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Response of serumleptin and insulinresistance to high intensityinterval exercise inobese postmenopausal women

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ABSTRACT

Back ground:leptin, a hormone product by adipose tissue, plays an important role in regulation of fat-carbohydrate metabolism**,Objective:** to determine the effect of HIIT on insulin resistance and serum leptin. The effects of three months interval exercise on insulin resistance and serum leptin forobese postmenopausal women were studied. **Methods:** thirty obese postmenopausal women with age of 50-60 years were included in the present study. Their body mass index (BMI from $\geq$ 30 kg/m^2.They were randomly divided into two groups, each group consisted of 15 patient, (group A) received low-calorie diet without any program of exercise, (group B) received a program of HIIT (25 min 3 times/week) with low-calorie diet . The biochemical changes in insulin resistance, serum leptin, percentage body fat, body weight and body mass index and waist circumference were measured at the beginning of the study and after twelve weeks. **Results:** As the research findings revealed that insulin resistance and serum leptin level were significantly decreased in both groups (0.05 vs 0.85, $P<0.05$) (0.04 vs 9.14 $P<0.05$) respectively, however there were statistically significant differences between the two groups. Also the difference of measurements of variables of the two groups including Body weight, BMI, Percent body fat had showed significantly decreased $P<0.05$, While there was statistically significant difference between the two groups. Moreover, Interval exercise group had significant decrease in WC but changes in the second group was not statistically significant ($P>0.05$)**.Conclusion**: Based on data obtained in thus study, it seems that HIIT exercise in a short term (up to twelve weeks) combined with diet induced weight loss is best method to regulate systemic leptin and decrease insulin resistance in obese postmenopausal women.

Key words:*Leptin, Insulin Resistance, HIIT, obese postmenopausal*

INTRODUCTION

Obesity represents a growing global public health issue in industrialized countries affecting a significant part of the population across all age, gender and ethnic groups [1].

Postmenopausal women have an increased tendency for gaining weight. It is as yet unclear whether the menopausal transition itself leads to weight gain, but is known that the physiological withdrawal of estrogen brings about changes in fat distribution, together with physical inactivity, are probably the major causes of this phenomenon [2].Other contributing factors include ethnicity, reduced lean mass, resting metabolic rate and treatment with certain drugs, e.g. steroids, insulin, glitazones[3].

Overweight individuals represent approximately 20% of the adult world population. Postmenopausalstatus is associated with higher prevalence of obesity, as 44% of postmenopausal women are overweight, among whom 23% are obese [4].

It is clear that there is a positive correlation between body weight and insulin resistance; moreover, the risk of developing all the metabolic abnormalities is strongly associated with insulin resistance [5].

Leptin is known as a key appetite-regulating hormone, which effects on appetite, energy expenditure, behavior, and glucose metabolism. Much evidence suggests that insulin and leptin act in the brain as adiposity negative feedback signals [6].

The level of serum leptin correlates with the fat content of the body [7].Significant correlation between leptin and insulin has been identified as regulators of food intake and energy balance [8, 3].There is direct relationship between leptin and insulin resistance and fasting glucose levels, so that an increase in blood leptin concentration can lead to insulin resistance and fasting glucose increase [9].

HIIT has typically been applied to older, diseased, and at-risk populations using longer work intervals (2–4 minutes), whereas more recent definitions of HIIT include work intervals of 30 to 60 s. [10]. This form of exercise for older adults, and even at-risk older adults, has until more recently received little attention [11].

Purpose of the study is to investigate the effect of HIIT exercise on insulin resistance and serum leptin in obese postmenopausal women.

METHODS

Thirty obese postmenopausal women their age ranged from 50 to 60 years were selected from the Out Patient Clinic of the National Nutrition Institute; for this study. Their body mass index (BMI) were ≥30 kgs/m² according to WHO's classification [12]. The Thirty obese postmenopausal women were classified into two groups; each group consisted of fifteen subjects. The first (control group) received a low-calorie diet only without any exercise program (group A). And the second (study group) received a program of HIIT exercise (25 min, 3 times/week) with a low-calorie diet (group B). Any patient had history of cardiovascular disorders, severe life limiting illness (cancer, renal failure), or any other type of chronic disease, weight loss medication and endocrinal disorders, hyper-or hypothyroidism, was excluded from the study.

Weight and Height scale(Healthy scale 200 kg) used to measure the weight, height and BMI of each participant, Tape measurement with non-stretchable material to measure waist circumference, Bicycle ergometer was used for warming up exercise (HinzKettler-co.kg.postfach 1020, Germany), Kitz and Tubes for blood samples.

