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Dietary Measures Combined with Physical Activity Versus Acupuncture in Management of Obese Males

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Abstract: Although there are different modalities for management of obesity, there is no definite conclusion on which one is more effective. So, comparing effect of two different protocols; namely dietary measures with physical activity and electrical acupuncture with healthy diet; in obesity management, was done among sample of Egyptian males. Randomized longitudinal prospective study, carried out on 32 males aged 30- 53 years. Blood pressure, anthropometric, body composition, Ultrasonographic and biochemical assessments were done. They classified into 2 groups following different obesity management protocols. Results revealed that in Males who undergo nutritional intervention showed highly significant improvement in most of anthropometric measurements, body composition, visceral fat by US, blood pressure and decreased triglycerides. However, there were highly significant increase in skin fold thickness, peripheral and central adiposity, fasting blood sugar, total cholesterol and LDL. While males who undergo acupuncture intervention showed highly significant improvement in all the anthropometric measurements under study, body composition, visceral fat by US, blood pressure and lipid profile. However, there were highly significant increases in subcutaneous fat by US and fasting blood sugar. In conclusion, in adult males, acupuncture with healthy diet is much more effective than nutritional intervention in improvement of body size and lipid profile.

Key words: Obesity · Visceral Fat · Dietary Measures and Physical Activity · Acupuncture

INTRODUCTION

Obesity itself is considered now as a serious disease [1]. It is associated with many risk factors such as hypertension, diabetes, dyslipidemias and cardiovascular disease [2]. Its prevalence has increased from 11.9% to 33.4% in men when surveying the National Health and Nutrition [3].

The general principles for the management of obesity are to achieve weight loss, to maintain this reduction in body weight following this loss and to finally reduce the risk factors for obesity. There are several different modalities for management of obesity [4]. It would be desirable to control obesity by safe and effective treatment modalities. One of these different methods is diet [5] and other is acupuncture treatments [6].

Balliet and Burke [7] stated that low-energy-density dietary intervention can lead to weight loss and improvements in total cholesterol and low-density lipoprotein cholesterol levels. Others recommended acupuncture as it can provide good therapeutic effects for obesity [6, 8, 9]. Lee *et al*. [8] found that acupuncture management reduce body mass, decrease fatty tissues content and lead to normalization of blood serum lipids.

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While Zhou-hong [9] reported that after acupuncture treatment, the body weight, waist line, the serum total cholesterol (TC), the fasting triglyceride (TG) and low-density lipoprotein (LDL) were changed.

So, the aim of this work was to analyze and compare the effect of two different protocols; namely dietary measures and physical activity in one side and electrical acupuncture combined with healthy diet on the other side; in management of obesity; especially visceral obesity; among a sample of Egyptian adult males.

MATERIALS AND METHODS

This study was a randomized longitudinal prospective one, carried out from October 2011 to December 2012. Seventy five obese adult males with total body obesity [body mass index (BMI) greater than or equal to 30 kg/m^2], aged from 30 up to 53 years (with mean age 45.8 ± 6.5 years) were included; at the start of the study; from the employee of the "National research Centre". Any person was excluded if he presented with a contra-indication to effort, a major orthopedic problem, severe psychiatric disorders, a personal history of heart disease and/or a recent myocardial infarction, not consenting to the protocol and those who had not diligently followed twelve consecutive weeks of any of the two used protocols. Participants were informed about the purpose of the study and their permission in the form of written consent was obtained. The protocol was approved by the "Ethical Committee" of the "National Research Centre". The agreement reference number is 10/119.

From them, only 32 males were included in the study analysis because the remaining had not correctly completed the initial follow up programme (due to a lack of diligence, a health problem …….etc). All the participant males underwent blood pressure, anthropometric, body composition, ultrasonographic and biochemical assessments.

Blood pressure was measured with a standard mercury sphygmanometer after the subjects had rested at least for 10 minutes.

