

Home based therapeutic intervention for type 2 diabetes mellitus

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ABSTRACT

The purpose of this study is to find out the effects of exercise in type 2 Diabetes Mellitus in prevention and modification of risk factors and its role in improving quality of life among community. 71 subjects were assessed of which 53 subjects were selected based on the inclusion and exclusion criteria and the subjects were assigned randomly in 2 groups, Group A (Experimental group) and Group B (control group). Informed consent and ethical clearance had been obtained prior to the study. Subjects were assessed for fasting blood glucose level using one touch glucometer and were assessed for quality of life using diabetic specific quality of life questionnaire as a pretest at the onset of the study and post test after a 4 weeks of intervention program. All Subjects were asked to continue the medications prescribed by the physician. Group A - aerobic exercises were taught and advised to perform at home and asked to report to hospital once a week and exercise will be monitored on the same. Group B advised to continue regular activity no exercise prescribed. Group A showed significant difference than Group B in improving fasting blood glucose level and quality of life.

Keywords: Diabetes, Home Based, Aerobic Exercise, Quality of Life.

INTRODUCTION

Diabetes mellitus is a prevalent and costly disease. Across the world, there are 285 million adults, aged 20–79 years, with diabetes, which is projected to increase to 439 million people globally by 2030(Andrew J, 2011). The increasing prevalence of Type 2 Diabetes Mellitus is directly related to an increasing rise in the prevalence of physical inactivity and obesity (WHO, 2010). Type 2 diabetes-related complications, like nephropathy, retinopathy, neuropathy, myocardial infarction, stroke, and even death, will be experienced more frequently and at a much earlier age (Pavkov ME, 2006).

European Association for the Study of Diabetes (EASD) , or the American College of Physicians (ACP) all firmly recognize the therapeutic strength of exercise intervention. The ADA states that “To improve glycemic control, assist with weight maintenance, and reduce risk of cardiovascular disease” (ADA, 2007).

Aerobic exercise is known to reduce weight and maintain good glycaemic control, and thus reduce the risk of cardiovascular disease among diabetic patients. Studies involving exercise as a therapeutic intervention in patients with Type 2 diabetes mellitus have focused primarily on aerobic training (Cindy LW Ng, 2010).

In patients with type 2 diabetes, exercise may improve insulin sensitivity and assist in diminishing elevated blood glucose levels into the normal range. Other risk factors for Type 2 diabetes include high blood pressure and inappropriate dietary intake. Exercise can play an important role in preventing or delaying the onset of Type 2 diabetes because of its ability to improve blood sugar metabolism, reduce body fat, increase muscle mass and improve cardiovascular fitness (Aas AM, 2005; McAuley KA,2003).

Physical activity is underutilized due to factors like lack of understanding, lack of recommendations and sedentary life style. Physical activity affords significant benefits on diabetes mellitus (ADA, 2002). Hence, the purpose of this study is to find out the effects of home based exercise intervention among type 2 Diabetes Mellitus in prevention and modification of risk factors and its role in improving quality of life.

METHODS AND MEASURES

A total of 71 subjects were assessed to rule out risk factors based on the selection criteria, of which 53 subjects with type 2 diabetes mellitus were assigned randomly to one of two groups. Group A (Experimental group) and Group B (control group). Both males and females between the age of 35 to 55 years were included in this study and Subjects were excluded from the study if they were already performing the exercise, cardiovascular diseases, micro vascular diseases, autonomic neuropathy, pregnancy, dyspnea at rest - Grade 4 (NYHA grade), uncontrolled hypertension, musculoskeletal disorders, fasting blood glucose more than 250mg/dl.

All subjects were assessed for fasting blood glucose level using one touch glucometer and their quality of life was assessed using a Diabetic specific quality of life questionnaire as a baseline tests and the same tests were

repeated after 4 weeks intervention. All the subjects were asked to continue the medications prescribed by Physician.

Study was performed at Saveetha Medical College and Hospitals. Ethical clearance and Informed consent had been obtained prior to the study.