Procedure:-

A- Evaluation:

The sample was randomly assigned into two groups equal in number, 15 for each group. The anthropometric measures (Weight, BMI and WC) were obtained for each one in both groups.

Blood samples were collected from each woman in groups (A & B) for measuring leptin and insulin levels in the amount of 10 ml from the brachial vein of the participants' left arm while in a seated position. Samples taken were then poured into sterile tubes and incubated at room temperature for 10 minutes. Their blood serum was then separated from the blood clot by centrifuging at 3000 rpm for 10 minutes and was kept frozen at -70 °C till the measuring stage.

Serum insulin levels (using DRG, ELISA kit made in Germany), insulin resistance (using the Homeostasis model assessment formula based on insulin and glucose levels) calculated by.

HOMA-IR = [fasting glucose (mg/dL) × fasting insulin (mU/mL)/405] [13].

Serum leptin levels (using DRG leptin (sandwich) ELISA kit made in Germany)

After selection of the patients an informed consent was taken from all patients that participated in the study. Before starting the study all patients were informed about the nature, benefits and procedure of the study.

The steps of training were explained for each patient.

Group (A) received low calorie diet alone without any exercise program monitored by a diet questionnaire. Dietary intake data were obtained using 24-hour dietary recalls to determine the approximate amount of nutrients received. Participants were asked to list every food and drink they had consumed over the last 24 hours. This questionnaire was filled out by all participants on three non-consecutive occasions once a month over a 12-week period. The questionnaire was used the 24-hour Dietary Intake Assessment by the Department of Clinical Nutrition Institute, Cairo University.

Group (B) received low- calorie diet using 24-hour dietary recalls to determine the approximate amount of nutrients in addition to program of HIIT exercise (25 min, HIIT exercises, 3 time/week) thus for twelve weeks according to the following:-

The supervised HIIT protocol was performed on a cycle ergometer. Each session consisted of 10×60 s cycling intervals set in constant watt mode at a pedal cadence of 80–100 revolutions/min. that elicits ~90% of maximal heart rate, Interspersed with 60 s of recovery. During recovery, a participant was allowed to rest or pedal slowly against a resistance of 50 W. Each training session included a 3-min warm-up and 2-min cool-down at 50 W, for a total of 25 min per session.

The prescribed intensity of exercise training was calculated for the main period using the Karvonen heart rate

reserve formula which used to determine the exercise intensity.

Indicator heart rate = (maximum heart rate) - (resting heart rate)*(intensity training) + (resting heart rate) [14].

At the end of the study program (after 12 weeks), another blood sample were obtained and all measures were obtained and the pre and post samples for the two groups were compared.

Descriptive statistics was done in the form of mean and standard deviation. Inferential statistics assessed changes in insulin resistance and serum leptin using independent t-test between the two groups and dependent t-test was used to assess changes within group, analysis was done using SPSS version 17 and Relatives changes percentage was calculated according to:

Relatives changes percentage = $\frac{post - pre}{pre} \times 100$

Items		Age (Yr)	Height (cm)	Weight (kg)	BMI (kg/m2)	WC (cm)
Group A N=15	Mean	54.00	158	95.67	38.23	**111.33**
	S.D.	±2.20	±0.06	±4.61	±2.71	**±4.21**
	Minimum	51	153	91	30.7	**105**
	Maximum	57	173	106	42.72	**138**
Group B N=15	Mean	54.20	158	95.87	38.62	**115.00**
	S.D.	±2.21	±0.04	±4.42	±2.70	**±4.76**
	Minimum	51	152	91	36	**108**
	Maximum	57	159	104	42.73	**123**
t-value		0.550	0.355	0.092	0.366	**0.669**
P-value		0.588	0.626	0.928	0.719	**0.514**
Sig.		NS	NS	NS	NS	NS

RESULTS

There was no significant difference between both groups in their ages, weights, heights, BMI and WC respectively as shown in Table (1).

Table 1: Demographic and clinical characteristics of patients in both groups (A&B)

Yr: Years, NS: Non-significant, Kg: Kilogram, P: Probability, WC: Waist Circumference, SD: StandardDeviation, BMI: Body Mass Index, Kg/m2: Kilogram permeter square

The results of the present study showed that body weight was statistically significant decrease in group (A) -5.49 Kg; and group (B) -11.87 Kg, while statistically it was significant difference between the two group post treatment P=0.0019. The percentage of change of body weight for group (A) was- 5.74% whereas, in group (B) was -12.38% Table (2), fig. (1).

