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RESEARCH ARTICLE

EFFECT OF ELECTRICAL STIMULATION ON ACUPUNCTURE POINTS ON LIPID PROFILE IN OBESE PREMENOPAUSAL WOMEN

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ABSTRACT

The purpose of this study was to determine the effect of electrical stimulation on acupuncture point on lipid profile in obese pre-menopausal women. Fourty pre-menopausal women diagnosed with hyperlipidemia, were participated in this study. They were selected from outpatient clinic of Om El-Masreen General Hospital. Their age ranged from 40-45 years old, their body mass index (BMI) ranged from 30-35 kg/m^2. All participants were free from Diabetes mellitus, hypertension, any cancer diseases, pacemaker and Hyperthyroidism. All women were randomly divided into two groups equal in number, study group (A) and control group (B). **Study group (A):** this group was consisted of 20 obese pre-menopausal women. Each woman in this group received electrical stimulation on acupuncture points (ST-36, SP-6 and Cv-12) for 20 minutes, 3 times per week for 3 months, in addition to nutritional recommendation**. Control group (B):** this group was consisted of 20 obese pre-menopausal women who received nutritional recommendations only for 3 months. All participants in both groups (A&B) were evaluated before and after the end of the treatment program. Assessment of total cholesterol (TC), triglyceride (TG), low density lipoprotein cholesterol (LDL-C) and high density lipoprotein cholesterol (HDL-C) were measured for both group (A&B) before and after 3 months of treatment. The result of this study showed that, there is a significant decrease in total cholesterol, triglyceride and low density lipoprotein cholesterol and a significant increase in high density lipoprotein cholesterol after treatment in study group who treated by electrical stimulation on acupuncture points in addition to nutritional recommendations compared to control group (B) who treated with nutritional recommendations only. This means that using electrical stimulation on acupuncture points in addition to nutritional recommendations were better than using nutritional recommendations only in improving lipid profile.

INTRODUCTION

Pre-menopause is the period of time prior to the cessation of menses, it is not clearly understood and frequently overlooked or undertreated. Irregular menstrual cycles have been the defining characteristic to differentiate pre-menopause or menopause period (Mesler, 2003). The average age of menopause is approximately 51 years. The reported duration of pre-menopause may range from 1 to 10 years before menopause, a mean average of 4 to 5 years. Menopausal symptoms include hot flashes, poor sleep, aches and joint pain, urinary symptoms and weight gain (Mesler, 2003). Many women experience weight gain, increases in central adiposity and other changes in body composition around menopause, but the extent to which these changes are specific to levels or changes in reproductive hormones or to other behavioral and disease factors are complex and not clearly identified (Donato *et al.,* 2006).

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Obese women have lower estradiol levels, lower inhibin b levels, and higher FSH levels compared to non-obese women in the earliest stages of the menopausal transition. Also, postmenopausal obese women have higher estradiollevels compared to non-obese women. The associations between obesity and hormones reverse in the transition stages (Ginsberg and Maccallum ,2009). Obesity is characterized by atherogenicdyslipidaemia—that is, elevated levels of low-density lipoprotein cholesterol (LDL-C) and triglycerides and decreased levels of high-density lipoprotein cholesterol (HDL-C) (Ginsberg and Maccallum, 2009). Hyperlipidemia comprises a heterogeneous group of disorders, characterized by high levels in one or more lipids and/or lipoproteins (atherogenic free fatty acids (FA), triglycerides (TG), (hypertriglyceridemia), small dense low-density lipoprotein cholesterol (LDL-C) (hypercholesterolemia), and apolipoprotein (apo) B, and/or low level in anti-atherogenic HDL-C, in the circulation **(**Athyros. *et al.,* 2011 &Durrington, 2003). Adipose tissue may play an important role in the development of atherosclerosis. Adipose tissue fatty acids are in constant interchange with plasma and plasma triacylglycerol.