Group A (Experimental Group): 28 Subjects were advised to perform the aerobic exercise at home, initially subjects were taught to perform the exercise in the physiotherapy Outpatient department, Exercise protocol was clearly explained and they were given an exercise regimen chart, and recording chart to follow the frequency of the exercise in which they were asked to record when exercise is performed.

Subjects were asked to come to physiotherapy Outpatient department once in a week along with the recording chart which was verified, those who performed the exercise less than 5 days per week were discontinued from the study. Subjects were asked to perform the exercise under the supervision of the researcher on the same day.

Duration: 4 weeks exercise program

Frequency: 5 days a week

Intensity: 12 - 14 Borg scale (somewhat hard in Breathing).

Duration per session: 45 minutes total exercise per day.

5 minutes warm up exercise

30 minutes aerobic activity – Brisk walking

10 minutes active cool down period.

Warm Up: Breathing exercises and Active exercises for upper limb and lower limb

Cool down Period: Breathing exercises and Self Stretching exercises were given for upper and lower extremities for major muscle groups. Each stretch was asked to hold for 30 seconds and 3 repetitions of each stretch.

Group B (Control Group): 25 Subjects were advised to continue their normal activity. They were not advised any form of exercise and were asked to come to physiotherapy Outpatient department at the end of 4 weeks.

Outcome measures: Outcome measures were performed at baseline and after 4 weeks of intervention. Fasting Blood Glucose level was analyzed using one touch Glucometer. Diabetic specific quality of life questionnaire was regularized based on the assessment of quality of life outcome which categorized the questionnaire into 3 parameters – Physical, psychological and social which has been validated and used to test the quality of life among diabetics before and after the intervention.

Statistical analysis: SPSS software version 17 was used to analyze the data before and after intervention. Statistical significance was tested using the paired t test within the group and unpaired t test between the groups. P value < 0.05 is considered to be statistically significant. Analyses were conducted on the intention to treat basis

Table.1.Characteristics of Participants

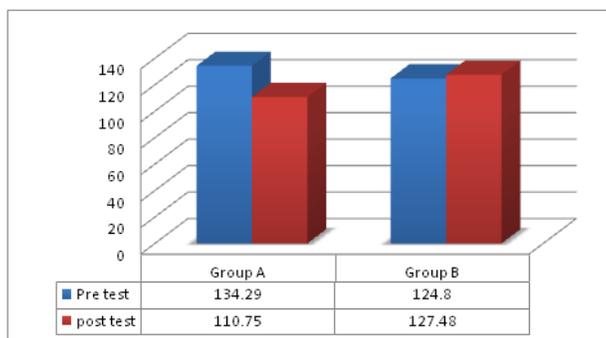
	Experimental Group (28)(Mean±SD)		Control Group (25)(Mean±SD)	
	Females (13)	Males (15)	Females(14)	Males (11)
Age (years)	43.38±5.74	44.07±6.25	44±6.36	44.45±4.99
Height(cms)	159.08±8.25	164.20±6.36	158.79±4.64	167.36±8.03
Weight(kg)	67.38±6.67	82.47±8.25	64±6.04	77.55±11.22
BMI(kg/m ²)	26.64±2.42	30.65±3.67	25.4±2.89	27.5±3.31
Systolic Blood Pressure (mm Hg)	129.92±5.28	131.53±7.38	129±6.46	132.45±6.88
Diastolic Blood Pressure (mm Hg)	82.92±5.42	85.93±4.85	81.64±5.56	85.09±6.04

Table.2.Comparison of Pre-test and Post-test results of Fasting Blood Glucose in Group A

Test	Mean	S.D.	Std. Error Mean	Paired t-value	P value
Pre test	134.29	18.61	3.52	8.0546	< 0.0001
Post test	110.75	9.98	1.89		

Table.3. Comparison of Pre-test and Post-test results of Fasting Blood Glucose in Group B