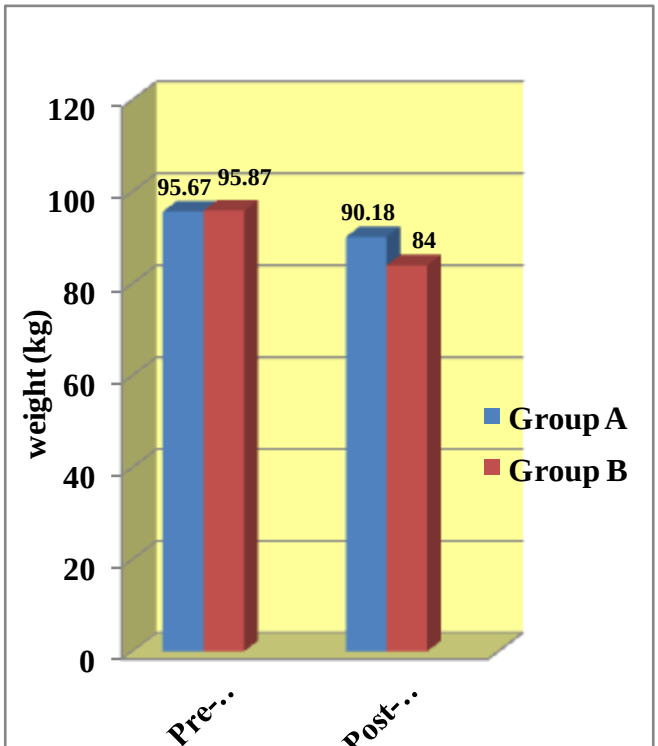
BMI was statistically significant decrease in group (A) and (B) -2.67Kg/m2; vs.-5.02 Kg/m2; while statistically it was significant difference between the two group post treatment P= 0.004.The percentage of change of BMI for group (A) was -6.88%; whereas in group (B) was -12.87%, Table (3), fig. (2).

Table 2: Statistical analysis for body weight (Kg) values between group (A) and group (B) pre- and post-the program

Items		Pre-	Post-	t-value	P-value	% of changes	Sig
Group A N=15	Mean + SD	95.67 ±4.61	90.18± 3.73	13.46	0.0001	-5.74%	S
Group B N=15	Mean + SD	95.87± 4.42	84.00 ±5.45	15.35	0.0001	-12.38%	S
t-value		0.092	3.82				
P-value		0.928	0.0019				
Sig.		NS	S				

SD: Standard deviation, S: Significant, P: Probability, NS: Non-significant

Fig. 1: Mean weight values between pre- and post-treatment within each group



	Items	Group A N=15 median	Group B N=15 median	z-value	P-value	Sig
BMI (Kg/m2)	Pre-	38.80(37.40, 39.80)	39.00(37.30, 40.50)	0.547	0.643	NS
	Post-	36.13(35.37, 37.91)	33.98(31.64, 35.33)	3.462	0.004	S
z-value		16.52	15.89			
P-value		0.0001	0.0001			
% of changes		- 6.88%	-12.87%			
Sig.		S	S			
Percentage Body Fat (%)	Pre-	47.91(46.65, 51.93)	48.96(46,49, 50.41)	0.486	0.706	NS
	Post-	48.26(45.25, 51.63)	40.14(37.85, 41.56)	8.282	0.0001	S
z-value		3.42	20.01			
P-value		0.02	0.0001			
% of changes		-0.73%	-18.01%			
Sig.		NS	S			

Percentage Body Fat (%) was statistically significant decrease after the program in group A -0.35; and group (B) -8.82, while statistically it was significant difference between the two group post treatment P=0.0001. The percentage of change of % body fat for group (A) was -0.73%; whereas, in group (B) was -18.01% .Table (3), fig. (3).

Waist Circumference was statistically significant decrease in group (B) recipients of a program of HIIT exercise combined with low calorie diet (-11.93 cm; P=0.0001).

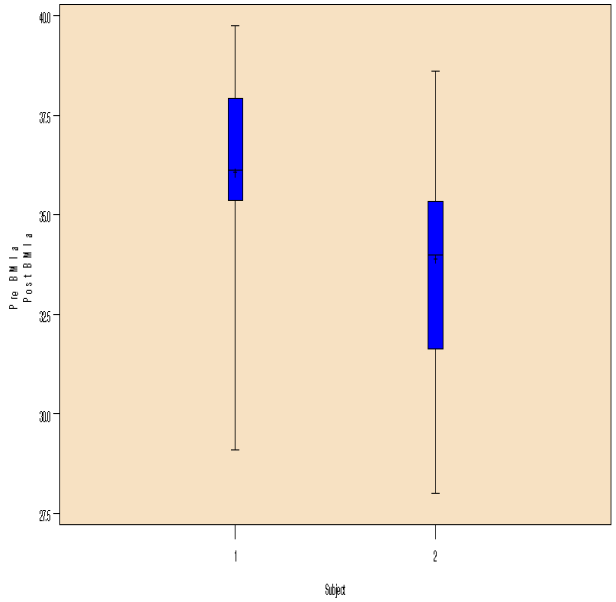
Table 3: Statistical analysis for BMI (Kg/m2) values between pre- and post-treatment within each group

S: Significant, P: Probability, NS: Non-significant

The percent of change was -10.37%.But statistically it was not significant in group (A) recipients of the low-calorie diet only without any exercise program. Table (4), figure (4).

