

Life Style Modification Modulates Adhesive Molecules and Depression Among Saudi Type 2 Diabetic Patients



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Submission: June 01, 2018; **Published:** July 17, 2018

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Abstract

Background: Globally, type 2 diabetes (T2DM) can be considered as one of the most common health-related problem and it is considered as a cardiovascular disorders risk factor.

Objective: This study aimed to detect the influence of weight reducing program on adhesive molecules and depression among Saudi patients with T2DM.

Methods: One hundred obese Saudi patients with T2DM enrolled in two groups, group (A) received aerobic exercises & diet regimen, while group (B) considered as a control group and received no exercise intervention or diet control for 3 months. Assessment of adhesive molecules and depression were done before and at the end of the project.

Results: Results of group (A) stated that mean values of BMI, ICAM-1, VCAM-1, E-selectin, BDI and POMS significantly decreased in addition to significant increase in the mean value of RSES as result of weight reducing program, where parameters of group (B) displayed non-significant variations. Additionally, no significant differences found between both groups in all parameters ($P < 0.05$).

Conclusion: Life style modification led to weight loss which modulates depression and adhesive molecules in obese type 2 diabetics.

Keywords: Type 2 diabetes; Obesity; Adhesive molecules; Depression; Weight reduction

Introduction

Globally, diabetes mellitus affects about 365 millions of subjects by 2030 [1]. Type 2 diabetes (T2DM) is considered a cardiovascular disorders risk factor [2]. Obesity is a state of excessive adipose tissue mass caused by increased size and number of adipocytes [3]. Mortality rate due to cardiovascular disorders is higher among patients with diabetes [4] due to dyslipidemia [5,6] and hypertension [7].

Adipose tissue secretes some chemical materials include adipocytokines which are locally and systemically involved in regulation of many inflammatory and metabolic processes [8]. Insulin resistance, atherosclerosis and T2DM may be induced by abnormal adipose tissue endocrine function [9]. Abnormal levels of inflammatory cytokines among patients with T2DM cause endothelial cell dysfunction [10], that may be induced by factors as dyslipidemia, hyperinsulinemia and β -cell failure [11]. Insulin is an important regulator for vascular function [12-14].

As there is inconclusive data regarding the impact of life style modification upon adhesive molecules and depression among obese type 2 diabetic patients. Therefore, the study aimed to determine the impact of 12 weeks of weight reduction program on depression and adhesive molecules dysregulation in obese type 2 diabetic patients.

Patients and Methods

Subjects

One hundred obese Saudi subjects with T2DM, their body mass index (BMI) was 30 to 34 Kg/m², exclusion criteria included smoking, hepatitis, renal failure, heart failure, pregnancy and respiratory failure. Consent form signed by all participants who were enrolled in two groups, group (A) received aerobic exercises and diet regimen, while group (B) was the control group received no intervention for three months.

Measurements

Biomarkers of endothelial function measurements: Biomarkers of endothelial function included intercellular cell adhesion molecule-1 (ICAM-1), vascular cell adhesion molecule-1 (VCAM-1) and soluble E-selectin levels were measured from frozen blood plasma samples that are stored at -80 °C. Also, ELISAs were used to measure soluble levels of ICAM-1, VCAM-1 and sE-selectin (GE Healthcare Amersham, Biotrak Easy ELISA), which employs the quantitative sandwich enzyme immunoassay technique.

Rosenberg self-esteem scale (RSES): Beck Depression Inventory (BDI) and Profile of Mood States (POMS) were measured to assess mood, psychological wellbeing and self-Esteem.

Procedures

All participants enrolled in two groups as following:

Aerobic exercise training: For group (A) participants completed a 3-months treadmill aerobic exercise. Training program included range motion and stretching exercises as a warming-up for five minutes, 30 minutes of aerobic exercise with intensity about 60-70% of the individual maximum heart

rate followed by cooling down for 10 minutes[15]. Participants had 3 sessions /weekly for 12 weeks. Also, a diet regimen that provide low caloric diet of 1200Kilocalories/day for 12 weeks.

