Journal of Metabolic Syndrome
ISSN: 2167-0943
Alharbi et al., J Metabolic Synd 2019, 8:1
Commentary Open Access

The Effects of (A Combined Exercise Programme Aerobic and Resistance) on Blood Glucose, and Incretin Hormone that Could Control the Diabetes in Type 2 Diabetes

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Received date: March 12, 2019; **Accepted date**: March 26, 2019; **Published date**: April 02, 2019

Abstract

Aim: An excessive number of calories consumed daily, in addition to a sedentary lifestyle, are the main causes of increasing Type 2 Diabetes (T2D) prevalence worldwide. Diabetes is usually accompanied by hypertension, lipid disorders, and obesity.

The aim of this study is to show that the combination exercise is effective. It will compare T2D and Non-Diabetes (ND) volunteer doing combination exercise consisting of resistance and cycling. The interventions are minor and fairly short consisting of 12 episodes of exercise over 6 weeks, yet this was enough to produce measurable change and improvement.

This included the re-categorization of two T2D volunteers to being ND, using normal metrics. A literature search was conducted by using electronic databases (Science direct, google scholar, Medline, Embase, Sports medicine, PubMed, CINAHL, Cochrane library, and Scopus) from April 2015 until January 2019.

Results show that changes in primary and secondary outcomes are significant between the different groups. The primary outcome is HbA1c, and the secondary outcomes are weight, waist, BMI, lipid, BP, HR, lactate and body fitness. Moreover, this study focuses on the changes in incretin level in the T2D group for effects of exercise on the secretion of this hormone and compare within T2D who are using a different medication for diabetes

Results: After just six weeks, there was a reduction in the HbA1c level for the T2D volunteers which is significant (P=0.000). Moreover, in ND the reduction was also significant (P=0.000). In the T2D group who are using (Metformin and SGT2-I group), their result shows elevation in GLP-1 in the assessment of the both acute and chronic effect of the programme. GLP-1 in this group was (3.9 ± 1.5) and increased to (8.4 ± 1.2), (P=0.345) after S1 and then increased more to (11.0 ± 0.8), (P=0.196) after 6 weeks of exercise. This was of interest because of the inference that incretins and exercise were linked. The crucial factor is metformin.

Conclusion: In T2D and ND combination exercise has a beneficial effect on HbA1c, the improvement was higher in T2D. The anthropometric variables (weight, waist, BMI and lung capacity) improved significantly as well in T2D and ND.

Exercise is also important to improve GLP-1 secretion. Despite the range of studies on incretin undertaken here, still, there is a need to compare the effect of exercise and different types of pharmacological therapy on GLP1.

This study compared the effect of exercise on T2D plus medication in volunteers. It has been found that within the T2D group only Metformin and SGT2-I group was improved. Both SGLT2 inhibitors and metformin have been found to affect body weight and this may explain the improvement of GLP-1 level, suggesting an area for future investigation.

Keywords: Diabetes; BMI; Obesity; T2D; Incretin; Exercise

Introduction

Diabetes mellitus (DM) is a chronic disease characterized by chronic persistent hyperglycemia. This hyperglycemia accompanied with a metabolic disorder which leads to organ damage and serious complications.

Type 2 diabetes (T2D) is a global epidemic which have been increased with increasing obesity and sedentary lifestyle [1].

Diet and exercise can potentially prevent the development of T2D of many of those at risk or in early stages (Diabetes UK, 2016). The aim of this study to show that combination exercise is effective [2].

It will compare T2D and Non-Diabetes (ND) volunteer doing combination exercise consisting of resistance and cycling. The interventions are minor and fairly short consisting of 12 episodes of

exercise over 6 weeks, yet this was enough to produce measurable change and improvement [3].

This study focuses on the changes in incretin level in the T2D group for effects of exercise on the secretion of this hormone and compares within T2D who are using a different medication for diabetes [4].

Methods

Participants were 17 T2D and 8 ND, in T2D (mean age=48.6 ± 2.6) and in ND mean age (mean age=31.6 ± 4) [5,6]. The two groups performed six weeks of moderate exercise which consisted of 3 sets of 10 repetition resistance exercise and then cycling for 20 min (50-60% VO_{max}), a total of 12 exercise sessions (Figure 1).

HbA1c, BG, weight, waist, BMI, lipid profile and lung capacity has been checked at baseline, and then after last exercise session. A sampling of venous blood for GLP-1 at baseline, three times in the first exercise session and then once weekly for six weeks (Tables 1 and 2) [7-9].

