

Review Article

A Holistic Ayurvedic Approach in Management of Sthoulya (Obesity)

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ABSTRACT

Sthoulya (Obesity) is a global problem and a recent world health study reports that obesity is included among the top ten selected risk to health. Sthoulya is such a disease which provides a platform for so many hazards like hypertension, coronary heart disease, diabetes mellitus, osteoarthritis, as well as psychological disorders like stress, anxiety, depression etc. In Ayurveda, Sthoulya (Obesity) regarded as *medoroga*, a disorder of *meda dhatu*, which includes fat tissue and fat metabolism. According to Ayurveda obesity begins with imbalance of *doshas* (*Vata*, *Pitta* and *Kapha*), *agni* (digestive fire), *malas* (waste products) or an imbalance of *shrotas* (microcirculatory channels). This collection of imbalances then interferes with the formation of tissues or *dhatu*s and leads to a tissue imbalance that we experience as excess weight. In this regard, an attempt has been made to critically review the *Medohar* and *Lekhaniya* (Anti-obesity and Hypolipidemic) drugs mentioned in Ayurvedic classical texts which may abet our understanding of prevention and management of obesity. *Charaka* has given single *Gana* of 10 drugs (*Lekhaniya Gana*), while *Sushruta* and *Vagbhata* have mentioned 8 and 10 *Ganas* respectively. *Rasaushadhis* like *Shilajatu*, *Loha bhasma*, *Rasasindhura/Parada bhasma* etc. are the best drugs to treat Sthoulya. Drugs that are *Katu*, *Tikta*, *Kashaya* in *Rasa*, possessing *Ushna Virya*, *Laghu Ruksha Guna* and *Vata Kaphahara* actions are largely responsible for *Medohara* and *Lekhaniya* activities. Hence the present work was planned to review and explore the potential drugs for the management of Sthoulya (Obesity).

Key words: Sthoulya, *Medohara* drugs, *Lekhaniya* drugs, *Rasaushadhis*.

INTRODUCTION

Obesity has become a serious global public health problem in the past few decades. It is defined as a medical condition with an abnormal accumulation of body fat and is associated with excessive growth and expansion of adipose tissue due to an imbalance between energy intake and expenditure.^[1] Obesity commonly leads to a risk of developing various life-threatening diseases, including diabetes, cardiovascular disease, hyperlipidemia, hypertension, non-alcoholic fatty liver, and certain cancers.^[2] Obesity is the most common cause of

dislipidemia. Lipid oversupply in a state of obesity, hyperinsulinemia, and/or insulin resistance results in increased non-esterified fatty acid availability and, in turn, higher Triglycerides stores in non-adipose tissues, e.g. the muscle, liver, and pancreas.^[3] Fatty acid-induced disorders are referred to as lipotoxicity. Thus, elevated Triglycerides level is often accompanied by a slight increase in total cholesterol and a marked drop in high-density lipoprotein (HDL) cholesterol. Moreover, low-density lipoproteins (LDL) rich in Triglycerides, partially metabolized by hepatic lipase, are

converted into small LDL, with higher atherogenic potential. [4]

Obesity and Hyperlipidemia being the most common problems in adolescents as well as older age groups, there is a necessity to combat them with drugs mentioned in classics which may be useful to address the associated conditions of *Medodushti*. In this regard, an attempt has been made to critically review the *Medohara* drugs mentioned in the classical texts which may abet our understanding of prevention and management of the conditions like Obesity and Dyslipidemia. In the present review, we surveyed the natural herbs and herbomineral drugs with antiobesity potential and reviewed the scientific data, including active components and mechanisms of action against obesity.

