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Impact of Combined Resisted and Aerobic Exercises on Obesity and Glycemic Control on Type 2 Diabetic Mellitus.

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ABSTRACT

Diabetes mellitus is the most prevalent non communicable disease in Indian population. In the next 15 to 20 years India is expected to be the diabetic capital of the world. Type 2 diabetes mellitus caused predominantly by insulin resistance is the major contributor to the total diabetic percentage. Increase in obesity also increases the risk of type 2 diabetes mellitus. This research study evaluates the impact of combined resisted and aerobic exercises in bringing down the levels of HbA1C and also waist circumference. This helps in improving the glycemic control of patients with Diabetes mellitus and their quality of life.

Keywords: Resisted exercise, HbA1C, Diabetes, Waist circumference.

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INTRODUCTION

Type 2 diabetes remains one of the most challenging global health problems. With increasing prevalence the burden will escalate [1]. Visceral obesity is considered a major risk factor for impaired glucose tolerance, Type 2 diabetes mellitus and cardiovascular disease [2].

Obesity has reached epidemic proportions globally and has become a major public health concern [3]. 85% of world population has sedentary life style (WHO 2011). Passive life style is a risk factor for obesity [4]. Waist Circumference may be a stronger predictor for identification of metabolic and cardiovascular disease associated risk factors [5].

As of 2000, the number of obese adults has increased to over 300 million. Contrary to conventional wisdom, the obesity epidemic is not restricted to industrialized societies; in developing countries, it is estimated that over 115 million people suffer from obesity-related problems [6].

The combination of obesity, hypertension, and poor glycemic control are associated with an increased relative mortality in Type 2 diabetes mellitus [7]. Combined aerobic and resisted exercises are effective in improving glycemic control [8]. Glycosylated Hemoglobin(HbA_1C) is a better predictor of diabetes mellitus [9]. This research study aims at evaluating the combined effects of Aerobic and resisted exercises on Type 2 diabetic mellitus among Indian population.

MATERIALS AND METHODS

After obtaining ethical committee approval for this research study, special diabetic camps were conducted at Chennai and subjects were recruited consent form from all the subjects were recruited. Consent forms from all the subjects were recorded. 100 known Type 2 diabetic mellitus subjects were at random allotted in two groups.

Inclusion Criteria

Known Type 2 diabetic mellitus of both sex between 30-60years, on due diabetic medication**.**

Exclusion Criteria

Type I Diabetic subjects, bed ridden diabetic subjects, subjects with uncontrolled diabetes and subjects who did not volunteer to participate in the study.

Place and duration of the study

The research study was conducted at Sree Balaji College of Physiotherapy, Chennai – 100 during the period from May 2013 to October 2013.

Tools of measurement

All the subjects waist circumference at iliac crest were measured at baseline, after 3 month and 6 month and all the subjects fasting various sample were taken and their HbA_1c was evaluated at baseline, 3rd month and after 6 month completion of the research.

All participants were instructed not to change their usual diet and to continue their duly prescribed medication by their physician.

Group I (Controls) were asked to maintain their inactive life style, Group II (Experimental subjects) have performed 3 days of Aerobic exercises per week and two days of resisted exercises per week using an inflatable physioball, for a period of 6 months. While aerobic activities involved proper stretching, warming up, aerobic activity and cooling period, resisted exercises involved 10 set of exercises with an inflatable physioball, where subjects own body weight forms the resistance. The resisted exercise training was done at the

physiotherapy department of sree Balaji College of physiotherapy.chennai. Progression was made as per the guidelines of ACSM and ADA.

RESULTS

In the control group, Obese subjects with type 2 Diabetes mellitus who did not perform any physical activity the waist circumference was found to increase 2.4cm from the mean value in the first 3 months and 5 cm increase from the mean value was found at the end of 6 months period.

Similarly the HbA1C levels also increased by 0.22% in the first 3 months and 0.41 % at the end of the 6 month duration indicating poor glycemic control.

The results of waist circumference for the test group which underwent the resisted and aerobic exercise training showed considerable decrease in waist circumference. The waist circumference decreased 4.28 cm from the mean value at the 3rd month and 8 cm decrease in waist circumference was found at the end of 6 months.

The HbA1C levels of the test group showed considerable reduction.0.66% decrease from mean value was found at the end of 3 months and 1.33% decrease from the mean value was found at the end of the 6 months period.

The results of waist circumference and HbA_1c of all the subjects all the controls and test group subjects statistically analysed and results are as follows.

Results of paired" t" test of Group I and II and mean values on Waist Circumference and HbA1c levels

Table 1: Results of paired T test for waist circumference measured at 3rd month and 6 th month within group I (Control)

Group I	Mean ±SD	P value
Control	115.82±11.09	<0.01
After3rd month	118.22±10.89*	<0.01
After 6th month	121.28±11.05 *	

Note: – * p value is found to be statistically Significant.