Anthropometric evaluation was performed. The height, weight, waist, hip and neck circumferences were measured following the recommendations of the International Biological Program [10]. The height was measured to the nearest 0.1 cm using a Holtain portable anthropometer and the weight was determined to the nearest 0.01 kg using a Seca Scale Balance, with the subject wearing minimal clothing and no shoes. Waist circumference was measured at the level of the umbilicus with the subject standing and breathing normally, hip circumference at the level of the iliac crest, neck circumference (NC) in the midway of the neck (between mid-cervical spine and mid-anterior neck), using non-stretchable plastic tape to the nearest 0.1 cm. In men with a laryngeal prominence (Adam's apple), NC was measured just below the prominence. All circumferences were taken with the subjects standing upright, with the face directed forward and shoulders relaxed. The following adiposity indices were calculated:

- Body mass index (BMI): as weight (in kilograms) divided by height (in meters squared).
- Waist/ Hip ratio (cm/ cm).

Body Composition: Each participant was also examined by the TANITA Body Composition Analyzer. As specified by the manufacturer, the unit was calibrated before testing. The participant stood on the foot board of the device, while he was holding the 2 handles carefully; each by one hand at the same time. By using his sex, age, weight and height approximated to the nearest unit, the percentage body fat (Fat %: an estimate of the fraction of the total body mass that is adipose tissue), fat mass (FM: an estimate of the fraction of the total body weight that is adipose tissue) and fat free mass (FFM: an estimate of the fraction of the total body weight that is not adipose tissue) were derived.

Ultrasound (US) examination to each participants was done to evaluate visceral fat at the umbilicus (USVF) in cm. Intra-abdominal fat thickness measurement was obtained using the " Medison Sonoace X8" Ultrasonographic equipment. For the visceral fat, a 3.5 MHz transducer was transversely positioned 1 cm above the umbilical scar on the abdominal midline, without exerting any pressure over the abdomen. The visceral fat thickness attempted corresponding to the measurement in centimeters between the internal surface of the abdominal rectus muscle and the posterior aortic wall in the abdominal midline, during expiration.

Biochemical Assessment: Early morning forearm venous blood samples (10 ml) were obtained from each males; before breakfast; for biochemical screening tests of plasma glucose and lipid profile; after 12-hours overnight fasting. Professional staff performed venipuncture. The blood samples were left to clot; sera were separated by centrifugation for 10 minutes at 5000 rpm then stored at -80 ºC until assays. Fasting glucose level was measured

using a quantitative enzymatic colorimetric commercial kit provided by STANBIO according to the glucose oxidase method. Serum concentrations of total cholesterol (TC), triglycerides (TG) and high-density lipoprotein-cholesterol (HDL-C) were measured using commercially available kits provided by STANBIO Laboratory Inc. (1261 North 18 Res. J. Medicine and Med. Sci., 8(1): 16-22, 2013. Main Street Boerne Texas 78006 USA). LDL-C was calculated according to an equation developed by *Friedewald et al.* [11] as follows:

- LDL-C= Total cholesterol –Triglycerides/5+ HDL-C.

Then, the 32 adult males; who completed the programme; were classified into 2 groups to undergo different obesity management protocols: 18 males undergo dietary modification plan with exercise programme; and 14 males received acupuncture therapy and healthy diet.

Dietary Modification Plan (18 Males): It was done under the supervision of a dietary consultant and was followed to assess the impact of a dietary behavior modification intervention to reach the ideal weight for age and sex. Nutritional education and behavior modification were performed first. Then; performing adequate exercise (in form of walking for at least 150 min / week; each not less than 30 min) and eating a healthy low caloric diet through participation evaluation, designing the program and patient education, specific programs for each age group; and daily classes for health.

The Prescribed Low Calorie Diet: The interview-based food survey was performed for all subjects by dieticians to specify previous food habits and possible anomalies in dietary behavior. The prescribed low calorie diet was balanced, with 15% as protein, 30 to 35% as fat and 50 to 55% as carbohydrate, on average, in order to provide about 1000 calories daily for two months for whole participants in this study.

Three different low caloric diets were designed to be followed by the males; each was followed for about 3 months. The main daily food items that were prescribed were: boiled egg, low fat milk and dairy products, broad bean dip (Foul me dams), steamed and fresh vegetables, fruits, whole grains product, low fat meat, chicken and fish which were either boiled or roasted. Green tea, coffee, cinnamon and natural fresh fruit were recommended as beverages. All sugar sweets and carbonate beverages were prohibited.

