



Obesity Management via Herbal Approach: A Review

Lakhwinder Singh^a and Manisha Bhatti^{a*}

^a University Institute of Pharma Sciences, Chandigarh University, Gharuan, Mohali, Punjab-140413, India.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2021/v33i63B35278

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/77500>

Review Article

Received 02 November 2021

Accepted 26 December 2021

Published 29 December 2021

ABSTRACT

Obesity is a one of the metabolic disorders which mainly occur due to the variation in balance between energy consumption and energy usage and furthermore, this disease associated with various other pathological states in obese person such as problems associated with CVS, CNS, Hormonal disorder like diabetes etc. So, it has become essential to monitor the overweight in reliable manner. There are different ways of obesity management but masses are eager to those standard ways which are cost effective with minimum side effects. In present era the plant-based approach is most widely famous for the control of obesity as this therapy consider with less side effects and efficient to reduce the weight of the obese people. This present review emphasised on plant-based approach to manage obesity.

Keywords: Obesity; metabolic disorders; plant-based approachis; fistula.

1. INTRODUCTION

Obesity is a disorder which results due to the over deposition of fatty substances in body. When a person is overweight then this state leads to other serious health concerns like Rise in blood pressure, other CVS disorders, hormonal changes (Diabetes), difficulty in

breathing and Induction various types of carcinomas. This condition has a prominent impact on person's social life, financial status and psychological aspects due to which there is a growth of depression [1]. According to WHO, approx. 2.8 million people dying each year due to Obese condition. At certain times, it was concerned with high-economic nations, but now

*Corresponding author: E-mail: manisha.uips@gmail.com, manishabhathi13.mb@gmail.com;

the scenario has flipped properly and in this era this disease is also prevalent in low as well as middle-economic nations. Now the obese patients are increasing world widely. There are different measures to control obesity such as change in lifestyle, exercise, conventional medicines and surgery. But the conventional therapy has many side effects, moreover, the surgical procedures also has various complications such as infection, postoperative anastomotic fistula, deep vein thrombosis, and long-term complications such as anaemia and malnutrition [2]. Due to this scenario the herbal drugs therapy showing promising effects in obese condition, moreover, with little or no side effects.

2. EPIDEMIOLOGY OF OBESITY ACCORDING TO WHO

Globally Obesity is increasing day by day and it has almost reached to triple in number since 1975. In year 2016 approximately 1.9 billion people found to be overweight. Mostly the global mass belongs to those countries where this condition of obesity kills people. According to a report in year 2019 more than 38 million children under age group 5 were found to be obese.

3. PATHOGENESIS OF OBESITY

The basic pathogenesis of this disorder deals with increase in energy intake and decrease in energy expenditure. Moreover, low calorie utilization regulation lead to cellular dysfunction and formation of excess of adipocytes further that lead to rise in release of cytokine, which further cause the complications associated with vascular system such rise in lipid content in blood, abnormalities in CVS and deposition of fats in arteries [3].

4. BODY MASS INDEX

The one of the vital parameters of evaluation of obesity is BMI. According to guidelines released by the American Association of Clinical Endocrinologists obesity can be measured with combined effect of abnormalities related to obesity and index of body and mass. BMI is calculated by mass of body in relation to body height. So, with the help of this parameter person can be evaluated of having adequate weight/low weight/ high weight/ obese [4,5]. The formula of calculation of this parameter is:

$$BMI = \frac{\text{weight in kilograms}}{(\text{Height in meters})^2}$$

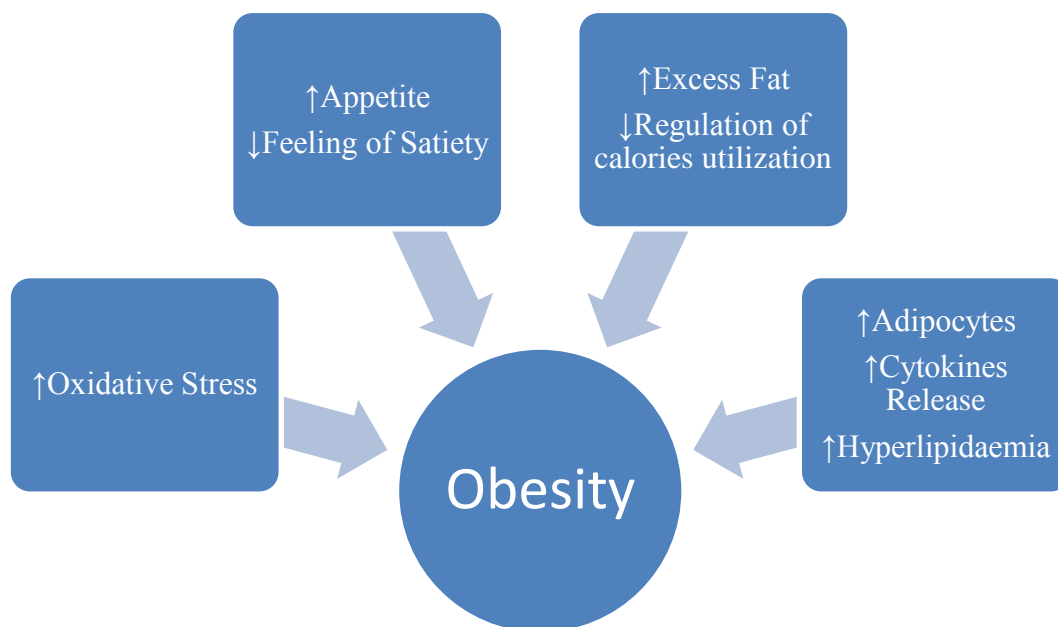


Fig. 1. Representation of pathogenesis of obesity

Table 1. Classification of weight status by BMI

WHO classification of weight status	
Weight category	Body Mass Index (BMI), kg/m²
Person fall in low weight category or underweight	BMI <18.5
Person fall in average weight category or normal weight	BMI is between 18.5-24.9
Person fall in highweight category or overweight	BMI falls between 25.0-29.9
Person fall in Obese Category	BMI corresponds to ≥ 30
Person fall in Obese Class I Category	BMI relates to 30.0-34.9
Person fall in Obese Class II Category	BMI is in between 35.0-39.9
Person fall in Obese Class III Category	BMI ≥ 40

5. MANAGEMENT OF OBESITY

The major cause behind obesity is variation in balance between consumption of calories and expenditure of calories. Moreover, decrease in physical work, rise in adoption of sedentary lifestyle, intake of high calories rich diet these are few major causes of obesity. So, regarding management of this state there is a need to control and diet as well introduction of physical activities in daily routine or few pharmacological methodologies may involve to get rid of this state of obesity such as medical natural supplements, balance diet supplements, homeopathy, surgical treatments and laser techniques etc [6]. In today era as there is a wide choice of management techniques to overcome obesity with maximum effect and at low cost with less side effects. So, herbal approach is effective with promising effects along with more convenience, more cost effectiveness as well as negative side effects. Various crude drugs such as Ginger, turmeric, jalapeno, bell pepper and ginseng etc has studied and found effective in management of obesity [7,8,9]. Moreover, these plants consist of different phytoconstituents present in different parts which act by different mechanism to

overcome obesity. The table below has enlisted few plants with various phytoconstituents present in them along with mechanism of action which is responsible of effect.

Targets of the herbal plants or medicines (Mechanism of action) [27]

- By balancing the energy intake and expenditure.
- Regulates the plasma lipid content.
- Inhibition of Pancreatic lipase enzyme
- By Induction of anorexia.
- By regulation in gene expression by reducing white adipocytes (fat cells) accumulation.
- Inhibition of enzyme α -amylase.
- Increase in the fatty acids oxidation by increasing the activity of hepatic Co-A oxidase.
- By increasing the metabolism of lipid.
- Increase levels of ghrelin.
- Various agents are word by suppressing the appetite or by inducing feeling of fullness (satiety).
- Regulation of mRNA mediated lipid metabolism.