Fig. 2: BMI box plot values between pre- and post-treatment within each group

Pre-treatment - BMI (Kg/m2)



Insulin Resistance was statistically significantly decreased in both group A and B (-0.05; vs. -0.85), while there was significant difference between the two groups P= 0.0133. The percentage of change of IR for group (A) was -1.20%; whereas, in group (B) was -20.28% Table (5), fig. (5).

Post treatment BMI (Kg/m2)

Serum Leptin was statistically significantly decreased in both groups (A) and (B) -1.26 mg/L vs. -9.14 mg/L ,while there was significant difference between the two groups P =0. 0166. The percentage of change of serum leptin for group (A) was -1.09%; whereas, in group (B) was -21.53%. Table (5), fig. (6).

DISCUSSION

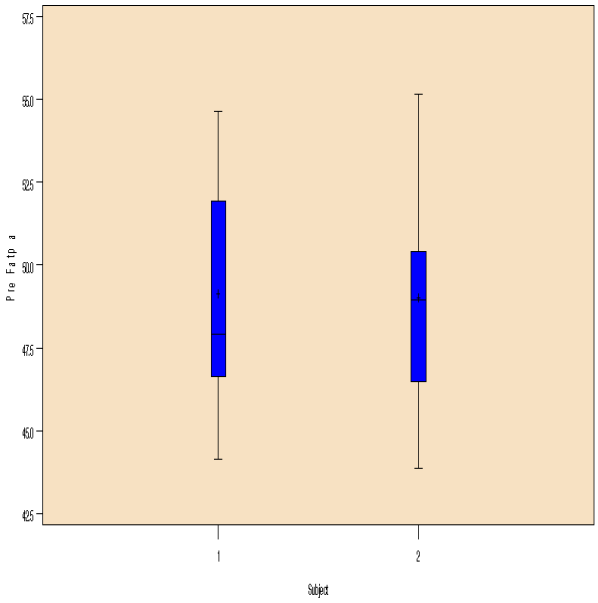
The present study was designed to study the effect of HIIT on insulin resistance and serum leptin (25 minutes HIIT exercise 3 times/week).With the hypothesis that there is no significant effect of HIIT exercise on insulin resistance and serum leptin in obese postmenopausal women. Results showed that statistically significant improvement in both study groups, But this significant improvement was more in group (B) than in group (A) (P<0.05) in insulin resistance (20.28% vs.1.20%),serum leptin level(-21.53%vs.-

1.09%),body wt(-12.31% vs.-5.74%), BMI (-12.87% vs. -6.88%) and percentage of body fat(-18.01% vs.-0.73%.);While there were statistically significant differences (P<0.05) between the two groups. WC in exercise group (B), had the significant improvement (P<0.05) after 12 weeks; but statistically it was not significant in group (A) (P>0.05).

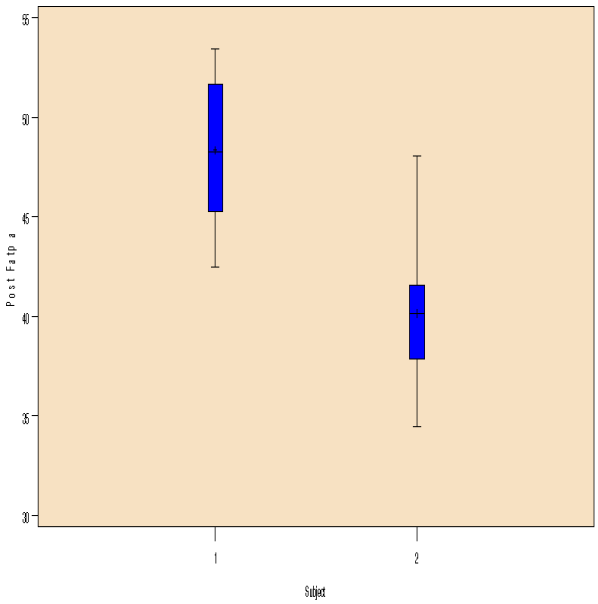
In agreement with the present study results of Shahram et al. [15]. Studied the impact of intermittent exercise on serum concentration of leptin and insulin resistance in overweight female students. That study included 30 female overweight volunteer students (BMI ≥ 26) divided into two groups: intermittent training group and control group.