Results

T2D	Pre 1st Se Ex	Post 12th Se Ex	P-value
Age (years)	48.6 ± 2.6	-	-
Height (cm)	170.35 ± 4.8	-	-
Weight (kg)	92.0 ± 4.3	90.0 ± 4.5	0.001
Waist (cm)	105.2 ± 3.6	102.3 ± 3.6	0
BMI (kg/m²)	30.8 ± 1.0	30.2 ± 0.9	0.001
Lung Capacity	381.8 ± 39.7	423.6 ± 33.6	0.001
HbA1c (mmol/mol)	55.7 ± 2.7	48.9 ± 2.1	0
TC (mmol/L)	4.44 ± 0.40	4.40 ± 0.35	0.867
HDL (mmol/L)	1.27 ± 0.21	1.25 ± 0.14	0.884
TRG (mmol/L)	1.58 ± 0.22	1.58 ± 0.31	1
LDL (mmol/L)	2.25 ± 0.38	2.48 ± 0.26	0.767
GLP-1 (pmol/L)	9.7 ± 2.1	7.0 ± 1.0	0.333
Glucose (mmol/L)	7.7 ± 0.6	5.7 ± 0.4	0.072

Table 1: It compares the two group's Type 2 Diabetes.

ND		Pre 1st Se Ex	Post 12th Se Ex	P-value
Age (years)	31.6	± 4	-	-
Height (cm)	167.4 cm ± 4.4		-	-
Weight (kg)	58.86 ± 1.2		58.22 ± 1.2	0.49
Waist (cm)	73.7	± 1.0	71.4 ± 0.5	0.052
BMI (kg/m²)	21.2	± 1.2	20.9 ± 0.9	0.382
Lung Capacity	380 ± 26.7		580 ± 39.8	0.008
HbA1c (mmol/mol)	34.6	± 0.6	31.2 ± 0.2	0.003
TC (mmol/L)	3.94 ± 0.26		3.85 ± 0.40	0.756
HDL (mmol/L)	1.50 ± 0.19		1.55 ± 0.17	0.301
TRG (mmol/L)	1.49 ± 0.27		1.28 ± 0.36	0.246
LDL (mmol/L)	2.17 ± 0.10		2.32 ± 0.27	0.621
Glucose (mmol/L)	5.4 ± 0.2		4.4 ± 0.3	0.031

Table 2: It shows a comparison between Non-Diabetes groups.

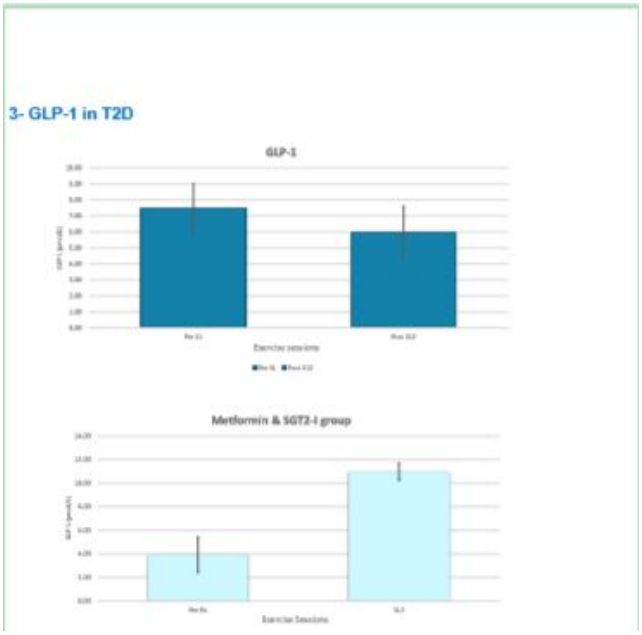

Figure 1: GLP-1 in T2D.

Conclusion

In T2D and ND combination exercise has a significant effect on HbA1c, the improvement was higher in T2D. The anthropometric variables (weight, waist, BMI and lung capacity) improved significantly as well in T2D and ND. Generally, it has been found in this study that 6 weeks of moderate combined exercise has no significant improvement in the GLP-1 level in T2D participants. However, metformin and SGT2-I group shows improvement in GLP-1 after S12.

Limitations and Future Work

Few recruitments (small sample size) and no data of GLP-1 was collected from the ND group due to the high price of special tubes that were used to collect a blood sample (BD P800). Therefore, there is a need to conduct another study with larger sample size and analyze GLP-1 in the ND group as well with longer time follow up to obtain conclusive results.

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