MATERIALS AND METHODS

Charaka has given single *Gana* of 10 drugs (*Lekhaniya Gana*), [5] while *Sushruta* and *Vagbhata* have mentioned 8 and 10 *Ganas* respectively. To evaluate their probable modes of action through which Obesity and Dyslipidemia are affected as per both *Ayurveda* & Modern aspect. A few herbs evaluated for *Lekhaneeya* (which scrapes excess *Medas*) and *Medohara* (which removes or dries up excess *Medas*) effect from *Lekhaniya Gana*, *Varunnadi Gana*, *Shalasaradi Gana*, *Lodhradi Gana*, *Arkadi Gana*, *Mushkakadi Gana*, *Nyagrodhdi Gana*, *Tryushana*, *Ushkadi Gana*, *Asandi Gana*, *Surasadi Gana*, *Vatsakadi Gana*, *Vacha Haridradi Gana* and *Rasaushadhis* like *Shilajatu*, *Loha bhasma*, *Rasasindhura/Parada bhasma* etc. *Surasadi Gana* is not indicated for *Medoroga* by *Sushruta* [6] while *Vagbhata* has included it. [7] This observation is useful for designing new formulations to treat *Medodushti* and its complications. They may have profound influence on reduction of bodyweight and dyslipidemia. Drugs that are *Katu*, *Tikta*, *Kashaya* in *Rasa*, possessing *Ushna Virya*, *Laghu Ruksha Guna* and *Vata Kaphahara* actions are

largely responsible for *Medohara* and *Lekhaniya* activities are as follows.

Herbs and Herbomineral Drugs used in treatment of obesity

A. HERBAL DRUGS

The traditional Indian medical system includes some herbal plants to treat Obesity and its chemical constituents work with anti-obesity potential.

1. *Cyperus rotundus* (Mustak)

The rhizomes or tubers of *Cyperus rotundus* L., family *Cyperaceae*, are commonly known as 'Nut Grass'. Cyperine is the active ingredient, working as a hypotensive agent (low blood pressure), anti-inflammatory, and diuretic (increases urine secretion), as well as reducing fat in the body. It helps clearing the blocked channels. An experimental study was performed on Rats show; *Cyperus rotundus* stopped weight gain and *in vitro*, stimulated lipolysis in 3T3-F442 adipocytes. [8]

2. *Picrorhiza kurroa* (Kutki)

The root or rhizome of *Picrorhiza kurroa*, family *Scrophulariaceae*, is the source of the active ingredient. *Picrorhiza kurroa* improves gallbladder secretions, thus aiding in the digestion and metabolism of fats. In a study of hyperlipaemic mice on a high-fat diet, daily doses of water extract of *Picrorhiza kurroa* significantly reduced total cholesterol, triglycerides and LDL levels after 12 weeks. [9]

3. *Plumbago zeylanica* (Chitrak)

The root bark of *Plumbago zeylanica*, family *Plumbaginaceae*, is used to treat obesity. [10,11]

4. *Acorus calamus* (Vacha)

The roots and rhizomes of *Acorus calamus*, family *Araceae*, are useful for weight loss and reducing LDL, cholesterol, triglycerides and increased the concentration of HDL.

[12] Animal studies, alcoholic or aqueous extracts of calamus roots and rhizomes, support a possible antihyperlipidemic action.

5. *Gymnema sylvestre* (Gurmar)

The anti-obesity effects of the leaves of *Gymnema sylvestre*, family *Asclepiadaceae*, were investigated in Wistar rats fed with high-fat diets. The saponins-rich aqueous extract administered to Wistar rats, suppressed increases in body weight, organs weight, and plasma lipids. [13] *Gymnema sylvestre* can be used to treat obesity as well as alter lipid and glucose metabolism.