It was checked that food was eaten as three daily meals and emphasized the need to have a substantial breakfast. They underwent an identical dietary monitoring programme, with an initial consultation, a check- up in the middle of the programme and another during the final sessions by a dietician who was blinded to the type of the programme that the subject had been following.

Exercise Programme: as performing adequate exercise (in form of walking for at least 150 min / week each not less than 30 min) with light aerobic exercises for 5-10 min daily.

Acupuncture: 14 males received 12 acupuncture sessions (once/week) using filiform disposable acupuncture needles with electrical stimulation. The acupuncture points were selected according to the theory of traditional Chinese medicine and the guidelines of WHO [12]. The total number of the points selected for obesity was 27 points: 3 auricular and 24 body acupuncture points each session.

Statistical Analysis: Data were analyzed using the SPSS computer program, version 16.0. Means and standard deviation (SD) of all studied parameters were calculated separately. Paired dependant t-tests were performed to compare between the anthropometric measurements, body composition, blood pressure and biochemical assessment before and after intervention. Student? s t-test was used to compare between the two types of intervention before and after their use. *P* value of 0.05 was considered significant.

RESULTS

In All the Article Use Males Group Not Males Group: The males group who undergo nutritional intervention showed highly significant improvement in the anthropometric measurements (decrease in body weight, BMI, WC, WHR and subscapular SF), body composition (decrease in fat% and Fat mass), visceral fat by US (decreased), blood pressure (both systolic and diastolic) and decreased triglycerides. However, after nutritional intervention; there were highly significant increase in skin fold thickness at triceps, suprailiac and abdominal sites, peripheral and central adiposity, fasting blood sugar, total cholesterol and LDL (Table1). While the males group who undergo acupuncture intervention showed highly significant improvement in all the anthropometric measurements under study (decrease in body weight, BMI, WC, hip C., WHR, NC and skin fold thickness at

Table 1: Comparison between the anthropometry, body composition and laboratory investigations before and after nutritional intervention using paired t-test

	Before N=18		After N=18			
	Mean	±SD	Mean	±SD	t	P
Weight (Kg)	78.63	9.86	71.73	5.90	6.85	0.000
BMI (Kg/m²)	28.23	4.12	26.00	2.70	6.67	0.000
Waist C (cm)	101.33	6.74	90.67	4.14	14.23	0.000
Hip C (cm)	103.67	10.37	100.67	2.95	1.70	0.107
Waist/Hip ratio (cm/cm)	0.98	0.06	0.90	0.02	5.27	0.000
Neck C (cm)	39.67	1.28	39.67	2.43	0.00	1.000
Skin fold (mm):						
Triceps	13.23	4.42	21.33	9.29	- 6.99	0.000
Biceps	14.50	7.78	15.00	11.67	- 0.52	0.607
Subscapular	25.37	3.48	22.33	7.94	2.88	0.010
Suprailiac	17.47	9.42	18.67	9.06	-4.62	0.000
Abdominal	20.83	14.86	26.83	7.52	-3.16	0.006
Peripheral Adiposity (mm)	27.73	12.18	36.33	20.65	-4.30	0.000
Central Adiposity (mm)	63.67	26.97	67.83	22.57	- 3.67	0.002
Body composition:						
Fat %	30.60	4.00	23.97	2.46	10.15	0.000
Fat mass (kg)	24.07	5.77	17.20	2.86	9.37	0.000
Fat Free mass (Kg)	53.43	3.11	54.43	3.30	-1.98	0.064
TBW	39.10	2.27	39.87	2.43	-2.09	0.051
BMR (Kcl)	1582.33	102.05	1584.33	96.24	-0.15	0.881
US at umbilicus:						
Subcutaneous fat (cm)	1.59	0.44	1.83	0.35	-0.18	0.856
Visceral Fat(cm)	6.45	1.89	4.11	0.62	7.47	0.000
SBP (mmHg)	126.67	4.85	115.00	5.22	3.32	0.007
DBP (mmHg)	86.67	4.85	80.00	0.00	3.32	0.007
Fasting Blood sugar (mg/dl)	99.00	5.51	117.00	106.00	-14.23	0.000
Total Cholesterol (mg/dl)	214.33	21.91	271.67	25.32	-6.60	0.000
Triglycerides (mg/dl)	182.33	52.81	125.67	49.58	6.37	0.000
HDL (mg/dl)	43.00	8.40	41.33	6.53	1.19	0.252
LDL (mg/dl)	135.33	20.65	205.33	24.84	-7.56	0.000

