IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Comparison Of Aerobic Training Vs Combined Training on Blood Sugar Levels, Lipid Profile and Quality of Life in Females with Type 2 Diabetes

[1]Dr Deepa Suvarna, [2]Dr Shrunkhala Kaushik

[1]Associate Professor, [1] Department of Cardiorespiratory Physiotherapy,MVP's College Of Physiotherapy,Nashik, India
, [2]Assistant Professor,[2]Department of Community Physiotherapy, [1]MVP's College Of Physiotherapy,Nashik, India

Abstract: **Objectives/Purpose/background of study**- Type 2 Diabetes,where in there is presence of high blood sugar levels over a prolonged period of time ;is more prevalent in females than males. This study was taken to compare the effects of Aerobic exercises and Aerobic exercises combined with Resistance training on the blood sugar levels, lipid profile, and quality of life in women with type 2 diabetes.**Methods**- The study was an experimental study-randomized control trial (equivalency trial) involving 40 females with type 2 diabetes; PAR-Q was administered. Patients were randomly divided into two groups. At 1st session of exercise programme, blood sugar level,lipid profile,and quality of life was assessed.Both groups underwent supervised exercise training programme with Group B receiving resistance training along with aerobic exercises.Total 18 exercise sessions were taken.Counseling session on dietary restriction was provided to the patients.**Results**- Data was analysed using t test.Significant changes in values of blood glucose levels, LDL,VLDL,HDL,TGL,DQOL within the combined group with $p<0.0001$ were found.Between groups result was extremely significant for blood sugar levels –fasting with $p<0.0001$;but not significant for other parameters.Aerobics group showed statistically significant changes in all the outcome measures except for LDL.**Conclusion-** The duration of 6 weeks aerobic exercise as well as combination exercise on Type II diabetic subjects was found to improve the glycemic control and lipid profile. However combination exercise was more effective in improving the blood glucose levels and QOL.

Index Terms - LDL-Low density,VLDL-very low density,HDL-high density lipoprotein,TGL-Triglyceride level,DQOL-Diabetes quality of life.

I. INTRODUCTION

Diabetes mellitus (DM), commonly referred to as diabetes, is a group of metabolic diseases in which there are high blood sugar levels over a prolonged period of time.Type 1 DM results from the pancreas's failure to produce enough insulin. This form was previously referred to as "insulin-dependent diabetes mellitus" (IDDM) or "juvenile diabetes". The cause is unknown.

Type 2 DM begins with insulin resistance , a condition in which cells fail to respond to insulin properly. As the disease progresses a lack of insulin may also develop. This form was previously referred to as "non insulin-dependent diabetes mellitus" (NIDDM) or "adult-onset diabetes". The primary cause is excessive body weight and not enough exercise.

Type II diabetes mellitus is associated with a cluster of interrelated plasma lipid and lipoprotein abnormalities, including reduced HDL cholesterol, a predominance of small dense LDL particles, and elevated triglycerides. Type 2 diabetes is a life-long (chronic) disease in which there is a high level of sugar (glucose) in the blood. Type 2 diabetes is the most common form of diabetes. Sustained elevated blood glucose levels places patients at risk for microvascular and macrovascular diseases as well as neuropathies (peripheral and autonomic).

As of 2015, an estimated 415 million people have diabetes worldwide, with type 2 DM making up about 90% of the cases. This represents 8.3% of the adult population worldwide. Diabetes is fast gaining the status of a potential epidemic in India also which is now known as the ''diabetic capital of the world" as the increase in prevalence has been dramatic ranging from 11.9 million in 1980 to 64.5 million in 2014.

Indians are genetically predisposed to the development of coronary artery disease due to dyslipidaemia and low levels of high density lipoproteins; these determinants make Indians more prone to development of the complications of diabetes at an early age (20-40 years).

Prevalence of diabetes has more than doubled for men and has risen by 80% among women in India (40-60 years) Regular exercise reduces dyslipidemia and increases insulin sensitivity. By increasing the GLUT-4 receptor concentration on the plasma membrane or sarcolemma, the insulin resistant state is positively affected ,the consequence being enhanced glucose uptake into cells and a normal insulin-glucose interaction.Exercise stimulus also results in muscle fiber type conversion because most type II diabetes patients are sedentary, they have a sub optimal ratio of type I (aerobic) to type 2(anaerobic) muscle fibers.