Fig. 3: Percentage body fat box plot values between pre- and post-treatment within each group

Pre-treatment - Percentage body fat (%)



Post-treatment - Percentage body fat (%)

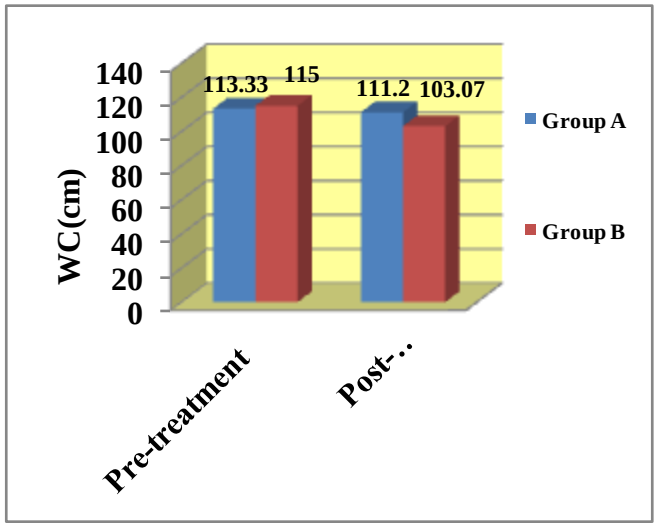


Training groups exercised for 12 weeks, three sessions a week with definite intensity and distance. Leptin, insulin, glucose, body weight, fat percentage and BMI were measured .weight and body composition was measured using a body composition monitor (OMRON, Finland).A session of training program included a ten-minute warm-up with and stretching exercises. The subjects then continued with running a distance of 1600 to 3200 meters with the intensity of 80 to 95% of their maximum heart rate reserve with the work to rest ratio of one to three.

Table 4: Statistical analysis of mean differences for waist circumference (cm) values between group (A) and group (B) pre- and post-the program

Items		Pre-	Post-	t-value	P-value	% of changes	Sig
Group A	Mean + SD	113.33 ±7.63	111.2 ± 4.21	1.91	0.075	----	NS
Group B	Mean + SD	115.00 ±4.76	103.07 ±6.21	13.08	0.0001	-10.37 %	S
t-value		0.669	3.750				
P-value		0.514	0.002				
Sig.		NS	S				

Fig. 4: WC between group (A) and group (B) Pre- and Post-program



They cooled off for five minutes. They confirmed that after 12 weeks of Intermittent training leptin level (11.70 ± 0.27 vs. 9.31 ± 0.45. p= 0.000) and insulin resistance index (2.62 ± 0.12 vs. 1.28 ± 0.09 .p= 0.000) showed a significant decrease. Also the difference of measurements of variables of the two groups including Body weight (p= 0.02), Body mass index (p= 0.03),

Body fat percentage (p= 0.006) and Insulin (p= 0.006) was significant decrease (0.05≥ P) .Similar results are found in the present study which showed that the significant decrease in leptin levels and insulin resistance after 12 weeks of HIIT exercise. But the examination of body composition in that study was by composition monitor (OMRON, Finland) and that study was done without program of low- calorie diet.

Racil et al. [16] approved that both training groups (high-intensity interval training (HIIT, n = 11), and moderate intensity

	Items	Group A N=15 Mean +SD	Group B N=15 Mean + SD	t-value	P-value	Sig
Insulin Resistance	Pre-	4.18±0.089	4.19 ±1.05	0.018	0.985	NS
	Post-	4.13 ±0.89	3.34 ±0.821	2.833	0.0133	S
t-value		2.82	**4.79**			
P-value		0.014	**0.0003**			
% of changes		-1.20%	**-20.28%**			
Sig.		S	S			
Serum Leptin mg/L	Pre-	42.37 ±12.06	42.44 ±11.16	0.022	0.982	NS
	Post-	41.91 ±11.97	33.30 ±4.92	2.721	0.0166	S
t-value		4.19	3.067			
P-value		0.0009	0.008			
% of changes		-1.09%	-21.53%			
Sig.		S	S			

interval training (MIIT, n = 11) had showed statistically decreased in body mass, BMI-Z-score, and percentage body fat (% BF). Waist circumference decreased only in HIIT group (P\0.05).also Significant decrease in the usual index of insulin resistance (HOMA-IR) occurred in HIIT and MIIT groups (-29.2 ± 5.3 and -18.4 ± 8.6 %, respectively; P\0.01).

