

Exercise Reduces HbA1C and Mostly Brings Good Control in Type 2 Diabetics Mellitus

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Abstract: *The aim of this study was to observe the effect of aerobic exercises on HbA1C level. Exercise is foundation of a healthy lifestyle especially for people with diabetes mellitus in type 2 diabetic patients. Exercise mobilizes and improves metabolic body functions. The Method Used: The blood samples were collected from T2DM patients and tested for HbA1C, by Nycocardcolor reflectometry method before and after the experiment. After initial testing for HbA1C, these group of patients were divided in to two group 1)one group was instructed to do walking exercise and another 2)to perform yoga for about four months, after which both group were again tested for HbA1C.Pre and post exercise HbA1C results were poked separately and statistically analysed. Equal number of controls in each group was included in the study. Principal result: Exercise is shown to have significant impact on HbA1Cin T2DM patients of group, i, e, walking & yoga respectively. Table 1 & 2 reflects the HbA1Cvalues in two groups -1) HbA1C is found to be decreased in walking group by 0.94%2)HbA1C is found to be decrease by 0.97% in yoga group . To compare this result, HbA1C was tested in equal number of healthy control who was non-diabetic and habitual to walking and yoga respectively. Conclusion: Exercise namely walking and yoga in T2DM patients leads to describe levels of control (HbA1C).*

Keywords: HbA1C (Glycated Hemoglobin), T2DM (Type 2 diabetes mellitus), BGL (Blood Glucose Level), Yoga, Walking Exercise.

1. Introduction

Diabetes is a chronic metabolic syndrome caused by body's inability to produce enough insulin or to use the insulin that it available as a result there is an increase in the concentration of glucose metabolic abnormalities. (1).The term HbA1C refers to glycated hemoglobin.

When hemoglobin, a protein within red blood cells(RBC) binds with glucose in the blood forming „Glycated Hb“. (2). Diabetes has become a widespread epidemic primarily because of the changing or altered life style of people and lack of exercise and awareness, stress and diet. Exercise has been considered a cornerstone of diabetes management. (3)

Guidelines recommend that patients with T2DM should perform at least 150 min. Resistance exercise minimum 3 times per week. (4).

It has long been known that exercise have substantial benefits for people with both types of diabetes (T1DM) and types (T2DM) it can increase insulin sensitivity, improve cardiovascular fitness, and help sustain weight loss. A common and desired outcome of exercise program is a lower (HbA1C) level particularly for both types of diabetes, in which case exercise alone may reduce blood glucose levels (5).

2. Literature Survey

The literature we have studied shown that the exercise have the effect on diabetes mellitus and controlled the HbA1C level as studied by Ana and Robert, (2011). Christ et.al. (2004) found that exercise increases glycogen synthesis activities. Sigal et.al. (2004) observed that effect of aerobic training on the glycemic in T2DM. Other literature survey

are carried out by following databases mesh trms, PMC, mercold codfishes peak, Pvbmed Health IJES, Pubchem and google scholar.

3. Method

A four month exercise intervention study was conducted using a single center in diabetic camp in Amravati. We conducted a study involving the yoga, walking at selected adult patients of T2DM which may be as a useful therapeutic regimen for the management of Glycated Hemoglobin (HbA1C) and equal number of healthy controls age matches. The samples were collected from the people involved in experiment before and after experiment to for testing HbA1C, blood glucose, and compare with control. The data was tabulated statistically analyzed for student “t test” the graphs plotted along with for both walking and yoga exercise. The data were expressed as t value compare with table value we used “t” testing method.

4. Result

The study was verified through direct observation of HbA1C values with T2DM patients. Before exercise and after exercise (Walking & Yoga) the exercise intervention, are shown in table 1& 2 Yoga, Walking respectively. First of all we measured the HbA1C values with T2DM patients in diabetic camp then exercise was recommended to patients and again after 4 months of exercise, we collected a blood sample and observe the result and compare before exercise and after exercise readings compare with control values. HbA1C Values were collected before to the initiation of the walking exercise program at the start of exercise program (Pre-Intervention) and the completion of the four months program (Post Intervention) there was significant reduction in HbA1C levels during the exercise interventions as 0.94%

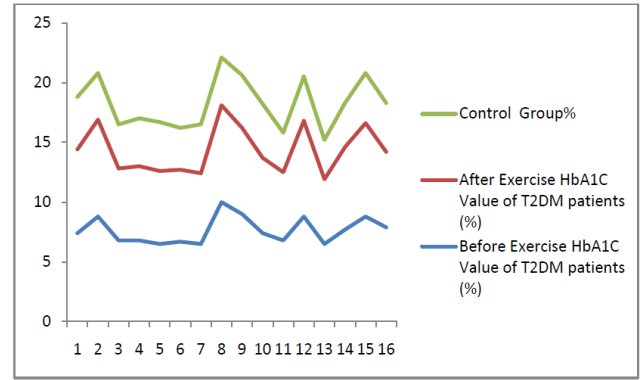
Volume 4 Issue 10, October 2015

www.ijsr.net

in walking exercise diabetic persons receiving the exercise had a significant lower HbA1C level at the end of months as 0.97% level in yoga (figure – 1&2) .

