



Review Article

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SHILAJEET FOR OBESITY: A PROBABLE PHARMACOLOGICAL POSTULATE

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ABSTRACT

Obesity, a multi-factorial disease caused by excessive accumulation of fat in adipose tissue causing impairment of routine health. It is measured in term of body mass index (BMI) and the person having more than 30 BMI is generally considered as obese. Its prevalence has been increased with alarming speed over the past twenty years and recently World Health Organization (WHO) recognises it as a 'global epidemic'. Various etiological factors are concerned with pathogenesis of obesity like energy business, serum level of iron, inflammation to adipose tissue, hypoxia etc. Shilajeet, an Ayurvedic medicines is exudates come out from rock during hot sunny days and contains mainly fulvic, humic acid along with higher percentage of iron. It is indicated for management of varieties of disorders like obesity, diabetes etc. as a single medicine or in combination with other herbs, metal and mineral. Shilajeet enhances energy business by improving activity of nicotinamide adenine dinucleotide (NADH) dehydrogenases, succinate dehydrogenase (SDH) and cytochrome oxidase, enhances serum iron concentration and facilitates oxygenation to tissues by increasing oxygen carrying capacity with facilitation of blood circulation to tissue. In this review paper it is being established that all these characters of Shilajeet may be probable reason for its effect on management of obesity.

Keywords: Shilajeet, Obesity, Fulvic acid, Energy business, Oxygenation

INTRODUCTION

Obesity, a metabolic disorder has been increased with alarming speed over the past twenty years and recently World Health Organization recognise as a 'global epidemic'. It is caused by imbalance between food intake and energy expenditure¹ and measured in term of body mass index (BMI), a person's weight (in kilograms) divided by the square of his or her height (in metres) and BMI more than 30 is generally considered obese. It should be considered a rough guide because it may not correspond to the same degree of fatness in different individuals². Obesity has reached epidemic proportions in India in the 21st century, with morbid obesity affecting 5 % of the country's population³. Worldwide, at least 2.8 million people die each year as a result of being obese and an estimated 35.8 million (2.3 %) of global disability-adjusted life (DALYs) are caused by obesity⁴. It leads to adverse metabolic effects on blood pressure, cholesterol, triglycerides and insulin resistance. Only few drugs have been registered for the treatment of obesity over last 15 years like Dexfenfluramine, Sibutramine, Orlistat etc. but these drugs are withdrawn from market due to safety rather than the effect on body weight reduction^{4,5} and also not approved by USA food and drug administration (FDA). Shilajeet is a pale-brown to blackish-brown exudates, of variable consistency, exuding from layers of

rocks in many mountain ranges of the world, especially the Himalayas and Hindukush ranges of the Indian subcontinents, having bitter taste and its odour resemblance like cow urine⁶. It consists of a complex mixture of organic substances such as humus, fulvic acid and organic plant materials which are compressed by layer of rocks^{7,8} and humus consists of 60-80 % of organic materials⁹. It is an important drug mentioned in Ayurvedic materia media since Samhita period to the current era and used for treatment of obesity and other diseases as single drug or in compound formulations¹⁰. Along with this Shilajeet has been also used as a rejuvenator and adaptogen for thousands of years¹¹. Due to, potential use of Shilajeet in management of obesity, here an attempt has been made to search out probable mode of action of Shilajeet in light of contemporary science. References of Shilajeet cited for treatment of obesity were search out in manuscripts of Ayurveda mentioned in Schedule I of Drug and Cosmetic act 1940 like Charak Samhita, Sushrut Samhita, Rasa Shastra literature such as Rasa Tarangini and contemporary researches done by different institutions and published in various reputed international and national journals. It was observed that Shilajeet was used for treatment of obesity as single drug as well as combination of with other herbs. Details are summarized in Table 1.