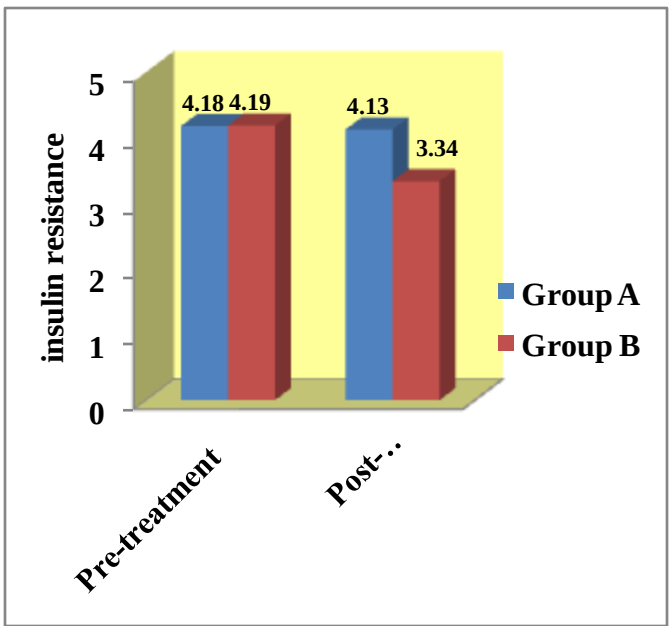
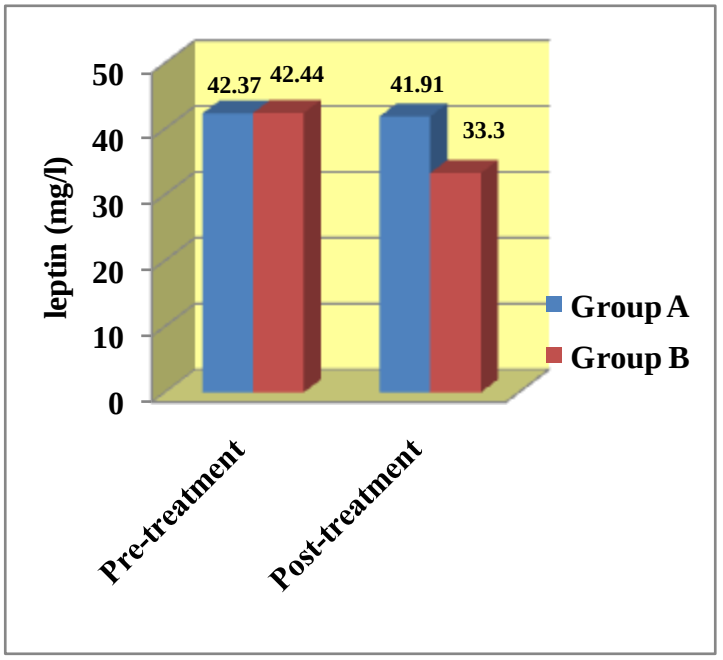


Table (5): Statistical analysis of mean differences for insulin resistance and serum leptin (mg/l) values between group (A) and group (B) pre- and post-the program

SD: Standard Deviation, S: Significant, P: probability, NS: Non-significant

Fig. 5:.Mean insulin resistance values between group (A) and group (B) pre- and post-program

Fig. 6: Mean serum leptin values between pre- and post-treatment within each group



Similar results are found in the present study which showed that improvements of body composition associated with cardiovascular adaptations, decreased HOMA-IR in obese women. HIIT seems to be a better approach for the prevention and management of the postmenopausal obesity and the metabolic, cardiovascular, and hormonal disorders observed in this population than does caloric restriction alone .But that study was examine the effect of exercise on three groups with progressive physical activity in adolescent female.

Malayeri et al. [17].examined 18 overweight men (age 20±2.29) and(BMI 29.2±2.7) to study the effect of 10 weeks of high- intensity interval training on insulin resistance, body weight, body fat percentage, waist hip ratio and body mass index. Participants were randomly assigned to two experimental groups (n = 9) and control (n = 9) Groups. The experimental group received a10-week exercise training, three times a week, each session for duration 35 minutes, with intensity 80 to 90% target heart rate. In accordance to principle of overload, 80% in

the first three weeks, 85% for second three weeks and last four weeks of the 90% target heart rate. Blood samples were taken before and after 10 weeks of training. Control group did not participate in any exercise program.

