

Review on *Lodhradi Kashaya*: All-rounder remedy for Diabetes mellitus patients

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Diabetes has been elaborately discussed with their management approach in every medical system including *Ayurveda*. Peoples have mindset that only elevated blood sugar is diabetes while it is symptom of disturbed physiology within body and leading to continuous malfunctioning related with glucose utilization. Only blood glucose level is not the problem, but the complications arise due to the elevated blood glucose, malfunctioning of organs and its physiology is also area for concern. Synthetic chemical ingredients of allopathic medicine are serving well through its unique target treatment but its safety against efficacy is always questioned. Authors have opinion to manage diabetic syndrome using natural multi-ingredients approach that can trigger many target (blood sugar, receptor locking, blood transport cycle, utilization chain, insulin management, beta cell, nervous system and blood vessels) with its own properties (Hypoglycemic, antioxidant, hypolipidemic, cytoprotective, healing, etc.) along with synergistic effect of other ingredients. So, author picked a formulation, *Lodhradi Kashaya* from ancient wisdom that was decorated with word *Madhumehajeet* (Win over diabetes) in *Basavarajiyam* and also mentioned in *Vaidya Chintamani* for *Prameha* (Diabetes). In this review paper, authors analyse critically as well as reasonably the treatment approach as well as management tricks associated with *Lodhradi Kashaya*.

Keywords: Diabetes mellitus (DM), Diabetic complications, *Lodhradi Kashaya*, *Madhumehajeet*, *Ayurveda*

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Diabetes mellitus (DM) is not a single disease but it is a metabolic-cum-vascular syndrome of multiple aetiologies characterise by chronic hyperglycaemia with distribution of carbohydrates, fats, protein metabolism resulting from defect in insulin secretion or insulin action or both. The chronic hyperglycaemia of diabetes is associated with long term damage, dysfunction, and failure of various organs due to malfunctioning of bio-physiology¹. World is standing over diabetic bomb, as in 2014 the global prevalence of diabetes was estimated to be 9% among adults. In 2012, an estimated 1.5 million deaths were directly caused by diabetes and among them Cardiovascular disease is responsible for between 50% and 80% of deaths in people. About 347 million people worldwide have diabetes, among them 90 % have DM². WHO (World Health Organization) runs many program for diabetic awareness but still people have thought that only blood glucose level is area of concern for diabetes mellitus while it is wrong because blood glucose is symptom that our body physiology is started malfunctioning. Elevation in the blood sugar is not only due to single reason but it involves multiple reasons for it.

Treatment approach of diabetes mellitus in 21st century is largely based on single API (active pharmaceutical ingredient) for single target management in synthetic medicine (Allopathy) and serve humanity in appreciable way. But if we survey the medical system in India, we found that diabetes is described since before 1000 BC in the name of *Prameha* (Diabetes) in *Ayurveda*. *Prameha* is elaborately described and discussed with their types, symptom and management by specific formulations as well as life styles. It is surprising that ancient scholars had prime focus to treat disease along with management of complications and thus use multi ingredient therapy for *Madhumeha* (Diabetes mellitus). They use multi drugs formulation having ingredient based on treatment approach to type of diabetes, *prakriti* (Body constitution that may be correlated with genomic constitution) and possible complication that may arise in future. Since, diabetes mellitus is a syndrome rather than disease so the multiple ingredients in formulation for targeting multiple aetiologytarget like blood sugar, receptor locking, blood transport cycle, utilization chain, insulin management, beta cell, nervous system and blood vessels, etc., with its own several

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properties (hypoglycemic, antioxidant, hypolipidemic, cytoprotective, healing, etc.) as well as synergistic effect of other ingredient used in formulation.

Authors have picked one formulation from ancient wisdom of *Ayurveda*, *Lodhradi Kashaya* for critical and comprehensive analysis of the concept and vision used in treatment approach as well as management of diabetes mellitus. *Lodhradi Kashaya* is basically described as *Ayurvedic kwath* dosage form (decoction) in *Basavarajiyam Meharoga Nidan Lakshanam Chikitsadhyaya (Kaphaj Prameha)*, and here it was called as *Madhumehajeet* (win over diabetes) when administered with honey (as supporting liquid for administration)³. Same formulation was also mentioned in *Vaidya Chintamani* under *Prameha Prakaranam* having same formulation⁴. So this formulation has been selected for review and its ingredients were kept under investigation on account for their properties to correlate with contemporary science. This comprehensive review of traditional formulation on the basis of contemporary science also put strong evidence in favour of ancient wisdom. *Lodhradi Kashaya* will show a glimpse of treatment approach used by ancient wisdom for diabetes and its related complications.

Ingredients of *Lodhradi Kashaya*

Lodhradi Kashaya (Madhumehajeet) is *Ayurvedic* formulation, recommended to administer in decoction form. It has four ingredients *Lodhra* bark (*Symplocos racemosa* Roxb.), *Musta* rhizome (*Cyperus rotundus* L.), *Katphala* bark (*Myrica esculenta*) and *Haritaki* fruit pulp (*Terminalia chebula* Retz.). These ingredients are made into *yavakut* (coarse powder) and were taken in equal quantity for preparation of decoction. All the ingredients are still available to the human being easily and naturally, so this formulation may be a cost effective formulation within reach of common peoples⁵.

Diabetes and related complications

Diabetes is a chronic, metabolic disease characterized by elevated levels of blood glucose (or blood sugar), which leads over time to serious damage to the heart, blood vessels, eyes, kidneys, nerves, etc.⁶. Diabetes complications are divided into microvascular (due to damage to small blood vessels) and macrovascular (due to damage to larger blood vessels). Microvascular complications include damage to eyes (retinopathy) leading to blindness, to kidneys (nephropathy) leading to renal failure and to nerves (neuropathy) leading to impotence and diabetic

foot disorders (which include severe infections leading to amputation). Macrovascular complications include cardiovascular diseases such as heart attacks, strokes and insufficiency in blood flow to legs. Good metabolic control can delay the onset and progression of diabetic retinopathy, control of high blood glucose, control of high blood pressure, intervention with medication in the early stage of kidney damage, and restriction of dietary protein⁷.

