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# ASSESSMENT OF STRUCTURED LIFESTYLE INTERVENTION PROGRAM WITH ANTIGRAVITY EXERCISE ON GLYCEMIC CONTROL IN PEOPLE WITH T2DM

Medicine

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## ABSTRACT

**Background:** Currently available national (RSSDI-ESI) and international (ADA) guidelines recommend lifestyle modifications for treatment of Type 2 diabetes mellitus. Although, guidelines suggest lifestyle modifications, it appears that most patients require pharma logical interventions, and lifestyle modification are not adequately emphasized as an integral part of the overall therapeutic regimen. Presently available literature regarding the effects of lifestyle modification, in terms of increasing the quantity and quality of physical activity on overall glycemic control independently or in combination with oral antidiabetic agents are scarce and inconclusive.

**Objective :** To assess the effectiveness of structured and unstructured lifestyle modification therapy on glycemic control. (change in HbA1c value from baseline to the end of the intervention) in people with T2DM.

**Methodology :** This study is a randomized parallel group one with lifestyle modification as intervention. Conducted from July 2019 to Dec 2019 in central India, the study included a total of 110 participants, 30 to 60-years-old, diagnosed with T2DM at least 12 months ago. Participants with HbA1c levels > 6.5 %, on a background of oral antidiabetic agents were enrolled after obtaining the informed consent. Group A (n=55) received advice for walking for 150 min/ week, with oral antidiabetic medications. The Group B (n=55) received a structured antigravity exercise program (15 min session) three times a day for 5 days / week, along with oral antidiabetic medications.

**Results:** Group A with unstructured physical activity with walking, was beneficial with HbA1c reduction of 0.26 % (p=0.13) from baseline. whereas, in Group B with structured antigravity exercise, was associated with a significant HbA1c decline of 0.80% (p=0.03) from baseline.

**Conclusion:** Structured antigravity exercise training was more efficacious than unstructured physical activity in achieving appreciable reduction in HbA1c. Although both structured and unstructured training provide benefits, only the former was associated with significant reductions in HbA1c levels. Hence, T2DM patients should be advised to follow a structured antigravity exercise training and focused dietary intervention program in addition to the routine pharmacotherapy.

## KEYWORDS

Antigravity exercise, lifestyle intervention, T2DM

## INTRODUCTION

Diabetes mellitus (DM) is a global epidemic with an estimated worldwide prevalence of 463 million in 2019, a figure projected to reach 578 million by 2030 and 700 million by 2040.[1] Type2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder of multiple etiology characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both.[2] With the onset of this chronic condition and the associated co-morbidities (hypertension, abdominal obesity, dyslipidemia and insulin resistance; together termed as metabolic syndrome), a life-long reduction in quality of life and premature mortality due to micro and macro-vascular complications can be expected.[3] The increasing prevalence of DM is attributed to a variety of factors, including the rise in the aging population, ethnicity, change in lifestyle, obesity, socioeconomic status, and urbanization.[4] The increasing prevalence in DM is associated with a significant increase in complications like cardiovascular diseases, end-stage renal disease, neuropathy, and retinopathy.[5]

National and international guidelines recommend lifestyle modifications for treatment of Type 2 Diabetes Mellitus. [2,6,7]. Although, there are guidelines suggest lifestyle modifications, it appears that most are treated pharmacologically, and lifestyle modification are not adequately emphasized as an integral part of the overall therapeutic regimen. Presently available literature regarding the effects of lifestyle modification, in terms of increasing the quantity and quality of physical activity on overall glycemic control independently or in combination with oral antidiabetic agents are scarce and inconclusive. Hence this study was planned with a primary objective to study the change in hemoglobin A1c value from baseline to the end of the intervention and secondary outcomes were measures of weight, plasma lipid levels and blood pressure from baseline to end of study.