Malayeri et al. [17] concluded that high- intensity interval training after 10 weeks showed significantly decreased insulin resistance index (p=0.008), body weight, body fat percentage (p=0.001), body mass index (p=0.001) in the experimental group compared with the control group (P <0/05) Similar results are found in the present study that HIIT exercise had favorably affected BMI, body weight, body fat percentage Insulin resistance, waist circumference and, WHR. But that study examined the effect of HIIT without diet control and was on overweight males. And short duration (10 week) less participant (18).

Trapp et al. [18] determine the effects of a 15-week high-intensity intermittent exercise (HIIE) program on subcutaneous and trunk fat and insulin resistance of young women. Subjects were randomly assigned to one of the three groups: HIIE, steady-state exercise or control .HIIE and SSE groups underwent a 15-week exercise intervention. Subjects: Forty-five women with a mean BMI of 23.2±2.0 and age of 20.2±2.0 years conducted a HIIE program in young women for 15 weeks with three 20 min sessions per week. HIIE consisted of an 8 s sprint followed by 12 s of low intensity cycling, repeated for 20min. Another group of women carried out an aerobic cycling protocol for 40min each session. Results showed that women in the HIIE group lost 2.5 kg of subcutaneous fat, whereas no change occurred with steady state aerobic exercise. Fat loss accruing through 15 weeks of HIIE was attained with 50% less exercise time commitment and similar energy expenditure to that of steady-state exercise. Trapp et al., 2008 confirmed that the HIIE group had a significant reduction in total body mass (TBM), fat mass (FM), trunk fat and fasting plasma insulin levels. Decreases in leptin concentrations were negatively correlated with increases in VO2peak .Similar results are found in the present study that HIIT exercise had favorably affected body weight, body fat percentage, insulin levels and decreases in leptin concentrations. But that study examined the effect of HIIT on three groups without control diet induce weight loss and was on duration (15 week).

Another study by Kordi et al. [19] matches with present study results That study concluded that high-intensity interval training is an appropriate method to reduce body fat and improve anthropometric indices in sedentary young women. Similar results are found in the present study which shoAAwed improvement in body fat, BMI, and insulin resistance with physical activity. But that study examined effect of physical activity without diet program on (22) females sedentary female students.

Similarly, Mason et al. [20] approvedthat a significant improvement in HOMA-IR was detected in the diet (−24%, p<0.001) and exercise+ diet (−26%, p<0.001) groups, but not in the exercise (−9%, p=0.22) group compared to controls (−2%); these effects were similar in middle-aged (50–60 years) and older women (aged 60–75 years). Among those with impaired fasting glucose (5.6–6.9 mmol/L) at baseline (n=143;33%), the odds (95% CI) of regressing to normal fasting glucose after adjusting for weight loss and baseline levels were: 2.5 (0.8, 8.4), 2.76 (0.8, 10.0), and 3.1 (1.0, 9.9) in the diet, exercise +diet, and exercise group, respectively, compared to controls. Similar results are found in the present study which showed that improvements HOMA-IR in obese postmenopausal women exercise in addition to diet seems to be a better approach for management of the postmenopausal obesity and improve insulin sensitivity .But that study was (439 participants) for longer duration and progressive physical activity .

On the other hand, Heydari et al. [21] was to the effect of a 12-week high intensity intermittent exercise (HIIE) intervention on total body, visceral fat mass, levels of insulin, and HOMA-IR of young overweight males. Participants were randomly assigned to either exercise or control group. The intervention group received HIIE three times per week, 20 min per session, for 12 weeks they confirmed that, No significant change (P > 0.05) occurred in levels of insulin, HOMA-IR, and blood lipids. These different results Due to lack of variation in body weight and negative energy balance maybe relate to lack of variations in insulin and calorie intake following exercise training.

Kishali et al. [22] reported no significant variation in the levels of leptin following 8 weeks\ of aerobic training at 50-70% of maximum heart rate. The training did not induce any changes in the subjects' weight and BMI. They contended that other factors may contribute to leptin variations rather than BMI. These different results due to the serum leptin levels to change there may be a need for high intensity and volume of training, as leptin is a highly stable index.

It was concluded that both insulin and leptin regulate food intake. There is a relationship between the levels of insulin and leptin with body weight. Low-volume HIT was a potent stimulus to increase mitochondrial capacity, as evidenced by increased enzyme activity of citrate synthase (CS) as well as elevated protein content of several subunits from complexes in the electron transport chain. It is possible that the rapid increase in skeletal muscle mitochondrial content following low-volume HIT may be a contributing factor related to reduced insulin resistance and improved glycemic control. However, the notion that mitochondrial deficiency mediates insulin resistance has been questioned recentlyHolloszy, 2009[23], indicating that other adaptations in skeletal muscle may be more important. The training-induced increase in GLUT4 protein content likely plays a role in improving glucose regulation. Studies in rodents indicate that the exercise-induced increase in GLUT4 protein is directly related to the increase in muscle glucose uptake at any

given insulin concentration Ren et al., 1994[24]. HIIT exercises effectively improve insulin sensitivity and may be beneficial for glucose-lipid metabolism. Regular exercise may be therapeutic in reducing fat deposition by increasing energy expenditure, improvement in skeletal lipid oxidation, reduction in total and abdominal adiposity.