6. *Butea monosperma* (Palash/Dhak)

The phytochemical analysis showed that major chemical constituents of *B. monosperma* were sterols, polyphenols, flavonoids, ascorbic acid and saponins. It is well established that saponins are useful in treatment of obesity, phytosterols have beneficial effects on hyperlipidaemia, and polyphenols, flavonoids have potential antioxidant properties. [14]

7. *Moringa oleifera* (Sahijan/Munaga)

Preliminary phytochemical studies of the extract of *M. oleifera* showed the presence of alkaloids, and various types of antioxidant compounds such as tannins, flavonoids and terpenoids, and steroids. [15,16] The hypolipidemic potential is associated with the presence of β -sitosterol [17] in crude extract of *M. oleifera*. The extract of leaves of *M. oleifera* possesses hypolipidemic and antiobesity potential that protect the body against adverse effects of high fat diet-induced obesity.

8. *Garcinia cambogia* (Vrikshamla)

Extracts from the dried peel from the fruits of *Garcinia cambogia* Linn, family *Clusiaceae*,

are ingredients in some herbal appetite suppressants and energy products. The active ingredient in *Garcinia cambogia* is hydroxycitric acid (HCA), which works against obesity by suppressing appetite and inhibiting lipid synthesis. In animal studies, HCA successfully inhibits lipogenesis and therefore lowers cholesterol and fats, increases glycogen production in the liver, suppresses appetite, and increases the body's thermogenesis process, thereby promoting weight reduction. [18,19]

9. *Commiphora mukul* (Guggul/Guggulu)

The resins from the *Commiphora mukul*, family *Burseraceae*, have been indigenously used in Ayurvedic system of medicine to treat obesity. *Commiphora mukul* enhances the body's metabolic activity by improving thyroid function, increasing the body's fat-burning activity, and augmenting thermogenesis or heat production. Extracts containing ketogenic steroid active substances such as guggulsterones have been shown to significantly lower serum low-density lipoprotein and very low-density lipoprotein (LDL and VDRL, respectively) and triglycerides. [20,21] Furthermore, it raises levels of high-density lipoprotein (HDL) cholesterol.

10. *Areca catechu* (Khadir)

The seed of *Areca catechu*, family *Arecaceae*, maintains healthy fat metabolism and reduces the conversion of carbohydrates to fats. In studies of rats fed on a diet containing cholesteryl oleate, betel nut extracts significantly lowered cholesterol and triglycerides. [22]

11. *Boerhavia diffusa* (Punarnava)

The entire herb of *Boerhavia diffusa*, family

Nyctaginaceae, has been used in the treatment of obesity since ancient time. [23]

12. *Embelia ribes* (Vidanga)

The root of *Embelia ribes* Burm. f., family *Myrsinaceae*, used for weight reduction or lipid-lowering activity. [24] Studies report that the lipid-lowering activity of ethanolic extracts of *Embelia ribes* can potentially help regulate diabetic dyslipidaemia.

13. *Boswellia serrata* (Shallaki; Salai Guggul)

The resin extract of *Boswellia serrata*, family *Burseraceae*, is Boswellic acids, have been found to reduce serum cholesterol and triglyceride levels in rat studies. [25]

14. *Achyranthes aspera* (Apamarga)

The seeds of *Achyranthes aspera* L., family *Amaranthaceae*, have been shown to reduce blood glucose levels and stimulate the production of thyroid hormones in animal models. Both these actions would help combat obesity and promote weight loss. Moreover, the seeds also have an appetite-suppressant effect. [26]

15. *Clerodendrum multiflorum* (Agnimantha)

The shrub *Clerodendrum multiflorum* Burm f., family *Verbenaceae*, is beneficial in weight loss. [26]

16. *Glycyrrhiza glabra* (licorice)

The roots from *Glycyrrhiza glabra*, family *Leguminosae*, had hypocholesterolemic effects in animal studies. [27] In human studies, a daily dose of licorice (3.5 g) potentially reduced body fat by inhibiting 11- β -hydroxysteroid dehydrogenase type-1, an NADPH-dependent enzyme in the adipose tissue. [28] In some studies, *Glycyrrhiza glabra* roots have antihyperlipidaemic and anti-

hypertriglyceridemic properties. [29,30]

17. *Aloe vera*

Studies of hyperlipidaemic patients have shown that the leaves of *Aloe vera*, family *Xanthorrhoeaceae* have serum lipid-lowering activity. [31]

18. *Operculina turpethum* (Nisonth)

The roots of *Operculina turpethum*, family *Convolvulaceae*, are beneficial in treating fatty liver and improving fat metabolism in the liver. It works effectively against obesity by decreasing excessive body fat. [32] Significantly decreases serum cholesterol and triglycerides levels.

