



Traditional herbal medicine for weight management: A Review

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ABSTRACT

The prevalence of obesity is increasing at an alarming rate in recent years. Many drugs for weight managing are available in the market; however their adverse effects and hazards have not been thoroughly evaluated, therefore herbal medicines are being proposed as an efficient, inexpensive and safe alternative. This review will address the current advances in using traditional herbal plants in obese and overweight humans and animals. Searching data bases were PubMed, Scopus, Google Scholar and Science direct, reported between 1990 and 2014. Articles were screened and selected by two researchers. Based on the available literature, abstract/full randomized clinical trials (RCTs), evidence studies, reviews, systematic reviews and books were surveyed. Studies with LI85008F, Itrifal Saghir, *Hunteria umbellata*, *Morus alba*, *Melissa officinalis*, and *Artemisia capillarie*, pomegranate leaf (PLE), NT (rhubarb, ginger, astragalus, red sage, and turmeric) combined with gallic acid (GA), ephedrine, caffeine, salicin, Adlay seed crude extract (ACE), *Bufo-tsusho-san* (BF) and Stimulant-free supplement (glucomannan, chitosan, fenugreek, *Gymnema sylvestre*, and vitamin C) show significant decreases in body weight. Only, NT (rhubarb, ginger, astragalus, red sage, turmeric) caused dose-limiting gastrointestinal toxicity. Additionally, *Ma Huang* and *Guarana* (ephedrine alkaloid and caffeine) caused mouth dryness, insomnia and headache. No other significant adverse effects were reported in all 31 trials included in this article. This review highlights the need for higher-quality randomized, controlled trials to confirm the results.

Key words: Traditional herbal, weight management

INTRODUCTION

In Medical definition, obesity is characterized as increased body weight and specifically adipose tissue to a degree to cause adverse health effects in the human body.¹ Body mass index (BMI) identified as weight/height² is a commonly used index to classify overweight and obesity in adults for both sexes and all age groups. According to the World Health Organization (WHO) definition a BMI greater than or equal to 25 is overweight and a BMI greater than or equal to 30 is obesity. BMI is a useful measure of overweight and obesity as it is the same for both sexes and for all ages of adults.² The worldwide prevalence of obesity has increased spectacularly (almost more than double) between the years 1980 and 2014. In 2014, 39% of adults aged 18 years and over (38% of men and 40% of women) were overweight and about 13% (11% of men and 15% of women) were obese.³ The etiological risk factors accounted for obesity are genetic, epigenetic, metabolic, behavioral and environmental variables. The rapid increase in the prevalence of obesity and overweight magnifies the influence of behavioral and environmental matters.^{4,5}

Obesity is one of the most preventable risk factors for morbidity and mortality and it is a major risk factor for many common chronic diseases.^{4,6} According to WHO, obesity is related to cardiovascular diseases, hypertension,

diabetes mellitus, gallbladder disease, cancer, endocrine and metabolic disturbances, osteoarthritis, gout, pulmonary diseases, as well as psychological issues, including social bias, prejudice, discrimination, and overeating.⁷ Insulin resistance and chronic inflammation are the major issues relating obesity and overweight to chronic diseases.⁵

From another point of view, the main cause of obesity is an energy imbalance between calories consumed and expended.⁴ In general; the two main reasons for overweight and obesity are increased intake of energy-dense foods and low physical activity. Therefore the fundamental treatment is calorie restricted diet and exercise.^{2,8} Despite calorie restricted diet and exercise, many other alternative methods for losing weight has been suggested which some of them are very popular among consumers. For example, pharmacological agents, medicinal herbal supplements, dietary supplements, botanicals, hypnotherapy, homeopathy, surgery, low level laser therapy, high intensity focused ultrasound, radiofrequency, non-invasive body contouring and Acupuncture.^{1,2,8,9} Today, due to the multiple therapies recommended for controlling weight, people are eager to use methods that are cost-effective and with no side effect. Consequently, many people have come to this point and also recent studies have confirmed that preliminary reports suggested that traditional herbal medicines are very effective in reducing appetite and helping lose weight.² Thus, the objective of this review was to assemble review and randomized controlled trials related to the effect of traditional herbal medicines on overweight and obesity.