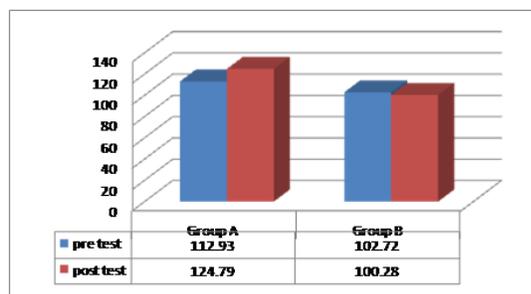
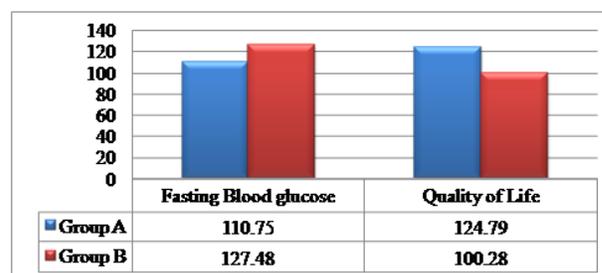
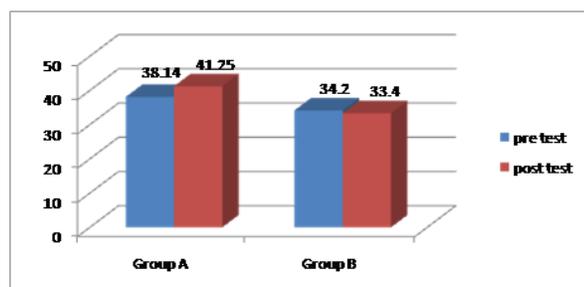
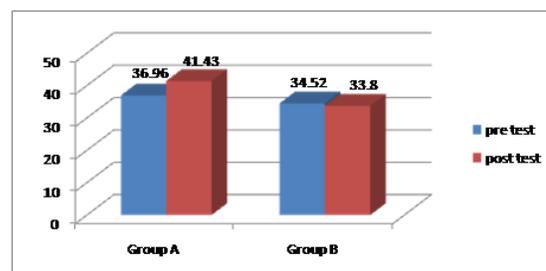
Test	Mean	S.D.	Std. Error Mean	Paired t-value	P value
Pre test	124.80	21.98	4.40	5.6829	< 0.0001
Post test	127.48	22.47	4.49		

**Figure.1. Comparison of Fasting Blood Glucose between Group A & Group B****Table.4. Comparison of Pre-test and Post-test of Quality of Life for Group A**

Test	Mean	S.D.	Std. Error Mean	Paired t-value	P value
Pre test	112.93	24	4.54	5.2208	< 0.0001
Post test	124.79	20.29	3.84		

Table.5. Comparison of Pre-test and Post-test results of Group B Quality of Life

Test	Mean	S.D.	Std. Error Mean	Paired t-value	P value
Pre test	102.72	15.23	3.05	3.6096	= 0.0014
Post test	100.28	16.94	3.39		

**Figure.2. Comparison of Quality of Life between Group A & Group B****Figure.3. Comparison of post test results of Group A and Group B****Figure.4. Comparison of Physical domains in quality of life questionnaire between Group A & Group B****Figure.5. Comparison of social domains in quality of life questionnaire between Group A & Group B**

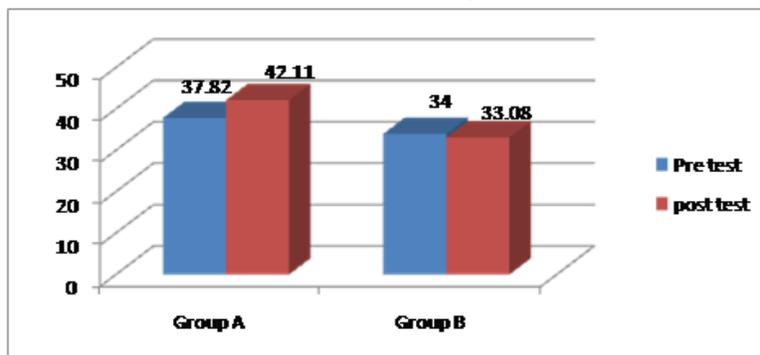


Figure.6. Comparison of Psychological domains in quality of life questionnaire between Group A and Group B

