

A Dissertation On
**“EVALUATING THE EFFECT OF CLASSICAL ACUPUNCTURE ON OBESE
INDIVIDUAL WITH SPLEEN ENERGY DEFICIENCY”**

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ABBREVIATIONS (IN ALPHABETICAL ORDER)

ALBP	Adipocyte lipid-binding protein
AGMI	Acute gastric mucosal injury
AR	Adrenergic receptor
ACTH	Adrenocorticotropic hormone
ANS	Autonomic nervous system
ANP	Atrial natriuretic peptide
BBS	Belly button surgery
BMI	Body mass Index
cAMP	Cyclic adenosine monophosphate
cGMP	Cyclic guanosine monophosphate
CCK	Cholecystokinin
CD 4	Cluster of differentiation 4
CD 8	Cluster of differentiation 8
CTIF	Connective tissue interstitial fluid
DNA	Deoxyribonucleic acid
DM	Diabetes mellitus
EA	Electro acupuncture
EB	Evans blue
FFA	Free fatty acid

GH	Growth hormone
HC	Hip circumference
HSL	Hormone sensitive lipase
HPA	Hypothalamus pituitary adrenal axis
HPG	Hypothalamus pituitary gonad axis
HPT	Hypothalamus pituitary thyroid axis
IL	Interluekin
LMF	Lipid mobilizing factor
NIDDM	Non insulin dependent diabetes mellitus
NPY	Neuropeptide Y
NEFA	Non- esterified fatty acids
NFKB	Nuclear factor kappa beta
NEI	Neuro endocrine immune network
NASH	Non-alcoholic steatohepatitis
NO	Nitric Oxide
NK	Natural killer
NS	Nervous system
PVN	Paraventricular nucleus
Po2	Partial pressure of oxygen
PVS	Perivascular space
PDE	Phosphodiesterase
PAI	Plasminogen activator inhibitor

PFA	Platelet function analyser
PKA	Protein kinase A
PKB	Protein kinase B
POMC	Pro-opiomelanocortin
SP	Substance P
SNS	Sympathetic nervous system
SMC	Smooth muscle cell
TCM	Traditional Chinese Medicine
TG	Triglycerides
TNF	Tumour necrosis factor
UCP	Uncoupling protein
WHR	Waist hip ratio
WAT	White adipose tissue
ZAG	Zinc alpha 2-glycoprotein

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ABSTRACT

Obesity a low grade chronic inflammatory disease with excess storage of adipose tissue, energy imbalance being the prime factor for pathogenesis of obesity through oxidative stress which results in long term complications such as type 2 diabetes mellitus, cardiovascular diseases, hypertension, arthritis, cancer.

Objective :

To evaluate the change in the anthropometric measurements after the classical acupuncture.

Methods :

This study was conducted on 30 adults between the age of 18 - 35 years not under any medication and fulfilling the inclusion criteria of this study. The study design is experimental pre post study, Acupuncture given to the recruited subjects thrice a week, up to 90 days; parameters were recorded primarily at the baseline, finally at the end were compared and evaluated at the end of the study.

Result :

Results of this study showed that a significant reduction in ($P < 0.001$) on the anthropometric measurements significant reduction of ($P = 0.05$) in Weight from 68.90 ± 5.70 to 61.83 ± 6.60 , ($P = 0.02$) in BMI from 31.50 ± 2.66 to 28.56 ± 4.20 , ($P = 0.04$) in HC from 98.24 ± 7.86 to 96.29 ± 5.50 , ($P = 0.04$) in WC from 85.60 ± 3.34 to

81.06±2.90,(P = 0.12) in WHR from 0.86±0.23 to 0.83±0.12, (P = 0.01) in Total score from 12.60±2.56 to 3.40±5.28.

R statistical software free version3.2.0 and paired T test were used for data analysis.

Conclusion :

The present study demonstrated the efficacy of classical acupuncture over obese individuals with spleen energy deficiency, influencing positively through reduction in weight, BMI, Waist circumference and Waist Hip Ratio.

Key words: Acupuncture, Obesity, Spleen Energy deficiency, BMI, Waist Circumference

INTRODUCTION

Obesity, the most prevalent non-communicable diseases and a major concern for public health worldwide, mainly due to its well-established relationship with alterations, such as insulin resistance and diabetes, atherosclerosis, hypertension, or some types of cancer, among others. Obesity, like those chronic diseases mentioned earlier, presents an inflammatory component. Indeed, it is now widely agreed that obesity is also a state of low-grade chronic inflammation ^[1,2]

According to WHO “Obesity is defined as the excessive amount of fat in the body” .Obesity is determined through the anthropometric measurements which is calculated by body mass index [BMI]., measured by height in m^2 and weight in kg ^[3].

In accordance with WHO prevalence of obesity in world statistics report took on 2012 in which one in six adults are obese individuals. Currently, over a billion people are overweight and half a billion are obese.

In INDIA, the prevalence of obesity is about 132 millions individuals.

In TAMILNADU, about 24.6% among residents are obese ^[4].

The fundamental cause of obesity and overweight is an energy imbalance between calories consumed and calories expended. Globally, there has been: an increased intake of energy-dense foods that are high in fat; and an increase in physical inactivity due to the increasingly sedentary nature of many forms of work,

changing modes of transportation, and increasing urbanization. Changes in dietary and physical activity patterns are often the result of environmental and societal changes associated with development and lack of supportive policies in sectors such as health, agriculture, transport, urban planning, environment, food processing, distribution, marketing, and education.

Raised BMI is a major risk factor for noncommunicable diseases such as: cardiovascular diseases [mainly heart disease and stroke]., which were the leading cause of death in 2012; diabetes; musculoskeletal disorders [especially osteoarthritis – a highly disabling degenerative disease of the joints].; some cancers [including endometrial, breast, ovarian, prostate, liver, gallbladder, kidney, and colon]. The risk for these noncommunicable diseases increases, with increases in BMI.

Obesity is a chronic and multi-factorial disease and one of the most important causes of morbidity and premature mortality worldwide. Non-surgical and non pharmacotherapeutical treatment options include diet, exercise, behaviour modification and psychological support. The effect size has been reported with a single digit weight loss in kilograms which can be maintained ^[5].

Being one among the most effective modalities in Complementary and Alternative Medicine, Acupuncture harmonizes energy flow inside the human body which leads to optimal physiological functions through its positive influence over the HPA axis by reestablishing the balance between Sympathetic and Parasympathetic Nervous system ^[6,7,8].

Obesity was first mentioned in Chinese medicine in the Yellow Emperor's Internal Classic of Medicine:

"When treating exhaustion syndromes, sudden syncope, hemiplegia, atrophy, or rapid respiration conditions that occur in obese patients, recognize that these are usually due to overindulgence in rich foods"^[9].

The etiology and pathogenesis of obesity in Chinese medicine has four main factors. They include "righteous *qi* deficiency, improper diet, lack of physical exercise, and constitutional factors." ^[8].

Deficiency of righteous *qi* has many reasons. The result however is damage to the spleen energy. The spleen energy is in charge of transportation and transformation. When there is a dysfunction of the spleen energy there will be an accumulation of dampness and phlegm causing weight gain. Improper diet can also injure the spleen energy and stomach energy. When an individual eats too much greasy and rich foods overtime it will injure the spleen energy and stomach energy. The result of eating too much greasy foods will be an accumulation of damp-heat and phlegm. Lack of physical exercise can cause poor circulation within the body. *Qi* and blood are not able to flow in the body causing stagnation. The stagnation of fluids in the body can result into dampness and fat. Constitutional factors were noted in the Internal Classics. The physical appearance of being overweight can be inherited from parents and past generations ^[10].

The main factors that cause obesity in Chinese medicine is phlegm and dampness ^[10]. Bob Flaws noted that fat in Chinese medicine is phlegm and dampness^[16]. Because phlegm and dampness is the major contributor to fat in Chinese medicine, the spleen energy is the major organ because of the spleen's physiological function. However, there is also another factor that may cause obesity is *qi* and blood stagnation ^[10].

PATTERN DIFFERENTIATION

Obesity and overweight in Chinese medicine is based on differentiation of syndromes. Although the main cause of obesity is phlegm and dampness there will be accompanying symptoms that will help differentiate obesity according to each individual's constitution. The main differentiation of syndromes for obesity are spleen energy deficiency with dampness accumulation, hyperactive stomach with hypoactive spleen, phlegm- dampness obstruction in the middle burner, *qi* stagnation and blood stasis, and spleen and kidney *yang* deficiency.

Obesity due to spleen energy deficiency with dampness occurs because the spleen is not able to transport and transform resulting in accumulation of dampness which will cause obesity. The accompanying symptoms include obesity or overweight with edema, heaviness of extremities, fatigue, abdominal distention, poor appetite, loose stool, pale and swollen tongue with soft thready or slippery pulse ^[10].

The Internal Classic says the same about abdominal obesity as what modern medicine describes ^[11]. TCM therapy holds that phlegm dampness produced by deficiency of the spleen energy and accumulation of body fluid is an important pathological factor in

obesity. The failure of the spleen to transport and transform nutrients can cause stagnation of water to produce dampness and phlegm, giving rise to symptoms of obesity. The pathological nature of obesity mainly manifests as deficiency in origin and excess in superficiality, and obesity is first caused by spleen energy deficiency.

Acupuncture used to treat obesity is safe, effective, and non-toxic. In a study on using acupuncture to treat obesity, Xu ^[12] found that acupuncture can strengthen the function of sympathetic nerves, inhibit overactive parasympathetic nerves, regulate the function of vegetative nerves, and effectively enhance the basal metabolic rate and the level of endocrine hormones. These changes can increase the consumption of energy and promote lipodieresis.

Acupuncture also can improve appetite, intestinal motility, metabolism, as well as emotional factors such as stress. Further, researches show that the application of acupuncture can cause increases in neural activity associated with the ventromedial nuclei of the hypothalamus, the tone of the smooth muscle of the stomach and levels of enkephalin, b-endorphin and serotonin in plasma and brain tissue.^[13,14]

Though previously many studies had been done to reveal the efficacy of acupuncture in weight management, it is yet to explore the efficacy of classical acupuncture approach over obesity caused by spleen deficiency as per TCM.

AIMS AND OBJECTIVES

AIM:

To evaluate the change in the anthropometric measures after the classical acupuncture.

OBJECTIVES:

PRIMARY OBJECTIVE:

To evaluate the changes in anthropometric measurements.

SECONDARY OBJECTIVE:

To assess the changes present in spleen energy deficiency using specific scoring pattern.

REVIEW OF LITERATURE

Obesity is a chronic disease that is increasing in prevalence since 1980 in the United States and other parts of Western World. It poses a serious risk for the development of diabetes mellitus along with insulin resistance, cardiovascular disease, non-alcoholic fatty liver disease, endocrine problems, and certain forms of cancer, modestly increasing the risk of overall mortality. Obesity varies by age and sex, and by race-ethnic group. The most widely used formula for relating the height and weight of an individual is body mass index (BMI). BMI is defined as a ratio of weight (kilograms) and height² (squaremeters) ^[15] .

A BMI between 20-25 kg/m² is normal and associated with lowest mortality, whereas a BMI of 25-30 kg/m² is considered overweight.

In adults a BMI above 30-40 kg/m² is defined as obesity and BMI above 40 kg/m² is severe obesity.

Among the children and adolescent population with a BMI above the 95th percentile for age belong to the obese group ^[16]. However, BMI does not discriminate between muscle and adipose tissue and does not directly assess regional adiposity ^[17]. Still, BMI primarily due to its simplicity often serves a guide in treatment selection.

Obesity relates to the molecular regulation of appetite that affects energy homeostasis, particularly as positive energy balance upsets lipid and glucose metabolism. ^[18,19]

Obesity appears to play a central role in the dysregulation of cellular metabolism that accounts for insulin resistance in diabetes mellitus type 2. Excess adipocytes secrete numerous cytokines that contribute to vascular dysfunction in hypertension and dyslipidemia, as manifested by hypercholesterolemia and triglyceridemia. These conditions eventually contribute to significant atherosclerosis, and when associated with obesity and/or diabetes and insulin resistance, they constitute the metabolic syndrome.^[20,21] New knowledge related to fatty liver and its association with inflammation, as well as visceral adiposity's effect on gastroesophageal reflux, gallstone disease, and cancer of the bowel, also make the liver and gut vulnerable to comorbidities of obesity.^[21-24]

FACTORS CONTRIBUTING TO THE DEVELOPMENT OF OBESITY

The etiology of obesity is multifactorial, involving complex interactions among the genetic background, hormones and different social and environmental factors, such as sedentary lifestyle and unhealthy dietary habits^[25]. Table .1 lists the key factors that might promote or protect against weight gain and obesity as suggested by the WHO^[26].

GENETICS AND OBESITY

Genetic determinants can either play a major role in the pathogenesis of obesity or enhance susceptibility to its development. The dysmorphic forms of obesity in which genetics play a major role include the Prader-Willi syndrome, Ahlstrom's syndrome, the Laurence-Moon-Biedl syndrome,

TABLE.1. KEY FACTORS THAT MIGHT PROMOTE OR PROTECT AGAINST WEIGHT GAIN AND OBESITY AS SUGGESTED BY THE WHO

Summary of strength of evidence on factors that might promote or protect against weight gain and obesity. Strength of evidence	Decreased risk	Increased risk
Convincing	Regular physical activity	Sedentary lifestyle
High dietary intake of fiber	High intake of energy-dense foods	
Probable	Home and school environments that support healthy food choices for children Breastfeeding	Adverse socioeconomic conditions in developed countries
Possible	Low glycemic index foods	Large portion sizes
High proportion of food prepared outside the home (developed countries)		
Rigid restraint/periodic disinhibition eating patterns		
Insufficient	Increased eating frequency	Alcohol

Cohen's syndrome and Carpenter's syndrome ^[27]. Reportedly, 244 genes, when mutated in the mouse, result in an obese phenotype. A growing number of studies indicate associations between DNA sequence variation in specific genes and the occurrence of obesity.

Interestingly, the involvement of 22 such genes was reported in at least five separate studies. The obesity gene map shows putative loci on all chromosomes except Y ^[28].

In the *ob/ob* mice both copies of the leptin gene are defective resulting in truncated protein. Unlike in humans, treatment of obese mice with leptin reduces both food intake and body fat. Splicing defects on the leptin receptor are responsible for the obesity in the *db/db* mouse, which is phenotypically similar to the *ob/ob* mouse. The gene defect called *tub* results in a defective phosphatase and causes retinitis pigmentosa and obesity in mice, making it similar to the Laurence-Moon-Biedl syndrome in humans ^[27].

Linkage of human obesity to other factors related to energy balance has been reported. For instance, the Trp/64/Arg mutation of the human β_3 adrenergic receptor (β_3 AR) gene is associated with an earlier age of onset of NIDDM and characteristics of insulin resistance as well as weight gain in patients with morbid obesity. However, such findings have not been consistent in different ethnic populations ^[29]. It has been reported that plasma IL-8 levels are increased in obese subjects. IL-8 is related to fat mass and TNF system.

Elevated circulating IL-8 could be one of the factors that link obesity to greater cardiovascular risks ^[30]. Most of genomic studies in humans, demonstrated substantial genetic heterogeneity influencing BMI regulation ^[31].

ENVIRONMENTAL FACTORS AND OBESITY

Environmental factors interact with genetic susceptibility in the pathogenesis of obesity. For example, hypothalamic injury from trauma or surgery and destructive lesions in the region of the ventromedial or the paraventricular nuclei can produce obesity. The two major factors in hypothalamic obesity are hyperphagia and a disturbance in the ANS activity.

One explanation for this is altered secretion of NPY, which is produced in arcuate nucleus and stimulates eating ^[32]. Other possible explanations are impairment in reproductive function, decrease in sympathetic and increase in parasympathetic activity – other key features of hypothalamic obesity ^[33]. Endocrine disorders such as Cushing's disease, polycystic ovary syndrome and administration of some drugs (phenothiazines; such as chlorpromazine, antidepressants; amitriptyline, antiepileptics; valproate, steroids; glucocorticoids, antihypertensive agents; terazosin) may be associated with obesity ^[34, 35].

FOOD INTAKE AND OBESITY

A typical obese subject has usually put on 20 kg over 10 years. This means that there has been a daily excess of energy input over output of 30-40 kcal initially, increasing gradually to maintain the increased body weight. The type of food eaten can play a role in disturbing the energy balance. Fat has more calories per gram compared to carbohydrates or proteins. There are 9 calories per gram of dietary fat, whereas caloric value of carbohydrates and proteins is only 4 calories. It is possible that the mechanisms regulating appetite react more slowly to fat than to protein and carbohydrate, so satiety system come into the picture too late. Increase in density of foods, portion size, better palatability of food, increase in availability and low cost promote obesity ^[36].

Obese people try to diet to lose weight. But when a subject reduces calorie intake, there is a shift into negative energy balance. An individual loses weight but, in parallel, the resting metabolic rate decreases, and there is a concomitant reduction in energy expenditure. Probably, the system is trying to return the body weight to the “set- point A”, which implies maintenance of energy balance is dependent on numerous metabolic feedback loops that are tuned by an individual’s susceptibility genes. Thus, an individual who was previously obese and is now of normal weight, generally needs fewer calories for maintaining that weight than an individual who has never been obese. The decrease in energy expenditure appears to be largely due to an alteration in the conversion efficiency of chemical energy to mechanical work in skeletal muscle. This adaptation to the caloric restriction contributes to the difficulty of maintaining weight loss by diet ^[37].