MATERIALS AND METHODS

Data were recruited from various databases including Google scholar, Science Direct, Pub-Med, Scopus and books from 1990 until 2014. Key search words consisted of: obesity, overweight, weight loss, weight management, traditional medicine, herbal medicine and complementary and alternative medicine. The main outcome measures for evaluating anti-obesity effects were, body weight, fat mass, fat percentage, visceral adipose tissue, waist and hip circumference and serological measures such as Triglyceride, LDL-c, HDL-c, VLDV-c, cholesterol, lipids and HOMA-IR. Based on the available literature, abstract/full randomized clinical trials (RCTs), evidence studies, reviews, systematic reviews and books were surveyed. All studies containing human and animal surveys evaluating the effect of herbal plants on obesity were included in this review. Studies on other relevant diseases such as diabetes, Hyperlipidemia, Metabolic syndrome and etc. were excluded. Furthermore, In vivo, In vitro and unpublished data and letters to the editor were also excluded.

In this review, traditional herbal medicines are considered as simple products derived from plants used for modifying body weight. Other expressions for traditional herbal medicines were complementary medicines, Pharmacotherapy, Herbal medicines, Medicinal plants, Alternative medicines, etc.

RESULTS

Body Weight

Significant decrease in body weight was seen by LI85008F (*Moringa olifera*, *Murraya koeingii* and *Curcuma Longa*)¹⁰, *Itrifal Saghir* (*triphala*)¹¹, *Hunteria umbellate*¹², *Morus alba*, *Melissa officinalis*, and *Artemisia capillarie* (total: Ob-X)¹³, pomegranate leaf (PLE)¹⁴, NT (*rhubarb*, *ginger*, *astragalus*, *red sage*, and *turmeric*) combined with gallic acid (GA)¹⁵, ephedrine, caffeine, salicin¹⁶, *Adlay seed crude extract* (ACE)¹⁷, *Bufo-tsusho-san* (BF)¹⁸ and Stimulant-free supplement (*glucomannan*, *chitosan*, *fenugreek*, *Gymnema sylvestre*, and *vitamin C*)¹⁹ (Table 1).

Body Fat

Significant decrease in body fat was seen by *Sinetrol*²⁰, ephedrine, caffeine, salicin¹⁶, Stimulant-free supplement (*glucomannan*, *chitosan*, *fenugreek*, *Gymnema sylvestre*, and *vitamin C*)¹⁹ and *Garcinia cambogia* (*Hydroxycitric Acid*)²¹. Additionally, there were significant reductions in TG, cholesterol, VLDV-c, LDL-c and increase in HDL-c by LI85008F (*Moringa olifera*, *Murraya koeingii* and *Curcuma Longa*)¹⁰, *Hunteria umbellate*¹², *L-carnitine* and *Egyptian Herbal mixture* (HMF) Consisting of *T. chebula*, *Senae*, *rhubarb*, *black cumin*, *aniseed*, *fennel* and *licorice*²², *Bufo-tsusho-san* (BF)¹⁸.

Waist and hip circumference

Significant decrease in Waist and hip circumference was seen by LI85008F (*Moringa olifera*, *Murraya koeingii* and *Curcuma Longa*)¹⁰, *Itrifal Saghir* (*triphala*)¹¹, ephedrine, caffeine, salicin¹⁶, *Bufo-tsusho-san* (BF)¹⁸, *glucomannan*, *chitosan*, *fenugreek*, *Gymnema sylvestre*, and *vitamin C*¹⁹.

Other effects

Anti-hyperglycemic, antioxidant, hypolipidaemic, insulin sensitizing, anti-hyperlipidemic effects were detected in these clinical trials^[10-25].

Adverse effects

Minor side effects were reported by consuming chinese herbal medicine formula (RCM-104)²⁶, *Cissus quadrangularis*²³. Ma Huang and Guarana (ephedrine alkaloid and caffeine) caused mouth dryness, insomnia and headache Safety with long-term use requires further investigation²⁷. glucomannan, chitosan, fenugreek, *Gymnema sylvestre*, and vitamin C¹⁹ and Itrifal Saghir (triphala)¹¹ caused few side effects in both groups. There were no other significant adverse effects reported in all 22 trials included in this article.

DISCUSSION

All herbal plants with anti-obesity effects are summarized in Table 1 with information of their active components and effects on the body. Anti-obesity effects such as decreasing body weight, body mass index or waist circumference in humans was seen in most of these studies^[10-19]. However, some of them showed an anti-obesity effect by decreasing total body fat^[10,12,16,18,19,20,22].