triceps, biceps, subscapular, suprailiac and abdominal sites, peripheral and central adiposity), body composition (decrease in fat% and Fat mass and increases in FFM and TBW),visceral fat by US (decreased), blood pressure (both systolic and diastolic)and lipid profile (decreased triglycrides, total cholesterol and LDL and increased HDL).However, after acupuncture intervention; there were highly significant increase in subcutaneous fat by US and fasting blood sugar (Table 2).

Comparisons Between Groups Before and after Intervention: Before intervention; there were highly significant differences between the 2 groups where the males who were randomly collected to acupuncture intervention had highly significant higher values of some anthropometric measurements (body weight, BMI, hip circumference, neck circumference and triceps skin fold thickness), body composition (FFM, TBW and BMR), subcutaneous fat by US, fasting blood sugar and lipid profile (triglycerides, total cholesterol and LDL) and lower values of HDL. While the males who were selected to nutritional intervention had highly significant higher values of waist/ hip ratio and systolic blood pressure (Table 3). After intervention, the males who undergo acupuncture intervention still had highly significant higher values of some anthropometric measurements (body weight and hip circumference only), body composition (FFM, TBW and BMR), subcutaneous fat by US and triglycerides only. There were no changes in body composition before and after intervention, while the picture was changed in the skin fold thickness and lipid profile. The males who undergo nutritional intervention became had highly significant higher values of skin fold thickness at triceps, suprailiac and abdominal sites,

Table 2: Comparison between the anthropometry, body composition and laboratory investigations before and after Acupuncture using paired t-test

	Before N=18		After N=18			
	Mean	±SD	Mean	±SD	t	P
Weight (Kg)	91.20	5.71	81.35	7.63	19.20	0.000
BMI (Kg/m²)	32.35	4.20	28.90	4.67	27.64	0.000
Waist C (cm)	102.50	4.67	93.00	8.30	9.786	0.000
Hip C (cm)	114.50	6.75	107.50	7.78	25.24	0.000
Waist/Hip ratio (cm/cm)	0.90	0.01	0.86	0.01	4.45	0.001
Neck C (cm)	45.00	1.04	41.00	2.08	4.80	0.000
Skin fold (mm):						
Triceps	21.00	8.30	12.25	4.41	8.41	0.000
Biceps	15.90	9.44	9.00	2.91	3.95	0.002
Subscapular	28.50	10.90	21.50	6.75	6.31	0.000
Suprailiac	23.00	11.42	9.25	1.30	5.09	0.000
Abdominal	29.00	7.26	20.00	4.15	10.82	0.000
Peripheral Adiposity (mm)	36.90	17.75	21.25	7.32	5.61	0.000
Central Adiposity (mm)	80.50	29.58	50.75	12.19	6.40	0.000
Body composition:						
Fat %	29.10	6.02	19.40	9.34	10.93	0.000
Fat mass (kg)	26.90	7.16	16.45	9.08	20.37	0.000
Fat Free mass (Kg)	64.35	1.40	64.90	1.45	-39.67	0.000
TBW	47.10	1.04	47.50	1.04		
BMR (Kcl)	1899.50	20.24	1875.50	14.01	14.42	0.000
US at umbilicus:						
Subcutaneous fat (cm)	2.05	0.26	2.20	0.42	-3.61	0.003
Visceral Fat(cm)	6.20	1.45	3.50	0.11	6.49	0.000
SBP (mmHg)	122.50	2.59	110.00	10.38	6.01	0.000
DBP (mmHg)	85.00	0.00	70.00	10.38	5.41	0.000
Fasting Blood sugar (mg/dl)	107.50	3.63	117.00	106.0	-3.26	0.006
Total Cholesterol (mg/dl)	306.50	3.632	281.00	12.45	10.82	0.000
Triglycerides (mg/dl)	237.50	38.92	206.00	19.72	6.14	0.000
HDL (mg/dl)	33.00	5.19	40.50	2.59	-10.82	0.000
LDL (mg/dl)	235.00	15.57	199.50	14.01	85.33	0.000

