index and physical performance parameters among experimental and control group.

## HYPOTHESIS

**Alternate Hypothesis:** The aerobic exercise with high force resistance exercises will be effective on glycemic control and physical performance in type-2 diabetes.

**Null Hypothesis:** The aerobic with high force resistance exercises will show no change on glycemic control and physical performance in type-2 diabetes

## MATERIALS AND METHODOLOGY

Materials: 1. Eccentric Stepper, 2. Weighing Machine, 3. Inch Tape, 4. Stop watch.

Setting: The study was conducted in SVIMS Hospital, Tirupati.

Study Design: Convenient Sample.

Sample Size: 24 Subjects were conveniently selected and allocated into 2 groups.

Group 1 – Experimental Group.

Group 2 – Control Group.

Study Duration: 12 Weeks.

Criteria for Selection:

Inclusive criteria:

Age 40-55Years.

Diagnosed type-2 Diabetics.

Consent from the patient.

Exclusive criteria:

Uncontrolled Hypertension.

Orthopedic problems.

Central or peripheral nervous system disorders.

Rheumatological disease.

The logo for JETIR (Journal of Emerging Technologies and Innovative Research) is a watermark in the background. It features the word "JETIR" in a large, serif font, centered within a shield-like shape. Below the text is a colorful, multi-petaled flower or starburst design with petals in shades of red, orange, yellow, green, and blue. The entire logo is surrounded by a laurel wreath.

## METHOD

Twenty four patients who met the inclusive criteria were conveniently assigned into experimental and control groups, 12 subjects were included in each group and informed consent is taken from all patients. All subjects were evaluated for Body Mass Index, 12 minute walk test, Glycosylated hemoglobin test before and after the intervention.

Control group performed aerobic exercises and the experimental group performed aerobic with high force eccentric resistance exercises.

## PROCEDURE

For each individual, the anthropometrics measurements data height and weight was measured. The person was asked to stand straight leaning on his back against straight wall. Marking was made on the wall keeping a broad scale over the head. Height was measured in centimeters with a measuring tape.

12 Minute walk-test.

Study Outcomes: Body mass index, Glycosylated hemoglobin test, Distance walked in 12 minutes

Exercise protocol: The subjects are assigned to Group 1 – Control group

Group 2 – Experimental group

Control group who underwent supervisor aerobic training programme for 12 weeks

i.e., walking – 5 to 30 Minutes 6 times per week.

Experimental group who underwent supervised aerobic training with high forced resistance exercise programme for 12 weeks.

#### High-Force resistance excises in eccentric stepper

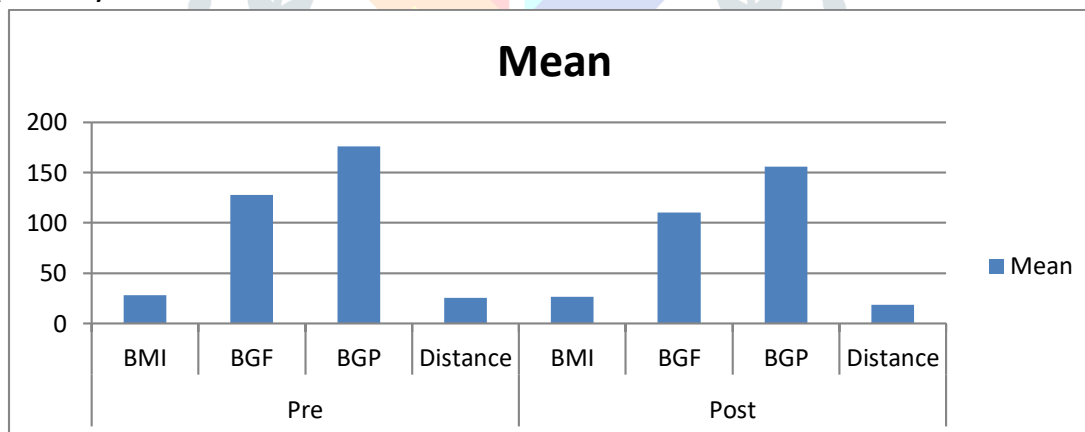
Week	Time/Week	Duration	RPE
1	3	5 Minutes	Very very light (7)
2	3	5-10 Minutes	Very light – fairly light (9-11)
3	3	10 – 15 Minutes	Fairly – somewhat hard (11-13)
4	3	15 – 20 Minutes	Somewhat hard
5-12	3	20 Minutes	Somewhat hard

- **Study Outcomes: Body mass index, Glycosylated hemoglobin test, Distance walked in 12 minutes.**