Anti-obesity mechanisms for herbal plants included reduced energy intake, increased energy expenditure^{14,21}. Lipid absorption was mainly influenced by decreased pre-adipocyte differentiation and proliferation, or decreased lipogenesis and increased lipolysis^{16,25,28}. In one study, Ob-X containing *Melissa officinalis* L. (Labiatae), *Morus alba* L. (Moraceae), and *Artemisia capillaris* Thunb, increased hepatic mRNA levels of PPAR α target enzymes responsible for fatty acid β -oxidation²⁵. Additionally, SH21B (*Scutellaria baicalensis* Georgi, *Prunus armeniaca* Maxim, *Ephedra sinica* Stapf, *Acorus gramineus* Soland, *Typha orientalis* Presl, *Polygala tenuifolia* Willd and *Nelumbo nucifera* Gaertner) inhibited fat accumulation by down-regulating the expression of genes involved in the adipogenesis pathway²⁴. In a study by Amin and Naghi, L-carnitine and Egyptian Herbal mixture (HMF) Consisting of *T. chebula*, *Senae*, rhubarb, black cumin, aniseed, fennel and licorice reduced body fat by reducing perirenal and mesenteric fat²².

In a study by Adeneye *et al.* *Hunteria umbellata* reduced atherogenic and coronary artery risk indices and there were significant hepatic fatty degeneration, anti-obesity and antihyperlipidaemic activities¹². *Kochia scoparia* (KS), however, accommodates anti-obesity actions through delaying the intestinal absorption of dietary fat by inhibiting pancreatic lipase activity¹⁶. Green tea and *Garcinia cambogia* possess multi-functional antiobesity activities^{21,29}. For example, Green tea, due to owning high concentration of catechins, including epicatechin, ECG, and EGCG is an excellent anti-oxidant and anti-obesity component. The antiobesity action of catechins resulted from the combined actions of appetite reduction, greater lipolytic activity and energy expenditure, and less lipogenic activity and adipocyte differentiation²⁹. *Eriochloa villosa* (Thunb.) Kunth, *Orixa japonica* Thunb. and *Setaria italica* are good source of effective crude drug for the treatment of obesity caused by a high fat diet due to their anti-lipase activity³⁰. A systematically review of anti-obesity medicinal plants concluded that *Nigella sativa*, *Camellia synensis*, green tea, and black Chinese tea were found to have acceptable anti-obesity effects. Furthermore, there have been some reports on anti-oxidative stress effects of some of these plants which may be important in the management of other diseases accompanying with obesity like cardiovascular diseases and diabetes³¹. In another systematic review, a variety of herbal supplements especially ephedra, CQ, ginseng, bitter melon (*Momordica charantia*), and zingiber had beneficial effects on obesity, particularly by expressing antioxidant effects³².

In the included studies, only few have reported adverse effects, the undesired effects may be due to interactions between the different phytochemical constituents present in different plants⁷. Therefore, we cannot conclude that use of these herbals is without adverse effects. We believe that safety of these plants remains to be elucidated by further long-term studies.