They are probably the major source of endogenous and exogenous fatty acids for the synthesis of complex lipids (Frayn, 2000). Varying proportions of fatty acids from adipose tissue may be related to atherosclerosis and other diseases and might exert a direct influence on serum lipids that may differ depending on the adipose tissue region. It was suggested that intra-abdominal fat has a higher turnover rate than does subcutaneous fat and therefore the former may have a greater influence on the plasma lipid profile (Frayn, 2000). Acupuncture is a useful and effective way for weight loss and for treatment of obesity. It may have a better effect than other general methods such as exercises. The combination of acupuncture with other methods such as low caloric diet can have a better effect than a single method alone (Wozniak et al.,2003).

It has been reported that acupuncture application is effective in weight loss through its effect in reducing intestinal motility, and metabolism, as well as emotional stress. Increases in neural activity of the ventromedial nuclei of hypothalamus, tone of the smooth muscle of the stomach and levels of the encephalin, beta endorphin, and serotonin in the plasma and brain tissue have been observed with the application of acupuncture (Cabyoglu *et al.,* 2006). acupuncture exerts its effects on weight loss through different mechanisms, such as reducing hunger, affecting lipid and carbohydrate metabolism, affecting activity of glucose-inhibited neurons and modulating feeding behavior (Zhi *et al.,* 2013). Manual acupuncture stimulation produces soreness, fullness and distention. Electro-acupuncture generally produce sting lingandnumbness (Kong *et al.,* 2007). Electrical stimulation of acupuncture points was developed as an alternative to manual acupuncture points. Electrical stimulation has several advantages. It is less painful than manual stimulation, requires less practitioner time directly spent with the patient and provides better analgesia (Zhou *et al.,* 2011).

Purpose of the study: The aim of the study is to evaluate the effect of electrical stimulation of acupuncture points on lipid profile in obese pre-menopausal women.

SUBJECTS AND METHODES

This study was carried out upon forty overweight pre-menopausal women. Patients were selected randomly from outpatient clinic of Omm El- Masreen General Hospital in Giza, on the following criteria:

Inclusion criteria: Forty overweight premenopausal women. Their age ranged from 40-45 years. Their body mass index was ranged from 30- 35 kg/ m^2.

Exclusion criteria: Any participant was excluded if she meets one of the following criteria:

- Diabetic.
- Hypertensive.
- Hyperthyroidism.
- Patients with pacemaker.
- BMI more than 30 kg/ m^2.
- Patients with skin disease or sensory impairment.
- Cancer diseases.

Design of study:

Two group pre-test and post design. They were assigned randomly into two groups equal in number;

- **Group (A):** consisted of twenty women. They received electrical stimulation on acupuncture points in addition to nutritional recommendations.
- **Group (B):** consisted of twenty women. They received nutritional recommendations only.

Assessment of All participant in both groups (A&B) were carried out in the before and after the treatment program (after 3 months) throughout assessment of total cholesterol, triglycerides, LDL-C and HDL-C.

METHODS

For Evaluation

- Detailed medical history was taken from each female before starting the study to confirm that there were not any contraindications that interfere with the study.
- Standard weight and height scale (floor type, RGT-200)
- Body mass index (BMI) = body weight in kilograms/ height in meter squared (Kg/ m^2) was measured for all participants of both group (A&B) before and after treatment.
- Measurement of lipid profile (Total cholesterol, Serum Triglyceride, High density lipoprotein (HDL) and Low density lipoprotein (LDL).

Specimen collection, storage and handling procedures:

The sample volumes required are as follows: total cholesterol and/or triglyceride, 0.5 ml; HDL measured with the direct method, along with total cholesterol, 0.2 ml Serum was stored at -20°C in a non-self defrosting freezer for up to 4 weeks. For longer storage (> 4 weeks) It maintained at -80°C or lower. Total cholesterol, triglyceride and HDL-cholesterol are stable for at least one year at -80°C or lower.