RESULTS AND DISCUSSION

Home Based therapeutic intervention had been performed both males and females Diabetic subjects were included in this study. Characteristics of the participants (Table 1). Mean differences were compared before and after the intervention protocol within Group A, Experimental group shows that fasting blood glucose level reduced from 134.29 to 110.75, p value being less than 0.0001 (Table 2 and figure 1). And among Group B fasting blood glucose 124.80 in pretest to 127.48 in post test, p value less than 0.0001 (Table 3 and figure 1).

To our knowledge not many studies emphasized on Home based therapeutic intervention which had an effect on quality of life among Group A improved from 112.93 in pretest to 124.79 in post test, p value being less than 0.0001 (Table 4 and figure 2). Mean comparison of pre test and post test values of quality of life of group B shows statistical significance as the pretest is 102.72 vs 100.28 in posttest, p value equals 0.0014 (table 5 and figure 2).

Significant differences were observed in comparison of post test results of fasting blood glucose level between group A and Group B as 110.75 is proved to be higher than 127.48 shown in figure 3. Post test results of quality of life of group A 124.79 is greater than group B 100.28 (figure 3).

Quality of life had been categorized into 3 categories Physical, social and Psychological status. Comparison of Physical status of quality of life was observed among 2 groups, Group A Mean 38.14 pretest vs 41.25 posttest, p value less than 0.0006 shows extremely statistically significant, Group B shows 34.20 in pre test and 33.4 in post test, p value equals 0.0135 (Figure 4). Comparison of social status of quality of life Group A shows extremely statistical significant differences as p value less than 0.0001, mean value in pretest 36.96 increased to 41.43 in the posttest. Group B shows p value equals 0.0529 not quite statistically significant difference as it was 34.52 in pretest and 33.8 in posttest (Figure 5). Psychological status of quality of life shows p value less than 0.0001 considered to be statistically significant, mean 37.82 in pretest increased to 42.11 in posttest. And Group B shows differences as Mean being 34 vs 33.08, p value equals 0.0010 (Figure 6).

Type 2 Diabetes mellitus is a progressive disorder that causes various problems such as heart diseases, microvascular disease like retinopathy or nephropathy, autonomic neuropathy, peripheral vascular disease (ADA, 2002). Hence, it is necessary to start exercises for diabetes to avoid complications, but the once diabetic complications like neuropathy, retinopathy are developed, then exercise would lead to further complications therefore, diabetic complications are excluded from this study. 71 subjects were screened of which 1 subject reported with pacemaker, and 4 subjects were characterized with sensory disturbances, 11 subjects reported with difficulty to walk longer due to arthritis and 2 subjects reported dyspnea at rest - Grade 4. Hence 18 subjects were excluded as they did not meet the selection criteria.

