Safety, Efficacy and Metabolism of Traditional Medicinal Plants in the Management of Obesity: A Review

Mahnaz Kazemipoor, Che Wan Jasimah Wan Mohamed Radzi, Geoffrey A. Cordell, and Iman Yaze

Abstract—Obesity is an important global health concern, and is associated with high morbidity and mortality rates. Modern methods of treatment, such as synthetic drugs and surgery, still have to be improved to show safety and efficacy. The main concerns with such treatments are the high costs and serious complications. As a result, there is great interest in the use of plant-based medicinal agents as an alternative therapy. This study aims to provide a review of the studies on accessible botanical sources for the treatment of obesity. Based on published studies, this review attempts to explain how these medicinal plants act in humans to cause weight loss, and which method of usage is safer and more efficient. Information was gathered from books, journals and electronic sources published in the period of 1991 to 2012. The medicinal plants studied can reduce weight through five basic mechanisms, including stimulating thermogenesis, lowering adipogenesis, enhancing lipolysis, suppressing appetite, and decreasing the absorption of lipids. Furthermore, consumption of reliable medicinal plant extracts in a single form and at an optimum dosage could be a safe treatment for obesity. However, based on reviews, some combinations of certain medicinal plants may result in either lower efficacy or cause unexpected side-effects.

Index Terms—Anti-obesity, fat absorption, slimming aids, dietary supplements

I. INTRODUCTION

Since 1997, the WHO has warned of obesity as a global epidemic, although it was not noticeable during most of the 20th century [1]-[2]. Statistics show that the prevalence of obesity had reached up to 400 million adults by 2005 [3]. Currently, it is reported that half of the adult population in OECD countries are overweight, and 1/6th are obese. Based on the classification by WHO a body mass index [BMI] greater than 25 Kg/m2 is defined as overweight and BMI value of greater than 30 Kg/m2 is termed as obesity, besides, BMI greater than 40 Kg/m2 is termed “morbid obesity. According to this report by WHO, obesity is related to several health problems, including cardiovascular diseases, hypertension, diabetes mellitus, gallbladder disease, cancer, endocrine and metabolic disturbances, osteoarthritis, gout, pulmonary diseases, as well as psychological problems such as social bias, prejudice, discrimination, body shape dissatisfaction, and eating disorders which are seen in both children and adults [4]. From an economic point of view, obesity and its related health consequences involve enormous costs currently and for future health care, such as physician visits, hospitalization, and other related expenses [5]-[6]-[7]. Being overweight is a cosmetic problem and a major risk factor for human health [8]. In short, obesity can cause a decline in life expectancy [9]. Despite vast attempts to address this issue, “globesity” remains an enormous challenge.

A. Challenges in Treating Obesity

Recently, there has been a proliferation of different anti-obesity products appearing on the market [10]. Despite the high cost of such products, their long-term consumption is still not recommended as they have exhibited several side effects, such as gastrointestinal and kidney problems [11]. For example, among the varieties of anti-obesity drugs, only Orlistat and Sibutramine can be used long-term. In addition, such products do not satisfactorily impact weight loss or are not tolerated by the body [12]-[13]. However, the use of natural remedies for weight loss has increased. Scientists believe that botanical sources seem more reliable, safer, and also cheaper than current conventional methods, such as synthetic chemical drugs [14] or surgical procedures [15] which may have adverse effects or be of limited duration in effectiveness [16].

B. Natural Medications

Studies show that natural food ingredients and medicinal plant preparations are able to enhance satiety, boost metabolism, and speed up weight loss [17]-[18]. Including these foods in the diet on a regular basis will therefore assist an individual to lose weight slowly. However, there is still some doubt about their application for humans [19]. On the other hand, despite the global market for satiety, fat burning, dietary supplements and other weight management remedies, the awareness of the usefulness of these products is neither sufficient nor clearly perceived by patient [20]. This study aims to provide a review of previous reports about the availability of natural medicinal agents and their potential for assisting in losing weight. This information could aid patients in their selection of the appropriate botanical product to develop a lean and healthy body.

II. METHODS OF DATA COLLECTION

Data were acquired from various databases, including Google Scholar, Science Direct, Pub-Med, Scopus, Web of Science, and from library books and theses. The studies ranged from 1991 until January 2012. The key search words included: traditional medicine, medicinal herbs, plant extracts, anti-obesity, weight loss, overweight, botanical remedy, complementary therapy, natural, alternative, phytonutrients, phytochemicals, efficacy, safety, bioactive...
Some components which might inhibit the anti-obesity properties of the examined herb. Infusion procedures can concentrate the constituents of the medicinal plants which have shown antiobesity properties were prepared in the form of aqueous or alcoholic extracts. This may be because the decoction, distillation, and articles related to obesity medication based on plants are used in this discussion.

