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Immediate Effect of High Intensity Interval Training in Type 2 Diabetes Patients

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Abstract: ***Exercise is widely perceived to be beneficial for glycaemic control in patients with type 2 DM. Hence purpose of this study the effects of High Intensity Interval Training (HIIT) reducing blood glucose levels in Type 2 DM patients. Aim: To study the immediate effect of HIIT in Type 2 DM patients. Objectives: To study the effect of HIIT to reduce blood glucose levels in type 2 DM patients using Glucometer. Study Design: Experimental Study. Sampling Technique: Purposive Sampling. Sample Size: 30Inclusion Criteria: Age group 30 – 60 yrs, males and females with Random Blood sugar level ≥140mg/dl Exclusion Criteria: People on insulin, musculoskeletal problems, Cardiovascular Problems, Balance impairments. Method: 30 subjects according to the inclusion criteria were selected by Purposive sampling. Random pre exercise and post exercise blood glucose levels were tested using Glucometer. Results: Paired T test was used in HIIT Pre & Post values. Discussion: Results show significant reduction in blood glucose level. Conclusion: The present study concluded that High Intensity Interval Training has immediate effect in reducing blood glucose levels in Type 2 Diabetes Patients.***

Keywords: diabetes mellitus, glycaemic control

1. Introduction

Diabetes is a group of metabolic disorders where there are high blood sugar levels over a prolonged period of time. Diabetes is due to either the pancreas not producing enough insulin or the cells of the body not responding properly to insulin produced. It is the most commonest non-communicable disease in India with its onset almost a decade earlier as compared to developed countries[1]. It is estimated that 387 million people in the world are suffering from diabetes with its prevalence being 8.3%. Early onset of diabetes leads to sooner susceptibility of development of fatal cardiovascular diseases in a relatively shorter time than seen in non diabetics.[2] Diabetes affects 5-8% of rural population in India which still remains undiagnosed and has become the major cause of mortality. In type 2 diabetes the body processes the blood glucose wrongly i.e. the body doesn't produce enough insulin or fails to resist it and as it progresses, lack of insulin develops.[3] Prevention includes healthy balanced diet, physical activity, normal BMI and avoiding addiction of alcohol and tobacco.[4] High Intensity Interval Training (HIIT)[5,6] involves short bursts of intense anaerobic exercise program with short recovery period. The foundation point of HIIT is to push the limit of intensity of cardio that our body has been adapted to.

2. Literature Survey

1. Acute High- intensity interval training exercises reduces the postprandial glucose response & prevalence of hyperglycaemia in patients with type 2 diabetes mellitus.[7]

Gillen JB, Little JP, Punthakee Z, Tarnopolsky MA, Riddell MC, Gibala MJ

Using Continuous Glucose Monitoring (CMG) , they examined the 24 hours blood glucose response to one session of HIIT consisting of 10 × 60 seconds cycling efforts at approximately 90% maximum HR, interspersed with 60 seconds rest period. 7 adults with type 2 diabetes underwent under standard dietary conditions following acute HIIT and a non exercise control day. HIIT reduced hyperglycaemia measured as proportion of time spent above 10mmol/l. These findings highlight the potential of HIIT to improve glycaemic control in type 2 DM patients.

2. The acute versus the chronic response to exercise.[8]
Thompson PD, Crouse SF, Goodpaster B, Kelley D, Moyna N, Pescatello L

There is a strong and consistent evidence the a single exercise session can acutely reduce triglycerides, reduce blood pressure and improve insulin sensitivity and glucose homeostasis. Exercise training increases the capacity for exercise , thereby permitting more vigorous and more prolonged individual exercise sessions and a more significant acute effect. Exercise has definite acute effects on blood lipids, blood pressure and glucose homeostasis.

3. Walking for exercise? Immediate effect on blood glucose levels in type 2 diabetes.

Tomas Fritz, Urban Rosenqvist[9]

The objective of the study was to determine the immediate effect of walking on blood glucose levels in patients with type 2 diabetes. Participating patients walked for half an hour on one occasion and on another day remained physically inactive for half an hour. Blood glucose was measured before and after walking. 39 patients with type 2 DM were taken. Post walk glycaemic levels were reduced

by 2.2 mmol/l. They concluded that walking can be safely employed in groups or individually as an introduction to low intensity exercise and as a demonstration to reduce blood glucose level in type 2 DM patients.

4. The impact of brief High Intensity Exercises on blood glucose levels.

O Peter Adams, Faculty of Medical sciences, The University of the West Indies, Cave Hill Campus, St Michael, Barbados[10].

Six studies with a total of 51 males and 14 Female participants in the high intensity exercise groups were reviewed. The results suggested that in non- diabetic adults, as little as 15 minutes of high intensity exercise spread over 2 weeks was enough to improve insulin sensitivity. In contrast, a typical aerobic training program consumes 150 minutes of training per week. The HIIT required a total time commitment of 75 minutes.

5. The effects of free- living Interval walking on glycaemic control, body composition and physical fitness in type 2 Diabetes Patients.

Kristian Karstoft, Kamilla Winding, Thomas P. J. Solomon[11].

Subjects with type 2 diabetes were randomized to a control, continuous walking or interval walking groups. Training group was prescribed 5 sessions per week (60 minutes/ session). Continuous walkers performed all training at moderate intensity. CGM glucose levels decreased in the interval walking group. The continuous walkers showed no change in glycaemic control.