Table 3: Comparison between the anthropometry, body composition and laboratory investigations among the 2 groups of before intervention using independent t-test

	Acupuncture group N=14		Nutritional group N=18			
	Mean	±SD	Mean	±SD	T value	P
Age (years)	47.0	5.19	47. 7	3.40	-.439	0.664
Weight (Kg)	91.20	5.71	78.63	9.86	4.241	0.000
Height (cm)	168.50	5.71	167.67	4.63	.456	0.651
BMI (Kg/m²)	32.35	4.20	28.23	4.12	2.771	0.010
Waist C (cm)	102.50	4.67	101.33	6.74	.552	0.585
Hip C (cm)	114.50	6.75	103.67	10.37	3.567	0.001
Waist/Hip ratio (cm/cm)	0.90	0.01	0.98	0.06	-5.605	0.000
Neck C (cm)	45.00	1.04	39.67	1.28	12.649	0.000
Skin fold (mm):						
Triceps	21.00	8.30	13.23	4.42	3.169	0.005
Biceps	15.90	9.44	14.50	7.78	.449	0.657
Subscapular	28.50	10.90	25.37	3.48	1.036	0.317
Suprailiac	23.00	11.42	17.47	9.42	1.503	0.143
Abdominal	29.00	7.26	20.83	14.86	2.039	0.052
Peripheral adiposity (mm)	36.90	17.75	27.73	12.18	1.654	0.112
Central Adiposity (mm)	80.50	29.58	63.67	26.97	1.679	0.103

Table 3: Continued

	Acupuncture group N=14		Nutritional group N=18			
	Mean	±SD	Mean	±SD	T value	P
Body composition:						
Fat %	29.10	6.02	30.60	4.00	-.792	0.436
Fat mass (Kg)	26.90	7.16	24.07	5.77	1.207	0.239
Fat Free mass (Kg)	64.35	1.40	53.43	3.11	13.247	0.000
TBW	47.10	1.04	39.10	2.27	13.260	0.000
BMR (Kcl)	1899.50	20.24	1582.33	102.05	12.864	0.000
US at umbilicus:						
Subcutaneous fat (cm)	2.05	0.26	1.59	0.44	3.652	0.001
Visceral Fat(cm)	6.20	1.45	6.45	1.89	-.404	0.689
SBP (mmHg)	122.50	2.59	126.67	4.85	-3.116	0.004
DBP (mmHg)	85.00	0.00	86.67	4.85	-1.458	0.163
Fasting Blood sugar(mg/dl)	107.50	3.63	99.00	5.51	4.983	0.000
Total Cholesterol(mg/dl)	306.50	3.632	214.33	21.91	17.537	0.000
Triglycerides(mg/dl)	237.50	38.92	182.33	52.81	3.274	0.003
HDL(mg/dl)	33.00	5.19	43.00	8.40	-3.904	0.000
LDL(mg/dl)	235.00	15.57	135.33	20.65	15.020	0.000

Table 4: Comparison between the anthropometry, body composition and laboratory investigations among the 2 groups after intervention using independent t-test

