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Stability ball exercises on glycemic control and lipid profile on type 2 diabetic patients

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ABSTRACT: *In an era of technological advancements, improved life style, more dietary intake with lowered physical activity, increased longevity of life and early onset of many non – communicable diseases including type 2 diabetic mellitus resulting in many health complications on functioning of cardiac, nervous, renal system. This study aims to minimize such complications among diabetic patients, provide better health care with an improved quality of life.*

KEY WORDS: *Type 2 diabetes, Stability Ball*

ABBREVIATIONS:
- Stability Ball Exercises (SBE)
- High Density Cholesterol (HDL)
- Low Density Cholesterol (HDL)
- Body Mass Index (BMI)

NOTE:
Stability ball is also called physio ball, swiss ball / gym ball, which is an air inflated ball of 55cm size widely used as a rehabilitation tool in physiotherapy.

INTRODUCTION

India leads the world with largest number of diabetic subjects earning the dubious distinction of being termed the diabetes capital of the world, with around 40.9 million diabetic patients currently, as in expected to rise to 69.9 million by 2025[1] with genetic predisposition to develop diabetes[2], decreased physical activity, sedentary occupational habits, higher fat diets which have accompanied the process of modernization has resulted in the doubling of the prevalence of obesity and Type 2 diabetes[3]. What was considered as a mild disorder of the elderly, 30 years back, there is a shift in aged of onset of diabetes affecting the youth, middle aged people, adolescents and children which could have long lasting adverse effects on individual health care cost and economy of the nation[4]. With 15 – 25% of the urban school children in India are at risk of developing Type 2 diabetes at an early age[5].

Exercises apart from influencing glycaemic control, has important effects on the development of cardiovascular complications in Type 2 Diabetes mellitus[6]. Aerobic training have reported to influence lipid profile and glycaemic control[7]. Vibration exercises are effective in achieving a better glycaemic control among Type 2 diabetic patients[8].

Resistance exercise training can improve insulin sensitivity and can allow for blood glucose levels to be better managed in adult with Type 2 diabetes[9]. Also the potential benefits of increase in muscle mass on body composition and other cardiovascular diseases, risk factors are well recorded[10].

The decrease in the total cholesterol and triglyceride levels is important in preventing macrovascular complications associated with Type 2 diabetes mellitus is well documented with resisted exercises[11].

MATERIALS AND METHODS:

50 male Type 2 diabetic subjects between 30 – 60 years have participated in the study. Subjects were recruited through diabetic camps organized during July 2010, through advertisements given in regional English news paper, The Hindu, and Velachery Times. The study was conducted at Sree Balaji College of Physiotherapy, Chennai – 100 in July 2010.

INCLUSION CRITERIA AS FOLLOWS:

- ➔ Male subjects between 30 – 60 years
- ➔ Not on regular Insulin therapy
- ➔ Established Type 2 diabetes

The eligible subjects were medically screened an physically evaluated to exclude individuals with advanced retinopathy, uncontrolled hypertension, neuropathy and severe orthopaedic conditions restricting any physical activity.

Subjects were assigned at random to one of the two groups: Stability ball exercises (n=25) or control group (n=25). All the subjects gave their written informed consent to participate in the study.

OUTCOME MEASURES:

All the subjects were tested on two occasions by using same protocols. Baseline measurements were taken before the intervention and after the study again. Venous blood sample of all participants were taken for analysis of Lipid profile and Glycelated Haemoglobin.

Anthropometric measurements: Waist circumference at iliac crest was measured in centimetres before and after the study.

INTERVENTION

STABILITY BALL EXERCISE GROUP (SBE):

Subjects assigned to this group have performed systematic supervised resistance training inline with Exercise guidelines notified by American diabetic association and American college of sports medicine. Having done the exercises for three times per week, each exercise session comprising of ten different exercises for major muscle groups of Lower extremities including Gluteus maximus, Quadriceps femoris, Hamstrings, Gastrocnemius, Abdominal muscles, Lumbar spine extensors. For a period of 12 weeks subjects have performed 3 sets of 5 repetitions of each exercises per session. Progressive increase in intensity was designed in such a way that up to 4 weeks no holding period of each physical activity, from 4 – 8 weeks 5 second hold of each exercises, and 10 seconds hold of each exercise during the period from 8 – 12 weeks.

CARE POINTS:

Subjects were advised and ensured of no breath holding during exercises.

