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Research Article

Effect of diet control and exercise on the lipid profile of obese men

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ABSTRACT

Background: Obesity is a major health problem which might contribute to many other problems such as heart disease and hypertension as well as diabetes due to abnormal lipid profile. The main objective of the current study was to compare the effectiveness of diet or treadmill exercise on normalizing the lipid profile of obese subjects.
Methods: Forty women complaining from obesity was enrolled in this study and was randomly divided into 4 groups: control group: 10 obese women which don't receive any thing, diet group: 10 obese women which received polysaturated fatty acid diet, exercise group: 10 obese women which received treadmill exercise for 30 minutes and lastly diet/exercise group: 10 obese women which received both diet and exercise. Measurement of weight, body mass index, and lipid profile for all groups was measured before and after 60 days of treatment intervention.
Results: Diet and exercise should have a highly significant decrease of weight and body mass index and normalizing the lipid profile ($p \leq 0.05$) under the current situation used in this study.
Conclusions: It was concluded that the combination of diet and exercise was highly effective in normalizing the lipid profile and overcoming obesity.

Keywords: Obesity, Abnormal lipid profile, Treadmill exercise

INTRODUCTION

Overweight and obesity are defined by a body mass index (BMI) of 25 to 29.9 kg/mj^2 and 30 kg/mj^2 or greater, respectively. Together, overweight and obesity are exhibited by approximately 66.3% of adults in the US.[1] Both overweight and obesity are characterized by the accumulation of excessive levels of body fat and contribute to heart disease, hypertension, diabetes, and some cancers as well as psychosocial and economic difficulties.[2-4]

Management of overweight and obesity is considered an important public health initiative because numerous studies have shown the beneficial effects of diminished weight and body fat in overweight and obese individuals. These beneficial effects include an improvement in CVD risk factors such as decreased blood pressure,[5,6] decreased LDL-C,[5,7] increased HDL-C,[8] decreased triglycerides (TG),[9] and improved glucose tolerance.[10] Weight loss has also been associated with a decrease in inflammatory markers, such as C-reactive protein,[11] which have also been associated with the development of CVD.[12]

Besides the intrinsic factors such as age, genetic heritage and sex, modifiable factors such as diet, smoking, psychological stress and a sedentary lifestyle affect the plasma lipid and lipoprotein levels. Most of the studies have shown that physical exercise, performed with sufficient frequency and intensity, is effective in lowering the level of TG and LDL-C and raising the level of HDL-C.[13-15]

The main objective of the current study was to compare the effectiveness of diet or treadmill exercise on normalizing the lipid profile of obese subjects.

METHODS

The study was conducted on women in the age range of 25 to 45 years who were free from complications like hypertension, cardiac disease, diabetes etc. The other criteria for the selection of the subjects included BMI (>25), body fat (>30%), and disturbed lipid profile (Low density lipoprotein 150 to 170 mg/dl., serum cholesterol 225 to 275 mg/dl, serum triglyceride 150 to 200 mg/dl, high density lipoprotein 30 to 55 mg/dl).

The selected patients were divided into 3 groups. Group I constituted of 10 obese patients that served as the control group. Group II constituted of 10 obese patients who were recommended to take special diet according to their ideal body weight for 60 days, group III constituted of 10 obese patients who were recommended to take treadmill exercise for 30 minutes per day for 60 days. Group IV constituted of 10 obese patients who were recommended to take 30 minutes treadmill exercise in addition to diet control for 60 days.

Anthropometric measurements

The body weight was measured without shoes using an electronic measuring scale, and height to the nearest cm was taken. The body mass index (BMI) was calculated as weight in kg divided by the height (in m2).[16]

Blood biochemistry

Both male and female subjects attended the laboratory in the morning, after a 12 h fast. A 10 ml blood sample was obtained by venipuncture. When blood samples were collected from female subjects, they were not having menstruation. Analyses were made from the serums. A modification of McGovan method was used form determining TG. According to this method, TGs are hydrolysed into glycerol and fatty acids by lipase. Emergent glycerol is measured by an enzymatic reaction catalysed by glycerol kinase, glycerol phosphate oxidise and peroxidase. Normal values are 30-190 mg/dl.[17]

TC was determined by an enzymatic method.[18] Normal TC value is 140-250 mg/dl. Mg^{+2} and dextran sulfate method of Sclavo, were used in order to measure HDL-C. CHOL-HDL of Sclavo, which is a commercial name of HDL analyses, is based on the methods defined by Finely and Kostner.[19,20] Mg^{+2} and dextran sulfate precipitate all the fractions of serum lipoproteins except HDL. After centrifugation, HDL fraction remains in the supernatant. The amount of cholesterol in this fraction is analysed by a total cholesterol enzymatic reaction. Normal HDL-C values for males are 35-59 mg/dl, and for females they are 38-75 mg/dl.[21]

The amount of LDL-C was calculated by Friedwald equation.[22] Normally, LDL-C should be less than 150 mg/dl.