For Treatment: Electrical stimulation of acupuncture pointsof study group(A):

Preparation of the apparatus

- All parts of the TENS device were checked to be present.
- Wire connections were checked, to ensure that every part in its right position.
- Adhesive electrodes were checked to be connected to wires to the TENS device.
- The plug of TENS device inserted into the power output socket after making sure that the power adjusting knobs at the off position.
- The apparatus switched on.

Electrode placement: electrical stimulation applied to acupuncture points. The electrodes were placed on the ST-36 (one finger width lateral to the anterior crest of the tibia, in the tibialis anterior muscle), SP-6(on the medial aspect of the lower leg, 3cun above the medial malleolus, on the posterior border of the medial aspect of the tibia) and Cv-12(on the midline, 4 cun superior to umbilicus).

Preparation of the patient

Electrical stimulation of acupuncture points for group (A):

The purpose of the study was explained for each patient

Consent form was signed from each participant as an agreement to be included in the study. Each patient was advised to relax in supine lying position. The treated points mapped and marked. TENS was applied bilateral on points (ST-36 and SP-6) and applied on point Cv12 at the same time. TENS on acupuncture points was applied 20 min with frequency of 10 Hz and intensity of 5 mA with a discontinuous wave (muscle contraction 7 times with an interval of 8 seconds between contractions). It was repeated three times per a week for 12 weeks for participants of group (A).

Nutritional recommendation of a low caloric diet for both groups (A&B): Each patient of both groups A&B received nutritional recommendation of a low caloric diet ranging from 1200- 1500 Kcal.

Statistical analysis

- Descriptive statistics and t-test were conducted for comparison of the mean age, weight and height between both groups.
- Un paired T test was conducted for comparison of pre and post treatment mean values of BMI, TC, LDL, HDL and TG between both groups (A&B) before and after treatment.
- Paired t test was conducted for comparison between before and after treatment mean values of BMI, TC, LDL, HDL and TG in each group.
- The level of significance for all statistical tests was set at $p < 0.05$.
- All statistical measures were performed through the statistical package for social studies (SPSS) version 19 for windows.

RESULTS

Demographic data of participant of both groups (A&B):

Group A: Twenty overweight premenopausal women were included in this group. Their mean ± SD age, weight and height were 43.13 ± 2 years, 76.53 ± 5.7 kg and 160.93 ± 4.78 cm respectively as shown in table (1).

Group B: Twenty overweight premenopausal women were included in this group. Their mean ± SD age, weight and height were 42.26 ± 2.12 years, 75.33 ± 4.43 kg and 161.33 ± 5.82 cm respectively as shown in table (1). Comparing the general characteristics of the subjects of both groups before treatment revealed that there was no significance difference between both groups in the mean age, weight and height ($p > 0.05$).

Body mass index (BMI) for both groups (A and B) before and after treatment

The mean values of (BMI) for both group (A and B) before treatment:

The mean ± SD BMI pre-treatment of group A was 29.63 ± 0.74 kg/m² and that of group B was 28.96 ± 1.38 kg/m². The mean difference between both groups was 0.67 kg/m². There was no significant difference in the (BMI) between group A and B pre-treatment ($p = 0.11$). (Table 2).

The mean values of (BMI) of group (A) before and after treatment: The mean ± SD BMI pre-treatment of group (A) was 29.63 ± 0.74 kg/m² and that post treatment was 26.19 ± 1.09 kg/m². The mean difference between pre and post treatment was 3.44 kg/m² and the percent of change was 11.6%. There was a significant decrease in the (BMI) of the group A post treatment compared with pre-treatment ($p = 0.0001$) (Table 3, Fig. 14).

The mean values of (BMI) of group (B) before and after treatment: The mean ± SD BMI pre-treatment of group (B) was 28.96 ± 1.38 kg/m² and that post treatment was 27.86 ± 1.35 kg/m². The mean difference between pre and post treatment was 1.1 kg/m² and the percent of change was 3.8%. There was a significant decrease in the (BMI) of the group B post treatment compared with pre-treatment ($p = 0.0001$) (Table 4).