CONCLUSION

The present study showed clear benefits of HIIT which produced statistically significant improvement in serum leptin concentrations and insulin resistance with greatest reduction occurred in body weight, BMI, percent body fat, and waist circumference.

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الملخص العربي

استجابة هرمون الليبتين في الدم و مقاومة الأنسولين للتمرينات المتقطعه عاليه الشدةفي السيدات البدينات بعد سن اليأس

هدف البحث: - تحديد تأثير ممارسة التمرينات المتقطعه عاليه الشدة على مقاومة الأنسولين و اللبتين في الدم . ، وقد تمت هذه الدراسة على مدار اثنى عشرة أسبوع لقياس نسبة مقاومة الأنسولين و اللبتين في الدم في السيدات اللذين يعانون من السمنة المفرطة بعد سن اليأس. **تصميم البحث:** - برنامج علاجى باستخدام التمرينات المتقطعة عالية الشدة على نسبة هرمون الليبتين فى الدم ونسبة مقاومة الإنسولين. **مقاييس النتائج الرئيسية:** - قياس التغيرات الكيميائية في مقاومة الانسولين، و هرمون الليبتين في الدم ، النسبه المئوية للدهون في الجسم ، وزن الجسم ،ثم قياس مؤشر كتلة الجسم ومحيط الوسط. **طريقة البحث:** - أجرى البحث على ثلاثين سيده من يعانون من السمنة المفرطة تم اخيارهم من المعهد القومي للتغذية جامعة القاهره حيث تتراوح أعمارهن ما بين خمسين إلى ستين عاما و مؤشر كتلة الجسم اكثر من30وقد تمت هذه الدراسة على مدار اثنى عشرة أسبوع لقياس نسبة مقاومة الأنسولين و اللبتين في الدم قسمن خلالهم السيدات إلى مجموعتين كل مجموعة تكونت من خمسه عشر سيده. المجموعة الأولى (المجموعه الضابطه) التى تلقت نظام غذائي قليل السعرات ولكن بدون أى نوع من التمرينات والمجموعة الثانية (مجموعة الدراسه) التى تلقت التمرينات المتقطعه عاليه الشدة (25 دقيقه 3 مرات أسبوعيا) مع نظام غذائي قليل السعرات وقد تم تسجيل التغيرات الكيميائية في مقاومة الانسولين، و هرمون الليبتين في الدم ، النسبه المئوية للدهون في الجسم ، وزن الجسم ،ثم قياس مؤشر كتلة الجسم ومحيط الوسط.**النتائج:** - أظهرت النتائج انخفاضاً ملحوظاً ذات دلاله احصائيه فى مقاييس نسبة اللبتين في الدم في المجموعة (أ) و المجموعة (ب). ايضا هناك فرق كبير بين المجموعتين و أيضا مقاومة الأنسولين انخفضت بشكل ملحوظ في مجموعة ألاولي و المجموعة الثانية و ايضا هناك فروق ذات دلالة إحصائية كبيرة بين المجموعتين. أيضا النسبة المؤية للدهون في الجسم ووزن الجسم ومؤشر كتلة الجسم انخفضت بشكل ملحوظ في المجموعة (ا) و مجموعة (ب) وبينما كان هناك فروق ذات دلالة إحصائية بين المجموعتين وعلاوة على ذلك ايضا انخفاض كبير في محيط الوسط ولكن لم تلقى المجموعة (ا) انخفاضاً ذات دلاله احصائيه مقارنة بالمجموعه التانية وذلك بعد الأسبوع الثانى عشر.**الخلاصة:**-استنادا إلى البيانات التي تم الحصول عليها في دراستنا، يبدو أن ممارسة التمرينات المتقطعه عاليه الشدة في المدى القصير (تصل إلى اثني عشر أسبوعا) جنبا إلى جنب مع النظام الغذائي الناجم عن فقدان الوزن هو أفضل طريقة لتنظيم هرمون اليبتين وتقليل مقاومة الأنسولين في السيدات اللذين يعانون من السمنة المفرطة بعد سن اليأس.

مفتاح كلمات البحث:- اللبتين- مقاومة الانسولين-السمنة - السيدات -بعد سن اليأس- التمرينات المتقطعه عاليه الشدة.