The control group (group B): Received no intervention.

Statistical Analysis

The investigated parameters mean values in both groups were detected at the beginning and at the end of the study and they were compared by student paired “t” test. While, the unpaired” test was used in comparison between the two groups (P<0.05).

Results

The baseline criteria comparison proved that the two groups were homogenous as there were no significant differences between both groups (Table 1). Results of group (A) stated that mean values of BMI, ICAM-1, VCAM-1, E-selectin, BDI and POMS significantly decreased in addition to significant increase in the mean value of RSES as result of weight reducing program (Table 2), where parameters of group (B) displayed non-significant variations (Table 3). Additionally, no significant differences found between both groups in all parameters (Table 4) (P<0.05).

Table 1: Baseline all participants criteria.

	Group (A)	Group (B)	Significance
Age (year)	47.53±4.26	49.24±5.17	P>0.05
BMI (kg/m ²)	34.12±3.97	33.86±4.12	P>0.05
Duration of diabetes (years)	10.14±2.19	9.23±2.55	P>0.05
SBP (mmHg)	146.47±10.11	144.53±9.28	P>0.05
DBP (mmHg)	88.16±6.21	87.27±5.93	P>0.05
Total Cholesterol (mg/dL)	197.24±20.13	194.88±19.13	P>0.05
HDL-C (mg/dL)	44.16±5.37	45.63±5.72	P>0.05
Triglycerides (mg/dL)	141.72±15.18	138.64±13.95	P>0.05
HBA1c (%)	9.23±2.62	9.15±2.38	P>0.05
Glucose (mmol/L)	5.46±1.21	5.33±1.47	P>0.05
Insulin (pmol/L)	20.51±4.25	19.73±4.82	P>0.05

BMI: Body Mass Index; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; HDL-C: High Density Lipoprotein Cholesterol; HBA1c: Glycosylated Hemoglobin

Table 2: Mean value and significance of parameters in group (A) before and at the end of the study.

	Mean +SD		T-Value	Significance
	Pre	Post		
BMI (kg/m ²)	34.12±3.97	27.34±3.56*	6.81	P<0.05
ICAM-1 (ng/ml)	91.43±10.21	80.72±8.22*	8.12	P<0.05
VCAM-1 (ng/ml)	812.41±33.56	736.85±27.46*	10.38	P<0.05
E-selectin (ng/ml)	15.82±2.53	12.19±2.45*	7.83	P<0.05
RSES	20.37±3.14	26.82±3.27*	6.15	P<0.05
BDI	8.13±2.16	4.86±1.74*	5.71	P<0.05
POMS	24.17±4.32	18.51±3.76*	6.32	P<0.05

BMI: Body Mass Index; ICAM-1: Inter-Cellular Adhesion Molecule; VCAM-1: Vascular Cell Adhesion Molecule; RSES: Rosenberg Self-Esteem Scale; BDI: Beck: Depression Inventory; POMS: Profile of Mood States

(*) indicates a significant difference, P <0.05

Table 3: Mean value and significance of parameters in group (B) before and at the end of the study.

	Mean +SD		T-Value	Significance
	Pre	Post		
BMI (kg/m ²)	33.86±4.12	34.12±3.98	1.46	P>0.05
ICAM-1(ng/ml)	90.74±9.88	91.26±9.85	1.72	P>0.05
VCAM-1(ng/ml)	807.92±34.15	815.78±33.69	1.98	P>0.05
E-selectin(ng/ml)	15.83±2.42	16.12±2.47	1.15	P>0.05
RSES	20.61±3.54	19.85±3.72	1.31	P>0.05
BDI	7.95±1.92	7.98±1.95	0.95	P>0.05
POMS	23.87±4.25	24.21±4.28	1.22	P>0.05

BMI: Body Mass Index; ICAM-1: Inter-Cellular Adhesion Molecule; VCAM-1: Vascular Cell Adhesion Molecule; RSES: Rosenberg Self-Esteem Scale; BDI: Beck: Depression Inventory; POMS: Profile of Mood States

P <0.05

Table 4: Mean value and significance of parameters in group (A) and group (B) at the end of the study.

