SOUTH BAYLO UNIVERSITY

A LITERATURE REVIEW OF THE EFFICACY OF ACUPUNCTURE ON WEIGHT LOSS

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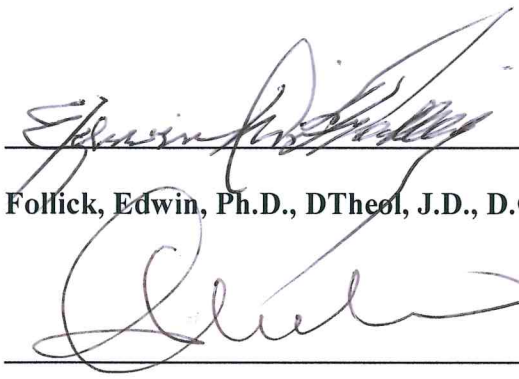

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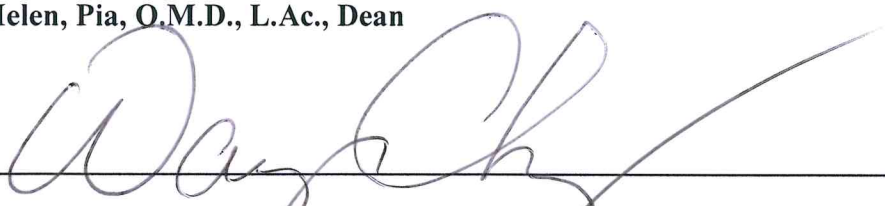

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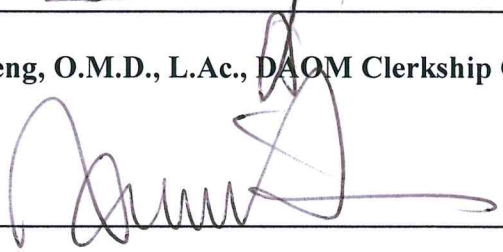

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A LITERATURE REVIEW OF THE EFFICACY OF ACUPUNCTURE ON WEIGHT LOSS

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ABSTRACT

The purpose of this literature review is to analyze the mechanism and efficacy of acupuncture on weight loss. The key words “acupuncture” AND “weight loss”, “obesity”, “overweight” were entered into Southbaylo University registered research database (EBSCO) Medline with Full Text database, and 12 articles based on randomized controlled tiral(RCTs) clinical studies were selected for analysis. Body acupuncture with and without manual stimulation, electroacupuncture, auricular acupuncture, and auricular acupressure were used in different groups of overweight or obese participants such as adolescents, female college students, Asian young adults, patients with simple obesity, postmenopausal symptoms or polycystic ovary syndrome **(**PCOS). Most of the studies showed the effect of acupuncture in weight loss with other anthropometric and biophysiological parameter changes. The possible mechanism is involved in nervous system, endocrine system, immune, and digestive system. The most common points were body points: Zusanli (ST36) , Sanyinjiao (SP6), Zhongwan(CV12), Tianshu (ST25), Guanyuan (CV4), and ear points: Shenmen, mouth, stomach, endocrine, small intestine. The results are consistent with those of past literature reviews. Most of the studies showed that different forms of acupuncture have a certain effect on weight reduction.

Due to lack of high quality studies and short-term study design, more research is required in the future to explain the mechanism and efficacy of acupuncture on weight loss.

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I. INTRODUCTION

Obesity is defined as an excess of adipose tissue. It is one of the most common disorders in medical practice and among the most frustrating and difficult to manage. Obesity is one of the leading health risk factors globally, 1.1 billion people (15.7%) are classified as overweight. [1] U.S. survey data demonstrates that 68% of Americans are overweight and 33.8% are obese.[2] Women in the United States are more apt to be obese than men, and African-American and Mexican-American are more obese than whites.[3] Little progress has been made in prevention or treatment even though its implications for health are more and more pronounced. Obesity is associated with several other risk factors and health problems including insulin resistance, hyperinsulinaemia, type 2 diabetes mellitus, hyperlipidemea, hypertension, coronary heart disease, gallbladder disease and certain malignancies.[4]