Muscle fiber type conversion of type IIb to IIa (fast twitch, power fibers) increases muscle insulin receptor number and GLUT-4 concentration, thereby enhancing the reduction in blood glucose levels.It is now established that participation in regular Physical activity improves blood glucose control and can prevent or delay type 2 diabetes.

Also, individuals with type 2 diabetes engaged in supervised training exhibit greater compliance and blood glucose control than those undertaking exercise training without supervision. With supervised training ,the cardiovascular system and the muscles used during training, gradually adapt to the training stimulus over time and significant changes can be measured in 10 to 12 weeks upon blood sugar levels, lipids and quality of life of the patient.Most benefits of physical activity on diabetes management are realized through acute and chronic improvements in insulin action, accomplished with both aerobic and resistance training but reference regarding which of them dominates over the other is either lacking or too old which has necessitated the need for study.

Population and Sample

Individuals suffering from type 2 diabetes,Individuals fulfilling the criteria of PAR Q questionnaire,Individuals in age group 40-60 years,Individuals not participating in any other aerobic or resistance exercise programme elsewhere,Patients on stable doses of oral hypoglycemic drugs (sulfonylureas, biguanides,and meglitinides) for the previous 3months were taken in the study. Individuals at risk of coronary heart disease,Individuals with blood sugar levels more than 300 mg/dl (fasting) and 350 mg/dl (post prandial),Individuals on insulin doses,Significant respiratory disease, orthopedic problems that would interfere with resistance exercise training, advanced diabetes-induced end-stage organ damage, or pregnancy Individuals with previous history of angina Individuals with peripheral neuropathy Individuals with impaired balance and history of falls.Patients having all domains as“yes” in PAR- Q questionnaire were excluded from the study.The sample size was statistically calculated and was 40.

RESEARCH METHODOLOGY

The Type of study was Comparative interventional study.The Study setting was Nashik.Type of sampling was convenient sampling.The Sample size was 40(Group A- 20,Group B- 20)Population consisted of Type 2 diabetic females.The Duration of study was 12 weeks.

Materials and Methods

Materials and Methods which were used in which were used in our study were-Pen ,Paper,Consent form,Glucometer,Quality of life questionnaire,Pulse oxy meter,BP apparatus,Weight cuffs ,Dumbbells .The Outcome measures included assessment of Blood sugar level fasting Blood sugar level post prandial ,LDL ,VLDL, TGL ,HDL, diabetes quality of life (DQOL) questionnaire.

Individuals with Type 2 diabetes were included ; Physical activity readiness questionnaire PAR-Q was administered after which as per the responses of patients, they were included in the study. Thereafter, patients were randomly divided into two groups; group A (aerobic exercise) and group B (aerobic & resistance exercise) with 20 patients in each group. Both groups underwent 6MWT to determine the intensity of aerobic exercises.At 1st day of exercise programme, blood sugar level (fasting and post prandial) ,lipid profile was assessed and quality of life questionnaire was given to both groups.

Group A was prescribed Aerobic exercises –3days per week for 40 minutes per session for 6 weeks i.e 18 sessions (3days*40 mins=120 -150 min recommended by ACSM).Following aerobic exercises were given -V step, hamstrings curl, knee lift, lunges,turn steps,biceps curl,hammer curls,upright row,overhead pull,grape vine.Exercise was performed to the beats of rhythmic music which was gradually increasing in beats 100 bpm initially and was increased to 120 bpm .Group B was prescribed Aerobic exercises in addition with resistance training -3 days in a week for 6 weeks i.e 18 sessions ;40 minutes per session (20 mins aerobic training and 20 mins resistance training).

Progressive resistance training was administered by calculating repetition maximum at start of exercise protocol.First 1RM for the particular muscle group was identified .The patient was started on one weight less than that for a 1RM.The patient performed 10 repetitions and two sets (moderate intensity) in each group of muscles .As patient was able to perform such exercise at the end of the week,0.5 kg weight was added the next week.

Patients were educated to continue their oral hypoglycemic drugs with large intervals and not before exercising.Counseling session on dietary restriction and adherence to exercise programme was provided to the patients

At the last day of exercise session, samples of blood for blood sugar levels(fasting and post prandial)&lipid profile were taken and quality of life questionnaire was given to patients.

Statistical tools

Data was analysed using Paired t test and unpaired t test.The values within the group were compared using paired t test.The values between the group were compared using unpaired t test .

RESULTS AND DISCUSSION

The key findings of the study were that there were significant changes in the blood glucose levels (fasting and postprandial) , LDL (aerobic+resistance group) VLDL(aerobic+resistance group),HDL,TGL,DQOL within the group with $p<0.0001$.