PHYSICAL ACTIVITY AND OBESITY

Physical activity can be broadly divided into exercise and non-exercise activities. Non-exercise activities include employment related work and the activity of daily living. It is difficult to measure the energy expended in non-exercise activity. In general, an increase in sedentary behavior and decrease in activity of daily living and employment physical activity promotes obesity ^[38]. It is now recognized that increased energy expenditure by physical activity has a more positive role in reducing fat stores and adjusting energy balance in the obese, especially when it is combined with modification of the diet.

Native population study gives an example. Many years ago, a tribe of Pima Indians was divided into two groups: one of them settled in Mexico and continued with simple life, eating frugally and spending most of time in hard physical work. They are usually lean and have low incidence of NIDDM. Another group moved to the USA – an environment with easy access to calorie rich food and less need for hard physical work. They are on average 57 pounds heavier than the Mexican group and have a higher incidence of early onset NIDDM ^[39,40].

ENERGY BALANCE IN THE BODY

Fat accounts for 21-37 % of the body weight of middle aged men and women. In case of obese individual more calories are consumed than expended and appetite does not subsequently reduce to compensate for the increase in energy stores (Fig. 1). The amount of the adipose tissue is tightly regulated through neural and humoral signals

transmitted to the brain. Failure of fat cells to send adequate signals or failure of the brain to respond to appropriate signals causes obesity ^[41]. An effective system for the regulation of energy balance require sensors of energy stores in adipose tissue, mechanisms of relay of information to central control sites (hypothalamus) for subsequent integration, which in turn will determine food intake and energy expenditure ^[42].

Food intake is regulated by at least four processes: olfactory and gustatory factors, gastrointestinal distension, release of gastrointestinal hormones such as insulin, cholecystokinin (CCK) and gastrin-releasing peptide and activation of thermogenic components of the efferent sympathetic nervous system (SNS) ^[43,44].

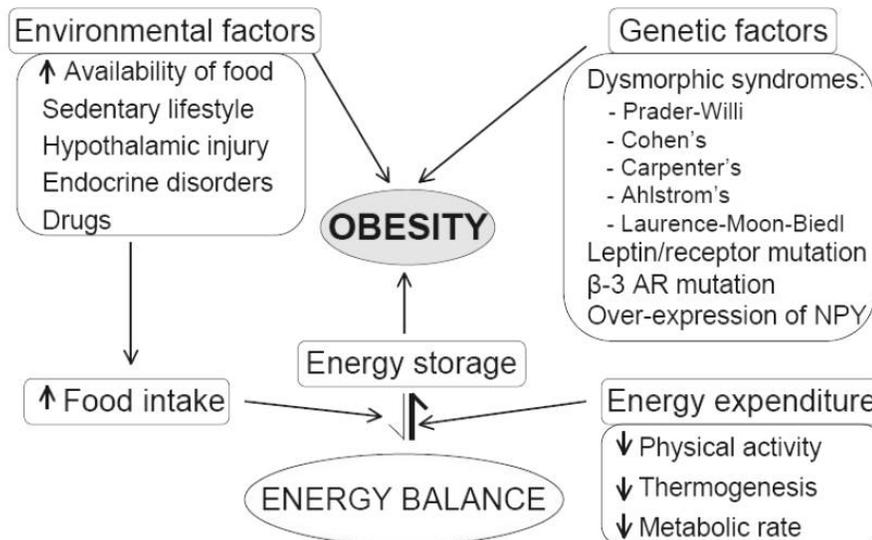


Fig. (1). Energy balance and etiology of obesity.

Energy balance is determined by the interplay between food intake, energy expenditure and energy storage. Obesity is a multifactorial disorder resulting from combination of several environmental and genetic factors. Reduction in physical activity, metabolic rate and thermogenesis eventually decrease energy expenditure leading to increased energy storage and obesity.

Availability of palatable food as well as hypothalamic injury and different drugs stimulate food intake. A growing list of genetic factors including dysmorphic syndromes, leptin/receptor mutation, β 3AR mutation and overexpression of NPY contribute to development of obesity.

Energy expenditure is determined by physical activity, metabolic rate and thermogenesis. The metabolic side of energy expenditure includes cardio-respiratory work, the maintenance of ion gradients and various enzymatic activities.

Physical activity increases energy expenditure by work of the skeletal muscle in addition to all above-mentioned factors. The SNS affects not only skeletal muscle and cardiovascular system but also thermogenesis^[45]. Brown fat is specialized in adaptive thermogenesis. Its thermogenic capacity is possible through the expression of the uncoupling protein-1 (UCP-1), which uncouples oxidative phosphorylation from electron transport through mitochondrial respiratory chain [46]. Brown fat cells

are rich in mitochondria, and produce more heat and less ATP than white fat cells. UCP-2 occurs in both brown and white fat and is upregulated if mice are fed a high-fat diet. In humans, fat cells express the product of a gene similar to the mouse gene for

UCP-2. Infants and children have much more brown fat than adults, it has extensive sympathetic innervations. Heat is produced through the action of noradrenalin on β 3AR in brown fat. Activation of β 3AR increases lipolysis and fatty acid oxidation. Interestingly, in genetically obese mice the expression of β 3AR s is decreased ^[45].

ADIPOSE TISSUE AND ITS PHYSIOLOGY

PHYSIOLOGICAL FEATURES OF WHITE ADIPOSE TISSUE INNERVATIONS

The fat cell is under multiple influences, including that of autonomous nervous system (Fig. 2), local blood flow changes and various hormones and factors delivered from plasma or produced locally.

Adipose tissue secretes leptin in states of food deprivation, SNS stimulation, exercise and cold exposure.

Leptin secretion from adipose tissue is inhibited by obesity states, glucocorticoids, glucose and insulin. Leptin reaches hypothalamus, where in turn it inhibits secretion of NPY that normally reduces energy expenditure, enhances appetite and stimulates synthesis and storage of fat.

Adiponectin normally sensitizes tissues for insulin effects. Obesity and insulin resistance negatively regulate adiponectin secretion from adipose tissue, whereas weight reduction enhances its secretion.

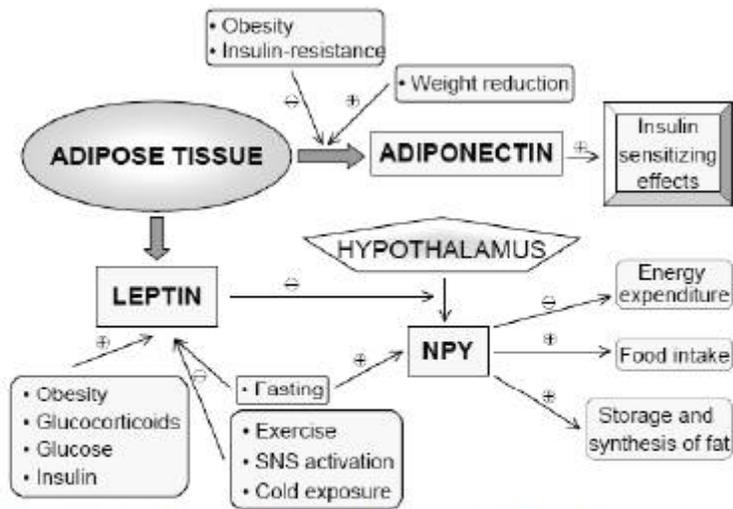


Figure (2). Physiologic regulation and metabolic effects of leptin and adiponectin.

Following SNS stimulation, noradrenaline and NPY are released from sympathetic nerve terminals, whereas adrenal medulla secretes adrenaline. The major pathways regulating lipolysis are adrenergic. In human fat cells, both β_1 & β_2 AR adrenergic receptors (ARs) initiate activation of lipolytic cascade by stimulation of cyclic adenosine monophosphate (cAMP) production, activation of cAMP-dependent protein kinase A (PKA) leading to phosphorylation of perilipin and hormone-sensitive lipase (HSL), and promotion of lipolysis *in vitro* [47]. Human fat cells express large number of 2 adrenergic receptors, their stimulation inhibits cAMP production and lipolysis. Rodents possess β_3 AR in the white fat cells, whereas in human fat cells the role of the β_3 AR s is unclear.

Differences exist in the adrenergic regulation of lipolysis in adipose tissues from different sites in normal-weight subjects and in obese subjects. The lipolytic response of isolated fat cells to the catecholamines is weaker in subcutaneous (abdominal/femoral) than in visceral adipose tissue [48].

One possible explanation includes defective signaling pathways such as reduced $\beta 1$ & $\beta 2$ AR adrenergic receptors (ARs) or increased $\beta 2$ AR responsiveness. Alterations in expression and function of HSL or other interacting proteins like adipocyte lipid-binding protein (ALBP) may also explain these site-related regional differences in lipolysis ^[49]. Reduced lipid mobilization occurs during exercise in subcutaneous fat of obese subjects ^[50]. Functional changes in $\beta 1$ & $\beta 2$ AR adrenergic receptors (ARs) balances appear with the extent of the fat mass and are related to fat cell hypertrophy.

Hypertrophic subcutaneous fat cells (abdominal, femoral) are least responsive to the lipolytic action of catecholamines; they exhibit the highest amount of $\beta 2$ ARs and the lowest amount of $\beta 1$ & $\beta 2$ AR adrenergic receptors (ARs)

Increased expression of the former with concomitant decrease of the latter in hypertrophied fat cell could be a physiological adaptation leading to a reduction of the lipolytic responsiveness of the hypertrophied adipocytes ^[51]. Limitation of basal and SNS-dependent lipolysis avoids excessive non-esterified fatty acids (NEFA) release from some fat deposits. The “buffering” effect of NEFA by adipose tissue is an important phenomenon. When NEFA buffering capacity is inadequate, other tissues are exposed to elevated NEFA concentrations ^[52].

Profound unresponsiveness of the subcutaneous adipose tissue to lipolysis by neural stimulation has been described in obese subjects ^[53]. $\beta 2$ adrenergic mediated increases in thermogenesis and lipid oxidation are impaired in obese individuals ^[54].

Polymorphisms in the coding and non-coding sequences in the human $\beta 2$

AR gene could be of major importance for obesity, energy expenditure, and β 2AR dependent lipolytic function. Full β -adrenergic activation of the human fat cell usually requires synergistic activation of β 1 & β 2 AR adrenergic receptors (ARs). AR adrenergic receptors (ARs) – adrenergic defect could be sufficient enough to alter normal β adrenergic responsiveness. Besides, in human fat cell, any reduction in β 2 AR mediated lipolytic response disturbs the normal functional balance existing between β 1 and β 2 AR mediated affects and amplifies reduction of the lipolytic responsiveness initiated by the physiological amines in stressful situations ^[51].

INSULIN SIGNALING IN THE ADIPOCYTES

Insulin plays a major role in the control of adipose tissue development and function. Insulin not only regulates lipogenesis but also the rate of lipolysis and NEFA efflux. Insulin controls glucose uptake and causes fatty acid transport protein translocation and enhanced fatty acid uptake in adipocytes ^[55]. Insulin inhibits basal and catecholamine stimulated lipolysis through phosphorylation via the Ser/Thr protein kinase B (PKB) dependent action and activation of type 3B phosphodiesterase (PDE-3B), leading to a decreased cAMP level, that prevents HSL activation.

Insulin-induced antilipolysis and activation of NEFA re-esterification are blunted in omental compared to subcutaneous fat cells. Various functional differences have been identified at the receptor level and the post-receptor level of insulin signaling cascade ^[56]. Other substances possibly playing a role in lipolytic pathways are atrial natriuretic peptide (ANP), growth hormone (GH), and miscellaneous agents such as nitric oxide

(NO). ANP stimulation of human fat cells activates cyclic GMP (cGMP)-dependent protein kinase (cGK-I type), which phosphorylates perilipin and HSL, thus explaining lipolytic action ^[57]. Although GH treatments in adults reduce visceral obesity and affect insulin sensitivity, the physiological contribution of GH to the control of human adipose tissue lipid mobilization remains elusive ^[51].

GH dependent modification of the relationships between adenylyl cyclase and Gi2 alpha protein removes inhibition of cAMP production and consequently increases lipolysis ^[58]. NO or related redox species such as NO⁺/NO⁻ have been proposed as potential regulators of lipolysis in rodent and human fat cells ^[59]. Cachexia-inducing tumors produce a lipid-mobilizing factor (LMF), and induction of lipolysis by LMF was associated with increased levels of intracellular cAMP ^[60]. ZAG is a new adipose tissue protein that may be involved in the modulation of lipolysis in adipocytes. Zinc α -2-glycoprotein (ZAG) and tumor related LMF were detected in major fat deposits in mice. ZAG expression and protein was also found in human fat cells ^[59].

Various hormones and autacoids are known to negatively control adenylyl cyclase activity and inhibit cAMP production and lipolysis in fat cells. In addition, the stimulation of leptin secretion was observed with various agonists (A1-adenosine, β 2AR, and NPY-Y1 receptor agonists) ^[51].

DYSREGULATION OF LIPID AND GLUCOSE METABOLISM:

LIPOTOXICITY AND INSULIN RESISTANCE IN OBESITY

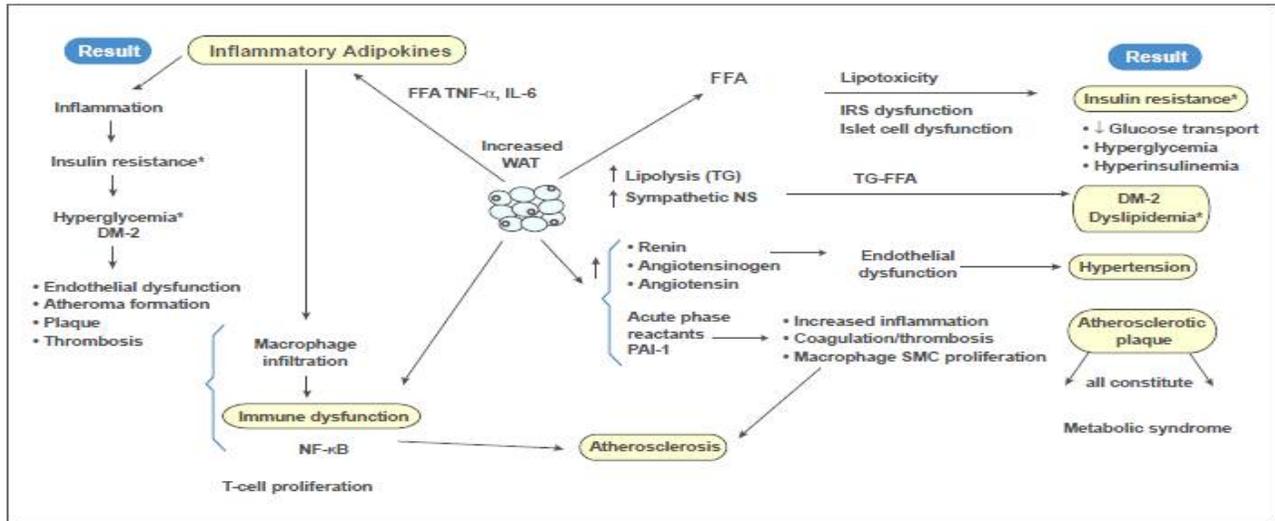


FIGURE.3.ROLE OF LIPOTOXICITY AND INFLAMMATION ON OBESITY.

White adipose tissue (WAT) releases pre-fatty acids and adipokines, which are lipotoxic and inflammatory and result in diverse effects, outlined in the left-hand columns. Their correlation to the metabolic syndrome is shown on the right-hand column, whereas all the effects culminate in atherosclerosis on the bottom of the figure.

*Perturbed glucose and lipid metabolism. DM-2=diabetes mellitus-2; FFA=free fatty acids; IL=interleukin; IRS=insulin receptor substrate; NF- KB=nuclear factor kappa beta; NS=nervous system; PAI-1=plasminogen activator inhibitor-1; SMC=smooth muscle cell; TG=triglyceride;

TNF=tumor necrosis factor.

The abundance of stored fat is required for survival during nutritionally deprived states such as starvation. In times of prolonged abundance of food, however, very efficient fat storage results in the excessive storage of fat, eventually resulting in obesity [61-63]. It has been hypothesized that the storage of fatty acid as triacylglycerol within adipocytes protects against fatty acid toxicity; otherwise, free fatty acids would circulate freely in the vasculature and produce oxidative stress by disseminating throughout the body.

However, the excessive storage that creates obesity eventually leads to the release of excessive fatty acids from enhanced lipolysis, which is stimulated by the enhanced sympathetic state existing in obesity. The release of these excessive free fatty acids then incites lipotoxicity, as lipids and their metabolites create oxidant stress to the endoplasmic reticulum and mitochondria. This affects adipose as well as nonadipose tissue, accounting for its pathophysiology in many organs, such as the liver and pancreas, and in the metabolic syndrome.^[64,65] The free fatty acids released from excessively stored triacylglycerol deposits also inhibit lipogenesis, preventing adequate clearance of serum triacylglycerol levels that contribute to hypertriglyceridemia. Release of free fatty acids by endothelial lipoprotein lipase from increased serum triglycerides within elevated β lipoproteins causes lipotoxicity that results in insulin-receptor dysfunction. The consequent insulin-resistant state creates hyperglycemia with compensated hepatic gluconeogenesis. The latter increases hepatic glucose production, further accentuating the hyperglycemia caused by insulin resistance. Free fatty acids also decrease utilization of insulin-stimulated muscle glucose, contributing further to

hyperglycemia.^[66,67] Lipotoxicity from excessive free fatty acids also decreases secretion of pancreatic β -cell insulin, which eventually results in β -cell exhaustion^[68].