19. *Withania somnifera* (Ashwagandha)

The roots of *Withania somnifera*, family *Solanaceae*, promote natural weight loss without any negative side effects and are very efficient in the development of good health. In human case studies, treatment with Ashwagandha caused significant reduction in serum total cholesterol, triglycerides, LDL and VDRL levels. [33]

20. *Clerodendron glandulosum* (East Indian Glory Bower)

The leaves of *Clerodendron glandulosum* Coleb, family *Lamiaceae*, are used in aqueous extracts by the natives of North-East India to treat obesity. Its method of action involves the prevention of the differentiation of adipocytes and visceral adiposity through the down regulation of peroxisome proliferator-activated receptor γ -2 (PPAR γ -2)-related genes and Lep expression. [34]

21. *Triphala*

Triphala balances all dosha, very good cleanser, purifies blood rejuvenating herb. It decreases excessive Meda, reduces serum cholesterol, reduces the plaque

formation in the arteries, high blood pressure and provides remarkable protection in CVD. In a study conducted by the American Botanical Council, it was shown that Triphala decreased serum cholesterol and at the same time increased the levels of HDL cholesterol. [35]

22. *Terminalia arjuna* (Arjuna)

The Composition of Arjuna bark contains arjunic acid, tannic acid, tannins, saponins, flavonoids and gallic acid. It is also contains a lot of phytosterols, biologically active compounds, which are now increasingly studied because of their positive effects in the prevention and treatment of cardiovascular diseases. The phytosterols in Arjuna effectively reduces the level of bad cholesterol, breaking down deposits in the blood vessels. [36]

23. *Curcuma longa* (Turmeric)

Effect of 50% ethanol extract from fermented *Curcuma longa* L. (FCE50) on lipid metabolism. FCE50 suppressed lipogenesis with a decrease in the expressions of fatty acid synthase (FAS), acetyl-CoA carboxylase (ACC), adipocyte protein 2 (aP2), and lipoprotein lipase (LPL) and increased lipolysis and β -oxidation by up-regulating the expression of lipases such as adipose triglyceride lipase (ATGL), hormone-sensitive lipase (HSL), adiponectin, and AMP-activated protein kinase (AMPK) phosphorylation. [37]

24. *Saussurea lappa* (Kuth/Costus root)

This plant has been reported to contain certain phytochemical constituents like flavonoids and sesquiterpene. Protein tyrosine phosphates (PTPases), is known to be a negative regulator of insulin signal transduction by dephosphorylating the insulin

receptor (IR) as well as its substrate, insulin receptor substrates. Consequently, the PTP1B inhibitors are recognized as potential therapeutic agents for the treatment of type II diabetes and obesity. [38]

25. *Berberis aristata* (Daruhaldi)

Obesity is due to an increase in the number and hypertrophy (volume increase) of adipocytes. Berberine inhibited lipid accumulation in adipocytes. This means that berberine could reduce the size of our fat cells and cut down on their numbers. [39]