Table 1: References of Shilajeet in obesity

S. No.	Name of classics	Details Description	References
1	Charak Samhita	With Agnimantha Swarasa	Sutra Sthan 21/24
2	Sushutra Samhita	Mentioned as single drug	Sutra Sthan 15/37
3	Astang Hriday	With Agnimantha Swarasa	Sutra Sthan 14/21-24
4	Astang Hriday	With Asanadi Gana	Uttar Tantra 12/34-35
5	Chakradatta	As ingredient of Lauha Rasayan	Shaulya Chikitsa prakaran 19/28
6	Bhav Prakash	With Musta, Dhatura etc.	Chikitsa Prakaran 39/28
7	Rasa Taragini	Mentioned as single drug	Tarang 22/85
8	Rasa Taragini	With Agnimantha Swarasa	Tarang 22/101

Probable Mode of Pharmacological Action of Shilajeet

Shilajeet is important minerals indicated for the treatment of obesity as single or along with others herbs, metals and minerals in manuscripts of Ayurveda mentioned in schedule I of Drug and Cosmetic Act 1940.

Table 2: Classical and proprietary formulations for Obesity containing Shilajeet

Name of Formulations	Composition	Reference/ Name of pharmaceutical company
Lauha Rasayan	Shilajeet, Guggul (<i>Commiphora mukul</i>) lauha, Haritaki (<i>Terminalia chebula</i>)	Chakradatt 36/19-29
	Shilajeet, Kustha (<i>Saussurea lappa</i>), Musta (<i>Cyperus rotundus</i>), Devadaru (<i>Cedrus deodara</i>)	Bhava prakash 39/28
Decrin	Shilajiet, Navak Guggul, Guduchi (<i>Tinospora cordifolia</i>),	Phyto Pharma Pvt. Ltd.
Nirmeda	Vyosadi Guggul, Shilajeet	Pavaman Pharmaceuticals
Obex	Shilajeet, Navak Guggul	Arya Aushadi Pharmaceutical Works
Defet 5	Shilajeet, Guggul, Arogyavardhini Rasa,	Ayulabs
Lipan	Shilajeet, Guggul (<i>Commiphora mukul</i>), Arjuna (<i>Terminalia arjuna</i>), Yastimadhu (<i>Glycyrrhiza glabra</i>)	BAN Labs Ltd
Ref	Shilajiet, Lauha, Chitrak (<i>Plumbago zeylanica</i>), Guggul (<i>Commiphora mukul</i>)	Capro Labs Export India Pvt Ltd
Slimex	Shilajeet, Chitrak (<i>Plumbago zeylanica</i>), Vidang (<i>Embelia ribes</i>), Amalaki (<i>Embelia officinalis</i>)	Lala Dawasaz Pvt. Ltd
Slim lip	Shilajeet, Guggul (<i>Commiphora mukul</i>), Nimb (<i>Azadirachta indica</i>), Vidanga (<i>Embelia ribes</i>)	Fort Herbal Drugs
Medo har vati	Guggul (<i>Commiphora mukul</i>), Shilajeet, Kutki (<i>Pichrohiza kurroa</i>), Nishoth (<i>Oeperculina turpethum</i>)	Divya pharmacy

Facilitation of energy business

Obesity results from imbalance of food intake and energy expenditure, among them energy expenditure plays major role for its development. Energy is released from basic nutrients like carbohydrate, protein and fats by the process of Glycolysis, Krebs cycle and electron transport chain (ETC) which is interconnected to each other. Among them highest energy is produced in to ETC by transfer of electrons¹². Enzyme nicotinamide adenine dinucleotide (NADH) dehydrogenases is responsible for transportation of electrons in ETC besides this succinate dehydrogenase (SDH) is another pathway for the initiation of transfer of electrons in ETC pathway along with cytochrome C.¹³ Shilajeet prevent the attenuation of active NADH dehydrogenases¹⁴ SDH activity¹⁵ and significantly reversed cytochrome complex activity¹⁶. It was also reported that increase energy production¹⁷ helpful in reduction of body weight. Thus we can assume that by improving activity of NADH dehydrogenases, SDH and cytochrome oxidase, Shilajeet facilitate energy production and helpful in reduction of body weight.