Body Mass Index is calculated by dividing measured body weight in kilograms by the height in meters squared closely correlates with excess adipose tissue. The National Institutes of Health (NIH) defines a normal BMI as 18.5-24.9, overweight is 25-29.9, Class I obesity is 30-34.9, Class II obesity is 35-39.9, and Class III obesity is BMI greater than 40. Abdominal circumference (greater than 102cm in men and 88 cm in women) or high waist-hip ratios (greater than 1.0 in men and 0.85 in women) have a great risk of diabetes mellitus, stroke, coronary artery disease and early death than equally obese patient with lower ratios. Furthermore, upper body obesity and visceral fat within the abdominal cavity is more hazardous to health than lower body obesity and subcutaneous fat around the abdomen. [1]

Obesity has been considered to be the direct result of a sedentary lifestyle plus chronic ingestion of excess calories and genes which affect control of appetite. Current conventional therapeutic strategies for obesity, which include diet, physical exercise, drugs and bariatric surgery, cannot achieve adequate weight control in all patients. Complementary types of treatment are therefore being tested and, in this context, acupuncture is one of the most rapidly growing therapies. In the USA, the NIH consensus panel recommends acupuncture as a useful clinical procedure and thus created the National Center for Complementary and Alternative Medicine with the object of integrating complementary therapies into mainstream clinical practice.[5,6]

This article focuses on analysis of past 10 years of records related to acupuncture on weight loss to find out its efficacy and some potential mechanism on weight loss.

II. MATERIALS & METHODS

Study Design and Research Methods

An electronic research strategy was conducted on the EBSCO Medline with full text using the key words “acupuncture” AND “weight loss”, “obesity”, “overweight”. The timeframe for the publication of articles was set from 2006 January 1st to 2016 April 30th. Database language was set to English, and only full text articles were selected.

Inclusion Criteria

This review was restricted to randomized controlled trials (RCTs) clinical studies that compare acupuncture or their variants with a control group. Here, a study that stated the phrase “randomization” or “randomized” was regarded as a randomized trial. No restriction was imposed on studies with respect to blinding. Only studies with clear hypotheses, objectives, setting, participants (with inclusion or exclusion criteria), assessments, interventions, results and conclusion were included.

This review included all participants irrespective of ages, sex and races, including overweight/obese adolescents, young adult and simple obesity or with other chronic medical conditions. All appropriate definitions of overweight or obesity were accepted.