B. HERBO-MINERAL DRUGS

Rasaushadhis preparations are safe in therapeutic doses and absorbs easily in the body. *Bhasmas* and *Sindoora*, the unique Ayurvedic preparation for curing diseases, can easily enter into the blood stream and become more biocompatible as compare to conventional medicines. They have developed a new era in nano-medicine system due to its nano particles size and holistic approach towards disease. [40] *Rasaushadhis* like *Shilajatu*, *Loha bhasma*, *Rasasindhura/Parada bhasma* are the best drugs to treat *Sthoulya*. *Rasaushadhis* given in *Bruhatrayis* (*Charak*, *Shushurta*, *Vagbhata*) are *Shilajatu*, *loha bhasma*, *kshara*, *Vidangadya loha* etc. and in *Laghutrayis*, *Yoga Ratnakara* and *Bhavaprakasha* respectively *Rasa bhasma/Rasasindhura*, *Trayushanadhya Loha*, *Trimurti Rasa*, *Vadavagni Rasa* and *Shilajatu* with *Guggulu*, *Shilajatu* with *Agnimantha kwatha*, *Loharasayana*, *Loharista* etc.

Chemical Composition of *Shilajatu*

Shilajatu contains more than 85 minerals in Ionic form and Fulvic acid. The Fulvic acid concentration in *shilajit* is between 60% to 75%. Fulvic acid plays a vital role in penetrating the cell walls and transporting the minerals in to the cells. This is the most important property of the *Shilajit* that helps in arresting and reversing the aging process.

Chemical Composition of *Loha Bhasma*

Iron - 94%, Silicon - 1.07%, Sulphur - 0.08%, Phosphorus - 0.07%, Manganese - 0.30%, Carbon - 0.39%, Graphite - 3.9%

A few small studies have noted a possible association between iron deficiency and obesity. Two epidemiologic studies published in the early 1960s noted an association between overweight status among children and adolescents and iron deficiency. A recently published cross-sectional study found that overweight children and adolescents exhibited lower iron levels. The objective of this study was to investigate the association between weight status (measured as BMI) and iron deficiency among a nationally representative sample of children and adolescents. In addition, almost 1 of every 10 overweight adolescents was iron-deficient.

CONCLUSION

Weight management is a life-long process and permanent weight reduction is difficult to achieve. The ultimate cause of obesity is an imbalance between calorie intake and energy expenditure resulting from complex interactions between many genetic and environmental factors. Natural products can play a safe and effective role with obesity specially those containing fibers, polyphenols, sterols, and alkaloids. In addition, they are a good supplement for vitamins and minerals. In general, natural products with potential action in treatment of obesity act as a general body cleanser, regulate metabolism, dissolve fat in the body, help to eliminate craving of food, stimulate glandular secretions, reduce water retention and boost energy. The use of multiple phytochemicals might result in synergistic and enhanced effects. *Rasaushadhis like Shilajatu, Loha bhasma, Rasasindhura/Parada bhasma* are the best drugs to treat *Sthoulya*. This observation is useful for designing new formulations to treat *Medodushti* (obesity) and its complications.