Data analysis

This study was a controlled post-test experimental design with a control and a three treatment groups. Groups were compared for differences at different time interval, one way ANOVA followed by Tucky Kramer post hoc test was used for comparing differences between 3 treatment groups and control group. The level of significance was set at 0.05 for all statistical tests.

RESULTS

Patients were divided into four groups as described earlier in the material and methods section; there was no significant difference between them regarding age, weight and the body mass index prior to treatments intervention as showed in Table 1.

Table 1: Physical characteristics of study groups.

Date of sampling	Weight (in kg)			
	Control group	Diet group	Exercise group	Diet/ exercise group
Age	27.8 ± 1.71	26.7 ± 1.70	27.8 ± 1.75	27.3 ± 1.25
Weight	70.3 ± 1.16	69.3 ± 2.49	68.5 ± 3.68	68.8 ± 3.22
Body mass index	32.8 ± 1.31	31.7 ± 1.63	32.1 ± 1.19	31.8 ± 1.81

Data were expressed as means ± SD of 10 obese women/group, a; significantly different versus control group, b; significantly different versus exercise group, †; at $p \leq 0.05$, significance was carried out by one way ANOVA Tukey Krammer test.

Table 2: Effect of diet, exercise or both on weight measured pre and post treatment.

Date of sampling	Weight (in kg)			
	Control group	Diet group	Exercise group	Diet/ exercise group
Pre-treatment	70.3 ± 1.16	69.3 ± 2.49	68.5 ± 3.68	68.8 ± 3.22
Post-treatment	70.1 ± 0.99	61.00 ± 1.76[a,†]	60.8 ± 2.57[a,†]	57.2 ± 1.03[a,b,c,†]

Data were expressed as means ± SD of 10 obese women/group, a; significantly different versus control group, b; significantly different versus exercise group, †; significantly different versus pre-treatment at $p \leq 0.05$, significance was carried out by one way ANOVA Tukey Krammer test.

As shown in Table 2 and 3, all treatment groups (Diet, exercise or both) have succeeded in decreasing weight and body mass index values over the treatment period but there was no significant difference between diet and exercise, on the other hand, the combination of diet and exercise have succeeded on reducing weight and body mass index values more than diet or exercise alone.

Table 3: Effect of diet, exercise or both on body mass index measured pre and post treatment.

Date of sampling	Body mass index			
	Control group	Diet group	Exercise group	Diet/ exercise group
Pre-treatment	32.8 ± 1.31	31.7 ± 1.63	32.1 ± 1.19	31.8 ± 1.81
Post-treatment	32.4 ± 1.43	26.2 ± 0.91 ^{a,†}	25.9 ± 0.73 ^{a,†}	22.8 ± 1.13 ^{a,b,c,†}

Data were expressed as means ± SD of 10 obese women/group, a; significantly different versus control group, b; significantly different versus exercise group, †; significantly different versus pre-treatment at $p \leq 0.05$, significance was carried out by one way ANOVA Tukey Krammer test.

As shown in Tables 4, 5, 6, and 7, there was a significant decrease of total cholesterol, triglycerides. Low density lipoproteins in post-treatment values ($p \leq 0.05$) when compared with pre-treatment values, on the other hand, there was a significant increase in high density lipoproteins of post-treatment values when compared with pre-treatment values ($p \leq 0.05$), also the combination of diet and exercise was able to decrease the total cholesterol, triglycerides, low density lipoproteins, high density lipoproteins more than either treatment alone.

Table 4: Effect of diet, exercise or both on total cholesterol measured pre and post treatment.

Date of sampling	Total Cholesterol (in mg)			
	Control group	Diet group	Exercise group	Diet/ exercise group
Pre-treatment	255.9 ± 2.13	254.9 ± 2.02	256.2 ± 1.81	256.8 ± 2.53
Post-treatment	236.4 ± 6.24 †	203.2 ± 9.27 ^{a,†}	203.6 ± 7.33 ^{a,†}	157.8 ± 5.00 ^{a,b,c,†}

Data were expressed as means ± SD of 10 obese women/group, a; significantly different versus control group, b; significantly different versus exercise group, †; significantly different versus pre-treatment at $p \leq 0.05$, significance was carried out by one way ANOVA Tukey Krammer test.

Table 5: Effect of diet, exercise or both on Triglycerides measured pre and post treatment.