Oxygenation

Adipose tissue expansion eventually reaches a point where the development of local vasculature is insufficient and cannot meet the oxygen demands of distant enlarged adipocytes and produces hypoxia. It forces the cell to

switch from aerobic to anaerobic glycolysis and enhanced lactate concentration in adipocytes¹⁸ which stimulates inflammatory pathways in macrophages¹⁹ and also enhances lipopolysaccharide-induced inflammatory response in pre-adipocytes²⁰ and these are accountable for development of obesity. It is apparent that hypoxic response fails to achieve the increasing adipose tissue vascularisation and leads to local fibrosis, which in turn contributes to adipose tissue dysfunction²¹. Shilajeet enhances the oxygen-carrying capacity of the blood^{22,23} and helps in improving blood circulation hence diffusion of oxygen take place into tissues and maintains the necessary oxygen supply in the body during hypoxia,²⁴ so that cell get sufficient oxygen and their metabolism shifted from anaerobic to aerobic environment and enhances pyruvic acid concentration instead of lactate. Decreases lactate concentration reduces the production and release of proinflammatory cytokines (causative factors of obesity). Thus it might be possible that Shilajeet act by shifting anaerobic to aerobic respiration and check pathogenesis of obesity.

Elemental status

Trace elements are essential for regulation of immunological and antioxidant functions as well as essential components or cofactors of various enzymes throughout metabolism²⁵. It was observed that serum iron concentration is inversely related to obesity i.e. low serum

iron concentration is found in obese persons^{26,27}. Shilajeet, contain various trace element along with higher concentration of iron, copper etc.²⁸ along with organic materials which have the highest percentage of fulvic acid that helps in the absorption of iron into the body, in this way serum iron concentration is increased and bioavailable to bone marrow stem cells for blood formation^{22,23}. Thus Shilajeet have high iron concentration and fulvic acid enhances absorption of iron so that serum iron status increases and become helpful in management of obesity.

Immuno-stimulant

Positive chronic imbalance between energy intake and expenditure leads to situations of obesity, which may influence unspecific and specific immune responses mediated by humoral and cell mediated mechanisms and impairments in the immune response produces obesity^{24,25}. It was also reported that 38 % of obese children and adolescents showed a variable impairment of cell-mediated immune responses²⁶ and lower immunoglobulins occurred in overweight women²⁷. It is accompanied by an excessive fat deposition (adipocytes) for a given stature, sex and age, these adipocytes act as endocrine organ²⁸ and produces immune-related proteins like leptin, tumour necrosis factor a (TNF-a), which involve in pathogenesis of obesity. Leptin, regulates immune function on various levels by stimulating monocyte proliferation and differentiation into macrophages, modulating the activation of natural killer lymphocytes, or inducing the production of pro-inflammatory cytokines such as TNF-a, IL-6, or IL-12²⁹. Shilajeet act as immuno stimulant and very effective in treating immune disorders^{30,31} by improving the immunity³²⁻³⁴. It also activates macrophages and splenocytes which have adaptogenic properties^{32,35}. Fulvic acid is main constituent of Shilajeet increase the size of thymus gland as well as stimulates production of lymphocyte which in turn produces antibodies thus fulvic acid boost up immunity of person.

Anti inflammatory

Adipose tissue as a whole has limited capacity to expand and to store energy. Exceeding this limit leads to enhanced lipolysis within the adipocyte and the subsequent release of non esterified fatty acid (NEFA) into the blood stream. It reaches to other tissues and organs and exerts toxic effects on them, e.g. insulin resistance etc.³⁶. The chemical natures of fatty acids produced by lipolysis of adipose tissue is also triggering the inflammatory process and accelerate the inflammatory change in the adipose tissue which is responsible for development of obesity³⁷. Presence of high concentration of fulvic and humic acid in Shilajeet reduces inflammations which prevent the toxic effect of inflammation on body tissue and improve insulin resistance. Shilajeet also stimulates the pancreas to secrete insulin and maintains equilibrium of catabolism and anabolism in the body^{38,39}. Thus, by reducing

inflammation and increasing serum insulin Shilajeet may be helpful in reduction of body weight.

CONCLUSION

Obesity is metabolic disorder caused by unbalanced energy business, hypoxia and chronic inflammation along with this serum iron concentration. Shilajeet, an exudates comes out during summer season from mountains, contains mainly of iron and fulvic acid with various trace element which facilitate energy expenditure, oxygenation, anti inflammatory and immune stimulant properties. Probably these properties of Shilajeet are able to check the pathological process of obesity at different stages, thus helpful in management of obesity.

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