REFERENCES

1. Must A, Spadano J, Coakley EH, Field AE, Colditz G, Dietz WH. The disease burden associated with overweight and obesity. *JAMA* 1999; 282: 1523-9.
2. Rose DP, Gracheck PJ, Vona-Davis L. The interactions of obesity, inflammation and insulin resistance in breast cancer. *Cancers (Basel)* 2015; 7: 2147-68.
3. World Health Organization, "Obesity. Preventing and Managing the Global Epidemic, Report of a WHO Consultation (WHO Technical Report Series 894)," WHO, 2000. <http://www.who.int/nutrition/publications/obesity/WHO-TRS-894/en>
4. "Worldwide Obesity Trends-Globesity," <http://www.annecollins.com/obesity/causes-of-obesity.htm>
5. Agnivesha, Charaka, Dridhabala. Charaka Samhita, Sutra Sthana, Shadvirechansatasritiya Adhyaya 4/3. In: Vaidya Jadavaji Trikamji Acharya., editor. 5th ed. Varanasi: Chaukhamba Sanskrit Sansthan; 2008; P.72.
6. Sushruta. In: Sushruta Samhita, Sutra Sthana, Dravyasangrahaneeeyam Adhyaya, 38. 8th ed. Vaidya Jadavji Trikamji Acharya., editor. Varanasi: Choukhambha Orientalia; 2005; P.164-8.
7. Vagbhata. In: Ashtanga Hrudaya, Sutra Sthana, Shodhanadiganasangraha Adhyaya, 15/31. 9th ed. Anna Moreshwar Kunte, Krishnashastry Navare, Harishastri, editors. Varanasi: Choukhambha Orientalia; 2005; P. 237.
8. Lemaure B et al. Administration of *Cyperus rotundus* tubers extract prevents weight gain in obese Zucker rats. *Phytother Res* 2007; 21:724-730.
9. Lee HS, Yoo CB, Ku SK. Hypolipemic effect of water extracts of *Picrorrhiza kurroa* in high fat diet treated mouse. *Fitoterapia* 2006; 77:579-584.
10. Dwivedi S. Effect of *Plumbago zeylanica* in hyperlipidemic rabbits and its modification by vitamin E. *Indian J Pharmacol* 1997; 29:138.
11. Chetty KM, Sivaji K, Sudarsanam G, Sekar PH. Pharmaceutical Studies and Therapeutic Uses of *Plumbago zeylanica* L. Roots (Chitraka,

- Chitramulamu). *Ethnobotanical Leaflets* 2006; 10:294-304.
12. Parab RS, Mengi SA. Hypolipidemic activity of *Acorus calamus* L. in rats. *Fitoterapia* 2002; 73:451-455
 13. Rama MR, Vijaya T, Pushpalatha B, Dattatreya RS. Saponins rich aqueous extract of *Gymnema sylvestre* R.Br. reduces high fat diet induced obesity in wistar rats. *J Pharm Res* 2011; 4:1237-1239.
 14. Dixit P et al. Anti-obese activity of *Butea monosperma* on obese rats. *Indian J Exp Biol*, July, vol.50, 2012; P.476-483.
 15. F. Anwar, S. Latif, M. Ashraf, and A. H. Gilani. "Moringa oleifera: a food plant with multiple medicinal uses," *Phytotherapy Research*, vol. 21, no. 1. 2007; P. 17-25.
 16. S. Ghasi, E. Nwobodo, and J. O. Ofili. "Hypocholesterolemic effects of crude extract of leaf of *Moringa oleifera* Lam in high fat diet fed wistar rats," *Journal of Ethnopharmacology*, vol. 69, no. 1, 2000; P. 21-25.
 17. H. P. S. Makkar and K. Becker, "Nutritional value and antinutritional components of whole and ethanol extracted *Moringa oleifera* leaves," *Animal Feed Science and Technology*, vol. 63, no. 1-4, 1996; P. 211-228.
 18. Heymsfield SB, Allison DB, Vasselli JR, Pirotbelli A, Greenfield D, Nunez C. *Garcinia cambogia* (Hydroxycitric Acid) as a Potential Anti-obesity Agent: A Randomized Controlled Trial. *JAMA* 1998; 280:1596-1600.
 19. Saito M. High dose of *Garcinia cambogia* is effective in suppressing fat accumulation in developing male Zucker obese rats, but highly toxic to the testis. *Food Chem Toxicol* 2005; 43:411-419.
 20. Satyavati GV. Gum guggul (*Commiphora mukul*) - The success of an ancient insight leading to a modern discovery. *Indian J Med Res* 1988; 87:327-35.
 21. Nityanand S, Kapoor NK. Hypocholesterolemic effect of *Commiphora mukul* resin (Guggal). *Indian J Exp Biol* 1971; 9:367-377.
 22. Jeon SM, Kim HS et al. Lower absorption of cholesteryl oleate in rats supplemented with *Areca catechu* L. extract. *Ann Nutr Metab* 2000; 44:170-176.
 23. Santhosha D, Ramesh A et al. Punarnava- A Review. *Res J Pharm Biol Chem Sci* 2011; 2:427-436.
 24. Phadke AS. A review on lipid lowering activities of ayurvedic and other herbs. *Nat Prod Rad* 2007; 6:81-89.
 25. Atal CK, Gupta OP, Singh GB. *Salai guggal*: a promising anti-arthritic and anti-hyperlipidemic agent. *Br J Pharmacol*. 1981; 74:203-204.
 26. Mangal A, Sharma MC. Evaluation of certain medicinal plants for anti-obesity properties. *IJTK* 2009; 8:602-605.
 27. Visavadiya NP, Narasimhacharya AV. Hypocholesterolaemic and antioxidant effects of *Glycyrrhiza glabra* (Linn.) in rats. *Mol Nutr Food Res* 2006; 50:1080-1086.
 28. Armanini D, De Palo CB, Mattarello MJ, Spinella P, Zaccaria M, Ermolao A et al. Effect of Licorice on the reduction of body fat mass in healthy subjects. *J Endocrinol Invest* 2003; 26:646-650.
 29. Sitohy MZ, el-Massry RA, el-Saadany SS, Labib SM. Metabolic effects of licorice roots (*Glycyrrhiza glabra*) on lipid distribution pattern, liver and renal functions of albino rats. *Die Nahrung* 1991; 35:799-806.
 30. Maurya SK, Raj K, Srivastava AK. Antidyslipidaemic activity of *Glycyrrhiza glabra* in high fructose diet induced dyslipidaemic Syrian Golden Hamsters. *Indian J Clin Biochem* 2009; 24:404-409.
 31. Nassiff HA, Fajardo F, Velez F. Efecto del aloe sobre la hiperlipidemia en pacientes refractarios a la dieta. *Rev Cubana Med Gen Integr* 1993; 9:43-51.
 32. Kohli KR, Nipanikar SU, Kadhbhane KP. A comprehensive review on *Trivrit* [*Operculina turpethum* Syn. *Ipomoea turpethum*]. *IJPBS* 2010; 1:443-452.
 33. Andallu B, Radhika B. Hypoglycemic, diuretic and hypocholesterolemic effect of winter cherry (*Withania somnifera*, Dunal) root. *Indian J Exp Biol* 2000; 38:607-609.
 34. Paranjpe P, Patki P, Patwardhan B. Ayurvedic treatment of obesity: A randomized double blind, placebo-