SITES AND FUNCTION OF ADIPOKINES

Adipocytes, consisting of over one billion cells, not only store triacylglycerol in fat depots in various body sites to provide energy reserves, but in aggregate constitute the largest endocrine tissue that constantly communicates with other tissues by adipocyte-released secretagogues, such as the proteohormones leptin, adiponectin, and visfatin. Along with insulin, these proteohormones help regulate body-fat mass.^[69,70] Other gene groups that contribute to adipocyte adipokines include cytokines, growth factors, and complement proteins^[70]. These include the inflammatory adipokines tumor necrosis factor (TNF)- α , interleukin (IL)-1, and IL-6 that cause local steatonecrosis, but are also distributed by the vascular system and cause inflammation elsewhere^[71]. The enhanced fat content in muscle becomes so significant in severe obesity that whole-body magnetic resonance imaging reveals cumulative fat depots in muscle sites similar in size to that of total visceral adipose tissue^[72]. Buttock fat appears to be largely inert with respect to endocrine function, as this fat is used largely for long-term energy reserves^[73]. Visceral fat depots release inflammatory adipokines, which, along with free fatty acids, provide the pathophysiologic basis for comorbid conditions associated with obesity such as insulin resistance and diabetes mellitus type 2^[74]. Visceral adipokines are transported by the portal vascular system to the liver, enhancing nonalcoholic steatohepatitis (NASH), and also by the systemic circulation to other diverse sites. Along with fatty-acid lipotoxicity, visceral adipokines also contribute to the adipokine inflammatory

injury that leads to pancreatic β -cell dysfunction, which, in turn, decreases insulin synthesis and secretion.

THE PHYSIOLOGY OF OBESITY

The amount of fat in the body (adiposity) is not, as was once thought, a passive result of bad habits or over-indulgence. Rather, it is precisely regulated as part of the process of energy homeostasis, a process where by energy intake (food intake) is matched to energy expenditure (metabolism and exercise) and the size of the body's energy stores (the fat mass).

The major organ regulating this system is the brain, although multiple organ systems participate in the process gastrointestinal system to control all aspects of energy homeostasis. Adiposity signals are connected through central autonomic pathways to centres that process satiety signals.

Reduced input from adiposity signals (eg after weight loss) increases meal size by reducing brain response to satiety signals. Source: Schwartz et al ^[75]

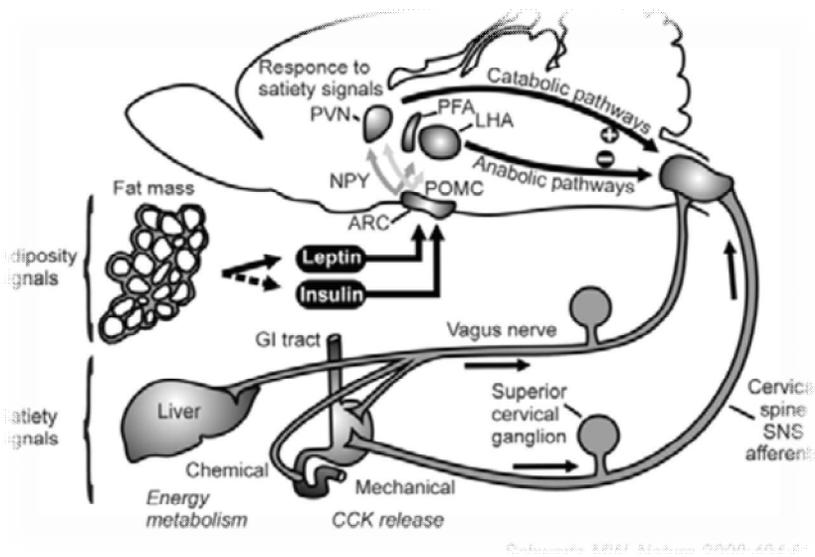


Figure .4. Pathways by which signals related to the fat mass are integrated with signals from the gastrointestinal system (satiety signals) to control energy homeostasis [75]. Adiposity signals enter the brain at the level of the hypothalamus. Neural signals from the gastrointestinal system and the liver provide information about the food that is being eaten, for example, the taste of the food, how much the stomach is distended, and the chemical content of the food. These satiety signals are sent to the hindbrain. The brain responds to the hormone signals via integrated neuropeptide pathways, leading to a number of outputs that are directly related to energy homeostasis. These include: neuroendocrine activation from the pituitary gland; motor behaviour (eating, exercise, etc); autonomic activity. In recent years it has become apparent that the autonomic nervous system has a much greater impact than was once thought upon many fundamental processes of metabolism, including lipolysis, the secretion of insulin and glucagon from the pancreas, and glucose synthesis and secretion from the liver. It is important to note that, while energy expenditure tends to decrease with ageing, mainly because of the absence of occupational activity and extreme physical exertion, energy

intake does not tend to decrease to the same extent, for a number of reasons, including lifetime habits. Thus there is a tendency over time for the body weight to increase.

CONTROL OF MEAL SIZE

There is little physiological evidence that appetite and meal initiation are controlled by metabolic or hormonal signals, such as low blood glucose. Rather, the available evidence suggests that, under normal circumstances, meal initiation is based on learned associations, for example, habit and the social environment. Regulation therefore has to involve how much is eaten and there is compelling evidence that meal cessation (that is, meal size) is controlled by pre-absorptive gut signals.

In recent years a mechanism for this regulation has been elucidated. As illustrated in Figure 2, gastrointestinal peptides provide a signal to tell the brain how much has been eaten, how many calories have accumulated and help to create the feeling of satiety. The best known of these satiety factors is cholecystokinin (CCK). A number of experiments have been carried out in humans in which CCK was given intravenously prior to a test meal and, in every instance, there was a significant reduction of meal size. An important aspect is that CCK is more effective in reducing meal size when the subject has been given a preload, that is, when the stomach is slightly distended, than when no preload is given^[76]. Giving CCK can therefore reduce food intake, but does endogenous CCK also contribute to satiety? A recent paper by Beglinger and colleagues³ shows that administration of the CCK antagonist loxiglumide to humans prior to a test meal was associated with a significant increase in the amount of food eaten. This suggests

that endogenous CCK normally acts to limit meal size, as has been shown in several animal species.

Although the size of individual meals can therefore be manipulated, therapies intended to mimic satiety mechanisms are not in themselves likely to be efficacious for weight loss. There are no studies in which CCK has been given on a chronic basis to humans, but animal studies suggest that this would probably not lead to loss of body weight.

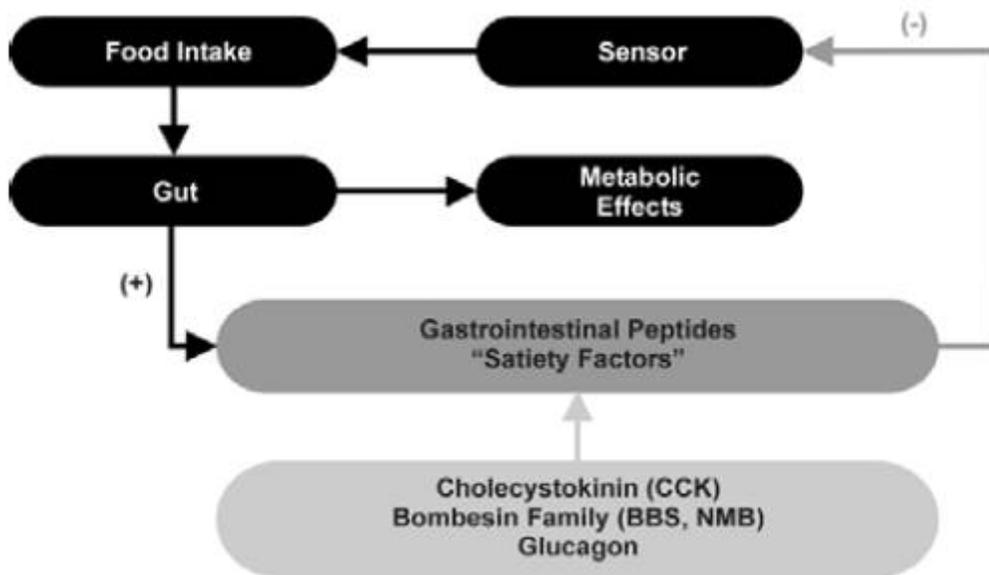


Figure .5. How satiety factors, such as cholecystokinin, control meal size.

CONTROL OF BODY FAT

There is strong evidence that key hormonal regulatory signals—the adiposity hormones—control both how much is eaten and how much energy is expended. These hormones circulate in the blood in direct proportion to body fat content. They enter the brain and act on receptors in areas of the hypothalamus known to regulate food intake

and energy expenditure. If weight is lost, the hormone levels fall, food intake goes up and energy expenditure is reduced. The opposite occurs when an individual has gained excess weight. Thus body weight tends to be maintained relatively constantly over time.

HEALTH CONSEQUENCES OF OBESITY

Numerous epidemiological studies have been conducted to show the relationship between excess weight, abdominal fatness and risk of a wide range of illnesses ^[77- 80]. Table.2. summarizes the approximate relative risk of physical health problems associated with obesity ^[81].

DIABETES

Of all physical health problems, type II diabetes has the strongest association with obesity. A meta-analysis examined the relative risk of incidence of various co-morbidities related to obesity and overweight from 89 studies ^[77]. Elevated BMI and WC were significantly associated with incidence of type II diabetes in men and women. Obesity, as defined by BMI, showed the strongest association with incidences of type II diabetes as compared to other co-morbidities. The pooled relative risks (95% confidence interval) across categories of BMI were 6.75 (5.55–8.19) in men and 12.41 (9.03–17.06) in women ^[77]. In the Nurses' Health Study, which followed 78,419 apparently healthy women for 20 years, for each 5-unit increment in BMI, the multivariate relative risk (95% confidence interval) of diabetes was 2.36 (1.83–3.04) for Asians, 2.21 (1.75–2.79) for Hispanics, 1.96 (1.93–2.00) for whites, and 1.55 (1.36–1.77) for blacks ^[82].

TABLE.2. APPROXIMATE RELATIVE RISK OF PHYSICAL HEALTH PROBLEMS ASSOCIATED WITH OBESITY.

Relative risk >3	Relative risk 2–3	Relative risk 1–2
Type II diabetes	Coronary heart disease	Cancer
Gallbladder disease	Hypertension	Reproductive hormone abnormalities
Dyslipidemia	Osteoarthritis	Polycystic ovary syndrome
Insulin resistance	Hyperuricemia and gout	Impaired fertility
Breathlessness		Low back pain
Sleep apnea		Increased risk of anesthesia complications
		Fetal defects (associated with maternal obesity)

CARDIOVASCULAR DISEASES

Obesity predisposes an individual to a number of cardiovascular risks including hypertension, dyslipidemia and coronary heart disease ^[77,83]. In the Multi-Ethnic Study of Atherosclerosis, which assessed the association between obesity and cardiovascular risk factors and subclinical vascular disease in 6,814 persons aged 45 to 84 years, showed that a higher BMI was associated with more adverse levels of blood pressure, lipoproteins, and fasting glucose, and higher prevalence ratios of hypertension ^[84].

Another study in an Asia Pacific population reported that a one-standard deviation increase in index was associated with an increase in risk of ischemic heart disease of 17% (95% CI 7–27%) for BMI, 27% (95% CI 14–40%) for WC, 10% (95% CI 1–20%) for hip circumference, and 36% (95% CI 21–52%) for WHR [85].

CANCERS

A number of reviews have considered the association of obesity and cancer [77, 86 - 88]. Data from a meta-analysis showed that the pooled relative risks across categories of BMI for various cancers ranged from 1.05– 2.29 in men and 1.13–3.22 in women [77]. The recent report by the World Cancer Int. J. Environ. Res. Public Health 2010, 7 – 771.

Research Fund and the American Institute for Cancer Research (2007) [81] also suggested that there was convincing evidence that overweight and obesity increased the risk of cancers of the esophagus, pancreas, colon and rectum, breast (postmenopausal), endometrium, and kidney. In addition, there was convincing evidence to support that abdominal fatness was a cause of colon cancer and may probably increase the risk of cancers of breast (postmenopausal) and endometrium.

OTHER HEALTH CONSEQUENCES OF OBESITY

There is a wealth of evidence to show that excess weight is an important risk factor in the development of other illnesses, including respiratory diseases [78], chronic kidney diseases [80], musculoskeletal disorders [89,90] gastrointestinal and hepatic disorders [91,92], lower physical functioning performance [93] and psychological problems [94].

CAUSES OF OBESITY FROM A TCM PERSPECTIVE

Obesity is a relatively untouched subject, and there is only a few mentioning in the Inner Classic of the Yellow Emperor ^[1,95], where it divides overweight patients into two types, depending on their bodily proportions of fat and muscles. It mentions that both types are a result of overeating heavy, rich, and sweet foods and that continuous consumption will lead to idiopathic thirst, urination, and eventually sudden loss of consciousness—currently postulated to be symptoms of diabetes and stroke. However, there is not much explanation on treatment. Therefore, current day primary obesity has to be approached by applying basic TEAM principles of maintaining harmony and balance of the five vital organs ^[2,96] and taking into account the consequent problems that may arise when such system goes awry.

In TEAM, the five vital organs that maintain our everyday health are the Liver ^[3,97], Heart, Spleen, Lung, and Kidney. These five work in close cooperation to maintain homeostasis by either supporting or hindering each other's functions. In obesity, the Spleen plays a critical role, and to understand this mechanism, we have to first peer into the digestive system.

Once the food enters the body, the Spleen functions like the “energy/qi transformer,” or the “dynamo” in a machine—to transform and collect worthy energy and essential materials from it. However, it needs help from another organ to do so and right below it, the Stomach, is the “burner” which helps to heat up and combust the food for the Spleen. Thus, the food that has been combusted from the Stomach is separated into either essential substances that are then collected by the Spleen and transported to the organs

and extremities or wastes—which are sent to the Small or Large Intestines for excretion. Next to the Spleen and Stomach, the Liver acts as a “booster” to help spread the clean energy absorbed by the Spleen up and outward, while the Kidney resides below the whole combustion site to fuel all organs fundamentally.

Yet, this is a very idealistic case, assuming that all organs are operating in optimal condition. When a person starts to gain weight in a pathological manner, the root of most causes arises with the deficiency of qi/energy in the Spleen. Deficiency of Spleen qi may be induced either congenitally or by actual unsparing, harmful use of the Spleen such as frequent binges and fasting. When our body’s “energy transformer” is weakened, it not only becomes difficult to garner enough energy sources for our body but it also becomes difficult to spread it around. Hence, the body gets congested with slow-flowing traffic, and just like today’s traffic congestion, all the essential substances get crammed failing to reach the place of its destination on time. The body will feel heavy and react like there is not enough energy, which is why most overweight people tend to feel more and more lethargic, with lower level of tolerance for hunger, and crave for snacks or junk food that provides fast energy. Truthfully, it is not that the person actually lacks the essential nutrients; it is that they lack the sufficient and efficient flow of open traffic to get the materials to their places.

When the deficiency of qi in the Spleen becomes chronic, and the transportation function decreases, this leads the Spleen to fail to move and transform water fluids efficiently as well, leading humid to gather and collect and to accumulate into symptoms of dampness and to even congeal into phlegm.

When phlegm ^[4,98] is produced, a myriad of other problems arise with it, and at this stage, the patient feels fatigued, experiences lower immunity, frequently develops edema and chest oppression, and develops a lot of sputum in the Lungs. Since the patient is lethargic, it leads to less exercise, starting a vicious cycle of accumulation of more phlegm and eventually of fat. Therefore, the basic treatment principle for all the aforementioned problems is to balance and strengthen the Spleen, which will eventually help the body to stop craving food and also effectively get rid of humidity and phlegm from the body.

The analogy between the flow of qi and the flow of traffic will work much better if you think of Your body's energy transportation system as a system of canals.

With Spleen qi deficiency in the background, there are multiple factors that aggravate the situation. One is excessive heat in the Stomach. Too much heat combusts foods too fast, produces hunger, and leads the person to develop a propensity to overindulge. A person can naturally have a lot of innate heat compared to others, but it can also be kindled up by eating a lot of heat-producing foods such as hot, spicy, greasy, and oily foods.

In Traditional Chinese Medicine (TCM), good health consists of the body's systems acting in harmony according to the individual's constitution. If all is working well, there will not be any weight problem.

TCM takes a holistic approach to obesity by focussing on the underlying changes in the body. According to TCM principles, development of obesity is due to the following

pathological changes (Integrated Chinese Medicine Holdings LTD. [ICMHL], Sheng Nong Info. a).