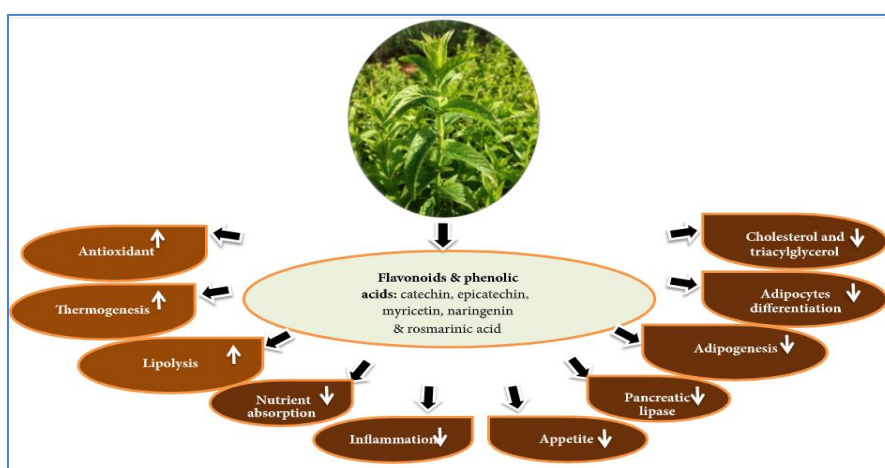








**Fig. 2. Mechanism of Action of herbal to manage obesity**



Table 2. Table Consists of Biological Source, Common Name, Plant part used, phytoconstituents and mechanism of action involved



Botanical name Family	Common name	Plant Part used	Mechanism of Action Involved	Phytoconstituents	Ref
<i>Aesculus turbinata</i> Sapindaceae 	Japanese horse- chestnut	Seeds	Pancreatic lipase Inhibition; inhibition of absorption of fat and oxidation of fat	Saponons – escins, desacetylescins.	[10]
<i>Salacia reticulata</i> Celatraceae 	Kothalahimbutu	Roots and stems	Regulation of the HFD induced body weight by controlling WAT	Epicatechin, epigallocatechin	[11]



Botanical name Family	Common name	Plant Part used	Mechanism of Action Involved	Phytoconstituents	Ref
<i>Actinidia arguta</i> Actinidiaceae	Hardy kiwi, kiwi berry	Roots	pancreatic lipase Inhibition, enhancement in lipolysis process	Ursolic acid	[12]
					
<i>camellia sinensis</i> Theaceae	Tea plant Tea shrub Tea tree	Leaves and leaf buds	Inhibition of catechol O- methyl-transferase (COMT), Stimulation of thermogenesis and fat oxidation	Polyphenols	[13]
					



Botanical name Family	Common name	Plant Partused	Mechanism of Action Involved	Phytoconstituents	Ref
<i>Capsicum spp</i> Solanaceae 	Bell peppers	Fruits	Responsible for increase protein metabolism ultimately there is increase in lipid metabolism	Capsaicin	[14]
<i>Panax quinquefolium</i> Araliaceae 	American ginseng	Plant leaves as well as stem part	Responsible for decrease in triglyceride levels in blood plasma and rise in faecal matter due to the inhibition of pancreatic lipase enzyme	Saponins	[15]

Botanical name Family	Common name	Plant Partused	Mechanism of Action Involved	Phytoconstituents	Ref
<p><i>Phaseolus vulgaris</i> Fabaceae</p> 	Kidney bean	Beans	Causes inhibition of enzyme alpha amylase, reduction in appetite by modulation of cholecystokinin and glucagon peptides	Phytohemagglutinin	[16]
<p><i>Eisenia bicyclis</i> Lessoniaceae</p> 	Arame	Brown algae	Responsible for lowering the lipid levels by reducing total cholesterol, low density lipoproteins and triglycerides content	tannins, flavonoids and phenols mainly present	[17]

Botanical name Family	Common name	Plant Partused	Mechanism of Action Involved	Phytoconstituents	Ref
<i>Rosmarinus officinalis</i> Lamiaceae	Rosemary	Leaves	Inhibits adipocytes differentiation	Carnosic acid	[18]
					
<i>Eclipta alba</i> Asteraceae	False daisy	All plantparts	Responsible for Lipolytic activity	Flavonoids, tannins, sterols	[19]
					

Botanical name Family	Common name	Plant Partused	Mechanism of Action Involved	Phytoconstituents	Ref
<i>Malus hupehensis</i> Rosaceae	Crab apple	Fruit	Lowers the serum lipid levels	Hyperoside, myricetin, kaemferol, ursolic acid	[20]
					
<i>Zingiber officinale</i> Zimngiberacea	Ginger	Rhizomes	Enhance lipid profile	Gingerol Paradol Rutin, anthocyanins	[21]
					

Botanical name Family	Common name	Plant Partused	Mechanism of Action Involved	Phytoconstituents	Ref
<p><i>Capsicum annum</i> Solanaceae</p> 	Jalapeno	Fruits	Regulates the expression of PPAR α , PPAR γ , UCP2 and adiponectins in body	Capsaicin	[22]
<p><i>Agave angustifolia</i> Asparagaceae</p> 	Caribbean agave	Leaves	Responsible to lowers triglyceride level and increase the serum GLP-1 levels, increase ghrelin	Agavins	[23]