- controlled clinical trial. *J Ethnopharmacol* 1990; 29:1-11.
35. Bharani A, Ganguly A, Bhargava KD (May 1995). "Salutary effect of Terminalia (3): 191-9. doi:10. 1016/0167-5273(95)02320-V.PMID7649665.
36. Dwivedi S, Jauhari R (1997). "Beneficial effects of Terminalia arjuna in coronary artery disease". *Indian Heart Journal* (5): 507-10. PMID 9505018.
37. Ji Hye Kim et al. Anti-obesity effect of fermented Curcuma longa L., *Food & Nutrition Research* 2016;60: 30428 - <http://dx.doi.org/10.3402/fnr.v60.30428>
38. Muhammad Shoaib Akhtar, Sajid Bashir, Muhammad Nasir Hayat Malik and Rashida Manzoor Cardiotoxic activity of methanolic extract of Saussurea lappa, Linn roots Pak. *J. Pharm. Sci.*, Vol.26, No.6, November 2013; P.1197-1201.
39. Ma X, Egawa T, Kimura H, et al. Berberine-induced activation of 5'-adenosine monophosphate-activated protein kinase and glucose transport in rat skeletal muscles. *Metabolism* 2010 Nov; 59(11):1619-27.
40. Prashant Kumar Sarkar, Anand Kumar Chaudhary, Ayurvedic Bhasma the most ancient application of Nano medicine, *J of Scientific and Industrial Res*, 2010; 69(12): 901-5.

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