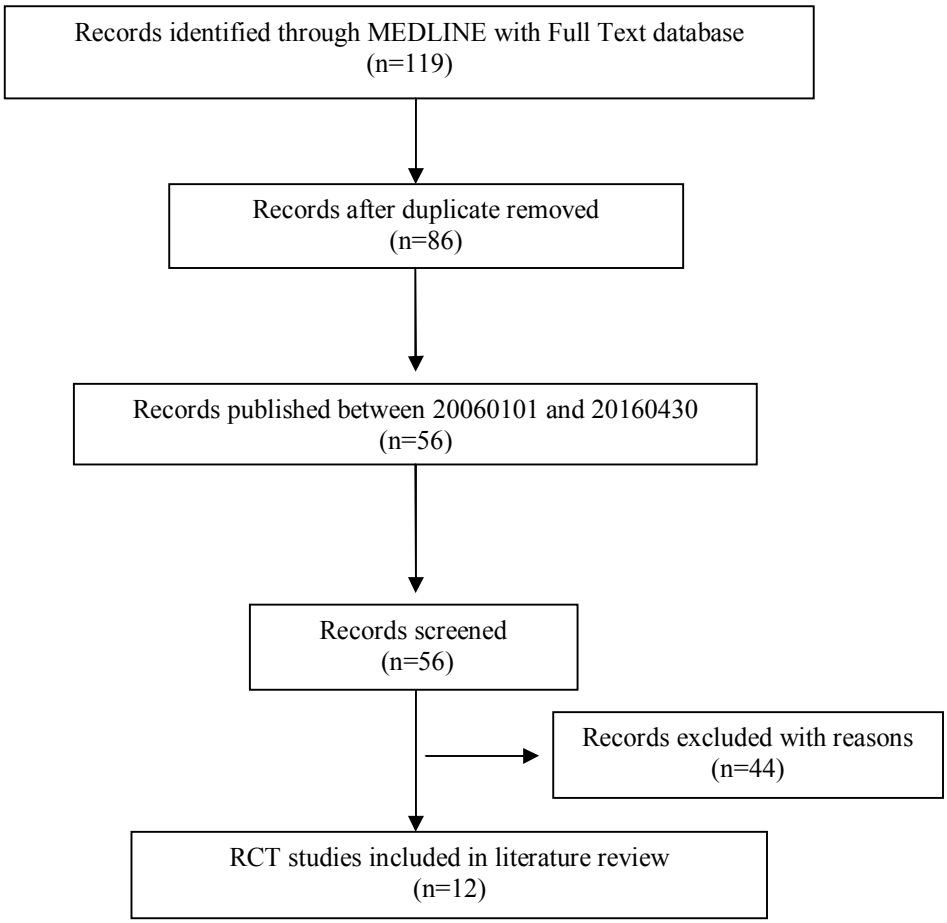
Clinical trials evaluating all forms of acupuncture (classical body/auricular acupuncture with or without manual stimulation, electroacupuncture, and acupressure) used alone was included. Studies with co-interventions, such as lifestyle modification, diet or physical exercise were included if they were given to both groups.

Exclusion criteria

Pregnant and lactating women, patients with serious medical conditions, and secondary obesity such as drug induced obesity were excluded. Exclusions also include preclinical studies (e.g. in vitro/in vivo animal studies), case reports, case series, self-control, longitude study and non-randomized controlled trials, as well as, trials that compared different forms or points of acupuncture without a non-acupuncture comparative arm.

Research and selection process of the articles are listed in figure 1.

Figure1.



III. RESULTS

The total of 12 articles was selected for this literature review. Out of 56 articles, only 12 of them met requirements of RCTs relevant to topic with clear explanation of study design, objectives, participants, interventions, results, discussion and conclusion.

Types of Acupuncture Intervention

Forms of acupuncture including body acupuncture with or without manual stimulation or electrical stimulation, auricular acupuncture and auricular acupressure were discussed in this review. There were 6 articles utilizing body acupuncture: 1 article used acupuncture alone, 2 articles used acupuncture with manual stimulation, 3 articles used acupuncture with electrical stimulation. There were 6 articles utilizing auricular acupuncture: 2 of them used ear acupuncture, 4 of them used ear acupressure. Common body points include Zusanli (ST36), Sanyinjiao(SP6)Zhongwan(CV12) , and Tianshu (ST25) which showed up in 4 articles, respectively. Other frequently used body points include Guanyuan (CV4) in 3 studies, Fenglong (ST40), Qihai(CV6), and Yinlingquan(SP9) in 2 studies, respectively. Common ear points include Shenmen in 6 studies, Stomach in 5 studies, Mouth and Endocrine in 4 studies, Small intestine in 3 studies respectively. (Table 1)

Table1. Frequently used body points and ear points

Body Points	Zusanli (ST36)	Sanyinjiao (SP6)	Zhongwan (CV12)	Tianshu (ST25)	Guanyuan (CV4)
Frequency	4	4	4	4	3
Ear Poitns	Shenmen	Stomach	Mouth	Endocrine	Small intestine
Frequency	6	5	4	4	3