Botanical name Family	Common name	Plant Partused	Mechanism of Action Involved	Phytoconstituents	Ref
<i>Glycine max L.</i> Leguminoseae	Black soybean	Seeds	Shows Lipolytic activity	Polyphenolic pigments	[24]
					
<i>Curcuma longa</i> Zingiberaceae	Turmeric	Rhizomes	It shows rise in lipolysis and beta-oxidation, moreover, decrease white adipose tissue weight,serum triglyceride concentration and cholesterollevel	Curcumin	[25]
					

Botanical name Family	Common name	Plant Partused	Mechanism of Action Involved	Phytoconstituents	Ref
<i>Paraguariensis</i> Magnoliaceae	Yerba mate	Stem bark	Responsible for rise in ghrelin levels, reduction in blood cholesterol and low-density lipoprotein levels	Polyphenolic components, flavonoids, alkaloidal constituents	[26]



6. CONCLUSION

Obesity is a metabolic disease which occur due to the ineffective balance between body's energy requirement and utilization and it leads various pathological condition in obese person like cardiovascular diseases, psychiatric disorder, type 2 diabetes therefore it became essential to control the overweight in effective manner there are various methods for the management of obesity but due to the multiple therapies for the management of obesity; Masses are more influenced towards those methodologies which are cheaper and negative side effects. Nowadays, plant based drugs are commonly adopted for the management of obesity as their lesser side effects approach and more efficiency to reduce the weight of the obese person by regulating the plasma lipid profile, inhibition of lipase, amylase, increase level of ghrelin, suppress appetite.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT AND ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Wang YC, McPherson K, Marsh T, Gortmaker SL, Brown M. Health and economic burden of the projected obesity trends in the USA and the UK, *The Lancet*. 2011;378 (9793):815–825.
2. Redinger RN. The pathophysiology of obesity and its clinical manifestations, *Gastroenterol. Hepatol. (N. Y)*. 2007; 3(856).
3. World Health Organization. Obesity. Preventing and Managing the Global Epidemic, Report of a WHO Con-sultation (WHO Technical Report Series 894). WHO; 2014.
4. Maynard L, Wisemandle W, Roche A, Chumlea W, Guo S, Siervogel R. Childhood body composition in relation to body mass index. *Pediatrics*. 2001;107: 343-350.
5. Lindsay R, Hanson R, Roumain J, Ravussin E, Knowler W, Tataranni P. Body mass index as a measure of adipose tissue in children and adolescents: Relationship to adiposity by dual energy x-ray absorptiometry and to cardiovascular risk factors. *Journal of Endocrinology & Metabolism*. 2001;86(9):4061-4067.
6. Kazemipour M, Radzi CA, Cordell G, Yaze I. Potential of traditional medicinal plants for treating obesity: A review. *IPCBE*. 2012;39:1-6.
7. Chandrasekaran CV, Vijayalakshmi MA, Prakash K, Bansal VS, Meenakshi J, Amit A. Review article: Herbal approach for obesity management. *AJPS*. 2012;3:1003-1014.
8. Verma RK, Paraidathathu T. Herbal medicines used in the traditional indian medicinal system as a therapeutic treatment option for overweight and obesity management: A review. *Int J Pharm Pharm Sci*. 2014;6:40-47.
9. Hasani-Ranjbar S, Nayebi N, Larijani B, Abdollahi M. A systematic review of the efficacy and safety of herbal medicines used in the treatment of obesity. *World Journal of Gastroenterology: WJG*. 2009; 15(25):3073.
10. Kimura H, Ogawa S, Katsube T, Jisaka M, Yokota K. Antiobese effects of novel saponins from edible seeds of Japanese horse chestnut (*Aesculus turbinata* BLUME) after treatment with wood ashes, *J. Agric. Food Chem*. 2008;56:4783–4788.
11. Im R, Mano H, Nakatani S, Shimizu J, Wada M. Aqueous extract of Kothahla Himbutu (*Salacia reticulata*) stems promotes oxygen consumption and suppresses body fat accumulation in mice, *J. Heal. Sci*. 2008;54:645–653.
12. Kim J, Jang DS, Kim H, Kim JS. Anti-lipase and lipolytic activities of ursolic acid isolated from the roots of *Actinidia arguta*, *Arch. Pharm. Res*. 2009;32:983–987.
13. Nakai M, Fukui Y, Asami S, Toyoda-Ono Y, Iwashita T, Shibata H, Mitsunaga T,