Table 2: Results of paired T test for HbA1C levels measured at 3rd month and 6 th month within group I (Control)HbA1C levels

Group I	Mean ±SD	P Value
At the start (o th Month)	7.63±0.54	< 0.001
After 3rd month	7.85±0.55**	< 0.0001
After 6th month	8.26± 0.54***	

Note : ***-P value Statistically very highly significant
* *-p value statistically significant

Table 3: Results of paired T test for waist circumference(cm) measured at 3rd month and 6 th month within group II (Test Group)

Group II	Mean ±SD	P Value
Pre treatment	116.44±10.37	< 0.001
Post treatment 3rd Month	112.26±9.91**	< 0.001
Post Treatment 6th month	108.46±9.77**	

Note ; ** -p value statistically highly significant.

Table 4: Results of paired T test for HbA1C(%) measured at 3rd month and 6 th month within group II

Group II	Mean ±SD	P Value
Pre treatment	7.88±0.49	< 0.001
Post treatment 3rd Month	7.22±0.44**	< 0.001
Post Treatment 6th month	6.65±0.38**	

Note: ** – p value is found to be highly statistically Significant.

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DISCUSSION

Type 2 diabetes, though poorly understood, is known to be a disease characterized by an inadequate beta-cell response to the progressive insulin resistance that typically accompanies advancing age, inactivity, and weight gain [10]. The disease accounts for substantial morbidity and mortality from adverse effects on cardiovascular risk and disease-specific complications such as blindness and renal failure. The increasing global prevalence of type 2 diabetes is tied to rising rates of obesity [11] in part a consequence of social trends toward higher energy intake and reduced energy expenditure. However, the mechanisms that underlie individual differences in the predisposition to obesity remain obscure.

The concept that exercise is medicine [12] is gaining popularity all over the world. Physicians along with medicines also recommend increased physical activity for better quality of life, American college of sports medicine has recommended that an adult individual needs 150 mins of moderate physical activity per week [13]. Prescription of exercise for health and disease prevention has roots that began in antiquity more than two millennia ago. Individuals and concepts to remember are that Susruta of India was the first “recorded” physician to prescribe moderate daily exercise [14,15].

The global epidemic of overweight and obesity – “globesity” - is rapidly becoming a major public health problem in many parts of the world [16]. World Health Organization (WHO) in its latest projections indicate that globally in 2008 approximately 1.5 billion adults (age 20+) were overweight and at least 500 million adults were obese. WHO further projects that by 2015, at least 2.3 billion adults will be overweight and more than 700 million will be obese. Overweight and obesity are associated with an increased risk of developing hypertension and diabetes [17-21].

As displayed in the Table a decrease in waist circumference 4cm from mean value during 3rd month and a decrease in waist circumference of 8cm from mean after 6month among experimental subjects indicates that combined aerobic and resisted exercises are effective in obese subjects in reducing abdominal obesity.

Health care spending of a obese person is 25% more than an average person of that age [22] a major economic benefit for obese Type 2 diabetic patient as an outcome of this study.

Improved muscle quality, decreased inflammation increased Adipotectin levels [24] an increased muscle mass on composition [23] and a decrease in cardiovascular risk factors [25] Wood, 1991 being other benefits following lowering of waist circumference, another major outcome of this study benefiting Type 2 diabetic who have done combined Aerobic and resisted exercises.

Reduction in HbA_1C levels can reduce the risk of developing micro and macro vascular complications of diabetes [26] as Type 2 diabetes mellitus is a silent disease which begins to develop several years before it is clearly diagnosed, a better understanding of its pathophysiology, is a pre requisite to detect individuals at high risk of diabetes earlier and consequently to design and develop preventive strategies [27].

A reduction of 1.3%in HbA_1C in 3months and 2% decrement in HbA_1C at 6months period among subjects who have performed combined Aerobic and resisted exercises findings are similar to a study where a decrease in HbA_1C by 1.2% [28].

1% decrease of HbA_1C reduces the risk of stroke by 11% subjects in the experimental group have benefited by a reduction in the risk of developing stroke by 22 %. Also 1% decrease in HbA1c reduces the risk of micro vascular disease by 37% hence experimental subjects have benefited by 74% against micro vascular disease hence by improving glycemic control. 1% decrement in HbA_1C reduces the risk of myocardial ischemia by 14% hence subjects who have performed combined Aerobic and resisted exercises have a reduced risk of myocardial ischemia by 28% [29].

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CONCLUSION

Combined resisted exercises and aerobic training helps in improving glycemic control in type 2 diabetic subjects and type 2 diabetic subjects have added advantage against prevention of micro and macro vascular complications.

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