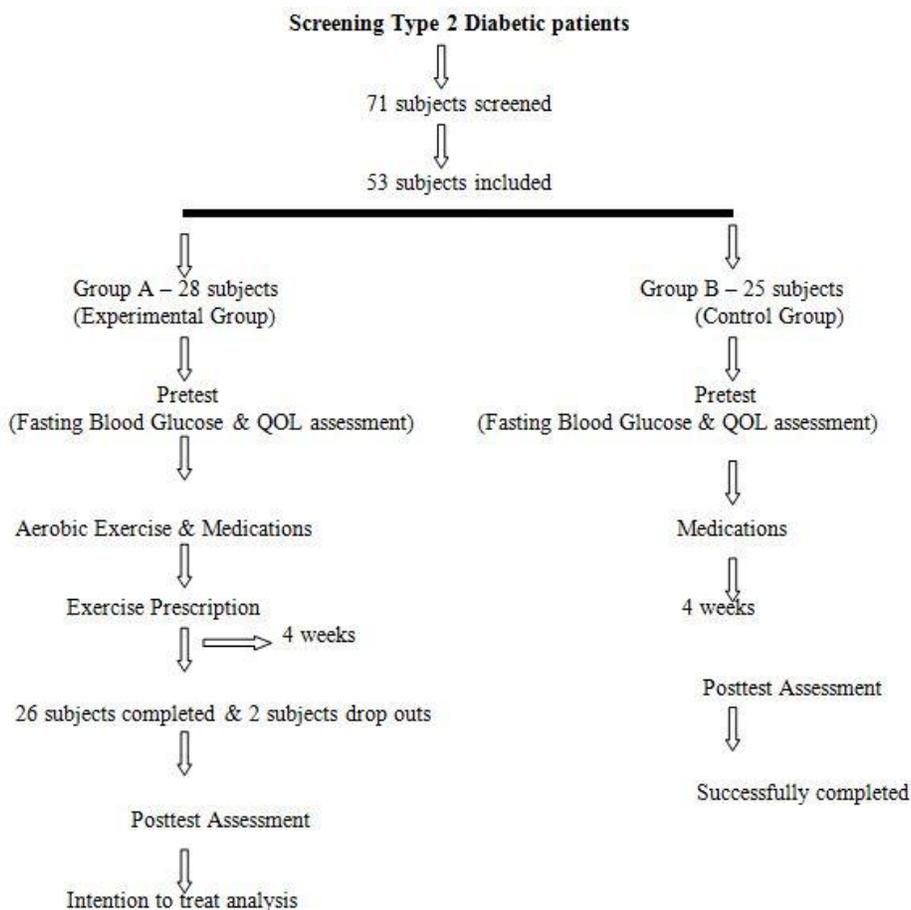
American Diabetes Association, (2010) states that for patients with type 2 Diabetes Mellitus, lifestyle changes, including medical nutrition therapy and exercise, are recommended to achieve and maintain glycemic control (ADA, 2010). Various reports on physical activity states it plays a major role in health promotion and disease prevention. The importance of promoting exercise as a prevention and management is high in priority for type 2 diabetes mellitus as physical activity improves the metabolic abnormalities of diabetes and it is greatest when it is used early in its progression from insulin resistance to impaired glucose tolerance. There are various studies which proved the effect of exercise on improving glucose level but quality of life was not concentrated and

there are not many studies about Home based therapeutic intervention among diabetic individuals as it is not possible for diabetic individuals to daily visit hospitals, hence on this basis this study was proposed to concentrate as a home based exercise intervention with periodical monitoring of the diabetic subjects to improve their blood glucose and quality of life.

53 Subjects were randomized into 2 groups; experimental group consisted of 28 subjects and control group with 25 subjects. 2 subjects were discontinued from the study after the first week as they did not perform the exercises regularly was less than 5 days a week according to the exercise chart the duration and regularity has been decided and outcomes had been performed following the first week and they were discontinued from the study. Intention to treat analysis has been performed.

Senez B et al demonstrated to assess a quality of life in Diabetes mellitus for which they used a quality of life questionnaire SF36 and QUODIEM (Senez B, 2004). In this study we used Diabetic specific quality of life scale as it was concluded to be a reliable and valid measure for diabetes specific quality of life (Ume bott, 1998) as it consists of various questions pertaining to the physical, psychological and social status in Diabetic subjects, this study particularly focuses on Quality of Life in Diabetic subjects following a Home Based Exercise intervention.

At the end of the 4 weeks, Home Based Therapeutic Intervention proved to be beneficial among Diabetic subjects, it improved Physical, social and Psychological status of quality of life and their fasting blood glucose levels were reduced.



Flow of Participants through the trial

CONCLUSION

This study proves that home based exercise training in type 2 diabetes individuals controls the blood glucose level and improves quality of life. Hence Home Based Exercises Intervention help the subjects to manage their blood glucose level as it was reduced following exercises and improved the quality of life.

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