- Hashimoto F, Kiso Y. Inhibitory effects of oolong tea polyphenols on pancreatic lipase in vitro, *J. Agric. Food Chem.* 2005; 53:4593–4598.
14. Tan S, Gao B, Tao Y, Guo J, Su Z. Antiobese effects of capsaicin–chitosan microsphere (CCMS) in obese rats induced by high fat diet, *J. Agric. Food Chem.* 2014;62:1866–1874.
 15. Liu R, Zhang J, Liu W, Kimura Y, Zheng Y. Anti-obesity effects of proto-panaxdiol types of ginsenosides isolated from the leaves of American ginseng (*Panax quinquefolius* L.) in mice fed with a high-fat diet, *Fitoterapia.* 2010;81:1079-1087.
 16. Carai MAM, Fantini N, Loi B, Colombo G, Riva A, Morazzoni P. Potential efficacy of preparations derived from *Phaseolus vulgaris* in the control of appetite, energy intake, and carbohydrate metabolism, *Diabetes, Metab. Syndr. Obese Targets Ther.* 2009;2:145.
 17. Eom S, Lee M, Lee E, Kim Y, Kim TH. Pancreatic lipase inhibitory activity of phlorotannins isolated from *Eisenia bicyclis*. *Phyther. Res.* 2013;27:148–151.
 18. Gaya M, Repetto V, Toneatto J, Anesini C, Piwien-Pilipuk G, Moreno S. Antiadipogenic effect of carnosic acid, a natural compound present in *Rosmarinus officinalis*, is exerted through the C/EBPs and PPAR γ pathways at the onset of the differentiation program, *Biochim. Biophys. Acta (BBA): Gen. Subj.* 2013;1830:3796-3806.
 19. Gupta A, Kumar A, Kumar D, Nandan S, Shankar K, Varshney S, Rajan S, Srivastava A, Gupta SS. Kanojiya, Ethyl acetate fraction of *Eclipta alba*: A potential phytopharmaceutical targeting adipocyte differentiation, *Biomed. Pharmacother.* 2017;96:572–583.
 20. Wen C, Wang D, Li X, Huang T, Huang C, Hu K. Targeted isolation and identification of bioactive compounds lowering cholesterol in the crude extracts of crab apples using UPLC-DAD-MS-SPE/NMR based on pharmacology-guided PLSDA, *J. Pharm. Biomed. Anal.* 2018;150:144–151.
 21. Mahmoud RH, Elnour WA. Comparative evaluation of the efficacy of ginger and orlistat on obesity management, pancreatic lipase and liver peroxisomal catalase enzyme in male albino rats, *Eur. Rev. Med. Pharmacol. Sci.* 2013;17:75–83.
 22. Tan S, Gao B, Tao Y, Guo J, Su Z. Antiobese effects of capsaicin–chitosan microsphere (CCMS) in obese rats induced by high fat diet, *J. Agric. Food Chem.* 2014;62:1866–1874.
 23. Santiago-García PA, López MG. Agavins from *Agave angustifolia* and *Agave potatorum* affect food intake, body weight gain and satiety-related hormones (GLP-1 and ghrelin) in mice, *Food Funct.* 2014;5: 3311–3319.
 24. Kim HK, Kim JN, Han SN, Nam JH, Na HN, Ha TJ. Black soybean anthocyanins inhibit adipocyte differentiation in 3T3-L1 cells, *Nutr. Res.* 2012;32:770–777.
 25. Jarzab A, Kukula -Koch W. Recent advances in obesity: the role of turmeric tuber and its metabolites in the prophylaxis and therapeutical strategies, *Curr. Med Chem;* 2016.
 26. Kazemipoor M, Radzi C, Cordell GA, Yaze I. Potential of traditional medicinal plants for treating obesity: A review. *IPCBE, 2012;*39:1-6.
 27. Roberts AT, Martin CK, Liu Z, Amen RJ, Woltering EA, Rood JC, Caruso MK, Yu Y, Xie H, Greenway FL. The safety and efficacy of a dietary herbal supplement and gallic acid for weight loss. *J Med Food.* 2007;10(1):184-186.

© 2021 Singh and Bhatti; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
 The peer review history for this paper can be accessed here:
<https://www.sdiarticle5.com/review-history/77500>