Acupuncture Effect on body composition

Almost all studies included body weight and body mass index (BMI) as one of their main parameters. Six (6) studies included both body weight and BMI, other 6 studies either included body weight or BMI as their main paremeter to measure weight loss. Several studies included body fat mass (BFM), percentage of body fat (PBF), lean muscle mass (LMM), and percentage of lean muscle mass (PLLMM). Compared to control group, 11 studies showed significant weight reduction or BMI decrease in experimental group except Darbandi's study[7]. In her article, although the percentage of weight loss in the intervention group was nearly twice as great as in the control group, the differences between groups did not reach statistical significance. Interestingly, Nourshahi's study [8] found out BMI and PBF (measured by bioelectrical impedance) decreased significantly in both experimental groups (diet and exercise group vs. diet, exercise and acupuncture group) when compared with the control group. However, there was no significant difference between the two experimental groups. It was concluded that acupuncture combined with diet and exercise does not generate larger reductions in body weight, body fat mass or BMI than diet and exercise alone. In this article the author also included skinfold thickness which is a body composition measurement as a paremeter, the author found out triceps, calf, subscapula and suprailiac skin folds did not change significantly in any of the groups. Abdominal and thigh skin folds (central region) decreased significantly more in experimental groups than in control group.

Chia-Hsien Lin[9] studied acupuncture on postmenopausal women with obesity and found out body composition including body weight, waist circumference, hip circumference, percentage of body fat decrease significantly in the experimental group, percentage of lean muscle mass increases significantly, there was no change in control group.

Acupuncture Effect on Anthropometry

Anthropometric parameters include waist circumference (WC) and hip circumference (HC), waist and hip ratio (WHR). Seven (7) articles included one or more of these above parameters as their main weight loss parameters. Significant reduction in at least one of the following parameters including weight, BMI, BFM, WC, and WHR was observed in most of the studies.

Ching Hsiu Hsieh's study[10] focused on auricular acupressure with magnetic pearls on Asian young adult (female dominant sample) for eight weeks. Both groups follow reduced calorie diet, physical activity, and lifestyle modification. The author found out weight reduction and WC reduction in both experimental group and control group, but increased WHR in control group, decreased WHR in experimental group. The significantly decreased body weight and WC may be due to the modification of lifestyle, diet, and exercise. The author concluded auricular acupressure proves to reduce WHR.

Sujung Yeo's[11] study applied five auricular points in experimental group 1 and Hunger point only in experiental group 2 with a non-intervention control group. BMI and body weigh were both significantly decreased in experimental groups than control group. Waist circumference and body fat mass are only decreased siginificantly in experimental group 1 when compared to experimental group 2 and control group which proved combination of acupuncture points are more effective in reducing abdominal fat.

Dongwon Kim[12] did not find difference in PBF and WHR between experimental and control groups pretest and post test in auricular acupressure in obese female college

students. Yan hua Zheng[13] targeted on PCOS women with abdominal acupuncture. Compared to pre-test significant reduction in BMI and WHR was found in both groups. Reduction in BMI and WHR and increase in menstrual frequency were significant in experimental group compared to control group.

Acupuncture Effect on Metabolism

In this literature review, 5 studies included metabolic paremeters. Ching Hsiu Hsieh[14] studied auricular acupressure on adolescents and found out no significant improvement in lipoprotein. On the contrary, it showed different degree of increase of total cholesterol (TC), total triglycerides (TG), low density lipoprotein cholesterol (LDL-C), and high density lipoprotein cholesterol (HDL-C) after acupuncture treatment. These biochemical findings may be limited by the relatively short eight-week time period of treatment. The author concluded that the short-term weight reduction may not affect serum parameters involved in metabolic syndrome.

Yan hua Zheng[13] focused on comparing acupuncture with Metformin on PCOS female, significant reduction in HOMA-IR, FBG, 2hBG, fasting insulin, 2-hour postprandial blood insulin, TC and TG and significant increase in HDL were observed compared to pre-test in both groups, but no significant difference between experiemental and control groups.

Acupuncture Effect on Neuro-endocrine System

The effect of acupuncture on neuro-endocrine system in weight loss is thought to be through diverse mechanisms such as suppression of hunger, inhibition of gastric acid secretion; decrease in plasma gastrin and increase in plasma somatostatin which inhibits secretion of gastric acid; increase in the expression of the anorexigenic peptides such as α melanocyte-stimulating hormone (α-MSH), and decrease in expression of orexigenic peptide neuropeptide Y.[15] In this literature review, studies included insulin, leptin, ghrelin, cholecystokinin, and nesfatin-1 as neuro-endocrine parameters.