Table 1. Human studies considering herbal medicines for treatment of obesity

Authors	Herbs (Scientific Name)	Main outcome	Other relevant effects & Complications
Sengupta et al, 2012 42	LI85008F (Moringa olifera, Murraya koeingii and Curcuma Longa)	21.26% increase in serum adiponectin level, compared with the placebo group 10.7% and 19.3% reduction in waist and hip circumference compared to control group Sig. reductions in body weight and BMI reduced fasting blood glucose, LDL, LDL/HDL ratio, and TG	No adverse side effects
Lenon et al, 2012 36	Chinese herbal medicine formula (RCM-104)	Sig. differences in BW and BMI between 2 groups	Minor adverse effects
Kamali et al, 2012 45	Itrifal Saghir (triphalala)	Sig. reduction in body weight, BMI, ALT, uric acid, waist and hip circumference compared to control group	The rate of reported minor side effects was similar in both groups.
Adeneye et al, 2010 37	Hunteria umbellata	Sig. reduction in body weight gain Sig. increase in liver weight in 200 mg/kg & decrease in 50 mg/kg HU group Sig. dose related reductions in TG, total cholesterol, LDL-c, VLDV-c and increase in HDL-c Sig. reductions in the atherogenic and coronary artery risk indices Sig. hepatic fatty degeneration anti-obesity and antihyperlipidaemic activities	
Amin & Naghi, 2009 44	L-carnitine and Egyptian Herbal mixture (HMF) Consisting of T. chebula, Senae, rhubarb, black cumin, aniseed, fennel and licorice	L-carnitine or HMF significantly reduced weight gain, food consumption, Serum TG, cholesterol, LDL/VLDL levels, and perirenal and mesenteric fat, Serum ALT, urea, uric acid, creatinine, LDH and increased HDL in HFD group compared with controls HMF has antioxidant, hypolipidaemic insulin sensitizing effects	
Lee et al, 2009 43	SH21B (Scutellaria baicalensis Georgi, Prunus armeniaca Maxim, Ephedra sinica Stapf, Acorus gramineus Soland, Typha orientalis Presl, Polygala tenuifolia Willd and Nelumbo nucifera Gaertner)	Sig. reduction in adipose tissue and serum TG SH21B inhibits fat accumulation by down-regulating the expression of genes involved in the adipogenesis pathway	No side effects
Lee et al, 2008 31	Morus alba, Melissa officinalis, and Artemisia capillarie (total: Ob-X)	Sig. decrease in body weight gain and adipose tissue mass Sig. decrease in TG, cholesterol and hepatic lipid accumulation inhibition	
Dallass et al, 2008 48	Sinetrol	Sig. decrease in body fat (%) and body weight strong lipolytic effect mediated by cAMP-PDE inhibition	No side effects
Lee et al, 2008 50	Ob-X Melissa officinalis L. (Labiatae), Morus alba L. (Moraceae), and Artemisia capillaris Thunb	Ob-X significantly reduced body weight gain, adipose tissue mass, TG, total cholesterol, and inhibited hepatic lipid accumulation Ob-X increased hepatic mRNA levels of PPAR α target enzymes responsible for fatty acid β -oxidation	
Lei et al, 2007 52	pomegranate leaf (PLE)	Sig. reduction in body weight, energy intake and various adipose pad weight, appetite, TC, TG, glucose levels and TC/HDL-C ratio PLE inhibited intestinal fat absorption PLE inhibits the development of obesity and hyperlipidemia in subjects having HFD	PLE may be a appetite suppressant that only affects obese subjects that have a HFD
T. Roberts et al, 2007 39	NT (rhubarb, ginger, astragalus, red sage, and turmeric) combined with gallic acid (GA)	body weight loss Placebo: 0.7% Low dose: 1.2% Sig High dose: 0.6% non Sig. Sig. difference in weight loss between the high and low-dose groups	

Greenway et al, 2006 34	Citrus aurantium and phenylephrine	Pilot1: Sig. weight gain and RMR rise in the intervention group Pilot2: Sig. RMR rise in the intervention group	no evidence of toxicity phenylephrine and Citrus aurantium are not efficient for weight loss
Greenway et al, 2006 35	Number Ten (rhubarb, ginger, astragalus, red sage, turmeric)	food intake increased 74 kcal with 250mg freeze-dried NT and decreased 193.7 kcal with 500mg freeze-dried NT	NT is not an effective dietary herbal supplement for obesity due to dose-limiting gastrointestinal toxicity
Han et al, 2006 46	Kochia scoparia (KS)	KS significantly increased fecal TG and inhibited the elevation of plasma TG The anti-obesity actions of KS is mediated through delaying the intestinal absorption dietary fat by inhibiting pancreatic lipase activity	No side effects
Oben et al, 2006 33	Cissus quadrangularis	Sig. decrease in weight, central obesity, fasting blood glucose, total cholesterol, LDL-c, TG and C-reactive protein in the formulation group regardless of having a diet	Few negative side effects
Maeda et al, 2005 53	Undaria pinnatifida	Sig. decline of WAT weight and UCP1 expression enhanced	No side effects
Coffey et al, 2004 46	Herbal product containing ephedrine, caffeine, salicin and other herbal components	Sig. reduction in body weight, BMI and waist circumference compared to control group No Sig. differences within percent body fat and fat mass	No presumed treatment related side effects such as blood pressure and pulse
Kim et al, 2004 41	Adlay seed crude extract (ACE)	Sig. decline in food intake, body weight, epididymal and peritoneal fat, WAT size, TG, total-cholesterol and leptin in blood serum, TNF- α mRNA expressions in WAT, adipose tissue mass and hyperlipidemia in the HFD+ACE group	No side effects
Hioki et al, 2004 38	Bufo-tsusho-san (BF)	Sig. decline in body weight, abdominal visceral fat, total cholesterol, TG, LDL-C, HOMA-IR. Sig. decline in waist and hip circumference in both groups but greater in the BF-treatment group	There were no other cardiovascular or central nervous system effects reported by subjects
E. Woodgate et al, 2003 40	Stimulant-free supplement (glucomannan, chitosan, fenugreek, Gymnema sylvestre, and vitamin C)	Sig. reduction in body fat, fat mass, BMI compared to the placebo group Sig. body weight reduction and fat loss Sig. reduction in upper abdominal, waist and hip circumference	Adverse side effects in both groups
Boozer et al, 2001 47	Ma Huang and Guarana (ephedrine alkaloid and caffeine)	Sig. reduction of weight, fat, hip circumference and serum TG in the treatment group in comparison to control	Dry mouth, insomnia and headache Safety with long-term use requires further investigation
Heymsfield et al, 1998 32	Garcinia cambogia (Hydroxycitric Acid)	Sig. weight loss and body fat mass in both groups but between group difference was not Sig Garcinia cambogia had no Sig. weight loss and fat mass loss effect	