A. DYSPEPSIA CAUSES STOMACH HEAT AND POOR SPLEEN FUNCTIONING

Over consumption of heavy, greasy and spicy foods or alcohol facilitate production of heat evils in the stomach. Meanwhile, inadequate exercise after eating these types of foods damages the spleen function. The over-heated stomach will ripen an excessive amount of food. Therefore, the stomach will digest food easier and make an individual feel hungry, but the spleen cannot handle an excessive food load causing it to under function and be unable to carry out its transformation and transportation functions properly.

As a result, the spare metabolic products turn into turbid fluid and phlegm which intermix with blood and qi (vital energy) filling up the organs, bones and muscles.

B. EXOGENOUS EVILS GIVING RISE TO OBESITY

Invasion of exogenous evils or over consumption of greasy foods leads to poor transformation and transportation functions of the spleen. Dampness evils then begin to accumulate in the middle burner, which is part of the triple burner (the passage through which water, food and fluid are transported).

When dampness and turbid fat enter these passages, they are further distributed by the lungs, allowing penetration into all the organs internally. Additionally, exogenous evils

can also penetrate the skin, subcutaneous tissue and muscles through the body's surface giving rise to obesity.

C.QI (VITAL ENERGY) STAGNATION CAUSES TURBID PHLEGM ACCUMULATION

For those who are emotionally disturbed, experience trauma, have menstruation problems or are elderly, the liver can fail to regulate qi flow which in turn affects digestion and blood flow. The resulting sluggish qi and blood flow tend to block the meridians. Therefore, in these people, dampness is likely to endure in the body.

Over time, this will congeal into phlegm and result in obesity.

D. KIDNEY ESSENCE EXHAUSTION LEADS TO DISHARMONY

Lifestyles, which consume kidney essence, such as being sexually over active can lead to the excitation of the internal ministerial fire. The excessive ministerial fire is a kind of "evil fire" which makes the body produce an over abundance of heat. This "evil fire" affects the middle burner, leading to a malfunction of the stomach and spleen. When this persists over a long period, the vaporization processes in the bladder and triple burner are impaired causing more evils to accumulate and worsen the obesity condition.

From TCM experience, the above causes of obesity can appear together or separately. In short, the fundamental causes of obesity are spleen and kidney deficiencies, which manifest as an overflow of body fluids, accumulation of dampness and phlegm evils and stagnation in blood flow. Sometimes stomach heat and qi stagnation are associated.

Moreover, improper vaporization of body fluids by the triple burner may also appear. All of these factors play an important role in the development of obesity.

TYPES OF OBESITY FROM A TCM PERSPECTIVE

Syndrome identification is the premise and foundation of TCM treatment. Currently there are still no standardized obesity patterns, ranging from 3 to 12 patterns by clinical reports. Most often, simple obesity was classified into deficiency syndrome and excess syndrome by syndrome differentiation of TCM, which further classified into four types (ICMHL, Shen-Nong Info.b).

1. EXCESSIVE INTERNAL PHLEGM AND DAMPNESS DUE TO SPLEEN DEFICIENCY

Phlegm is an important concept in TCM. TCM holds that fat or adipose tissue is mostly due to phlegm and dampness evils. The spleen is regarded to be at the root of all phlegm production. When the spleen becomes damaged, such as eating too many sweet foods and getting too little exercise, it will fail in its duty to move and transform waste fluids and foods. Instead these metabolic wastes will

gather, collect and transform into evil dampness. If dampness evils endure, over time they will congeal into phlegm, and become fat tissue. The excessive internal phlegm manifests itself as excess weight, accompanied by tiredness, body

heaviness, chest and/or stomach distension, and in some cases poor appetite. The tongue has a slimy covering of fur, while there is a rolling, taut pulse. This type of

obesity is generally due to an eating disorder, or secondarily by some other illness. Treatment revolves around sweeping away phlegm and removing stagnation. Once the phlegm is swept away, the qi can move smoothly and easily. This promotes the movement of phlegm and reduction of fat with the ultimate result of decreasing obesity.

2.STAGNATION OF QI AND BLOOD

Patients exhibiting this condition may suffer from irritability or low motivation, chest or breast fullness, insomnia, a dreamy state, menstrual disorder or amenorrhea (absence of menstruation), and infertility.

Some patients may complain of headaches. There may be dizziness and numbness of the four extremities; and the tongue is dark red with a white thin fur or a thin and greasy fur. The pulse is thready and rolling. This is because the movement of blood is not smooth or easily flowing. Stasis obstructs the vessels and inhibits the qi mechanism. Therefore, fat and dampness collect and accumulate within the vessels, making the blood more viscous. If this continues over time, obesity and arteriosclerosis (thickening and hardening of the arteries) will result. The principle treatment is to speed up the blood flow and remove stagnation.

3.YANG DEFICIENCY OF SPLEEN AND KIDNEY

In the case of yang deficiency of spleen and kidney, there is not enough qi to transform or melt the phlegm. People in this category often feel exhausted or fatigued. They may experience lower back and knee weakness, shortness of breath, impotence or low libido. The pulse is deep and fine, the tongue is pale and without any fur covering. Genetic

factors can play a part in this condition. It may also be the result of other illnesses, stress or an unhealthy lifestyle.

Treatment involves fortifying the spleen and rectifying the kidney deficiency.

4.LIVER STAGNATION

Liver stagnation caused by prolonged strong emotions or depression leads to disharmony between the spleen and the liver and gives rise to fluid retention. Due to the liver being depressed, the gall bladder is also depressed and exhausted; the ebb and flow of these organs become unbalanced, and the qi mechanism does not flow freely.

Hence fat turbidity is difficult to be transformed and over time it leads to obesity.

People in this category tend to have excessive fatty material deposited in the abdomen. The physique is bloated and individuals feel drained of energy. Individuals may also experience excess sputum secretion, dizziness, vertigo, retching, a dry mouth, lack of desire for food or drink and discomfort in chest and abdomen. A white glossy or greasy coating usually covers their tongues. The pulse is rolling. Treatment involves improving liver functioning, unblocking the gallbladder and moving stagnation.

INDIVIDUALIZED ACUPUNCTURE FOR THE TREATMENT OF OBESITY: EFFECTS AND METHODS

In terms of more healthy and holistic methods of weight loss in Chinese medicine, the fundamental prescriptive methodology is to “bian zheng lun zhi”—base treatment on the

patient's personal pattern discrimination. TCM doctors diagnose the name of a disease followed by the differentiation diagnosis of syndromes, for prescribing a treatment.

Acupuncture treatment based on a patient's syndrome differentiation is both safe and effective because it addresses that person's own metabolic reasons for being overweight or obese. Using this method, each obese patient can receive his or her own individually tailored acupuncture treatment plan. Very basically, acupuncture is the insertion of stainless steel filiform needles into precisely specified acupoints on the body's surface, in order to influence physiological functioning of the body.

According to TCM, the meridian system provides the transportation channel for the fundamental substances of qi, blood, and body fluids, and along the fourteen main meridians there are a total of 365 acupoints have been identified, each point belongs to a particular meridian and connects to a corresponding organ that make it exert particular therapeutic properties. TCM holds that obesity is caused by anomaly transportation and transformation of the body fluid, accumulation of water-dampness and phlegm turbidity, which are the result of disorders of zang-fu

organs, stagnation of qi and blood, disharmony of the Thoroughfare and Conception vessels. Therefore the weight loss can be achieved by needling meridian points to balance yin-yang, regulate zang-fu organs, promote flow of qi and blood of the meridians, and eliminate the inner pathogenic factors by means of dredging meridian and collateral. Accordingly, different set of points would be used, depending on which organ(s) needed to be energized or inhibited. Furthermore, acupuncture needles can be

twirled, electrically stimulated, penetrated to different depths and left in place for variable lengths of time.

A.INDIVIDUALIZED ACUPUPOINTS SELECTION

Acupuncture for weight loss refers to the therapeutic approach applying acupuncture or moxibustion on some special points under the guidance of meridian theory of the TCM. For point selection, the acupoints zhong-wan, xia-wan, liang-men and tai-yi were often used to regulate stomach qi, remove dampness to restore normal function of the spleen. Acupoints tian-shu and da-heng were selected to promote qi circulation and remove obstruction in the collaterals. Acupoints qi-hai and guan-yuan were used to reinforce the kidney. Acupoints wailing, shui-dao, qu-chi, zhi-gou and nei-ting were selected to eliminate the dampness and heat, induce diuresis to alleviate edema, and promote qi flow to relax the bowels.

Besides these routine points (mainly the points of Conception Vessel, Spleen, Stomach, Kidney, and Bladder Meridians) which were often selected as chief acupoints in the acupuncture treatment of obesity, different adjunct acupoints were added depending on the types of disharmony pattern.

Liu et al. (2004) used the following therapeutic principle and acupoints selection in their clinical practice:

PATTERN OF EXCESSIVE HEAT IN THE STOMACH AND INTESTINES:

The treatment was designed to clear away heat from the stomach and intestines. The auricular points selected were external nose, small intestine and large intestine, and the body acupoints selected were nei-ting, shang-ju-xu, tian-shu, and qu-chi.

PATTERN OF LIVER QI STAGNATION:

The treatment was designed to soothe the liver, regulate qi, activate blood and disperse blood stasis. The auricular points selected were liver, heart, pancreas and gall bladder, and the body acupoints selected were gan-shu, ge-shu, tai-chong, and qu-quan

PATTERN OF DAMP ACCUMULATION BY SPLEEN DEFICIENCY:

The treatment was designed to clear away heat, remove dampness, dry up dampness and strengthen the spleen. To clear away heat, the auricular points selected were sanjiao, spleen and lung, and the body acupoints selected were shui-fen, qi-hai, yin-lingquan, zu-lin-qi. To dry up dampness and strengthen the spleen, the auricular points selected were spleen, kidney and san-jiao, and the body acupoints selected were pi-shu, zhong-wan, zu-san-li and tai-bai.

PATTERN OF DEFICIENCY IN BOTH HEART AND SPLEEN:

The treatment was designed to reinforce the heart and spleen. The auricular points selected were heart, spleen and endocrine, and the body acupoints selected were xinshu, pi-shu, nei-guan and zu-san-li.

PATTERN OF DEFICIENCY IN BOTH THE SPLEEN AND KIDNEY:

The treatment was designed to tonify the kidney, strengthen the spleen and benefit qi. The auricular points selected were spleen, kidney and endocrine, and the body acupoints selected were shen-shu, pi-shu, tai-xi and zu-san-li.

PATTERN OF YIN DEFICIENCY IN THE LIVER AND KIDNEY:

The treatment was designed to nourish the liver and kidney. The auricular points selected were liver, kidney and endocrine, and the body acupoints selected were ganshu, shen-shu, guan-yuan and san-yin-jiao.

PATTERN OF DEFICIENCY IN BOTH LUNG AND SPLEEN:

The treatment was designed to tonify and benefit the lung and spleen. The auricular points selected were lung, spleen and san-jiao, and the body acupoints selected were fei-shu, pi-shu, zu-san-li and lie-que.

PATTERN OF QI DEFICIENCY IN THE HEART AND LUNG:

The treatment was designed to tonify and benefit the heart and lung. The auricular points selected were heart, lung and ear shen-men, and the body acupoints selected were xin-shu, pi-shu, fei-shu, nei-guan and dan-zhong. In case of heart palpitations and shortness of breath add shen-men and nei-guan; for scanty urine add shui-fen and yin-ling-quan; for qi depression, nei-guan and tai-chong need to be added; for yin deficiency and heat, tai-xi and zhao-hai need to be added; for menopausal obesity, qi-hai, guan-

yuan, pi-shu, shen- shu, tai-xi, or ming-men need to be added; for complications of high blood sugar (e.g.,

deficiency of both qi and yin), yang-chi, wan-gu, ran-gu, san-yin-jiao, yi-shu and shen-shu need to be added; for excessive appetite (e.g., excessive heat of spleen and stomach), liang-men, liang-qiu, nei-ting, gong-sun, fei-shu and wei-shu need to be added.

MECHANISMS AND METHODS OF ACUPUNCTURE

Acupuncture, practiced for several thousand years in China, ^[100] is increasingly used worldwide in the treatment of many disorders. An accumulating body of evidence summarized in a NIH Consensus Statement on Acupuncture ^[101] confirms that acupuncture treatment has beneficial effects for conditions ranging from postoperative dental pain to chemotherapy-associated emesis. It is also effective as an adjunctive modality for joint and muscle pain, addictions, and asthma.

MERIDIANS AND ACUPOINTS

In Traditional Chinese Medicine (TCM), life force or ‘Qi’ (‘chee’) is thought to circulate within energy pathways or ‘meridians’ longitudinally throughout the body. There are 14 major meridians, corresponding (loosely) to the Western definition of ‘organs.’ Acupuncture points are specific locations on the body considered to be connected to these energy meridians. ^[101-103] During illness Qi is thought to be out of balance, and stimulation of acupuncture points corrects this imbalance. Theoretically, an ‘excess’ or ‘deficiency’ of Qi can be ‘normalized’ by the specific manner of point

stimulation. Using this paradigm, obesity and/or excess appetite has been conceptualized in a variety of ways, such as 'heat' in the stomach and intestine,^[28,104] a deficiency of Qi in the spleen and stomach^[28,29,104,105] or a deficiency of primary Qi^[104]. Based on these beliefs about the causes of obesity, a variety of acupoints are targeted in the treatment of obesity,

including: Neiguan (P 6), Fenglong (St 40), Liangmen (St 21), Guanyuan (R 4), Zusanli (St 36), Tianshu (St 25), Quchi (LI 11), where P refers to a pericardium point, Lu refers to lung point, St to stomach, K to kidney, and LI to large intestine.^[106]

In terms of traditional medicine, it is believed that acupuncture works to alter central nervous system neurotransmitter levels by stimulating peripheral nerves at acupoints. These stimulated nerves then carry the signals centrally,^[31,32,107,108] shown in Figure 1, including to the spinal cord, pituitary, and midbrain. Activated centers can then release neurochemicals: endorphins, monoamines, and cortisol^[107].

ACUPOINT STIMULATION

A large number of acupuncture points (365 points have been identified in Chinese acupuncture maps) show concentration of peripheral nerve junctions, referred to as ‘trigger points’^[102]. A variety of methods are used to stimulate acupoints.^[101, 107, 109]. These include: 1. Needling or ‘traditional acupuncture’, in which fine stainless-steel needles are inserted through the skin

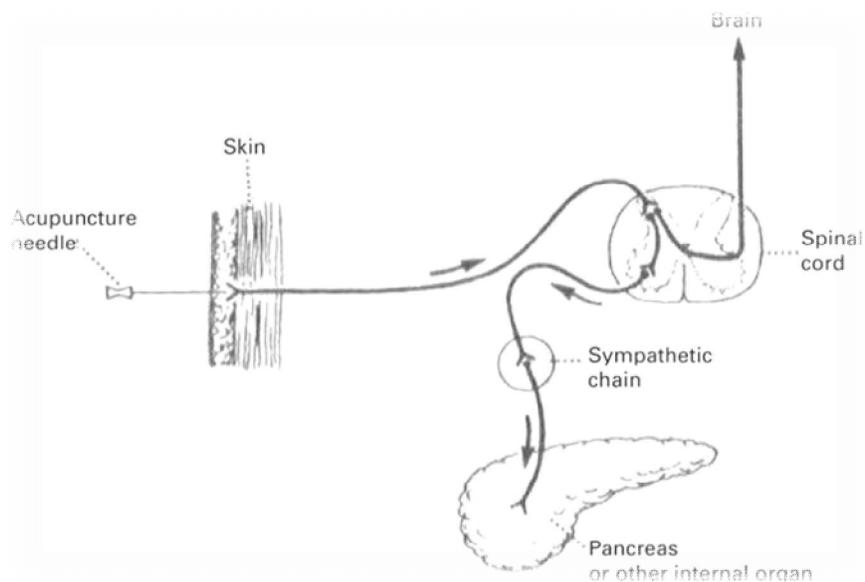


FIGURE-6 SIMPLIFIED THEORETICAL PATHWAY OF NEEDLE STIMULATION SENDING NERVE IMPULSES TO BRAIN AND INTERNA

MERIDIAN PHENOMENA WITH HOLISTIC THEORY

According to classic acupuncture theory, there are two opposing and complementary forces that coexist in nature: *Yin* and *Yang*. These two forces interact to regulate the

flow of *Qi* (pronounced chee). The traditional concept is usually regarded as energy or life force. When a person is in “good health,” that means *Yin* and *Yang* are in balance and then the flow of *Qi* is smooth. When *Yin* and *Yang* become “unbalanced,” there are disturbances in *Qi*, which lead to illness and disease ^[110]. The *Qi* circulates through all parts of the body via pathways called meridians, which bring *Qi* from the internal organs to the skin surface. Up to 365 points along and around these meridians which could be stimulated to correct the imbalance and restore the body to normal health are called acupoints ^[111].

Although the physical evidence for the existence of meridians has not been identified after years of investigation, some meridian phenomena can be found, especially with modern technologies ^[112]. A number of researchers hold the view that when some internal organs are affected by disease, acupoint sensitization has the potential for exerting dynamic functional changes, reflecting acupoint specificity ^[113].

Cheng et al. made a model of acute gastric mucosal injury (AGMI) in rats and observed the plasma extravasated Evans blue (EB) points on the skin of the whole body. They found that four acupoints interacting with stomach appeared extravasated EB points. Furthermore, the number of extravasated EB points was related to the phase of gastric mucosal injury, being greatest on the 2nd and 3rd days after modeling and disappearing gradually along with the natural repair of the AGMI ^[114]. Some research findings suggested that the anatomical structure of meridian channels and acupoints was related to the connective tissues and the connective tissue interstitial fluid (CTIF) system ^[115-122].