The mean values of (BMI) of both groups (A and B) after treatment: The mean ± SD BMI post treatment of group (A) was 26.19 ± 1.09 kg/m² and that of group B was 27.86 ± 1.35 kg/m². The mean difference between both groups was -1.67 kg/m². There was a significant decrease in the (BMI) of group A compared with that of group (B) post treatment ($p = 0.001$) (Table 5).

Low density lipoprotein (LDL) for both groups (A and B) before and after treatment

The mean values of (LDL) of both groups (A and B) before treatment: The mean ± SD LDL pre-treatment of group (A) was 132.28 ± 7.92 mg/dl and that of group (B) was 134.82 ± 8.94 mg/dl. The mean difference between both groups was -2.54 mg/dl. There was no significant difference in the (LDL) between group (A and B) pre-treatment ($p = 0.41$) (Table 6).

The mean values of (LDL) of group (A) before and after treatment: The mean ± SD LDL pre-treatment of group (A) was 132.28 ± 7.92 mg/dl and that post treatment was 117.14 ± 9.44 mg/dl. The mean difference between pre and post treatment was 15.14 mg/dl and the percent of change was 11.44%. There was a significant decrease in the (LDL) of the group (A) post treatment compared with pre-treatment ($p = 0.0001$) (Table 7).

The mean values of (LDL) of group (B) before and after treatment: The mean ± SD LDL pre-treatment of group (B) was 134.82 ± 8.94 mg/dl and that post treatment was 125.62 ± 7.87 mg/dl. The mean difference between pre and post treatment was 9.2 mg/dl and the percent of change was 6.82%. There was a significant decrease in the (LDL) of the group (B) post treatment compared with pre-treatment ($p = 0.0001$) (Table 8).

The mean values of (LDL) of both groups (A and B) after treatment: The mean ± SD LDL post treatment of group (A) was 117.14 ± 9.44 mg/dl and that of group (B) was 125.62 ± 7.87 mg/dl. The mean difference between both groups was -8.48 mg/dl.

Descriptive statistics and t test for the mean age, weight and height of group A and B.

	Group A $\overline{X}$ **± SD**	**Group B** $\overline{X}$ **± SD**	**MD**	**t- value**	**p-value**	**Sig**
Age (years)	43.13 ± 2	42.26 ± 2.12	0.87	1.15	0.25	**NS**
Weight (kg)	76.53 ± 5.7	75.33 ± 4.43	1.2	0.64	0.52	**NS**
Height (cm)	160.93 ± 4.78	161.33 ± 5.82	-0.4	-0.2	0.83	**NS**

$\overline{X}$: Mean SD: Standard deviation MD: Mean difference
t value: Unpaired t value p value: Probability value NS: Non significant

Comparison of mean values of (BMI) between both groups (A and B) before treatment

	BMI (kg/m²) $\overline{X}$ **± SD**	**MD**	**t- value**	**p-value**	**Sig**
Group A	29.63 ± 0.74	0.67	1.64	0.11	**NS**
Group B	28.96 ± 1.38				

$\overline{X}$: Mean SD: Standard deviation MD: Mean difference
t value: Unpaired t value p value: Probability value NS: Non significant

Comparison between mean values of (BMI) of group (A) before and after treatment:

	BMI (kg/m²) $\overline{X}$ ± SD	MD	% of change	t- value	p-value	Sig
Pre	29.63 ± 0.74	3.44	11.6	14.02	0.0001	S
Post	26.19 ± 1.09					

$\overline{X}$: Mean SD: Standard deviation MD: Mean difference
t value: Paired t value p value: Probability value S: Significant

Comparison between mean values of (BMI) of group (B) before and after treatment:

	BMI (kg/m²) $\overline{X}$ **± SD**	**MD**	**% of change**	**t- value**	**p-value**	**Sig**
Pre	28.96 ± 1.38	1.1	3.8	11.77	0.0001	**S**
Post	27.86 ± 1.35					