Abbreviations: BMI: Body Mass Index, I: Intervention, C: Control, LDL: Low Density Lipoprotein, HDL: High Density Lipoprotein, VLDL: Very Low Density Lipoprotein, TC: Total Cholesterol, TG: Triglyceride, RCT: Randomized Controlled Trial, BW: Body Weight, HU: Hunteria umbellata, HFD: High Fat Diet, LFD: Low Fat Diet, PLE: Pomegranate leaf, RMR: Resting Metabolic Rate, WAT: Weight Adipose Tissue

CONCLUSION

Concurrent studies have indicated that changes in dietary pattern, physical activity levels, life styles and environmental factors such as viral infections and toxins are related to high prevalence of obesity and risk of associated diseases^{5,33}. Different methods have been used to reduce body weight and its complications for many years. However, due to pharmacotherapy complications and decades of serious obsession with the modern medicinal system and also difficulties of maintaining life style modification, further attention has been given to herbal medicines as an effective, safe and inexpensive option to reduce body weight and body fat³¹.

Anti obesity pharmacological agents have a long history. In the first half of the 20th century, amphetamines were the common drugs used to treat obese patients. Unfortunately, besides having numerous side effects, they were highly addictive and were eventually banned by the FDA in the late 1970s⁵. In the past 30 years, Sibutramine and Orlistat have been the first drugs for treating obesity approved by the FDA. Sibutramine, is an anorectic or appetite suppressant and Orlistat reduces intestinal fat absorption via inhibiting pancreatic lipase. Sibutramine and orlistat may cause weight loss of up to 10% when used in combination with dietary, behavioral, and exercise therapy. Both

drugs have hazardous side-effects, including increased blood pressure, dry mouth, constipation, headache, and insomnia. For this reason, a wide variety of natural materials have been explored for their obesity treatment potential²⁹.

Taking all results collectively, Ma Huang, Guarana²⁷, Bufo-tsusho-san¹⁸, Adlay seed crude extract¹⁷, *Cissus quadrangularis*²³, *Kochia scoparia*¹⁶, gallic acid¹⁵, pomegranate leaf¹⁴, *Hunteria umbellata*¹², Itrifal Saghir (triphala)¹¹ and Egyptian herbal mixture (HMF)²² were found to have acceptable anti-obesity effects. Additionally, some herbal medications such as HMF have antioxidant, hypolipidaemic insulin sensitizing effects which may be important in the management of other diseases accompanying with obesity like cardiovascular diseases and diabetes²².

By taking all above-mentioned arguments into consideration the following conclusion can be drawn that the need to discover anti-obesity drugs having better efficacy and lower adverse effect is still vital. Studies with aim of evaluating the effect of pharmacological agents on obesity and related complications can be helpful for pharmaceutical industries to study on the components of these herbs and prepare medications with high efficacy and fewer side effects. Additionally, further well designed clinical trials on the isolation and characterization of their constituents are highly recommended.

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