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In particular, Yuan et al. analyzed the digital images from slices of cadavers and found that 365 acupoints were located in five types of connective tissues [123]. Dang et al. Indicated that 9 out of 11 acupoints of the lung meridian were on the periosteum ^[117].

Furthermore, another crowd of people devoted to examine the relationship between perivascular space (PVS) and the meridian. According to the perivascular dye injection and frozen section histology, they found that there was PVS around the blood vessels along the meridians, and it is a fluid pathway. Subsequent physiologic studies revealed that the PVS has significantly greater electrical conductivity and significantly higher partial oxygen pressure (pO₂) compared to medial and lateral tissues ^[124].

EFFECT OF ACUPUNCTURE ON NEURO-ENDOCRINE-IMMUNE NETWORK SYSTEM

EFFECT OF ACUPUNCTURE ON NERVOUS SYSTEM

The direct feeling during acupuncture is de qi, an internal composite sensation of soreness, numbness, heaviness, distension and aching, and a radiating sensation at and around the acupoints. The sensation of de qi is most closely related to nervous system. Therefore, most of these studies focus on nervous system. Many studies have found that acupuncture can directly or indirectly activate the nervous system, causing changes of functional activities in different levels of the nervous system, and then playing a modulatory role through release of related neurochemicals.

EFFECT OF ACUPUNCTURE ON NEURAL ACTIVITIES

The main form of nervous system functional activities is electrical activities. Electrophysiological studies of neural activities show that acupuncture stimulation can cause peripheral afferent nervfibers to be excited .^[125]

On one hand, the excitement could be transmitted via spinal cord^[126] to brain^[127] and after central integration, efferent nerves transfer information to the target organs. On the other hand, the excitement could be transmitted through axon reflex to target organs^[128]. eventually showing regulatory effect. Thus, acupuncture can cause discharge activities of different parts in nervous system, regulating nerve

functions at different levels. In recent years, many studies of acupuncture effect on neural functional activities have introduced advanced noninvasive neuroimaging technologies, including positron emission tomography, single proton emission computerized tomography and functional magnetic resonance imaging.

These powerful imaging technologies make it possible to visualize the anatomic and functional effects of acupuncture stimulation in the brain. Studies have shown that acupuncture can cause changes of activities in different functional areas of human or animal brain^[129]. It provides evidence that acupuncture can affect neurons functional activities in the brain

EFFECT OF ACUPUNCTURE ON NEUROCHEMICALS

Researches carried out in the past years have shown that acupuncture can affect synthesis, release and action of several neurotransmitters (such as serotonin, dopamine, catecholamine, glutamate, acetylcholine, etc.) and neuropeptides (such as oxytocin, neuropeptide Y, cholecystokinin, vasoactive intestinal peptide, substance P, calcitonin-gene-related peptide, pituitary adenylate cyclase activating polypeptide, etc.) in both the central and peripheral nervous systems^[130,131]. The changes of neurotransmitters and neuropeptides caused by acupuncture are different due to different diseases or needling parameters.

EFFECT OF ACUPUNCTURE ON ENDOCRINE SYSTEM

Because of the hypothalamus–pituitary–adrenal (HPA) axis, hypothalamus–pituitary–gonadal (HPG) axis and hypothalamus–pituitary–thyroid (HPT) axis playing an important role in the endocrine activities, recent researches about the effects of acupuncture on the endocrine system more focused on these axes, with related hormones as observation indexes. For example, acupuncture could obviously reduce hormones such as adreno corticotropic hormone (ACTH), corticosterone related to HPA axis in chronic stress-induced rats^[132]. Electroacupuncture (EA) could regulate the level of uterus estrogen, pituitary follicle-stimulating hormone and luteinizing hormone and hypothalamic gonadotropin releasing hormone in ovariectomized rats, to restore the disorder of hypothalamus–pituitary–ovary axis^[133].

Acupuncture could increase the level of thyrotropin releasing hormone, thyroid stimulating hormone and total three typical thyroid original acid in chronic fatigue rats, to restore the inhibition of HPT axis ^[134]. All these studies suggest that acupuncture can modulate the function of HPA, HPG and HPT axes.

EFFECT OF ACUPUNCTURE ON IMMUNE SYSTEM

Effect of acupuncture on local immunomodulation of acupoint

Modern studies have found that after inserting the needle into the acupoint, traumatic inflammation occurs in the acupoint, activating the local immunomodulation at the acupoint ^[135]. Our studies also showed that acupuncture could initiate mast cells to gather in the acupoint, secreting bioactive substances such as histamine, bradikinin, SP and serotonin. These secretions caused vasodilatation, increased local permeability and local reaction. At the same time, inflammatory cell infiltrated, cytokines (IL-1b, IL-6, IL-8, TNF-a and IL-4) and adhesion molecules (E-selectin and L-selectin) increased in the acupoint. These changes led a local inflammation in acupoints ^[136].

EFFECT OF ACUPUNCTURE ON NONSPECIFIC IMMUNITY

Numerous researches have shown that acupuncture can regulate the nonspecific immune function ^[137]. including the following aspects: acupuncture can improve the number and function of phagocytes, increase the number and activity of natural killer (NK) cell, promote the synthesis, secretion and biological activities of cytokines and adjust the content of serum complement.

EFFECT OF ACUPUNCTURE ON SPECIFIC IMMUNITY

Studies have shown that acupuncture has certain regulating effect on both cellular immunity and humoral immunity ^[138,139]. The influence of acupuncture on cellular immunity mainly include that it can promote the proliferation of T cells, improve the ratio of CD4+ T cells/CD8+ T cells and modulate the synthesis and secretion of cytokines in the immune response. The effect of acupuncture on humoral immunity mainly includes the following aspects: it can modulate the synthesis and secretion of various kinds of immunoglobulin and promote T-helper lymphocytes secreting cytokines.

EFFECT OF ACUPUNCTURE ON NEURO-ENDOCRINE-IMMUNE NETWORK

With the development of researches, scholars have found that acupuncture has modulating effect on the nervous, endocrine and immune systems. A researcher proposed a hypothesis, that was 'the bidirectional positive regulatory role of acupuncture was achieved by neuro-endocrine-immune network' ^[140]. Subsequently, several researches about acupuncture effect on NEI network were carried out, with related indicators of the three systems such as neurotransmitters, endocrine hormones, immune cells or cytokines as observed indexes. Ju et al ^[141]. conducted the related research at the early time. It's about acupuncture analgesia, finding that there was a NEI regulatory loop in the acupuncture analgesia.

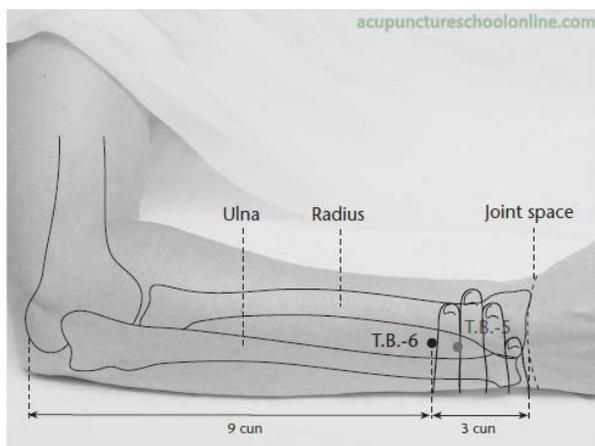
In addition, human studies have also indicated that acupuncture can modulate the NEI network. Liu and co-workers^[142] found that acupuncture can regulate the concentration of plasma IL-2, prostaglandin E2, mbright enkephalin and NK cell activity in patients with rheumatoid arthritis. These suggested that acupuncture could modulate the NEI network.

Further studies showed that acupuncture could also modulate some common signaling molecules of NEI network. For example, EA could promote T-cell immune responses in aging rats, with several common signaling molecules of NEI network involved in, such as serum IL-6, hippocampus IL-6R, hypothalamus b-endorphin and corticotropin-releasing hormone, ACTH and corticosterone of HPA axis^[143] But it remains to be studied that how acupuncture modulate the common signaling molecules.

ACUPUNCTURE POINTS

ZHIGOU : BRANCH DITCH

SJ-6 : HAND SHAOYANG TRIPLE BURNER 6 TW 6



SJ-6 : HAND SHAOYANG TRIPLE BURNER 6 TW 6

CLASSIFICATIONS:

Jing-River and Fire point

Hourly point of the Sanjiao channel

LOCATION:

3 cun proximal to Yangchi SJ-4, in the depression between the radius and the ulna, on the radial side of the extensor digitorum communis muscle.

NEUROANATOMY:

Superficial Innervation: Posterior cutaneous nerve of the forearm from C5 - C8

Dermatome Segment: C6, C7

Needling:

Slightly oblique insertion towards the ulnar side or oblique proximal or distal insertion towards the elbow or wrist respectively 0.5 - 1.5 cun, or joined by through needling to Jianshi P-5.

Warning:

Movement of the patient's hand or arm after needling this point can result in a bent needle.

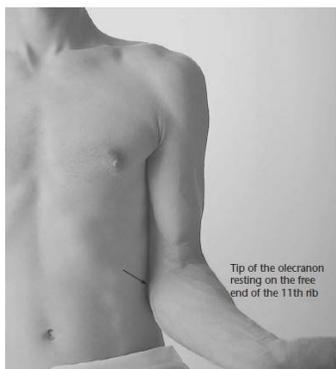
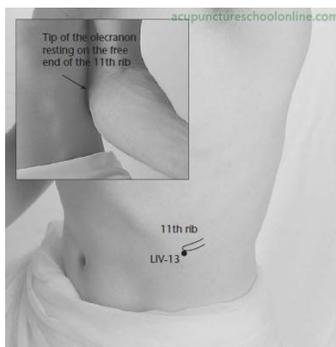
TCM ACTIONS:

- ❖ Regulates qi and clears heat in the three jiao
- ❖ Benefits the chest and lateral costal region
- ❖ Moves the stool
- ❖ Benefits the voice
- ❖ Activates the channel and alleviates pain

TCM INDICATIONS:

- ❖ Tinnitus, heat-wind tinnitus and deafness, sudden loss of voice, lockjaw, febrile disease with absence of sweating, pain of the eyes, redness, swelling and pain of the eyes, swelling and pain of the throat, scrofula.
- ❖ Pain of the lateral costal region, abdominal pain, sudden Heart pain and oppression of the chest, cough, cough with redness and heat of the face.
- ❖ Constipation, vomiting, sudden turmoil disorder, post-partum dizziness, blockage of the Ren Mai in women.
- ❖ Pain of the axilla, pain of the shoulder, arm and back, painful obstruction of the elbow, tremor of the hand, cold-wind hand trembling, numbness of the hand, hemiplegia.

ZHANGMEN:COMPLETION GATE LIV-13 FOOT JUEYIN LIVER 13



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CLASSIFICATIONS:

Front Mu point of the spleen

Hui-Meeting point of the zang

Meeting point of the liver and gall bladder channels

Origin of the Dai Mai

Meetings:

Meeting of Liver with Dai Mai, Gall Bladder Divergent and Liver Divergent

LOCATION:

Directly anterior and inferior to the free end of the eleventh rib. This point is usually lies just above the level of the umbilicus and on or near the mid-axillary line.

NEUROANATOMY:

Superficial Innervation:

Lateral cutaneous thoracic nerve from T11

Dermatome Segment: T11

Needling:

Transverse or oblique insertion medially or laterally, along the line of the rib 0.5 - 1 cun

Warning:

Deep perpendicular needling may damage an enlarged liver or spleen

TCM ACTIONS:

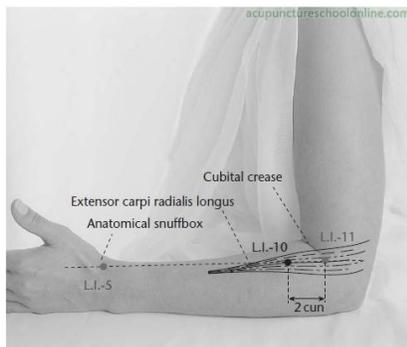
- ❖ Harmonises the liver and spleen
- ❖ Regulates the middle and lower jiao
- ❖ Fortifies the spleen
- ❖ Spreads the liver and regulates qi

TCM INDICATIONS:

- ❖ Injury to the Stomach and Spleen from overindulgence in eating, focal distension, distension and pain of the abdomen, drum distension, abdominal (ju ji) masses, oesophageal constriction, vomiting, pain of the Heart with vomiting, no pleasure in eating, undigested food in the stool, borborygmus, diarrhoea, constipation, emaciation and jaundice, frequent urination with turbid white discharge.
- ❖ Fullness of the chest and lateral costal region, pain of the ribs, sudden difficulty in breathing, inability to catch the breath, dyspnoea, cough, stone oedema.
- ❖ Weariness of the four limbs, running piglet qi with distension of the abdomen, diminished qi with inversion counterflow.
- ❖ Agitation and heat with dry mouth, propensity to anger, propensity to fear, mad walking, epilepsy.
- ❖ Cold and pain of the lumbar spine, rigidity of the spine, lumbar pain with inability to turn and bend the waist, inability to raise the arm and shoulder.

SHOUSANLI : ARM THREE MILES

LI-10 : HAND YANGMING LARGE INTESTINE 10



CLASSIFICATIONS:

Homeostatic point 1 (Ma, Ma & Cho, 2005, Biomedical Acupuncture for Pain Management)

Trigger point (Travell & Simons, 1998, Trigger Point Manual)

LOCATION:

On the radial side of the forearm, 2 cun distal to Quchi L.I.-11 on the line connecting Quchi L.I.-11 with Yangxi L.I.-5

Neuroanatomy:

Superficial Innervation: Posterior cutaneous nerve of the forearm (C6 - C8)

Dermatome Segment: C5

Deeper Structures: Deep radial from the posterior branch of the brachial plexus (C5 - T1)

Needling:

Perpendicular or oblique insertion, 0.5 - 1.5 cun

TCM ACTIONS:

- ❖ Regulates qi and blood,
- ❖ activates the channel
- ❖ alleviates pain
- ❖ Harmonises the intestines and stomach

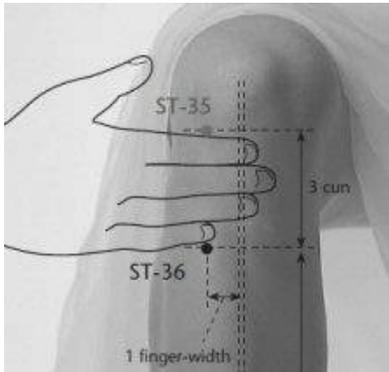
TCM INDICATIONS:

- ❖ Abdominal pain, vomiting and diarrhoea, periodic sensation of cold in the intestines,
- ❖ sudden turmoil disorder.

- ❖ Toothache with swelling of the cheek, deviation of the mouth, loss of voice, scrofula.

ZUSANLI : LEG THREE MILES

ST-36 : FOOT YANGMING STOMACH 36



CLASSIFICATIONS:

He-Sea and Earth point

Gao Wu Command point

Ma Dan-yang Heavenly Star point

Point of the Sea of Water and Grain

Horary point of the Stomach channel

Trigger point (Travell & Simons, 1998, Trigger Point Manual; Melzack, Stillwell & Fox, 1977,

Trigger Points and Homeostatic point 24 (Ma, Ma & Cho, 2005, Biomedical Acupuncture for Pain Management)

LOCATION:

Below the knee, 3 cun inferior to Dubi St-35, one fingerbreadth lateral to the anterior crest of the tibia.

NEUROANATOMY:

SUPERFICIAL INNERVATION: Lateral femoral cutaneous nerve of the calf (L4 - S1)

Dermatome Segment: L5

Deeper Structures: Common fibular (peroneal) nerve (L4 - S3)

Needling:

Perpendicular insertion 1 - 1.5 cun

TCM ACTIONS:

- ❖ Activates the channel and alleviates pain
- ❖ Fortifies the spleen and resolves dampness
- ❖ Supports the correct qi and fosters the original qi
- ❖ Tonifies qi and nourishes blood and yin
- ❖ Clears fire and calms the spirit
- ❖ Activates the channel and alleviates pain
- ❖ Revives the yang and restores consciousness

TCM INDICATIONS:

- ❖ Epigastric pain, nausea, vomiting, bitter vomiting, vomiting pus and blood, hiccup, belching, distension and pain of the abdomen, fullness and distension of the Heart and abdomen, heat in the middle jiao with propensity to hunger, hunger without desire to eat, poor appetite, difficult ingestion.

Borborygmus, flatulence, diarrhoea and dysenteric disorder, undigested food in the stool, cold in the middle jiao with borborygmus, cold in the intestines, chronic diarrhoea, sudden turmoil disorder, leg qi, oedema, heaviness of the four limbs, lower abdominal pain and swelling with inability to urinate, jaundice.

The five taxations and the seven injuries, insufficiency of original qi, insufficiency of yin qi, insufficiency of zang qi, insufficiency of Stomach qi, deficient dyspnoea, shortness of breath and cough, dyspnoea with inability to stand for long.