$\overline{X}$: Mean SD: Standard deviation MD: Mean difference
t value: Paired t value p value: Probability value S: Significant

Comparison of mean values of (BMI) between group (A and B) after treatment:

	BMI (kg/m²) $\overline{X}$ ± SD	MD	t- value	p-value	Sig
Group A	26.19 ± 1.09	-1.67	-3.73	0.001	S
Group B	27.86 ± 1.35				

$\overline{X}$: Mean SD: Standard deviation MD: Mean difference
t value: Unpaired t value p value: Probability value S: Significant

Comparison of mean values of (LDL) between group (A and B) before treatment:

	LDL (mg/dl) $\overline{X}$ ± SD	MD	t- value	p-value	Sig
Group A	132.28 ± 7.92	-2.54	-0.82	0.41	NS
Group B	134.82 ± 8.94				

$\overline{X}$: Mean SD: Standard deviation MD: Mean difference
t value: Unpaired t value p value: Probability value NS: Non significant

Comparison between mean values of (LDL) of group (A) before and after treatment:

	LDL (mg/dl) $\overline{X}$ ± SD	MD	% of change	t- value	p-value	Sig
Pre	132.28 ± 7.92	15.14	11.44	7.44	0.0001	S
Post	117.14 ± 9.44					

$\overline{X}$: Mean SD: Standard deviation MD: Mean difference
t value: Paired t value p value: Probability value S: Significant

Comparison between mean values of (LDL) of group (B) before and after treatment:

	LDL (mg/dl) $\overline{X}$ ± SD	MD	% of change	t- value	p-value	Sig
Pre	134.82 ± 8.94	9.2	6.82	6.13	0.0001	S
Post	125.62 ± 7.87					

$\overline{X}$: Mean SD: Standard deviation MD: Mean difference
t value: Paired t value p value: Probability value S: Significant

Comparison of mean values of (LDL) between group (A and B) after treatment:

	LDL (mg/dl) $\overline{X}$ ± SD	MD	t- value	p-value	Sig
Group A	117.14 ± 9.44	-8.48	-2.67	0.01	S
Group B	125.62 ± 7.87				

$\overline{X}$: Mean SD: Standard deviation MD: Mean difference
t value: Unpaired t value p value: Probability value S: Significant

Comparison of mean values of (HDL) between group (A and B) before treatment:

	HDL (mg/dl) $\overline{X}$ ± SD	MD	t- value	p-value	Sig
Group A	43.37 ± 5.14	2.35	1.21	0.23	NS
Group B	41.02 ± 5.44				

$\overline{X}$: Mean SD: Standard deviation MD: Mean difference
t value: Unpaired t value p value: Probability value NS: Non significant

Comparison between mean values of (HDL) of group (A) before and after treatment:

	HDL (mg/dl) $\overline{X}$ ± SD	MD	% of change	t- value	p-value	Sig
Pre	43.37 ± 5.14	-5.95	13.71	-5.87	0.0001	S
Post	49.32 ± 3.94					

$\overline{X}$: Mean SD: Standard deviation MD: Mean difference
t value: Paired t value p value: Probability value S: Significant

Comparison between mean values of (HDL) of group (B) before and after treatment:

	HDL (mg/dl) $\overline{X}$ ± SD	MD	% of change	t- value	p-value	Sig
Pre	41.02 ± 5.44	-3.16	7.7	-9.17	0.0001	S
Post	44.18 ± 5.48					

$\overline{X}$: Mean SD: Standard deviation MD: Mean difference
t value: Paired t value p value: Probability value S: Significant

Comparison of mean values of HDL between group (A and B) after treatment:

	HDL (mg/dl) $\overline{X}$ ± SD	MD	t- value	p-value	Sig
Group A	49.32 ± 3.94	5.14	2.94	0.006	S
Group B	44.18 ± 5.48				

$\overline{X}$: Mean SD: Standard deviation MD: Mean difference
t value: Unpaired t value p value: Probability value S: Significant

There was a significant decrease in the (LDL) of group (A) compared with that of group (B) post treatment (p = 0.01). (Table 9).