Date of sampling	Triglycerides (Kg/M^2)			
	Control group	Diet group	Exercise group	Diet/ exercise group
Pre-treatment	178.2 ± 1.93	174.9± 2.23	174.4 ± 1.77	174.8 ± 0.78
Post-treatment	155.9 ± 3.21 †	108.3± 2.05 ^{a,†}	120.2 ± 4.41 ^{a,b,†}	87.9. ± 0.99 ^{a,b,c,†}

Data were expressed as means ± SD of 10 obese women/group, a; significantly different versus control group, b; significantly different versus exercise group, †; significantly different versus pre-treatment at $p \leq 0.05$, significance was carried out by one way ANOVA Tukey Krammer test.

Table 6: Effect of diet, exercise or both on high density lipoproteins measured pre and post treatment.

Date of sampling	High density lipoproteins			
	Control group	Diet group	Exercise group	Diet/ exercise group
Pre-treatment	42 ± 1.78	42.4± 1.36	41.1 ± 2.02	42 ± 1.49
Post-treatment	53.9 ± 2.18 †	73.2± 3.19 ^{a,†}	74.8 ± 1.71 ^{a,†}	86.1 ± 3.51 ^{a,b,c,†}

Data were expressed as means ± SD of 10 obese women/group, a; significantly different versus control group, b; significantly different versus exercise group, †; significantly different versus pre-treatment at $p \leq 0.05$, significance was carried out by one way ANOVA Tukey Krammer test.

Table 7: Effect of diet, exercise or both on low density lipoproteins measured pre and post treatment.

Date of sampling	Low density lipoproteins			
	Control group	Diet group	Exercise group	Diet/ exercise group
Pre-treatment	160.4 ± 1.26	159.6± 1.57	160.5 ± 2.12	158.6 ± 2.91
Post-treatment	142.7 ± 2.40 †	134 ± 2.35 ^{a,†}	136 ± 1.70 ^{a,†}	120.7 ± 1.41 ^{a,b,c,†}

Data were expressed as means ± SD of 10 obese women/group, a; significantly different versus control group, b; significantly different versus exercise group, †; significantly different versus pre-treatment at $p \leq 0.05$, significance was carried out by one way ANOVA Tukey Krammer test.

DISCUSSION

Obesity is rapidly becoming one of the most important medical and public health problems of our time. Obesity is associated with a high rate of morbidity and early mortality if left untreated.[23] Studies indicate that the presence of obesity increases the risk for developing cardiovascular diseases and diabetes.[24]

Physical inactivity is the most important cause of the development of obesity. spending more time in front of television and computer lead this unused energy to be accumulated as lipid[25] therefore the purpose of the current study is to study the effect of diet or exercise or the combination of diet and exercise on lipid profile and reversing obesity

The current study showed the 3 treatment groups and control showed no significant difference regarding the age, weight, and body mass index, which indicate that the outcome measures lipid profile including total cholesterol, triglycerides. Low density lipoproteins and high density lipoproteins are changed only in response of treatment interventions.

The current study has proved the ability of exercise on decreasing weight. body mass index and altering the lipid profile (decreasing the total cholesterol, triglycerides, low density lipoproteins and increasing high density lipoproteins) the finding of the current study goes hand in hand with Haskel[26] who found in his study that triglyceride level has decreased mean 18% and high density lipoproteins has increased 16% in the individuals with hypercholesterol as a result of aerobic exercise. Still, there are studies alleging that triglyceride decreases with exercises[27,28] Besides, there are other studies maintaining that triglyceride does not change.[29]

Epidemiological studies have shown that diets rich in saturated fatty acids seem to increase the risk of coronary heart disease by increasing cholesterol and low density lipoproteins.[30] Our current study. Have focused on replacing saturated fatty acids by poly unsaturated on diet control which result in decreasing the total cholesterol, triglycerides , low density lipoproteins and increasing high density lipoproteins however this finding goes hand in hand with numerous intervention studies have shown that substitution of dietary saturated fatty acids by poly unsaturated fatty acids in diet has hypocholesterlmic effects, decrease the levels of total cholesterol , low density lipoproteins and increase the high density lipoproteins.[31]

Based on the result of the current study, the fourth group which combined the beneficial effect of both diet and exercise showed a significant decrease decreasing weight. Body mass index and altering the lipid profile (decreasing the total cholesterol, triglycerides, low density lipoproteins and increasing high density lipoproteins) when compared to control group or even to each treatment modality alone, which is quit logical.

CONCLUSION

It was concluded that the combination of diet and exercise was highly effective in normalizing the lipid profile and overcoming obesity.

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Ethical approval: The study was approved by the institutional ethics committee

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