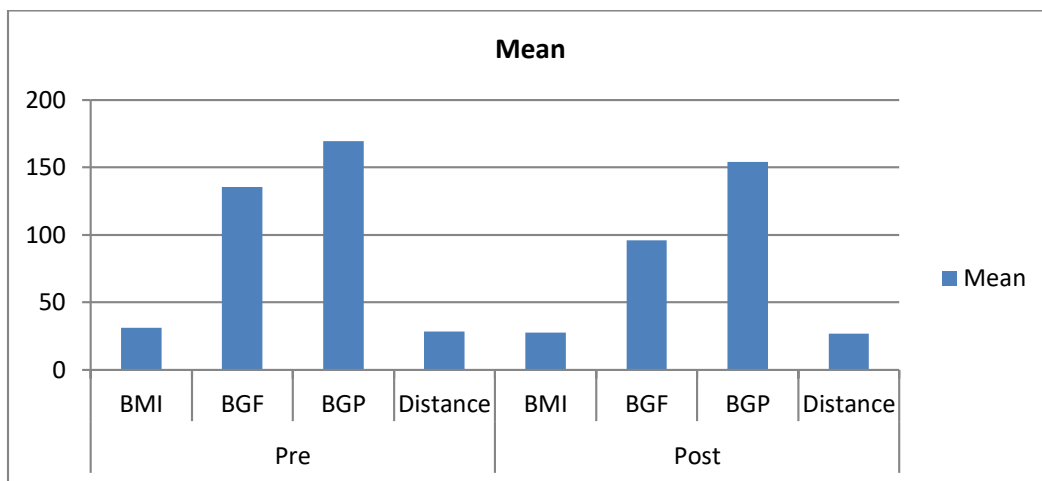
#### DATA ANALYSIS

- Data analysis was performed to observe and to compare the pre and post values of each parameter (BMI, Blood Glucose and Distance walked in 12 minutes).
- Entire results were obtained by using SPSS 16.0 version.

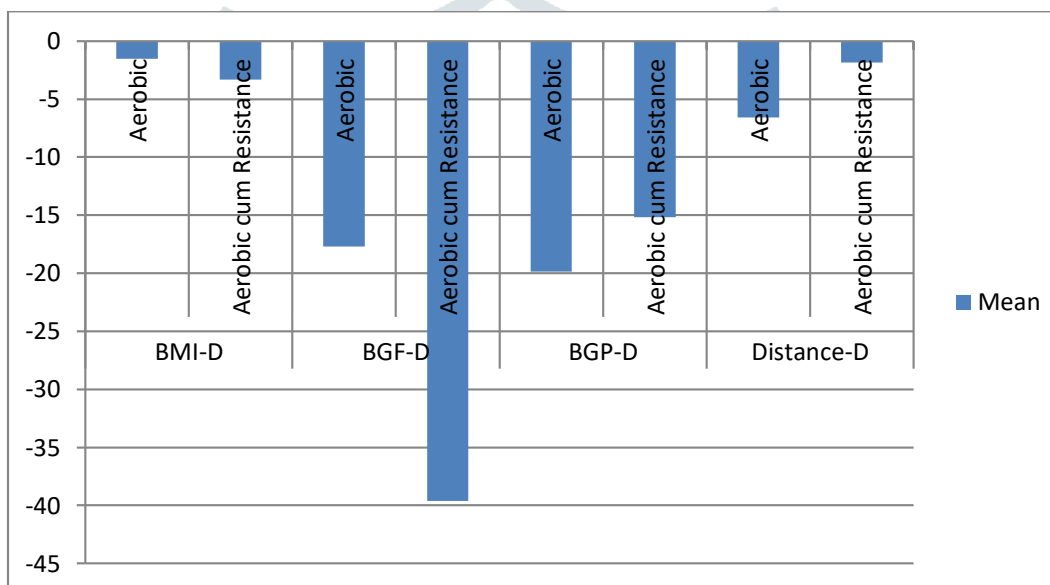
#### Control group (Aerobic) Mean Values of Pre and Post Exercises



**Experimental group (Aerobic cum Resistance Exercises) Mean Values of Pre and Post Exercises**



**Mean Difference of each parameter in two groups**



**DISCUSSION**

- In this study we sought to compare a combined aerobic and high force eccentric resistance exercises program with a program of aerobic exercise only and to evaluate the efficacy of high-force eccentric resistance exercise on glucose control, BMI, Distance walked in 12 minutes.
- Significant difference in BMI and Distance walked in 12 minutes, but there is no significant changes in blood glucose levels between the groups.
- After data analysis statistically we accepting null hypothesis i.e., the aerobic with high force resistance exercise will show no change on glycemic control.

## CONCLUSION

- Individuals with T2DM have been reported to have less strength and muscle quality than age matched control subjects who were healthy.
- This loss of protein reserve may predispose people with T2DM to muscle function impairments. Low muscle mass has been reported to be associated with poor lower extremity function and mobility limitations.
- High force eccentric training as the resistance training stimulus in an exercise. In this study, the low energetic cost associated with eccentric exercise may have contributed favorably to the high adherence of the subjects to our diabetes exercise program.
- This may be especially important because people with T2DM often do not willingly participate in exercise.
- Hence concluded that high force eccentric exercises are more beneficial for T2DM people.