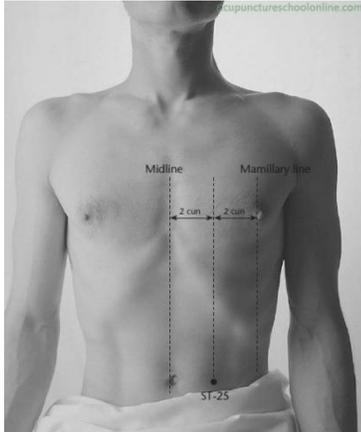
Dizziness, post-partum blood dizziness, dimness of vision, tinnitus, palpitations, hypertension.

Mania-depression, manic singing, raving, abusive talk, anger and fright, tendency to sadness, outrageous laughter, agitation with heat in the body.

- ❖ Throat painful obstruction with inability to speak, chills and fever, febrile disease with absence of sweating, febrile disease with heavy head and pain of the forehead, headache, cold nose, pain of the brain, pain of the lateral costal region, blood stasis in the interior, blood stasis in the chest, sudden Heart pain, fullness of the chest and lateral costal region, qi rushing up to the chest.
- ❖ Lock jaw, clonic spasm, loss of consciousness.
- ❖ Breast abscess, swelling of the breast, pain of the knee and shin, pain of the thigh and shin, wind stroke, hemiplegia, muscle pain, chronic painful obstruction, lumbar pain with inability to turn, shan disorder.

TIANSHU :HEAVEN'S PIVOT

ST-25 : FOOT YANGMING STOMACH 25



CLASSIFICATIONS:

Front Mu of the Large Intestine

Meetings:

Meeting of Stomach with Kidney Divergent and Large Intestine Divergent

LOCATION:

On the abdomen, 2 cun lateral to the umbilicus.

NEUROANATOMY:

Superficial Innervation: Cutaneous branches of thoracic nerves from T10

Dermatome Segment: T10

Needling:

Perpendicular insertion 1 - 1.5 cun Oblique inferior insertion towards the uterus for diseases of the uterus

Warning:

In thin subjects, deep needling may penetrate the peritoneal cavity

TCM ACTIONS:

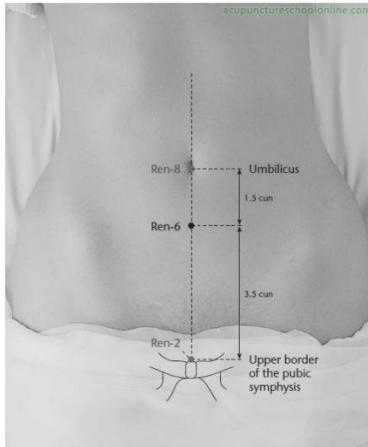
- ❖ Regulates the intestines
- ❖ Regulates the spleen and stomach
- ❖ Resolves dampness and damp-heat
- ❖ Regulates qi and blood and eliminates stagnation

TCM INDICATIONS:

- ❖ Diarrhoea, Spleen-diarrhoea, persistent, diarrhoea with undigested food in the stool,
- ❖ dystenteric disorder, borborygmus, lower yuan (origin) deficient and cold, constipation. Oedema, drum distension, swelling of the face, turbid painful urinary dysfunction.
- ❖ Vomiting, retching, difficult ingestion, poor appetite, sudden turmoil disorder.
- ❖ Abdominal pain, abdominal distension with laboured breathing, intestinal abscess,
- ❖ generalised, swelling with severe cutting periumbilical pain, umbilical shan disorder with localised pain that periodically surges up the Heart, shan disorder, running piglet qi.
- ❖ Abdominal (zheng jia) masses in women, pain of the uterus, dysmenorrhoea, irregular
- ❖ menstruation, infertility, red and white leucorrhoea.
- ❖ Cold shivering from malaria, severe heat with manic raving

QIHAI : SEA OF QI

REN-6 : EXTRAORDINARY CONCEPTION VESSEL 6



LOCATION:

On the midline of the lower abdomen, 1.5 cun inferior to the umbilicus and 3.5 cun superior to the pubic symphysis.

NEUROANATOMY:

Superficial Innervation: Anterior cutaneous thoracic nerves from T11 or T12

Dermatome Segment: T11, T12

Needling:

Perpendicular insertion 0.8 - 1.5 cun

Warning:

Deep needling may penetrate the peritoneal cavity. No deep needling in pregnancy, or perpendicular needling in advanced pregnancy.

TCM ACTIONS:

- ❖ Fosters original qi
- ❖ Tonifies qi

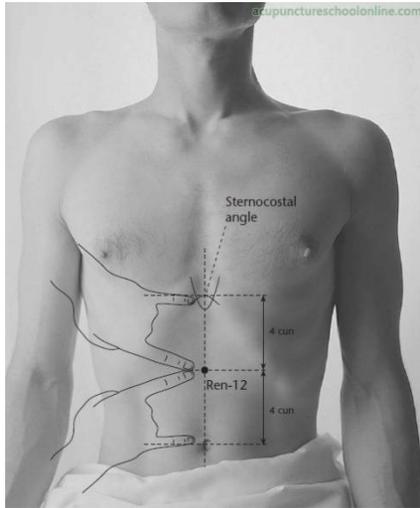
- ❖ Tonifies the kidneys and fortifies yang
- ❖ Rescues collapse of yang
- ❖ Regulates qi and harmonises blood

TCM INDICATIONS:

- ❖ Zang deficiency with qi exhaustion, original qi deficiency, collapse of yang, slow and minute pulse, yin deficiency with sudden collapse of yang, loss of consciousness from windstroke, all kinds of chronic qi disease that do not respond to treatment, emaciation of the muscles of the body, feebleness and weakness of the muscles, failure of the fontanelle to close in babies, upward attack of the qi of the five zang.
- ❖ Impotence, seminal emission, prolapse of the uterus, prolapse of the rectum. Deficiency and cold of the lower jiao, inversion counterflow of the four limbs, cold illness with dark face, diarrhoea, dysenteric disorder, white and turbid urine, dark urine, hesitant urination, childhood enuresis.
- ❖ Uterine bleeding, persistent flow of lochia, post-partum bleeding, irregular menstruation, dysmenorrhoea, red and white leucorrhoea, infertility.
- ❖ The seven kinds of shan disorder, twisting pain of the umbilicus, abdominal (zheng jia) masses, abdominal distension, pain and cold sensation below the umbilicus, retraction of the testicles. Upward staring eyes, constipation, sudden pain of the Heart, dyspnoea, lumbar sprain

ZHONGWAN : MIDDLE CAVITY

REN-12 : EXTRAORDINARY CONCEPTION VESSEL 12



CLASSIFICATIONS:

Front Mu point of the stomach

Hui-Meeting point of the Fu Confluent point of the San Jiao and Pericardium Divergent channels (Cecil-Sterman, 2012, Advanced Acupuncture)

Meetings:

Meeting of Conception Vessel with Small Intestine, San Jiao, Stomach, Stomach

Divergent, Spleen

Divergent, San Jiao Divergent and Pericardium Divergent

LOCATION:

On the midline of the abdomen, 4 cun above the umbilicus and midway between the umbilicus and the sternocostal angle.

NEUROANATOMY:

Superficial Innervation: Anterior cutaneous thoracic nerve from T8

Dermatome Segment: T8

Needling:

Perpendicular insertion 0.8 - 1.5 cun

Warning:

In thin patients deep needling may penetrate the peritoneal cavity. No perpendicular needling in advanced pregnancy.

TCM ACTIONS:

- ❖ Harmonises the middle jiao and descends rebellion
- ❖ Tonifies the stomach and fortifies the spleen
- ❖ Regulates qi and alleviates pain

TCM INDICATION:

- ❖ All diseases of the Stomach and Spleen, interior injury to the Stomach and Spleen, epigastric, epigastric pain and fullness, difficult ingestion, eats little but is easily full, nausea, Stomach reflux, vomiting, vomiting blood, abdominal distension, severe pain of the abdomen, sudden abdominal fullness, focal distension and fullness, pain of the Spleen, hardness and pain of the lateral costal region.
Injury by worry, anxiety and overthinking, injury by the seven emotions leading to epigastric pain.
- ❖ Diarrhoea, undigested food in the stool, red and white dysenteric disorder, difficulty in
- ❖ defecation, heat in the Small Intestine, dark urine, sudden turmoil disorder.

❖ Deficiency-taxation, sallow complexion, post-partum blood dizziness.

Heart pain, chronic and acute childhood fright wind, loss of consciousness, mania-depression, epilepsy, tongue thrusting. Cold body, scorched foul odour in the nose, running piglet qi, dyspnoea.

MATERIALS AND METHODS

Study design : *Experimental pre post study*

Study population :

The present study was conducted in Government Yoga and Naturopathy Medical College Hospital, Arumbakkam, Chennai – 600 106. The subjects were thirty outpatient from Government Yoga and Naturopathy Medical College Hospital, Arumbakkam, Chennai – 600 106.

Ethical committee clearance: Clearance from the Institutional ethical committee was obtained prior to the conduct of the study.

Written Informed consent

Subjects who fulfilled inclusion criteria were appraised about the purpose of the study and rights as research subjects. Informed consent form was administered in English.

Adequate time was given to each patient to go through the information sheet and their queries were answered. Their right to withdraw from the study and the need for willingness to participate voluntarily in the study was explained. All the subjects expressed their willingness to participate in the study by giving a signed informed consent. (A sample information sheet and consent form is enclosed in Annexure)

Selection of the subjects:

Inclusion Criteria:

- ❖ Age :18-35yrs
- ❖ Obesity grade 1 (30.0-34.9kg/m²)
- ❖ Patients conforming to the differentiation of obesity with spleen deficiency
- ❖ Both sexes

- ❖ Patients who had taken no weight loss drugs in past six months
- ❖ Got informed consent

Exclusion Criteria:

- ❖ Pregnancy
- ❖ Lactating Mothers
- ❖ Participation in other therapies for pain
- ❖ Patient who had taken weight loss drugs in the past six months
- ❖ Patients with secondary obesity caused by severe primary diseases in the brain and endocrine system.
- ❖ In any diet restriction for obesity

Data collection and Analysis:

- ❖ Subjects were given a set of spleen qi deficiency questionnaires for scoring. (one question- 1 score)
 1. Edema : yes / no
 2. Lassitude : yes / no
 3. Heavy sensation in the body : yes / no
 4. Oliguria : yes / no
 5. Anorexia : yes / no
 6. Abdominal fullness : yes / no
- ❖ Subject whose score was 2 and above were taken into study by measuring their height, weight, waist circumference along BMI & waist hip ratio.

Assessments of Parameters:

- ❖ WEIGHT
- ❖ BMI
- ❖ WAIST CIRCUMFERENCE
- ❖ WAIST HIP RATIO.

Weight:

Participants will be weighed in kilograms using a digital weight scale. At the end of the examination will display the weight in kilograms.

BMI:

Weight in kilograms

Height in meters²

Standing Height

Standing height is an assessment of maximum vertical size.. Standing height is measured with a fixed vertical backboard and an adjustable head piece.

1. Position the subject:

Direct the subject to the platform. Ask him or her to remove any hair ornaments, jewellery, buns, or braids from the top of the head. Exhibit the correct position for the measurement of standing height. First, have the subject stand up straight against the backboard with the body weight evenly distributed and both feet flat on the platform. Instruct the subject to stand with the heels together and toes apart. The toes should point slightly outward at approximately a 60°angle. Check that

the back of the head, shoulder blades, buttocks, and heels make contact with the backboard.

Waist circumference

1. Remove clothing from the waist line.
2. Stand with feet shoulder width apart (25 to 30 centimetres or 10 to 12 inches) and back straight.
3. Locate the top of the hip bone. This is the part of the hip bone at the side of the waist not at the front of the body. Use the area between the thumb and index finger to feel for the hip bone at the side of the waist.
4. Align the bottom edge of the measuring tape with the top of the hip bone. Wrap the tape measure all the way around the waist. Ensure that the tape measure is parallel to the floor and not twisted.
5. Take two normal breaths and on the exhale of the second breath tighten the tape measure so it is snug but not digging into the skin.

Hip circumference:

1. At a level parallel to the floor, at the largest circumference of the buttocks.
2. Make both measurements with a stretch-resistant tape that is wrapped snugly around the subject, but not to the point that the tape is constricting. Keep the tape level and parallel to the floor at the point of measurement.

Subjects will be Screened (n=30)

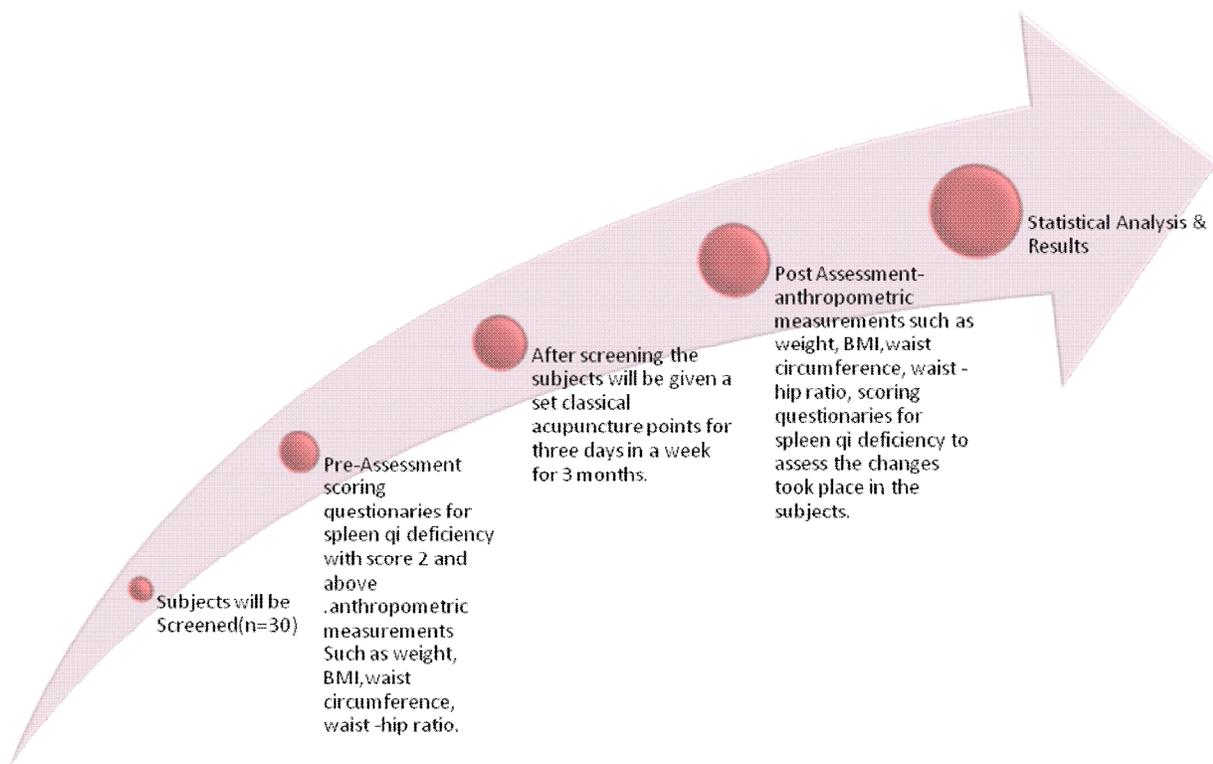
Pre-Assessment scoring questionnaires for spleen qi deficiency with score 2 and above .anthropometric measurements Such as weight, BMI,waist circumference, waist -hip ratio.

After screening the subjects will be given a set classical acupuncture points for three days in a week for 3 months.

Post Assessment-anthropometric measurements such as weight, BMI, waist circumference, waist -hip ratio, scoring questionaries for spleen qi deficiency to assess the changes took place in the subjects.

Statistical Analysis & Results

TRAIL PROFILE:



INTERVENTION:

CLASSICAL ACUPUNCTURE POINTS:

CV-6, CV-12, ST-25, ST-36, LIV-13, LI-10, TW-6.

NEEDLING

Needling methods:

- ❖ Subjects were treated with 'use and throw' stainless steel needles.
- ❖ Needles with the measurement of 0.25 * 0.25 were used throughout the study.
- ❖ During every visit patients were treated with new needles.
- ❖ Sterile measures were adopted and used needles were carefully disposed.
- ❖ Needles were inserted till the level of the dermis.

After screening the subjects will be given a set classical acupuncture points for three days in a week for 3 months.

After the period of three months same assessment will be done to assess the effectiveness of the intervention.

5) RESULTS:

Statistical Analysis Plan: Statistical Analysis done by paired T TEST method

Statistical Analysis Plan:

Data was expressed as Mean and SD. Inter group comparison was done using paired t-test by R statistical free software version 3.2.0.