High density lipoprotein (HDL) for both groups (A and B) before and after treatment

The mean values of (HDL) of both groups (A and B) before treatment: The mean ± SD HDL pre-treatment of group (A) was 43.37 ± 5.14 mg/dl and that of group (B) was 41.02 ± 5.44 mg/dl. The mean difference between both groups was 2.35 mg/dl.

There was no significant difference in the (HDL) between group (A and B) pre-treatment (p = 0.23) (Table 10).

The mean values of (HDL) of group (A) before and after treatment: The mean ± SD HDL pre-treatment of group (A) was 43.37 ± 5.14 mg/dl and that post treatment was 49.32 ± 3.94 mg/dl.

The mean difference between pre and post treatment was -5.95 mg/dl and the percent of change was 13.71%. There was a significant increase in the (HDL) of the group (A) post treatment compared with pre-treatment (p = 0.0001) (Table 11).

The mean values of (HDL) of group (B) before and after treatment: The mean ± SD HDL pre-treatment of group (B) was 41.02 ± 5.44 mg/dl and that post treatment was 44.18 ± 5.48 mg/dl. The mean difference between pre and post treatment was -3.16 mg/dl and the percent of change was 7.7%. There was a significant increase in the (HDL) of the group (B) post treatment compared with pre-treatment (p = 0.0001) (Table 12).

The mean values of (HDL) of both groups (A and B) after treatment: The mean ± SD HDL post treatment of group (A) was 49.32 ± 3.94 mg/dl and that of group (B) was 44.18 ± 5.48 mg/dl. The mean difference between both groups was 5.14 mg/dl. There was a significant increase in the (HDL) of group (A) compared with that of group (B) post treatment (p = 0.006) (Table 13).

DISCUSSION

The aim of this study was to investigate the effect of electrical stimulation of acupuncture points on lipid profile in obese Pre-menopausal women. This study was conducted on forty obese pre-menopausal women who were selected randomly from Om El-masreen General Hospital, Egypt and agreed to participate in the study; their age ranged from 40 to 45 years old. and they were divided into two groups equal in number. The study group; group (A): consisted of 20 participants, their ages ranged from 40 to 45 years old with mean of (43.13 ± 2) years. They received electrical stimulation on acupuncture points. Low frequency TENS on bilateral only ST-36, SP-6 and on Cv12. Duration was applied 20 min with frequency of 10 Hz and intensity of 5 MA. The treatment session was applied three times per week for 3 months, in addition to nutritional recommendation. The control group; group (B): consisted of 20 patients, their ages ranged from 40 to 45 years old with mean of (42.26 ± 2.12) years, they received nutritional recommendation only for three months. Results of this study showed that, there is a significant decrease in total cholesterol, triglyceride and low density lipoprotein cholesterol and a significant increase in high density lipoprotein cholesterol after treatment in study group (A) who treated by electrical stimulation on acupuncture points in addition to nutritional recommendations compared to control group (B) who treated with nutritional recommendations only.