	Acupuncture group N=14		Nutritional group N=18			
	Mean	±SD	Mean	±SD	T value	P
Weight (Kg)	81.35	7.63	71.73	5.90	3.897	0.001
BMI (Kg/m²)	28.90	4.67	26.00	2.70	2.069	0.052
Waist C (cm)	93.00	8.30	90.67	4.14	.962	0.349
Hip C (cm)	107.50	7.78	100.67	2.95	3.116	0.007
Waist/Hip ratio (cm/cm)	0.86	0.01	0.90	0.02	-5.378	0.000
Neck C (cm)	41.00	2.08	39.67	2.43	1.641	0.111
Skin fold (mm):						
Triceps	12.25	4.41	21.33	9.29	-3.652	0.001
Biceps	9.00	2.91	15.00	11.67	-2.099	0.049
Subscapular	21.50	6.75	22.33	7.94	-.314	0.756
Suprailiac	9.25	1.30	18.67	9.06	-4.352	0.000
Abdominal	20.00	4.15	26.83	7.52	-3.268	0.003
Peripheral adiposity (mm)	21.25	7.32	36.33	20.65	-2.875	0.009
Central Adiposity (mm)	50.75	12.19	67.83	22.57	-2.738	0.011
Body composition:						
Fat %	19.40	9.34	23.97	2.46	-1.782	0.096
Fat mass (Kg)	16.45	9.08	17.20	2.86	-.298	0.770
Fat Free mass (Kg)	64.90	1.45	54.43	3.30	12.028	0.00
TBW	47.50	1.04	39.87	2.43	11.996	0.000
BMR (Kcl)	1875.50	14.01	1584.33	96.24	12.665	0.000
US at umbilicus:						
Subcutaneous fat (cm)	2.20	0.42	1.83	0.35	5.188	0.000
Visceral Fat(cm)	3.50	0.11	4.11	0.62	-4.084	0.000
SBP (mmHg)	110.00	10.38	115.00	5.22	-1.510	0.144
DBP (mmHg)	70.00	10.38	80.00	0.00	-3.328	0.003
Fasting Blood sugar(mg/dl)	117.00	106.0	117.00	106.00	-6.130	0.000
Total Cholesterol(mg/dl)	281.00	12.45	271.67	25.32	1.366	0.184
Triglycerides(mg/dl)	206.00	19.72	125.67	49.58	6.267	0.000
HDL(mg/dl)	40.50	2.59	41.33	6.53	-0.494	0.626
LDL(mg/dl)	199.50	14.01	205.33	24.84	-0.785	0.439

peripheral and central adiposity and diastolic blood pressure. Also the differences between the 2 groups in lipid profile became insignificant except in triglycerides (Table 4). These augment the effect of acupuncture intervention on lipid profile and subcutaneous fat distribution

DISCUSSION

The current research revealed meaningful differences and improvements occurred for anthropometry, body composition, visceral fat, blood pressure and lipid profile. However, the present study revealed that acupuncture and healthy diet in males had the upper hand than nutritional intervention as obesity management protocol. Those who received acupuncture and healthy diet protocol had highly significant improvement in all the anthropometric measurements under study, body composition, visceral fat by US, blood pressure and lipid profile. While those who undergo nutritional intervention with exercise programme, had no improvement in hip and neck circumferences, skin fold thickness at triceps, suprailiac and abdominal sites, peripheral and central adiposity, fasting blood sugar, total cholesterol, HDL-c and LDL-c.

In agreement with Soong [13] who found that waist and hip circumferences and lipid metabolism could be regulated by acupuncture. Liu [14], stated that regulation of body mass index was reported in obese subjects received acupuncture therapy. Moreover, Hsu *et al.* [15] found that there is a higher efficiency of acupuncture than low caloric diet and exercise in lowering of BMI and the anthropometric parameters and decrease the appetite in subjects with simple obesity.

It is thought that acupuncture exerts its effects on weight loss through different mechanisms. In terms of traditional medicine, it is believed that acupuncture alters levels of central nervous system by stimulating peripheral nerves at acupoints. Signals are then carried by stimulated nerve resulting in changes in satiety and mood [6]. Acupuncture appears to be able to improve mood by increasing the release of neurotransmitters [16] and suppress appetite by the serotonin and endorphin-induced decreases in stress and depression [17]. On the other hand, it also increases the metabolic rate of the body and aids in burning more calories. Acupuncture stimulates the release of hormones called endorphins that help to reduce the body fat. Whereas, this effect was not seen by exercise and diet [18]. Richards and Marley [19] explained this, as acupuncture stimulates the auricular branch of vagus nerve and raises serotonin levels, both of which have been shown to increase tone in the smooth muscles of the stomach, thus suppressing the appetite which leads to weight loss in overweight patients. Waist circumference is related to the subcutaneous fat tissue of the abdomen and higher effects of body acupuncture in lipolitic activity and enhancing lipid metabolisms could be attributed to the direct effects of body acupuncture in redistribution, lyses of fat tissue and reducing waist circumferences [15]. Shiraishi *et al*. [20] stated that acupuncture stimulation clearly modulates feeding-related hypothalamic neuronal activity of experimental (both hypothalamic and dietary) obese rats. In addition, it has been shown that application of electroacupuncture at Zusanli (ST-36) and Neiting (ST-44) of the rat caused the increase in the electrical activity of ventral-medical hypothalamus in the obese rat, leading to activation of the satiety center [21].