III. RESULTS AND DISCUSSION

A. Mechanism of Action

Natural anti-obesity preparations can induce weight loss through several different mechanisms. Their functions can be classified into five major categories, as shown in Table I.

<table>
<thead>
<tr>
<th>No</th>
<th>Anti-obesity function</th>
<th>Anti-obesity preparations</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Inhibiting pancreatic lipase activity</td>
<td>chitosan [21]-[22], levan [23], mate tea [24], oolong tea [25] jasmine tea [26], green tea [27]</td>
</tr>
<tr>
<td>2</td>
<td>Enhancing thermogenesis</td>
<td>sea weed [28]-[29]-[30], bitter orange [31]-[32]-[33], soybean [34]</td>
</tr>
<tr>
<td>3</td>
<td>Preventing adipocyte differentiation</td>
<td>turmeric [35], capsicum [36], palm oil [37], banana leaf [38]-[39], brown algae [40], garlic [41], flaxseed [42], black soybean [43]</td>
</tr>
</tbody>
</table>

Based on the inhibition of pancreatic lipase activity [49], the intake of some medicinal plants will prevent the absorption of lipids in the intestine. Consequently, non-absorbed fat will be excreted through oily faeces. Furthermore, certain bioactive components can promote energy expenditure [50] by increasing the metabolic rate, which enhances thermogenesis. This function will help the body to burn additional calories and excess body fat. Through prevention of adipocyte differentiation [37], medicinal plant consumption will inhibit adipogenesis and the formation of fat cells in adipose tissues. Moreover, based on enhancing lipid metabolism (lipolysis) [51], some medicinal plant products can increase lipolysis through inducing β-oxidation or noradrenaline secretion in fat cells [26]. Other anti-obesity ingredients are able to suppress appetite and induce satiety [52], which will help individuals to control their appetite. Finally, these different functions of antiobesity medicinal plants will cause a reduction of food and energy intake [32].

B. Approaches in Medicinal Plant Preparation with Maximum Efficacy and Safety

Medicinal plant samples can be collected from the whole plant, or from parts of the plant, such as the stem, bark, leaf, flowers, and roots. These materials are then processed into different forms, such as powder or capsules. However, most of the medicinal plants which have shown antiobesity properties were prepared in the form of aqueous or alcoholic extracts. This may be because the decoction, distillation, and infusion procedures can concentrate the constituents responsible for the therapeutic efficacy of the examined herb. Some components which might inhibit the anti-obesity function of the bioactive compounds might be removed by the extraction procedure. Extraction and partial purification, or the isolation of the active principle(s) could increase the bioavailability of the bioactive constituents in medicinal plant extracts which consequently will enhance the efficacy of medicinal agent in losing weight [53]-[54].

In other studies, scientists have examined the anti-obesity properties of mixtures of medicinal plants. However, in several cases shown in Table 2, the consumption of different antiobesity preparations in combination with other plant-based ingredients could produce unexpected side-effects.

Based on previous studies, the application of single...
medicinal plants has not caused any adverse events. On the other hand, the undesired effects on the human body could be due to interactions between the different phytochemical constituents present in the different plants [68]-[69].

IV. SUMMARY AND CONCLUSIONS

In summary, there is evidence from a large number of in vivo studies regarding the efficacy of anti-obesity medicinal plant preparations. These preparations can demonstrate their effects in various ways, including stimulating thermogenesis, lowering lipogenesis, enhancing lipolysis, suppressing appetite and decreasing absorption of lipids. Single and mixed anti-obesity medicinal plant preparations can have different effects. However, there are other factors which can also affect the results of such studies, including the botanical sources and the route of administration, the presence of various bioactive components and their respective functions, the experimental methods used, the treatment dosage applied, the study design, the duration of treatment, and the safety and efficacy of the ingested plant. In conclusion, the dietary intake of these medicinal plants in the natural form, when taken singly, can apparently provide a higher degree of safety and efficacy than when mixed medicinal plant preparations are applied. These findings support the recommendation of many health organizations regarding the consumption of natural ingredients on a regular basis, especially vegetables and selected herbs, such as turmeric, capsaicin, ginger, and green tea. Efforts to improve knowledge for individuals on the consumption of anti-obesity medicinal preparations, and encouragement to overweight and obese patients to consume them at an optimum dosage, along with an enhanced exercise regimen and a healthy diet should be continued. In addition, more chemical, biological and clinical studies are needed on the effectiveness of selected medicinal plants, particularly those used as spices and condiments, in ameliorating and treating obesity in humans. These anti-obesity data would be useful for food and drug manufacturers as they consider the development of new products and to governments as they consider the regulation of food products as a way to promote and enhance public health.

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