3. Problem definition

Diabetes increases the risk of cardiovascular problems like coronary artery disease with chest pain (Angina), heart attack, stroke, narrowing of arteries and hypertension.

HIIT tends to avoid chronic cardiovascular or metabolic diseases like HTN, Obesity, Heart Failure or Metabolic Syndrome and control Blood glucose level.

15-20 minutes of HIIT reduces blood glucose level to the same significant levels as achieved with 60 minutes of HIIT.

4. Methodology

- Study design - Experimental Study.
- Sampling Technique – Purposive Sampling.
- Sample size – 30
- Duration - immediate

Inclusion Criteria

- Age group: 40 – 60 years.
- Males and Females.
- Random Blood Sugar level : >140mg/dl

Exclusion Criteria

Not taking intra muscular Insulin
No history of end- stage of liver or kidney diseases
Neuropathy
Retinopathy
HTN
Cardiovascular conditions.

Warm up: 5-7 minutes
Peak Exercise: 15-20 minutes
Cool down: 5-7 minutes

5. Results and Discussion

Paired T test was used for Pre and Post exercise blood glucose values. 30 subjects were selected according to the inclusion criteria. Results show significant difference in Pre and Post blood glucose levels. This improvement seen in the HIIT can be attributed to exercises such as Jumping Jacks, Air Squats, Spot Jogging, Mountain Climbers, Burpees which target the anaerobic mechanism of the body. In a study conducted by Gillen JB, Little JP, Punthakee Z, Tarnopolsky MA, Riddell MC, Gibala MJ in 2012, they used continuous glucose monitoring (CGM) and examined the 24 hours blood glucose response to one session of HIIT consisting of 10 x 60 seconds cycling efforts at average 90% maximal heart rate with a rest period of 60 seconds. 7 subjects with T2DM underwent CGM for 24 hours on two occasions under standard dietary conditions: following acute HIIT and on a non- exercise control day (CTL).HIIT reduced hyperglycemia measured as proportion of time spent above 10 mmol/l (HIIT: 4.5±4.4 vs CTL: 15.2± 12.3%, p= 0.04). In another study conducted by O Peter Adams, Six studies with a total of 51 males and 14 Females participants in the high intensity exercise groups were reviewed. The results suggested that in non- diabetic adults, as little as 15 minutes of high intensity exercise spread over 2 weeks was enough to improve insulin sensitivity. In contrast, a typical aerobic training program consumes 150 minutes of training per week. The HIIT required a total time commitment of 75 minutes. The present study aimed at observing the immediate effects of 30 mins of HIIT bout in reducing blood glucose levels in type 2 DM patients.

6. Conclusion

According to the results it can be concluded that High Intensity Interval Training and Moderate Intensity Training are equally effective in immediately reducing blood glucose levels in Type 2 Diabetes Patients.

7. Future Scope

To see the long term effects of HIIT in type 2 DM patients.

References

[1] Boule NG, et al. JAMA. 2001: Effects of exercise on glycaemia control and body mass in Type 2 diabetes patients: a Meta – analysis of controlled clinical trials.
[2] Thompson PD, et al. Med Sci sports Exerc. 2001: The Acute versus Chronic Response to exercise.
[3] Snowling NJ, Hopkins WG. Effects of Different modes of exercise training on glucose control and risk factors

for complications in type 2 DM patients: a meta-analysis. Diabetic care 2006; 29:2518-2527 [Pubmed].
[4] Boule NG, Haddad E, Kenny GP, Wells GA, Sigal RJ. Effects of exercise on glycaemia control in type 2 diabetes mellitus patients.
[5] Monique E. Francois and Jonathan P. Little: Effectiveness and safety of High Intensity Interval Training in Patients with Type 2 Diabetes Mellitus.
[6] Cassidy S, Thoma C, Houghton D, Trenell MI (2016): High Intensity Interval Training: A review of its impact on glucose control & cardio metabolic health.
[7] Gillen JB, Little JP, Punthakee Z, Tarnopolsky MA, Riddell MC, Gibala MJ (2012): Acute High- intensity interval training exercises reduces the postprandial glucose response & prevalence of hyperglycaemia in patients with type 2 diabetes mellitus.
[8] Thompson PD, Crouse SF, Goodpaster B, Kelley D, Moyna N, Pescatello L (2001): The acute versus the chronic response to exercise.
[9] Sheri R Colberg, Ronald J Sigal, Bo Fernhall, Judith G Regensteiner, Bryan J Blissmer, Richard R Rubin, Lisa Chasan- Taber, Ann L Albright, Barry Braun (2009): Exercise & type 2 diabetes: The American College of sports medicine & the American Diabetes Association: Joint position statement.
[10] O Peter Adams, Faculty of Medical sciences, The University of the West Indies, Cave Hill Campus, St Michael, Barbados (2013): The impact of brief High Intensity Exercises on blood glucose levels.
[11] Hansen D, Dendale P, Jonkers RA, Beelen M, Manders RJ, Corluy L, Mullens A, Berger J, Meeusen R, van Loon LJ (2006): Continuous low- to- moderate-intensity exercise training is as effective as moderate-to- high intensity exercise training at lowering blood HbA_{1c} in obese individuals with type 2 DM.