Regarding modalities for treatment of obesity in this work, acupuncture therapy also, recorded highly significant difference over dietary intervention in its effect on visceral adiposity and fat distribution in form of reduced peripheral, central and abdominal subcutaneous adipose tissue volume. Hsu *et al*. [15], explained this by that acupuncture stimulation reduced body weight, waist and hip circumferences. Under the premise that waist circumference is related to the subcutaneous fat tissue of the abdomen, abdominal acupuncture might help redistribute or lyses abdominal fat tissue directly and also other body adipose tissue [15]. Concerning visceral adiposity, Zhang *et al*. [22] was demonstrating that acupuncture therapy significantly reduces BMI and abdominal adipose tissue by reducing abdominal visceral fat content without significant changes in body weight, waist circumference, hip circumference, WHR, abdominal subcutaneous adipose tissue. Thus, the use of acupuncture therapy to selectively target a reduction in abdominal visceral fat content should become more important and more popular in the future. In contrast, Nourshahi *et al*. [23], concluded that acupuncture combined with diet and exercise does not generate larger reductions in fat mass than diet and exercise alone.

Obesity is associated with increasing prevalence of several other conditions such as hypertension. Current blood pressure results (SBP and DBP) showed a significant decrease in both groups after intervention and acupuncture group had significant effect on diastolic blood pressure over nutritional intervention group.

Lee *et al*. [8]; in their study concerning management of blood pressure; found that acupuncture may lower high BP but is inconclusive and that more rigorous trials are warranted.

Di Buono and his colleagues [24], stated that improved lipid profile as a result of weight reduction was approved. They reported that energy restriction resulting in even modest weight loss suppresses endogenous cholesterol synthesis which leads to a decline in circulating lipid concentrations and increased insulin sensitivity that contributes in improving lipoprotein profile after treatment of obesity. Current results showed that nutritional intervention group recorded negative effect on total cholesterol, LDL and positive significant effect on triglycerides, while acupuncture group had significant positive effect on all lipid profile. Both groups had significant negative effect on fasting glucose. Chu *et al*. [25], in accordance with current results, found that acupuncture reduces triglycerides and total cholesterol levels in overweight and obese subjects, as acupuncture has a good regulatory effect on lipid metabolism and plasma cycling adenosine monophosphate(cAMP); that is involved in the activation of phosphorylase helping glycogenolysis and on lipase enzyme helping lipolysis. They attributed the effect of acupuncture to its beneficial effect on hypothalamus-pituitary axis. Cabioglu and Ergene, 2006 [26] stated that acupuncture can reduce the body weight by 4.5%, with a parallel reduction in the total cholesterol, triglyceride and LDL- cholesterol by increasing the beta-endorphin level which stimulates lipolysis.

Increased level of HDL-c as a result of either management protocols agreed with Bounds *et al*. [27] who reported an increase in HDL-c (10.7%) and a concomitant fall in triglyceride (-25%) and total cholesterol (-3.5%) as a result of dietary intervention. Grandjean *et al*. [28] suggested that; similar in hyper-and normo-cholesterolemic men; this may be mediated; at least in part; by an increase in lipoprotein lipase activity. Moreover, Li and Wang [29] have reported significant changes in total cholesterol and LDL-c during acupuncture therapy when compared with control subjects. In other study, Cabioglu and Ergene [30] reported that a significant decrease of triglyceride, total cholesterol, LDL-C but no changes in HDL-C in acupuncture group when compared with controls. They suggested that these changes in lipid metabolism may be caused by increase in the serum beta endorphin levels

Similar pattern of changes in triglyceride, total-cholesterol, LDL-C and HDL-C changed has been reported as present study following acupuncture [14], however, other studies did not find any changes for HDL-C [30].

Conclusion: In adult males, acupuncture with healthy diet is much more effective than nutritional intervention in improvement of body size and lipid profile. Acupuncture therapy is safe and effective methods for simple obesity.

Conflict of Interest: The authors declare that there are no financial and personal relationships with other people or organizations that could inappropriately influence (bias) the present work.

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