Between groups result was extremely significant for blood sugar levels –fasting and with $p<0.0001$;but not significant for blood sugar- post prandial,LDL,VLDL,TGL,HDL,DQOL .

Table no 1: Comparison of mean of blood sugar levels(fasting) group A(Aerobic) & group B (Combined)

	AEROBICS		AEROBICS +RESISTANCE	
	PRE	POST	PRE	POST
MEAN	157.1	155.16	164.2	151.75
SD	2.28	2.30	9.06	8.19
t value	9.67		8.65	
P value interpretation-	<0.0001 EXTREMELY SIGNIFICANT		<0.0001 EXTERMELY SIGNIFICANT	

Group A showed statistically significant changes in all the outcome measures except for LDL with p value equal to 0.1621
Aerobic training tends to enhanced glucose disposal independent of changes in fat-free mass, fat mass, or maximum aerobic capacity, bringing about functional changes in the muscle.

Table 2: Comparison of mean of Blood sugar level (post prandial)of group A(Aerobic) & group B (Combined)

	AEROBICS		AEROBICS+RESISTANCE	
	PRE	POST	PRE	POST
MEAN	175.7	170.72	176.2	170.67
SD	2.219	4.04	9.32	8.75
t value	5.0572		9.763	
p value Interpretation-	<0.0001 EXTREMELY SIGNIFICANT		<0.0001 EXTERMELY SIGNIFICANT	

These changes would have been responsible for the significant change in the outcome measure.Group B also showed statistically significant changes in all the outcome measures except for VLDL
Resistance training produces an increase in fat-free mass, contributing to increased glucose disposal. Aerobic as well as resistance training, leads to an increase in skeletal muscle GLUT4 content.
As skeletal muscle is the principle area of glucose disposal, resistance training also increases muscle bulk which increases insulin sensitivity, due to improved muscle physiology and vascularity.Resistance exercises may also lead to decrease in intramyocellular triglyceride content, which may mask the increase in the muscle mass, and both effects could lead to an improvement in insulin sensitivity and quality of life.
All the above changes with reference to table 1 and table 2 above may lead to improvement in diabetic status and reduce the metabolic risk factors, insulin sensitivity.
Resistance exercises may also lead to decrease in intramyocellular triglyceride content, which may mask the increase in the muscle mass, and both effects could lead to an improvement in insulin sensitivity and quality of life.All the above changes may lead to improvement in diabetic status and reduce the metabolic risk factors, insulin sensitivity.

References

[1] Diabetes Fact sheet N°312". WHO. October 2013. Archived from the original on 26 Aug 2013. Retrieved 25 March 2014
[2] American College of Sports Medicine, American Diabetes Association. Booklet -Exercise and type 2 diabetes:
[3] American College of Sports Medicine and the American Diabetes Association: joint position statement.
[4] Exercise and type 2 diabetes. Med Sci Sports Exerc. 2010;42(12):2282–303
[5] McArdle, WD, Katch, FI, Katch VL: Essentials of Exercise Physiology,ed Lippincott Williams & Wilkins, Philadelphia, 2005
[6] McArdle, WD, Katch, FI, Katch, VL: Exercise Physiology: Energy,
[7] Nutrition, and Human Performance, ed 5. Lippincott Williams & Wilkins, Philadelphia, 2001.
[8] Powers, SK, Howley, ET: Exercise Physiology: Theory and Application,ed 4. McGraw-Hill, Boston, 2001
[9] Poehlman ET, Dvorak RV, de Nino WF, Brochu M, Ades PA: Effects of resistance training and endurance training on insulin sensitivity in nonobese, young women:a randomized controlled trial. J Clin Endocrinol Metab 85:2463–2468, 2000

[10] Cauza E, Hanusch-Enserer U, Strasser B, Ludvik B, Metz-Schimmerl S, Pacini G, Wagner O, Georg P, Prager R, Kostner K, Dunky A, Haber P: The relative benefits of endurance and strength training on the metabolic factors and muscle function of people with type 2 diabetes mellitus. ArchPhys Med Rehabil 86:1527–1533, 2005
[11] Cuff DJ, Meneilly GS, Martin A, Ignaszewski A, Tildesley HD, Frohlich JJ: Effective exercise modality to reduce insulin resistance in women with type 2 diabetes. DiabetesCare 26:2977–2982, 2003