	Mean +SD		T-Value	Significance
	Group (A)	Group (B)		
BMI (kg/m ²)	27.34±3.56*	34.12±3.98	4.25	P<0.05
ICAM-1(ng/ml)	80.72±8.22*	91.26±9.85	6.73	P<0.05
VCAM-1(ng/ml)	736.85±27.46*	815.78±33.69	8.13	P<0.05
E-selectin(ng/ml)	12.19±2.45*	16.12±2.47	6.27	P<0.05
RSES	26.82±3.27*	19.85±3.72	5.11	P<0.05
BDI	4.86±1.74*	7.98±1.95	4.85	P<0.05
POMS	18.51±3.76*	24.21±4.28	5.13	P<0.05

BMI: Body Mass Index; ICAM-1: Inter-Cellular Adhesion Molecule; VCAM-1: Vascular Cell Adhesion Molecule; RSES: Rosenberg Self-Esteem Scale; BDI: Beck: Depression Inventory; POMS: Profile of Mood States

(*) indicates a significant difference, P <0.05

Discussion

Cardiovascular dysfunction is the principal cause for higher mortality rate worldwide among diabetics [16]. The ideal approach for weight reduction is to combine exercise and diet regimen to modulate biochemical parameters of obese subjects [17-19]. Moreover, weight reduction improves psychological background. The principal finding of this study was that weight loss ameliorate adhesive molecules (ICAM-1 VCAM-1 and E-selectin) as well as improvement in depression of patients with T2DM.

Regarding psychological effects of weight loss, this study proved that life style modification (aerobic exercise and diet regimen) significantly decreased BDI & POMS and increased RSES, there are several studies proved that weight loss improved these psychological parameters [20-24]. While, Grave et al.[20]enrolled 500 obese individuals in oneyear weight reducing program and found that weight reduction improved psychological parameters. Moreover, another long-term weight reducing program for up to five years improved cardiovascular status in type 2 diabetics[21]. Also, Imayama et al. [22] concluded

that one year weight reduction program had a positive impact on quality of life and psycho-social background of the participants. In addition, Wycherley et al. [23]proved that diet regimen with or without resisted exercise training modulates biochemical and psychological parameters of obese T2DM patients. Similarly, Faulconbridge et al. [24] mentioned that weight reduction is associated with mood improvement of depressed patients.

Concerning adhesive molecules, this study proved that life style modification (aerobic exercise and diet regimen) significantly improved ICAM-1 VCAM-1 and E-selectin because of weight reduction, these findings are online with several previous studies [25-28]. However, Sharman & Volek[29]found that 6 week diet regimen reduced plasma ICAM-1. While, Forsythe et al. [30] stated that 3 months diet regimen modulated dyslipidemia and reduction in E-selectin and ICAM. Moreover, Thomson et al. [31] obtained modulation in parameters of endothelial function after 20 weeks of a high-protein energy-restricted diet and/or exercise in women with polycystic ovary syndrome. Finally, GarantyBogacka et al. [32] applied a 1 year program of exercise training and diet regimen which reduced adhesive molecules of obese adolescents.

Conclusion

Life style modification led to weight loss which modulates depression and adhesive molecules in obese type 2 diabetics.

Acknowledgment

Author thanks Prof. Shehab M. Abd El-kader for his valuable practical share in this research.

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DOI: [10.19080/CRDOJ.2018.07.555724](https://doi.org/10.19080/CRDOJ.2018.07.555724)

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