Observation Table 1 Walking

No. of Persons	Before Exercise HbA1C Value of T2DM patients (%)	After Exercise HbA1C Value of T2DM patients (%)	Control group (%)
1	7.4	6.0	3.9
2	8.8	7.8	4.4
3	9.0	8.3	4.3
4	6.8	6.0	3.7
5	9.8	8.0	4.0
6	8.8	8.1	4.1
7	6.5	6.0	4.4
8	7.4	6.2	4.3
9	9.1	8.2	4.2
10	7.0	6.2	4.0
11	10.0	9.2	3.7
12	6.8	6.0	3.8
13	6.5	5.7	4.3
14	7.0	6.3	4.0
15	8.2	7.4	4.1



Graph: HbA1C level of T2DM patient and Control age group persons during the Yoga exercise

5. Discussion

Our present study showed the similar results with the work of other investigator and focus on lowering of HbA1C & Maintaining the blood glucose level.

Boule (2001), studies in humans analysis which reviewed the studies concerning exercise intervention of at least 8 weeks in T2DM individuals regular aerobic exercise showed a statistically and clinical significant effect on HbA1C, suggesting that this non-pharmacological intervention improve glycemic controls, while little effect on body weight. (6)

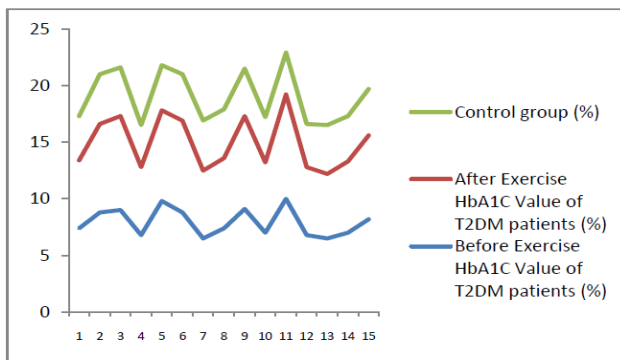
Sigal et.al. (2007), demonstrating that the effect of HbA1C (the major marker of glycemic control), is a well established finding.

The amelioration on glucose metabolism by exercise training may occur primarily through three distinct mechanisms. i) Stimulation of glucose transport to muscle ii) Increased in insulin action on cells of the organs involved in the exercise iii) Positive regulation of signaling pathway stimulated by insulin as a result of regular exercise.(7) Christ Roberts et.al. (2004), found that exercise training significantly increased expression of GLUT4 glucose transporter in overnight non diabetic subject by 38% and 22% respectively.(8)

Sigal et.al. (2004), showed a reduction of 0.9% points in HbA1C with combined aerobic and resistance exercises. (5) In a population based study it was revealed that both low and high HbA1C values are associated with increased short term risk of all case morbidity.

Low HbA1C values sometimes indicate the presence of morbidity and worse health studied by Currie et.al. (2010), (9) Improvements in long term glycermic control after walking training in patients with T2DM and 12 week of self placed walking to lower HbA1C by 7.6% the study by walker et.al. (1999) (10)

American Diabetes association (ADA) (2010), showed over ground walking training at velocity to promote a remarkable decrease in HbA1C as well as improvements in body composition and exercise capacity in these patients importantly, since volunteers presented little comorbidity and short disease duration reaching such low HbA1C values without hypoglycemia episodes may prove important



Graph: HbA1C level of T2DM patient and control age group persons during the Walking exercise

In the table 2 we use the two tail test we calculate the significant difference in HbA1C level the range of HbA1C levels for all patients during the yoga exercises. The patients assigned to exercises showed 0.9% reduction in HbA1C. The result is significant statistically difference showed beneficial effects on the lowering the blood glucose.

Observation Table 2Yoga

No. of Persons	Before Exercise HbA1C Value of T2DM patients (%)	After Exercise HbA1C Value of T2DM patients (%)	Control Group%
1	7.4	7.0	4.4
2	8.8	8.1	3.9
3	6.8	6.0	3.7
4	6.8	6.2	4.0
5	6.5	6.1	4.1
6	6.7	6.0	3.5
7	6.5	5.9	4.1
8	10.0	8.1	4.0
9	9.0	7.2	4.4
10	7.4	6.3	4.5
11	6.8	5.7	3.3
12	8.8	8.0	3.7
13	6.5	5.4	3.3
14	7.7	6.9	3.7
15	8.8	7.8	4.2
16	7.9	6.3	4.1

reductions in the risk of micro vascular complications. (11) Mourier et.al. (1997), studied that patients who exercised increased their VO₂ peak (oxygen uptake peak) by 41% and their insulin sensitivity by 46% physical training significantly decreased abdominal fat. (12) The change in visceral abdominal fat was associated with the improvement in insulin sensitivity studied by Quinn (2011), (3) Aerobic exercise program had the best result, with an average HbA1C reduction of 0.73% compared with control groups studied by Jenneifer, (2013). (13) Structured exercise training that consists of aerobic exercise registered training or both combined is associated with HbA1C reduction in patients with types diabetes studied by Daniel, (2010). (14)

6. Conclusion

Regular aerobic exercise as walking and yoga were associated with significantly reduction in the HbA1C in adults with T2DM.

7. Future Scope

T2DM is the ongoing problem and in particular more than the speed of exportation of its incidence due to rise in life expectancy in last 2-3 decades in India. The present study will focus on aerobic exercise activity and try to search and establish a relationship between aerobic exercise and HbA1C of adult with T2DM.

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