Leptin is produced from adipocytes proportionally to cell number and size, and is known to decrease body weight and appetite. For obese people with high levels of leptin, researchers have suggested that obesity is associated with a form of leptin resistance, caused by defects at the leptin receptor or in postreceptor signaling pathways. [16,17,18] Darbandi[7] studied electrical body acupuncture on obese patients for 6 weeks and found out significant reduction in plasma Leptin between experimental group and control group. Thus, interfering with the leptin pathway may be one of the possible mechanisms by which acupuncture controls appetite and induces weight loss.

Studies of the effect of acupuncture on insulin levels have mixed results, showing in different studies an increase[19] and a decrease[20] after treatment. Obesity, diabetes and insulin resistance are closely related.[21, 22] Ghrelin is produced by P/D1 cells in the Stomach, increases with hunger and decreases with satiety. An increase in ghrelin is known to increase appetite and cause weight gain.[23,24,25]There is also evidence that obese patients have lower plasma ghrelin levels and that a reduction in body weight raises plasma ghrelin levels.[26] Cholecystokinin (CCK) secretion has been shown to decrease hunger. CCK is a neurotransmitter causing satiety after a meal by affecting the central

nervous system, and hence it has close relationship with ghrelin.[27] Funda Gucel[15] studied acupuncture treatment on obeses women for 5 weeks and found out decreased insulin and leptin levels and induced weight loss, together with a decrease in BMI compared with sham acupuncture. Furthermore, between-group analyses demonstrated increase in plasma ghrelin and CCK levels in subjects who received acupuncture treatment.

Nesfatin-1 is a neuropeptide produced in the hypothalamus. It is distributed in the appetite- controlling hypothalamic nuclei, such as arcuate nuclei, paraventricular nuclei, supraoptic nuclei and lateral hypothalamic areas of the brain, pancreatic islets, gastric endocrine cells and adipocytes. Nesfatin-1 is a multifunctional metabolic hormone. It is related to reduced food intake and body weight, regulates gastrointestinal function and insulin secretion.[28.29] The mRNA expression of nesfatin-1 is significantly decreased by fasting and significantly increased in the hypothalamus on re-feeding.[30] Furthermore, systemically administered nesfatin-1 inhibits appetite and body weight gain in rodents, suggesting that it is an anorexigenic hormone.[31] In clinical studies, there are inconsistent results in clinical trials. Some of them found higher Nesfatin-1 in obese subjects compared to controls, positive correlation between Nesfain-1 and BMI. Some of them found lower Nesfatin-1 level in obese subjects than in controls, negative correlation between Nesfatin-1 and weight or BMI. Yongfang[32] studied electroacupuncture on 61 obese patients, weight reduction and plasma nesfatin-1 level increase were significant compared to control group. This study suggests the beneficial effect of acupuncture on obesity is associated with increased plasma nesfatin-1 level.

Acupuncture Effect on other aspects

Hamid Abdi[33] focused on immune antibodies: serum anti-heat shock protein (Hsp)-27, 60, 65, 70 and inflammatory marker: high sensitive C-reactive protein (hs-CRP) levels. The author studied aurilular acupressure on 204 participants for 12 weeks (1st period with intervention for 6 weeks, 2nd period wiouth intervention but only follow low calorie diet for 6 weeks). In 1st period, anthropometric parameters and hs-CRP changed significantly in both groups. Significant reduction in anti-Hsp antibodies was only observed in experimental group. In 2nd period, significant reduction in anti-Hsp antibodies in experimental group, anthropometric parameters are more prominent in control group. Between groups, significant reduction in anthropometric parameters and anti-Hsp antibodies but not hs-CRP in experiemental group than control group. It showed that acupuncture is more effective in reducing the levels of anthropometric factors and anti-Hsp antibodies.