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Data Analysis

Data expressed Mean \pm SD. Comparison of Mean in between the pre and post intervention was analyzed by paired t test. R statistical software version 3.1.1 was used for the analysis. P<0.05 set as significant

RESULTS

Table: 3 Demographical variable of the study participants

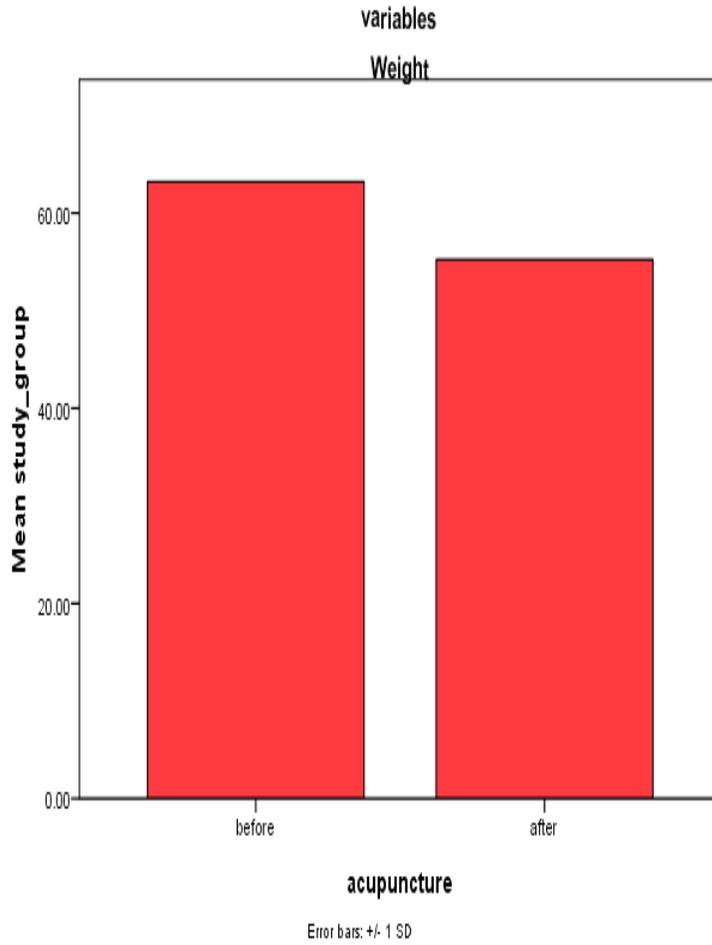
Variables	Study group
Age (yrs)	27.90±3.88
Height (cm)	153.42±7.52
Weight (kg)	68.77±9.23
BMI (kg/m²)	26.23±3.78

Table 4: Comparison of variables of study group before and after the intervention

Variables	Study group		P value
	Before	After	
Weight	68.90±5.70	61.83±6.60	0.05
BMI	31.50±2.66	28.56±4.20	0.02
HC	98.24±7.86	96.29±5.50	0.04
WC	85.60±3.34	81.06±2.90	0.04
WHR	0.86±0.23	0.83±0.12	0.12
Total Score	12.60±2.56	3.40±5.28	0.01

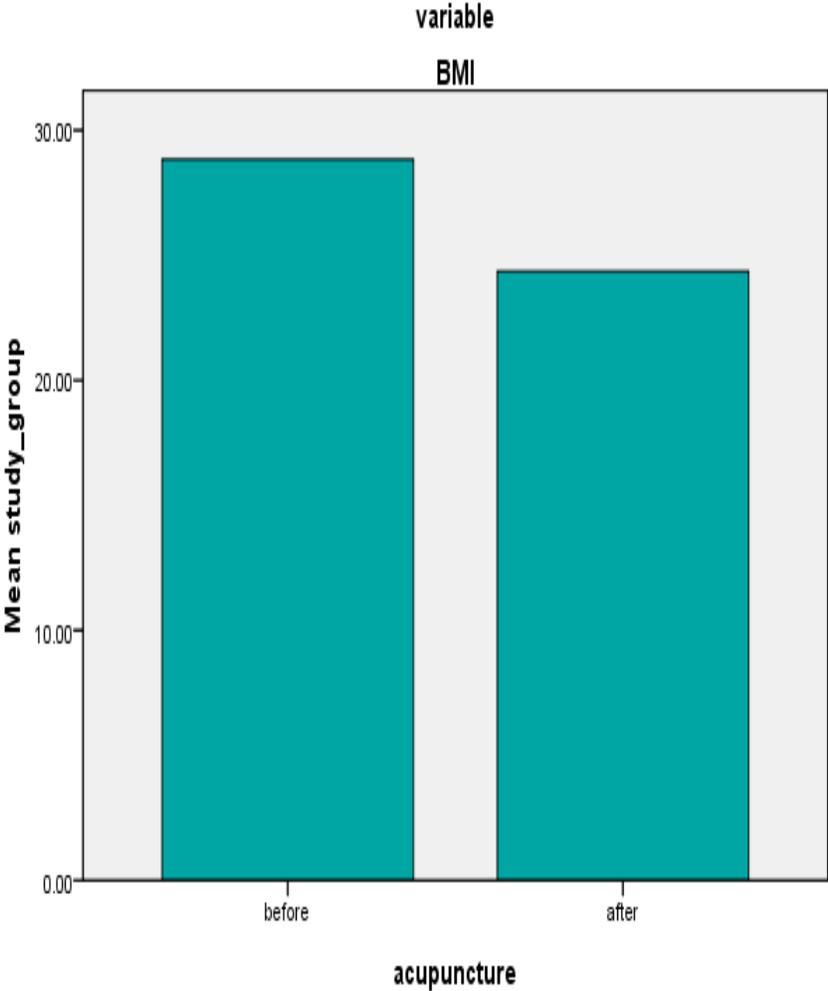
Result shows that the intervention efficiently influenced the nervous system by exerting a positive influence by creating a dominance of parasympathetic system over sympathetic aiding in physiological and psychological changes resulting in weight reduction and also in reduction of BMI, waist hip ratio, waist circumference.

Table 5: Comparison of WEIGHT of study group before and after the intervention



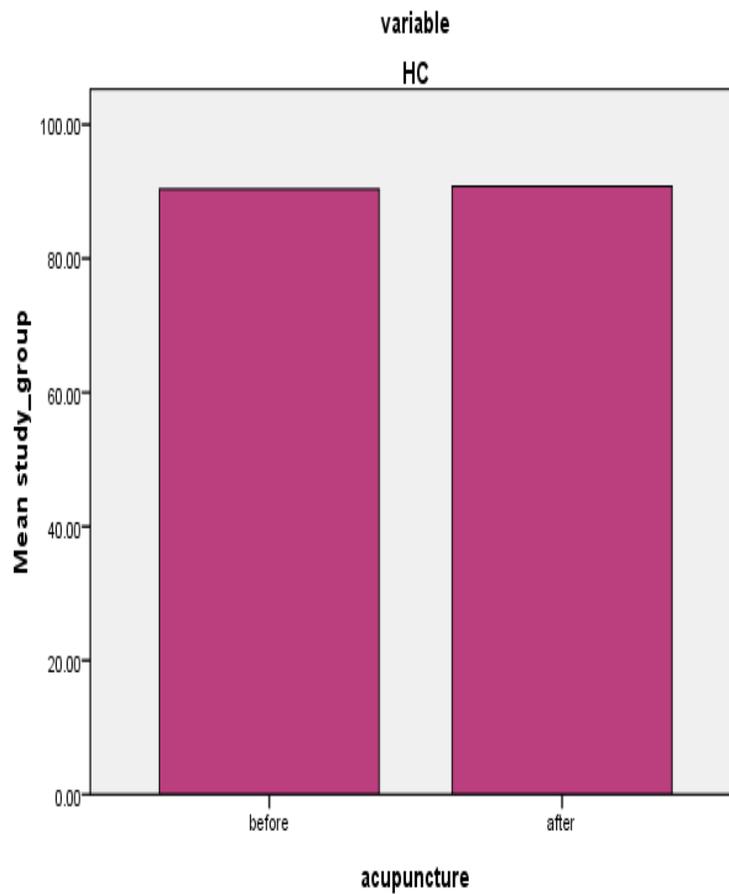
Result shows that the intervention efficiently reduced weight significantly 0.05 from 68.90 ± 5.70 to 61.83 ± 6.60 .

Table 6: Comparison of BMI of study group before and after the intervention



Result shows that the intervention efficiently reduced BMI significantly 0.02 from 31.50 ± 2.66 to 28.56 ± 4.20

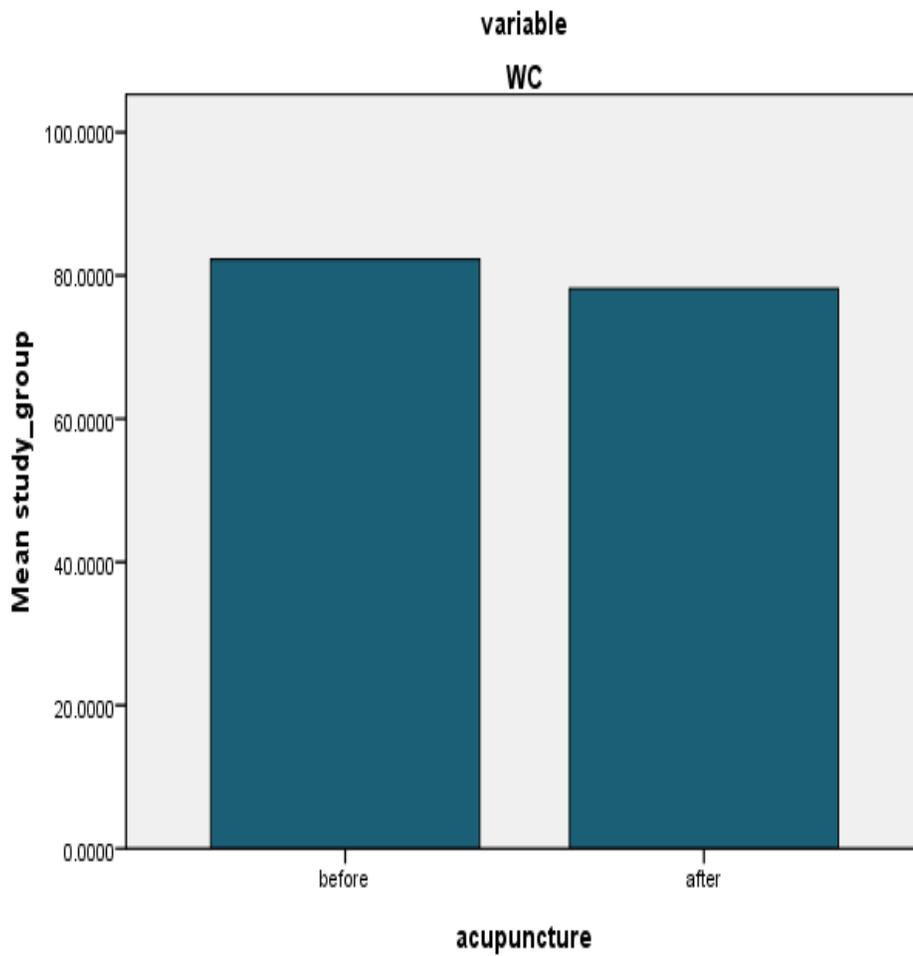
Table 7: Comparison of HC of study group before and after the intervention



Result shows that the intervention efficiently reduced HC significantly 0.04 from

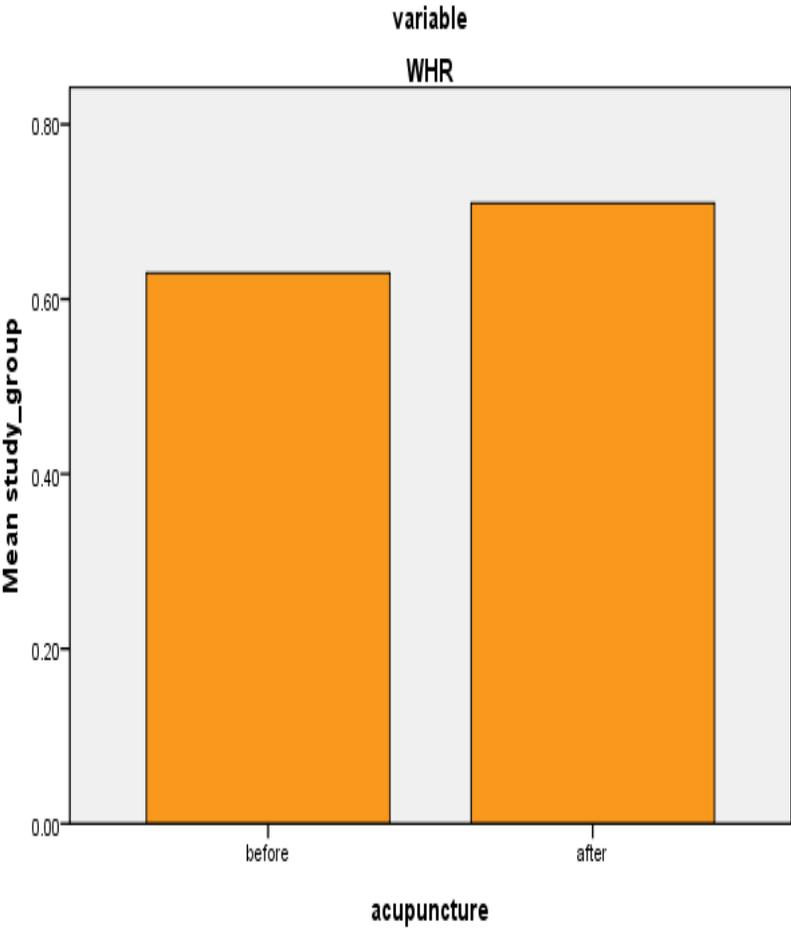
98.24 ± 7.86 to 96.29 ± 5.50

Table 8: Comparison of WC of study group before and after the intervention



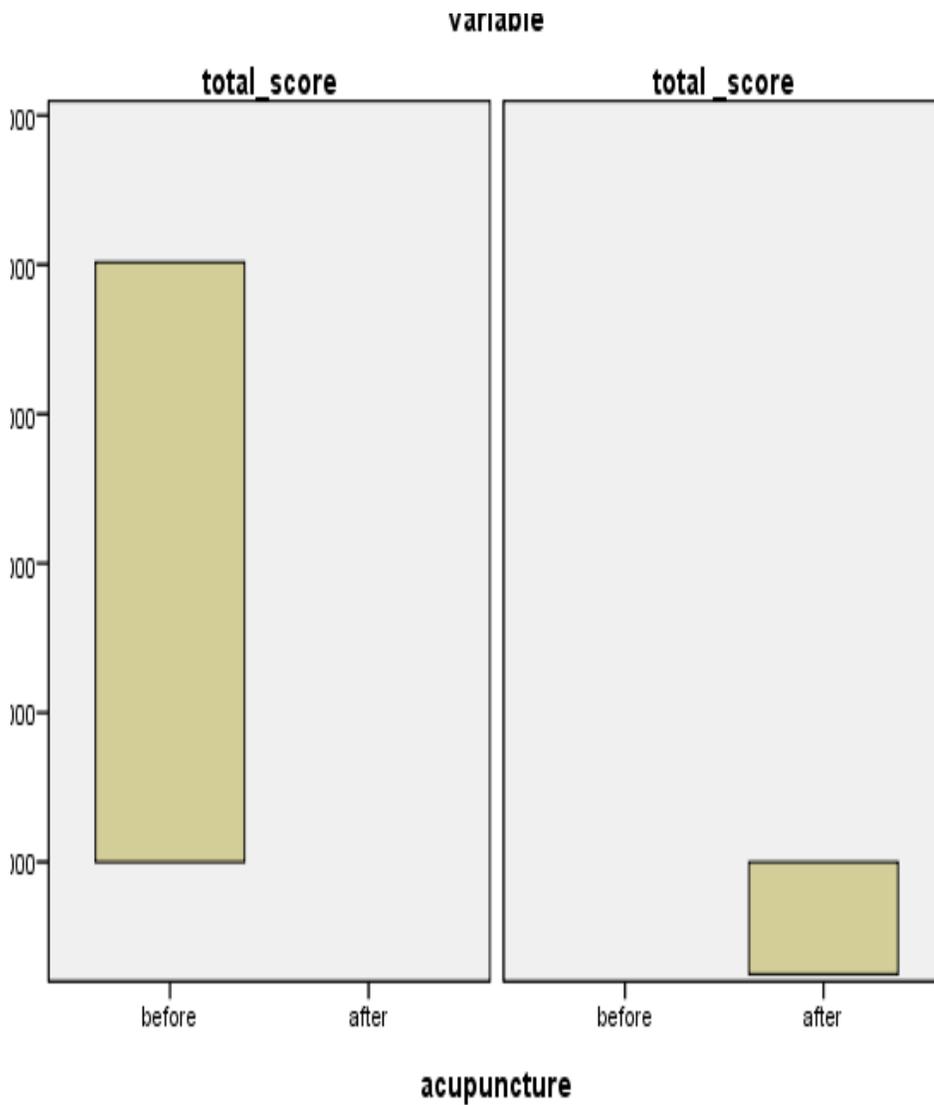
Result shows that the intervention efficiently reduced WC significantly 0.04 from 85.60 ± 3.34 to 81.06 ± 2.90

Table 9: Comparison of WHR of study group before and after the intervention



Result shows that the intervention efficiently reduced WHR significantly 0.12 from 0.86 ± 0.23 to 0.83 ± 0.12

Table 10: Comparison of TOTAL SCORE of study group before and after the intervention



Result shows that the intervention efficiently reduced WHR significantly 0.01 from

12.60±2.56 to 3.40±5.28

DISCUSSION

This Experimental pre post study was designed to analyze differences in the anthropometric measurements of obese individuals through acupuncture on specific points.