## MATERIALS AND METHODS

This study was a randomized, parallel group six months study with lifestyle modification as intervention. Conducted from July 2019 to Dec 2019 in three diabetes specialty hospitals in central India, a total of 110 participants, 30 to 60 years 'old, diagnosed with T2DM at least 12 months ago with HbA1c levels > 6.5 %, on a background of oral antidiabetic agents were enrolled after obtaining the informed consent. All enrolled participants underwent an educational session explaining on the lifestyle modification to reduce dropout and maintain adherence. After baseline assessment, which included blood test for lipid profile and glycated hemoglobin (HbA1c) they were allocated to respective groups using random sampling method. The first set of patients, group A (n=55) received an unstructured exercise advice for walking for 150 min/ week. The second set of patients, group B (n=55) received a structured antigravity exercise program (15 min session) three times a day for 5 days / week, along with oral antidiabetic medications. Anti-gravity exercise 1. Staircase climbing 200-250 steps or 2. Nitric oxide dump – squats, alternating arm raise, non- jumping jack, or 3. Lie down in floor, move your hands and legs in air. Both groups are followed up by 24weeks. The study protocol was approved by the human research ethical committee and informed consent was obtained (after providing a detailed study overview) from all the patients before enrolling into the study.

## EXCLUSION CRITERIA:

Patients with known cardiovascular risk factors, congestive cardiac failure, preexisting macro-vascular condition, severe illness (malignancy, severe infection, respiratory disease, kidney disease, liver disease), impairment of speech, hearing, vision or cognition, suffering from a serious diabetes complication, using insulin, use of corticosteroids, pregnant females or who had given birth within the preceding six weeks, orthopedic constraints or any musculoskeletal injury or joint or peripheral vascular disease during the preceding six

months, hypertension or any medical condition that prevented participants from adhering to the protocol or exercising safely, patients showing disinterest were excluded from the study

**Exercise program details:**
Structured exercise training was defined as an intervention in which patients were engaged in planned, individualized and supervised exercise programs (Anti-gravity exercise). Unstructured activity was defined as an intervention in which patients were not engaged in supervised exercise training, but received advice to increase the "physical activity" which refers to any bodily movement produced by skeletal muscles that results in an expenditure of energy and includes a walk for 150 min/week. Later two groups were asked to maintain the said activity during the six-month study period.

**Diet Plan:**
A diet similar to individual's routine diet was advised to all participants that would not cause weight loss to minimize dietary variability among groups.

**STATISTICALANALYSIS:**
Categorical data was expressed as number and percentages. Chi-square test was used to determine any significant difference between two groups. A P value of less than 0.05 was considered for statistical significance.

## RESULTS

**Table 1 Baseline characteristics**

| Baseline characteristics | All participants (*n*=110) | Group A (*n*=55) | Group B (*n*=55) |
|---|---|---|---|
| Age (years) | 46.91±7.16 | 46.29±6.15 | 47.60±9.32 |
| Sex Male (%) | 62 (56.36) | 30 (54.54) | 32 (58.18) |
| Female (%) | 48 (43.63) | 25 (45.45) | 23 (41.81) |
| Active smokers, *n* (%) | 10 (9.09) | 6 (10.90) | 4 (7.27) |
| Duration of Diabetes | 6.21±1.12 | 6.17±1.21 | 6.49±1.92 |
| HbA1c (%) | 8.51±0.6 | 8.43±0.56 | 8.65±0.66 |

**Group A – Unstructured exercise; Group B – Structured exercise**

Table 1 shows the baseline characteristics of the randomized participants. Totally 110 subjects enrolled in our study divided by two groups. Group A - walking along with OADs and Group B - antigravity exercise along with OADs. Mean age of Group A and Group B found to be 46.29±6.15 and 47.60±9.32 respectively. Male predominance was observed in this study 30 (54.54%) in Group A and 32 (58.18%) in Group B. The mean reported duration of diabetes mellitus in the participants was 6.17±1.21 years and 6.49±1.92 years in Group A and Group B. The baseline HbA1c levels in group A and group B were 8.43±0.56 and 8.65±0.66 respectively.