Chia-Hsien Lin[9] used Ryodoraku instrument to measure the meridian system non-invasively. Among 12 meridians on left and right, only Left triple burner meridian changed notably in both experimental group and control group, no change in other meridians and measurements between groups.

Zhuting Xu[34] studied fecal microbial flora and found out lactobacillus and bifidobacterium increased, but bacteriodesand C. perfringens decreased compared to control group. The results showed that acupuncture may have an ecological role in the gastrointestinal tract, activating gastrointestinal function by adjusting the body's immune system.

Dongwon Kim[12] included self-efficacy test which is self reported method using a self-efficacy scale consisting of 24 questions: 7 on confidence, 12 on self-regulatory efficacy, and 5 on task difficulty preference. Each question is measured with a 5-point Likert scale ranging from 1 (not at all) to 5 (strongly agree), and total scores ranged from 24 to 120 for 24 questions, with higher scores indicating better self-efficacy. The author found out significant improvement in self-efficacy in experimental group than control group. Increased self-efficacy will be valuable to obese individuals and could help to promote further efforts to control weight; previous researchers contended that self efficacy plays an essential role in choosing and maintaining health actions against obesity.

Sujung Yeo[11] included blood pressure in the study with no significant differences between the groups.

Yan hua Zheng[13] focused on PCOS women's ovarian volume and menstrual frequency. Compare to pre-test, significant reduction in ovarian volume, Ferriman–Gallwey score, LH, ratio of LH to FSH, and testosterone, while increase in menstrual frequency and HDL-C in both groups are observed. Increase in menstrual frequency is significant in experimental group compared to control group.

IV. DISCUSSION

Obesity is a serious, prevalent, and refractory condition which affects life quality and expectancy. It is not only becoming epidemic in developed countries such as USA, European countries, Canada, Australia, but also in developing countries. In this literature review, 12 RCT studies were identified. A total of 869 subjects were evaluated and the duration of studies ranged from 4 weeks to 6 months. The majority of these studies were conducted in Asian countries, such as mainland China, Taiwan, Korea, and Iran. Despite the small sample size and methodological limitations, analysis of the pooled data showed a consistent superior effect of acupuncture, compared to lifestyle modification, diet, physical exercise, and drugs in reducing body weight with improved body composition, anthropometry, metabolic profile, neuro-endocrine markers and other aspects. Contemporary evidence suggests that acupuncture effect on weight loss is involved in neurologic effect by activating central nervous system (CNS) and autonomic nervous system, inducing endocrine system and metabolic modulation, hormonal regulation, and initiating digestive system reaction. In this literature review, it reveals potential theories regarding acupuncture on weight loss as following: 1) Supress hunger and improve satiety through regulating leptin, ghrelin, CCK and nesfatin-1. 2) Increase metabolism through regulating glucose, insulin and lipiprotein. 3) Promote immune system through reducing anti heat shock protein HSP antibodies. 4) Activate gastrointestinal function and regulate microbial flora in digestive system. 5) Improve self efficacy. From a mechanistic perspective, researchers can apply various scientific techniques to improve our understanding of the mechanisms of acupuncture. The combined use of western principles of scientific inquiry and the holistic approach of Chinese medicine may

provide a vital new dimension in our pursuit of control and prevention of chronic diseases, such as obesity.

V. CONCLUSION

Both experimental and current clinical data suggest that acupuncture (in different forms, such as body acupuncture with or without manual stimulation or electrical stimulation, auricular acupuncture and auricular acupressure) exerts beneficial effect on weight loss. Apart from a reduction in body weight, body mass index and other body composition and anthropometric parameters, acupuncture seems to affect many biochemical markers of obesity such as insulin, glucose and lipoprotein profile, obesity-related peptides leptin , ghrelin, CCK, and nesfatin-1. The results are consistent with those of past literature reviews. Due to lack of high quality studies, limitations on the region the trials were conducted and short-term study design, further prospective clinical trials are needed to establish the efficacy of this complementary method for obesity treatment.

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