In this study, we investigated the effect of acupuncture on anthropometric measurement of obese individuals showed significant reduction in weight from 68.90 ± 5.70 to 61.83 ± 6.60 and BMI significantly from 31.50 ± 2.66 to 28.56 ± 4.20 , HC significantly from 98.24 ± 7.86 to 96.29 ± 5.50 , WC significantly 0.04 from 85.60 ± 3.34 to 81.06 ± 2.90 , WHR significantly 0.12 from 0.86 ± 0.23 to 0.83 ± 0.12 , WHR significantly 0.01 from 12.60 ± 2.56 to 3.40 ± 5.28 suggesting that there would be a possible improvement in spleen function which aids in proper distribution of energy to various parts of the body for optimal physiological functioning.

You and Hung, 2005 showed that 100 Hz EA (bilateral Zusanli (ST36) and Sanyinjiao (SP6) for 30 min during 14 days) significantly in human, a similar reduction in body weight, lipid profile (triglycerides, total cholesterol and LDL), as well as in waist and hip circumference, was observed when patients were treated with EA for six weeks (bilateral Tianshu (ST25), bilateral Weidao (GB28), Zhongwan (CV12), Shuifen (CV9), Guanyuan (CV4), Sanyinjiao (SP6), as well as Quchi (LI11) and Fenlong (ST40) for obese patients with higher energy, or Qihai (CV6) and Yinlingquan (SP9) for patients with lower energy, using 30-40 Hz and dense-disperse wave), followed by a six weeks period without any treatment for six weeks and another six weeks period with a low-calorie diet. These results demonstrated that EA exhibits long-term effects on body homeostasis in obese patients ^[144].

Body weight and serum leptin reduction ($p < 0.000$) in response to EA (ear points Sanjiao (Hungry) and Shenmen (Stomach), and body points Hegu (LI4), Quchi (LI11), Tianshu (ST25), Zusanli (ST36), Neiting (ST44), Taichong (LV3) and Qihai (CV6), once daily, for 30 minutes, during 20 days) were also associated with an increase in serum beta endorphin (BE) levels ($p < 0.05$). Authors hypothesized that the effect of EA in modulating serum BE level could enhance lipolytic activity, which may induce weight loss by mobilizing energy stores ^[145].

A randomized, sham-controlled preliminary trial confirmed that the significant reduction of body weight and body mass index (BMI) in obese women treated with EA (Hegu (LI4), Shenmen (HT7), Zusanli (ST36), Neiting (ST44), and Sanyinjiao (SP6) bilaterally, two sessions of 20 minutes/week for five weeks) was related to decreased levels of leptin. They also observed reduced insulin levels, and increased levels of ghrelin and cholecystokinin ^[146].

Lou et al. also reported that EA can significantly reduce leptin levels and increase adiponectin serum levels in obese ^[147]. Finally, study of Fan et al. evidenced that EA at lateral Housanli and Neiting (ST44) with 2-15 Hz, 4mA for 49 days, was more effective than the anti-obesity drug, sibutramine, to reduce body mass through the regulation of adiponectin and insulin levels in obese rats ^[148].

To confirm that EA, and not the stress produced by the manipulation, was responsible for body weight reduction and adipokines modulation, Kim et al. compared three groups of rats: AL (fed ad libitum without any treatment), Holder (fed ad libitum with daily holder restraint) and EA (fed ad libitum with daily holder restraint and 100 Hz EA stimulation) groups. After the four-week experimental period, they evidenced that food

intake and body weight reduction in EA group was associated to increased serum leptin levels, as previously reported. Interestingly, the level of stress hormones, such as epinephrine and norepinephrine, and corticosterone, was increased in Holder group, but not in EA group.

Altogether, these results suggested that the effect of EA on body weight was through increasing leptin, but was not due to the stress caused by the daily holder restraint ^[149].

Taken altogether, these studies indicated that EA might help to control obesity owing to its beneficial effects on hormones that participate in pathways regulating body weight, namely leptin and adiponectin, among others. An interesting study showed that the significant reduction in food intake and body weight in DIO rats treated with 2 Hz EA (Zusanli (ST36) and Sanyinjiao (SP6) with intensity increasing stepwise from 0.5-1-1.5 mA daily for 30 minutes), was associated with increased levels of α -MSH peptide and POMC mRNA in hypothalamus, and an elevated α -MSH concentration in CSF. These data suggested that the mechanism by which EA controls body weight in rat involves α -MSH that has an anorexigenic effect ^[150].

In another study, in addition to the effect on appetite and α -MSH, the of 2 Hz EA (four weeks, three sessions/week) in DIO rats also induced increase in anorexigenic CART peptide, and a decrease in orexigenic peptide NPY in hypothalamus. The modulation of these neuropeptides could explain the reduction of food intake and body weight in rat. Notably, 2 Hz EA treatment induced a more important reduction in food intake, body weight and ghrelin levels, than 100 Hz EA; while 100 Hz EA was more efficient to reduce cholesterol and triglycerides, and increase plasma leptin ^[151].

Some of the studies described above showed that EA not only modulates leptin and

adiponectin, but also affects insulin levels.

Cabioğlu and colleagues found that EA application (ear points Sanjiao (Hungry) and Shenmen (Stomach), and body points Hegu (LI4), Quchi (LI11), Tianshu (ST25), Zusanli (ST36), Neiting (ST44) and Taichong (LV3), once daily, for 30 minutes, during 20 days) produced a 4.8% weight reduction and a significant decrease ($p < 0.05$) in total cholesterol, triglycerides and LDL in obese women ^[152], as well as a significant decrease in lipoprotein A and apolipoprotein B ($p < 0.05$), indicating that EA therapy might be a useful approach for both losing weight and reducing risk factors for associated cardiovascular diseases ^[153]. Interestingly, the effects of EA also included an increase in serum insulin and c-peptide levels ($p < 0.001$) and a decrease in glucose levels ($p < 0.01$), suggesting that EA can help to control serum glucose levels through regulation of serum insulin and c-peptide levels ^[154].

Lin et al. reported that EA treatment with 15 Hz at bilateral Zusanli (ST36) was able to significantly reduce HOMA index from 7.29 ± 3.0 to 3.3 ± 1.1 in rats with insulin resistance induced by prednisolone, while HOMA index was 5.1 ± 1 in control. Plasma levels of FFAs were significantly decreased after 60 minutes of prednisolone injection (until $16 \pm 20\%$ in EA group, compared with $72 \pm 31\%$ in control). Therefore, the positive effect of EA on insulin resistance could be by lowering plasma FFAs levels ^[155].

Another study also demonstrated that the decrease in FFAs levels in response to 3 Hz EA (Zusanli (ST36) and Guanyuan (CV4), five sessions/week, eight weeks), was associated to up-regulation of skeletal.

Sirtuin 1 (SIRT1) protein expression, peroxisome proliferator-activated receptor γ

coactivator 1 α (PGC-1 α), nuclear respiratory factor 1 (NRF 1) and acyl-CoA oxidase (ACOX).

Authors concluded that low-frequency EA improves insulin sensibility in obese diabetic mice probably through activation of SIRT 1/PGC-1 α in skeletal muscle ^[156].

Obesity is closely associated with a chronic inflammation and a few studies have described the anti-inflammatory actions of acupuncture in the treatment of obesity. For example, results from Yu et al. evidenced that strong EA (20 Hz, 5 V at Zusanli (ST36) and Sanyinjiao (SP6) daily for 14 days) was more effective to regulate body weight, as well as triglycerides, cholesterol, HDL and LDL, than weak EA (20 Hz, 2.5 V) in obese rats. Interestingly, RT-PCR assays using RNA obtained from epididymis adipose tissue revealed a significant reduction of transcripts corresponding to that monocyte chemoattractant protein-1 (MCP-1) and TNF α , both proinflammatory molecules. Then the modulation of inflammation could contribute to the effects of EA in obese patients ^[157]. Song, et al found that paraventricular subnuclei neurons were active during the stress condition, especially the parvocellular subnuclei. In the present experiments, we observed that nearly 25% (163/653) of the neurons recorded in PVN responded to the noxious heat stimulus (48°C), including 42 inhibitory neurons and 121 excitatory ones. The experiments observed the characters of neurons via the feedback regulation of hydrocortisone.

The physiological characters of these neurons were similar to those of CRH neurons in PVN, indicating their correlation with CRH neurons activities. These neurons are the target neurons in our study.

The acupoints specifically activate SRNs in PVN were also the specificity acupoints for

the regulation of HPAA function.

CRH secreted by hypothalamus are the small cell peptidergic neurons. The hypothalamic regulatory peptides are released into the portal system via the projection of the axons to the median eminence. Its axonal endings contact with the first level of capillary in pituitary portal system.

These CRH neurons release regulatory peptide into the portal system. Regulating ACTH secretion from pituitary gland and promoting the secretion of CORT in target gland. At the same time, the secretion of CRH neurons in hypothalamus is regulated by the feedback signals and the central nerve system. The regulation of feedback signals includes the short-loop feedback and the long-loop feedback, representing the main type of regulation on CRH secretion.

Additionally, CRH itself can produce ultra short-loop feedback for its self-regulation. Studies have shown that acupuncture regulated the function of HPAA via promoting hypothalamic CRH secretion so that ACTH and CORT secretion could be regulated . In order to verify the effect of specificity acupoints on regulating HPAA, we examined the behavior, peripheral blood CORT levels, GR and CRH protein expressions in PVN in UCMS model rats under acupuncture at the specificity acupoints and the nonspecificity acupoints. The results showed that acupuncture at specificity acupoints modulated the behavior in UCMS rats, down-regulated the level of CORT in peripheral blood, promoted GR expression and suppressed ,CRH excessive secretion in PVN as compared with M group. It suggests that the acupoints for the specific activation on SRNs in PVN are also the specificity acupoints for the regulation of HPAA function.

Through this study it is found that acupuncture becomes one of the effective treatment

which helps in, reducing the anthropometric measurements, BMI, HC, WC, WHR and the possible mechanism or the proposed one behind the results are

The hypothalamus — particularly the arcuate nucleus (ARC) — and the brain — particularly the nucleus of the solitary tract (NTS) — are the main sites of convergence and integration of the central and peripheral signals that regulate food intake and energy expenditure ^[158, 159]

There are mechanisms of short-term regulation (satiety signals) which determine the beginning and end of a meal (hunger and satiation) and the interval between meals (satiety) ^[160], and long-term regulatory factors (signals of adiposity) which help the body to regulate energy depots. Satiety signals from the GIT are transmitted primarily through vagal and spinal nerves to the NTS, while the signals of adiposity reach the median eminence via ARC or by crossing the blood-brain barrier (BBB) through saturable and non-saturable mechanisms. There is, however, a large integration and convergence of these signals by neural connections between the ARC nucleus, NTS, and vagal afferent fibres.

In recent years, the central regulation of energy balance has become even more fascinating and complex with the characterization of new mechanisms of control. The endocannabinoid system participates in energy homeostasis by central and peripheral actions that influence appetite, motivation for consumption of palatable food, production and distribution of fat, energy expenditure, and glucose and insulin homeostasis ^[161].

These new findings on the neuroendocrine mechanisms controlling energy homeostasis and body weight show the complexity of these integrating systems and the existence of

many unravelled mysteries.

Nevertheless, each mystery unveiled opens new opportunities for the development of novel therapies for obesity and nutritional disorders ^[162].

This study is limited as the study design was not suitable and the sample size is small.

As a future study this can be repeated in all grades of obese individuals with the larger sample size and for a longer duration.

CONCLUSION

- ❖ There were noteworthy improvements, positive reduction of weight in obese individuals, waist hip ratio got significant reduction after acupuncture in the obese individuals.
- ❖ Through this study, Acupuncture plays an inevitable role in weight reduction through enhanced fat metabolism and prevention of fat deposition, which would be of utmost importance in effective weight reduction in case of obesity by improving spleen function.
- ❖ Also by improving spleen function it influences the psychological well being of the obese individuals as self esteemed reflecting in the improved quality of life.
- ❖ Acupuncture, being an effective therapy for improving spleen function in spleen energy deficient obese individuals.
- ❖ Hence Acupuncture influences the individual's quality of life and weight management positively making it an evidence based treatment for obese individuals of spleen energy deficiency.

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ANNEXURE

PROFORMA

Name: Age: yrs Gender: Male / Female

Occupation: Marital Status: Religion:

Address:

Emergency Contact:

Primary Language(s):

Complaints:

History of present Illness:

Previous Illness:

Personal History:

Bowel: Micturition: Addiction

Coffee/Tea: with/without sugar : Diet :

Family History:

History of Allergy to any specific drugs/food,if any:

Obstetrics & Gynaecology history:

Vital data:

Built:

BMI:

Waist Hip ratio:

Height: cms

Weight: kgs

Pulse: beats/min

Blood Pressure: mm/Hg

Temperature:

GENERAL PHYSICAL EXAMINATION:

SYSTEMIC

EXAMINATION:

Cardiovascular System:

Respiratory System:

Abdomen:

Nervous System:

Endocrine System:

Genitourinary System:

Locomotor System:

Investigation

SPLEEN QUESTIONNAIRE

Subjects were given a set of spleen qi deficiency questionnaires for scoring. (one question- 1 score)

1. Edema : yes / no
2. Lassitude : yes / no
3. Heavy sensation in the body : yes / no
4. Oliguria : yes / no
5. Anorexia : yes / no
6. Abdominal fullness : yes / no

INFORMED CONSENT FORM

Title of the study : “EVALUATION OF EFFECT OF CLASSICAL ACUPUNCTURE ON OBESE INDIVIDUALS WITH SPLEEN ENERGY DEFICIENCY”

Name of the Participant :

Name of the Principal Investigator : Dr.B.Narmada devi

Name of the Institution : Government Yoga & Naturopathy Medical

College, Chennai – 600 106

Documentation of the informed consent

I _____ have read the information in this form (or it has been read to me). I was free to ask any questions and they have been answered. I am over 18 years of age and, exercising my free power of choice, hereby give my consent to be included as a participant in

1. I have read and understood this consent form and the information provided to me.
2. I have had the consent document explained to me.
3. I have been explained about the nature of the study.
4. I have been explained about my rights and responsibilities by the investigator.
5. I have been informed the investigator of all the treatments I am taking or have taken in the past _____ months including any native (alternative) treatment.
6. I have been advised about the risks associated with my participation in this study.
7. I agree to cooperate with the investigator and I will inform him/her immediately if I suffer unusual symptoms.
8. I have not participated in any research study within the past _____ month(s).

9. I am aware of the fact that I can opt out of the study at any time without having to give any reason and this will not affect my future treatment in this hospital.

10. I am also aware that the investigator may terminate my participation in the study at any time, for any reason, without my consent.

12. I hereby give permission to the investigators to release the information obtained from me as result of participation in this study to the sponsors, regulatory authorities, Govt. agencies, and IEC. I understand that they are publicly presented.

13. I have understood that my identity will be kept confidential if my data are publicly presented.

14. I have had my questions answered to my satisfaction.

15. I have decided to be in the research study.

I am aware that if I have any question during this study, I should contact the investigator. By signing this consent form I attest that the information given in this document has been clearly explained to me and understood by me, I will be given a copy of this consent document.

For adult participants:

Name and signature / thumb impression of the participant (or legal representative if participant incompetent)

Name _____ Signature _____

Date _____

Name and Signature of impartial witness (required for illiterate patients):

Name _____ Signature _____

Date_____

Address and contact number of the impartial witness:

Name and Signature of the investigator or his representative obtaining consent:

Name _____ Signature_____

Date_____

INFORMATION TO PARTICIPANTS

Investigator: Dr.B.Narmada devi

Name of Participant:

Title: “EVALUATION OF EFFECT OF CLASSICAL ACUPUNCTURE ON OBESE INDIVIDUALS WITH SPLEEN ENERGY DEFICIENCY”

You are invited to take part in this research/ study /procedures. The information in this document is meant to help you decide whether to take part. Please feel free to ask if you have any queries or concerns.

You are being asked to participate in this study being conducted in Government Yoga and Naturopathy Medical College, Chennai.

What is the Purpose of the Research?

To evaluate the effect of classical acupuncture in obese individuals.

The Study Design

Thirty individuals both male or female with obesity will participate in the study.

Study Procedures

The study involves needling specific selected points for the selected subjects during the three days in a week for three months.

Possible Risks to you - Nil

Possible Benefits to you- Changes in the anthropometric measurements seen .

Possible benefits to other people The result of the research may provide benefits to the society in terms of use of acupuncture as an alternative approach to obesity instead of taking drugs and medicines. Improvement in their appetite is seen

Confidentiality of the information obtained from you

You have the right to confidentiality regarding the privacy of your medical information (personal details, results of physical examinations, investigations, and your medical history). By signing this document, you will be allowing the research team investigators, other study personnel, sponsors, IEC and any person or agency required by law like the Drug Controller General of India to view your data, if required.

The information from this study, if published in scientific journals or presented at scientific meetings, will not reveal your identity.

How will your decision to not participate in the study affect you?

Your decisions to not to participate in this research study will not affect your medical care or your relationship with investigator or the institution. Your doctor will still take care of you and you will not lose any benefits to which you are entitled.

Can you decide to stop participating in the study once you start?

The participation in this research is purely voluntary and you have the right to withdraw from this study at any time during course of the study without giving any reasons.

However, it is advisable that you talk to the research team prior to stopping the treatment