**Table.2 Change in glycemic parameters in the study (Group A)**

| Parameters | Group A (n=55) | | p Value |
|---|---|---|---|
| | Baseline | End of study (6 months) | |
| HbA1c (Mean± S.D) | 8.65±0.66 | 8.39±0.59 | 0.130 |
| Weight (Mean± S.D) | 72.48±6.78 | 71.13±7.98 | 0.150 |

**Table. 3 Change in glycemic parameters in the study (Group B)**

| Parameters | Group B (n=55) | | p Value |
|---|---|---|---|
| | Baseline | End of Study (6 months) | |
| HbA1c (Mean± S.D) | 8.54±1.79 | 7.74±0.74 | **0.030** |
| Weight (Mean± S.D) | 74.19±9.21 | 70.41±9.78 | 0.178 |

Tables 2 and 3 shows overall results for baseline, post- intervention change in HbA1c and weight parameters across the groups respectively, Unstructured activity was not found to have a statistically significant effect on HbA1c reduction (0.26%, P = 0.13). Structured exercise training reduced HbA1c by 0.80% (P = 0.03), which is considered both statistically and clinically significant.

The average baseline to post-intervention changes in body weight were −3.78 kg (P = 0.178) in the structured exercise training group and 1.35 kg (P = 0.48) in the unstructured activity group.

## DISCUSSION

People with diabetes are often recommended to have diet and physical activity in form of walk for a minimum of 30-45 minutes and practice yoga. There is a clear difference between exercise and physical activity. It is widely assumed that keeping busy throughout the day and engaging in a lot of physical movement, will compensate for exercise. All body movements that increase energy which involves in a day-to-day work is not exercise but is a simple physical activity for which the body is programmed and accustomed to.

Exercise is a planned structured physical activity with a certain goal and intention. Some forms of exercise are aerobic exercise, resistance training or combined aerobic and resistance training [8]. Anti-gravity is largely aerobic and slightly anaerobic exercise which involves repeated and continuous movement of large muscle groups. The main difference between walking versus going against gravity during stair climbing is the need for glucose increase at a faster pace hence blood glucose gets pulled into the muscle cells (at times even without the need for insulin). When one goes against gravity, muscles needs more glucose which will be extracted from the blood. Anti-gravity exercises use major muscle groups and may result in a drop in blood glucose levels. The basic premise of the anti-gravity is to open the receptor and to facilitate the movement of glucose into the cells and prevent this excess blood glucose from getting converted into fats.

The primary finding from this randomized, exercise study involving individuals with type 2 diabetes is that structured (anti-gravity) exercise training was more efficacious than unstructured activity (increased physical activity) in achieving HbA1c reduction. Although both structured and unstructured training provide benefits, only the former was associated with significant reductions in HbA1c levels.

Our results demonstrate that in patients with type 2 diabetes, a recommendation to increase physical activity was beneficial (0.13% HbA1c reduction), but was not significant, whereas, structured training is associated with a HbA1c reduction of 0.80%. (P =0.030). A reduction in HbA1c of this magnitude is clinically significant.

Each 1% reduction in HbA1c was associated with reductions in risk of 21% for any end point related to diabetes, 21% for deaths related to diabetes, 14% for myocardial infarction and 37% for microvascular complications. [8,9]. Our study demonstrated that exercise is a cornerstone of diabetes management and findings of this study strongly support the National [2] and international [6] guidelines recommendation that in the treatment regimen of T2DM, optimal physical activity programs consist of regular physical activity combined with structured training must be added to supplement the effect of pharmacological intervention.

**Limitations.**
- Sampling may not be true representative to all T2DM patients
- Findings cannot be generalized to patients who cannot or do not wish to undertake exercise programs.

## CONCLUSION

Our study demonstrates importance of lifestyle modification in management of T2DM. Both unstructured and structured exercise are associated with HbA1c reduction, but the magnitude of this reduction is significant with structured exercise program. The authors opine that T2DM patients should be advised to follow a structured antigravity exercise training and focused dietary intervention program and warrant more clinical research to establish the long-term efficacy and safety of structured antigravity exercise interventions in T2DM patients.

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