CARE OF THE TECHNIQUE:

Each exercise performed on Stability Ball in this study involves closed kinematic chain exercises and isometric muscle contractions of both lower extremities. Also subjects own body weight providing resistance to each activity, peak torque with every exercises are unique in this study.

CONTROL GROUP (CG):

Subjects underwent no training other than their day to day routine physical activities.
All the subjects participated in this study have continued their prescribed medications and their daily routine activities.

RESULTS

All the subjects have completed the study. 3 hypoglycaemic incidents have occured and was duly medically treated and no other complications reported.

Initial measurements and post training changes were analysed using paired "t" test. Statistical tests were performed using SPSS software.

Table 1: Results of paired "t" test among Stability Ball Exercises group:

A		Mean	S.D	SE	"t25"	Result
Glycelated Haemoglobin	Pre Test	8.09	1.39	0.28	7	P < .001
	Post Test	7.40				
Total Cholesterol	Pre Test	189	48.62	9.61	7.07	P < .001
	Post Test	171				
HDL	Pre Test	43.60	2.98	0.62	2.72	P < .05
	Post Test	44.32				
LDL	Pre Test	115	23.15	4.63	4.4	P < .001
	Post Test	105				
Triglyceride	Pre Test	176.44	29.94	5.99	7.18	P < .001
	Post Test	162.88				
BMI	Pre Test	26	2.94	0.59	7.12	P < .001
	Post Test	25				

s shown in the above table post mean value of Glycelated haemoglobin has decreased by 0.69% and is statistically significant at 0.1% probability level as P < .001 among stability ball exercises group. Total cholesterol of post mean score has decreased by 18 and is highly significant at 1% probability level at P < .001. High Density Lipoprotein of post mean value has increased by 0.72% and is highly significant at 5 level as P < .05.

Low Density Lipoprotein of post mean score of Stability Ball Exercise Group has decreased by 9.88 is more significant at 0.1% level as P <).001. Triglycerides of Stability Ball Exercise Group's post mean value score has decreased by 13 and is highly significant at 0.1% level as P < 0.001. Body Mass Index of Stability Ball Exercise group has decreased in their post mean value by 1 and is significant at P < 0.001 level.

Where as among the control group subjects, Body Mass Index, Glycelated Haemoglobin, Total Cholesterol, Low Density Lipoprotein, High Density Lipoprotein, Triglycerides level were statistically insignificant among their pre and post test scores.

DISCUSSION:

This study showed following Stability Ball Exercises significant improvement in Glycelated Haemoglobin, Lipid profile and Body mass index among male Type 2 diabetic patients.

Exercises accelerates more insulin absorption from the leg, than arm exercises[12]. 1% decrement in Glycelated haemoglobin following therapies to lower Glycelated haemoglobin can reduce the risk of diabetic complications such as myocardial infarction and microvascular disease[13].

A better glucose control due to improvement in insulin sensitivity and effects of glucose transporters due to muscular hypertrophy and blood flow following resisted exercises[14].In this study 0.69% reduction in Glycelated haemoglobin among the post mean score value, hence is effective for better glycaemic control.

Exercises lowers the risk of death by up to 25% in coronary heart disease patients, and the benefits include decreased Total Cholesterol, LDL, and an increased HDL[22]. A single bout of moderate exercise will increase after exercise regardless of training or intensity[23].

A reduction of 1% on Total Cholesterol has been shown to reduce their risk for coronary artery disease by 2%[18] which implies that participants in this study have reduced about 3.6% of their risk.

Moreover a 1% reduction in Low Density Lipoprotein reduces risk of major coronary events by approximately[19], which means that the subjects in this study have about 42% gain . As a decrease of 1% on High Density Lipoprotein has been associated with a 2 – 3% increase in the risk for coronary heart disease[20] and the reverse is true that an increase in High Density Lipoprotein by 0.87% among the participants should decrease the coronary artery disease by 2%.

Obesity is a most powerful determinant and a risk factor for developing diabetes[15] also an increase in Body Mass Index was demonstrated to increased risk to complications in Type 2 diabetic patients among Asian men[16]. Increased visceral or abdominal tissue in particular have been shown to be more strongly associated with metabolic and cardiovascular disease risk(17).

CONCLUSION:

A rise in early age of onset, complications associated with Type 2 diabetic mellitus, individual health care cost, economy of nation are all needs more focus, hence this study outcome can better be used in the overall diabetic care of patients.

LIMITATIONS AND RECOMMENDATIONS:

Increased sample size and longer duration of study involving women are recommended further. Also a prophylactic study for children can be considered.

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