The results of the study showed that there was a significant difference between study and control group post treatment in total cholesterol, triglyceride, low density lipoprotein cholesterol and high density lipoprotein cholesterol. This improvement may be related to effect of electrical stimulation which activate type 2 fibers with larger axons, in which glycogen is substantially used and externally applied electric current is easier to pass and so, regulate insulin production and blood sugar levels, improve the blood lipid profile and improve blood circulation (Li and Zhuang, 2009). The effect of acupuncture treatment on reducing the levels of triglycerides and total cholesterol suggested that these changes in lipid metabolism may be caused by increase in the serum beta-endorphin levels (Cabioglu and Ergene, 2005). Chen *et al.,* (2014) have proved that,acupunctureprevents and reverses dangerous cellular accumulation of fatty materials in cases of high cholesterol as it prevents and reverses the formation of foam cells which forms at the site of fatty streaks and is the beginning of atherosclerotic plaque formation in blood vessels. The presence of foam cells is indicative of an increased risk of heart attacks and strokes. The percentage of improvement of total cholesterol, TG, HDL, LDL and BMI are 23.43%, 22.7%, 13.71%, 11.44% and 11.6% respectively. In agreement with the results of the current study, (Ingle *et al.,* 2001)showed that acupuncture therapy showed significant effect on reduction of lipid profile and it also increased the level of high density lipoprotein at the same time. It also shows significant reduction in the body mass index. Also, Min *et al.,* (2004) reported that acupoints application not only alleviate the symptoms and decreased blood glucose but also mitigated the disorder of lipid metabolism, increasing high density lipoprotein while decreasing cholesterol, glyceride and low density lipoprotein in patient type II diabetes accompanied by hyperlipidemia. This method was simple, safe, economical of no toxic and side effects and convenient to accept for long time.

The decrease in the BMI in this study may be attributed to several mechanisms including, the diuresis and depletion in the stored glycogen that is associated with caloric restriction in addition to reduction in fat mass while preserving lean body mass. The depletion of fat depot is caused by hydrolysis and clearance of triglyceride stored in adipose tissue into glycerol and free fatty acid (FFA) by the action of lipoprotein lipase (LPL) **(**Dispres *et al.,* 2001). Chu *et al.,* (2001) provedthat the acupuncture reduces triglycerides and cholesterol level in over weight and obese subjects, as acupuncture has a good regulatory effect on lipid metabolism and plasma cycling adenosine monophosphate; that is involved in the activation of phosphorylase helping glycogenolysis and lipase enzyme helping lipolysis. (Cabioglu and Ergene,2006) stated that acupuncture can reduce the body weight of obese female by 4.5% with a parallel reduction in the total cholesterol, triglycerides and LDL-C by increasing the beta-endorphin level which stimulates lipolysis. Also, (Li and Wang, 2006) have reported significant changes in cholesterol and LDL-C during acupuncture therapy when compared with control subjects. Li *et al.,* (2010) have reported that electro acupuncture at St 36, Cv 12 and Sp 6 improves the lipid metabolism in subjects with the metabolic syndrome.

Sharman *et al.,* (2002)&Volek *et al.,* (2005)have reported that 68% carbohydrate reduction led to a significant decrease in serum triglyceride and significant increases in LDL-C, HDL-C and total cholesterol. Volek *et al.,* (2008);Volek *et al.,* (2005)&Volek *et al.,* (2003) have reported that, Carbohydrate reduction diet with 34% carbohydrate reduction was better at improving lipid profiles, as it not only resulted in an increase in HDL-C and a reduction in triglyceride, but also maintained LDL-C at the same level. In contrary, Mazzoni *et al.,* (1999) concludedthat acupuncture does not promote weight loss and is not recommendable in the treatment of obesity. It may however, improve the psychological status of obese patients. Also, (Cabioglu *et al.,* 2008) concluded that acupuncture combined with diet and exercise does not generate larger reductions in body weight, fat mass or BMI than diet and exercise alone. In another study which disagrees with the results of this study, (Li and Guo, 2009) pointed out that the true effects of acupuncture on weight loss should be investigated alone and avoid the influence of diet and exercise. Contrary to our finding, (Cabioglu and Ergene, 2005) showed thatno changes in HDL-C in acupuncture group when compared with controls, this may be explained by application of different acupoints. The result of this study in group (B) who received dietary intervention only this agree with

(Boundes *et al.,* 2000) who reported an increase in HDL-C and a concomitant fall in triglycerides and total cholesterol as a result of dietary intervention only. Finally, its concluded that electrical stimulation on acupuncture points can be used as a safe, efficient, adjacent therapy and can decrease total cholesterol, triglyceride and low density lipoprotein cholesterol and increase high density lipoprotein cholesterol in obese pre-menopausal women.

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