The clinical course and prognosis of health and life of diabetic patient are now determined by so called complications of diabetes. The characteristic progressive damage to the eyes, kidney, and nerves and heightened susceptibility to heart disease, gangrene and stroke are most prominent in metabolic disorders. These complications are Diabetic microangiopathy (progressive change in capillaries leads to renal and retinal disease), arterial disease, local tissue damage (reason behind Neuropathy and cataract), Diabetic neuropathy (malfunctioning of cardiovascular system, respiratory system, urinary and sexual function) and infection (Tuberculosis, fungal infection to skin & UTI or anaerobic infection of deep tissues). These complications can be managed by improvement of metabolic control, prevention of vascular disease, prevention of infections and preservation of organ function⁸.

Since DM is the disease due to increase of *vata* caused either by blockage of *strotas* (body channels) or aggravated *kapha* and *medo dhatu* or due to lifestyle disorder, viz. mental stress, food habit, life style, etc.⁹. So, ancient wisdom always talks about management of disease not only targeting the hypoglycemic action but also use the additive drugs in formulation to manage other possible complication or problems in future. In addition, they proposed curative treatment in pre-diabetic stage to avoid DM by specific formulation like *Lodhradi Kashaya*. The beauty of the formulation is that it is prepared by natural ingredients and thus may have upper hand in global market.

In integrated approach along with synthetic drugs, *Lodhradi Kashaya* can also be given on discussion with physicians because natural extract from plant origin generally did not interact with synthetic drugs and did not produce ADR (Adverse drug reactions). In addition, suitable herbal extract having good antioxidant, hypolipidemic properties, healing properties, etc., may improve Cytochrome P-450 that involve in oxidative metabolism of drug and other xenobiotic and promote body defense system¹⁰.

Ayurvedic properties of Lodhradi Kashaya ingredients

Ingredients that are present in *Lodhradi Kashaya* were used prominently for managing *Prameha* in different formulation combination due course of time and their indication for such particular formulation were given in Ayurvedic texts (Table 1). Properties in *Ayurveda* are described in term of *rasa, guna, veerya, vipaka and prabhava, karma*. Ayurvedic properties of all the ingredients are described here (Table 2) that is responsible for management of DM¹¹. They have *katu, tikta* and *kashaya rasa*

mainly that along with *ushna veerya*, responsible for *kapha* and *vata shamak*. *Laghu* and *Ruksha* property is responsible for reducing obesity and clear *strotas* and also subside *kapha* and *vata*. *Sheeta veerya* is responsible for *pitta shamak* along with *Kashaya rasa* and help in balancing metabolism. All the properties are assimilated in the formulation in such a way to control *kapha* and *vata* and *pitta dosha*. *Lodhradi kashaya* ingredients are having all properties that may be utilized for approaching toward equilibrium of *tridosha*. Its *Katu, Kashaya*

Table 1-Indication of ingredients of *Lodhradi Kashaya* present in different formulation mentioned in different ancient text

S No	References	Formulation	Contents of formulation	Indication
1	Ch. Chi. 6/27	<i>Haritakyadi Kashaya</i> <i>Madhvasava (Lodhrasava)</i> 6/41-44	<i>Haritaki, Katphal, Musta, Lodhra.</i> <i>Lodhra, Haritaki, etc.</i>	<i>Kaphaj Prameha</i> <i>Kapha Pittaj Prameha</i>
2	Su. Sa. Su. 38/15 Su. Sa. Su. 38/43 Su. Sa. Su. 38/48-49 Su. Sa. Su. 38/55 Su. Sa. Su. 38/57	<i>Phaltriadi Kwath</i> <i>Lodhradi Gana</i> <i>Parusakadi Gana</i> <i>Nyagradhadi</i> <i>Mustadi gana</i> <i>Triphala</i>	<i>Haritaki, Musta, etc.</i> <i>Lodhra, Katphal</i> <i>Katphala</i> <i>Lodhra, Savaralodhra</i> <i>Musta, Haritaki</i> <i>Haritaki</i>	<i>Sarvaprmeha</i> <i>Meda Kaphara gana</i> <i>Mutradosahara</i> <i>Dahamedohara</i> <i>Slesmadoshahar nisudana, Pacana</i> <i>Kapapittaghani, Meha Kusthavinasi</i>
3	A. H. Ch. 12/8 A. H. 12/25-28	<i>Rodradi Kasaya</i> <i>Rodhrasava</i>	<i>Lodhra, Abhaya, Musta Katphal,</i> <i>Lodhra</i>	<i>Kaphaj Prameha</i> <i>Meha</i>
4	B. R. 9/ B. R. 37/20-22 B. R. 37/24 B. R. 37/42-46	<i>Lodhradi kashaya</i> <i>Haritakyadi Kasaya</i> <i>Usiradi kasaya</i> <i>Nyagrodhadi curma</i>	<i>Lodhra, Haritaki, MustaKatphal</i> <i>Haritaki, Katphal, Musta, Lodhra.</i> <i>Lodhra, Musta, Haritaki</i> <i>Lodhra, Haritaki</i>	<i>Madhumeha</i> <i>Kaphaj prameha</i> <i>Pittaj Prameha</i> <i>Vinsatimeha</i>
5	B. P.N. Shloka 20-21 Shloka 20-21 Shloka 92-93 Shloka 181	<i>Haritakyadi varga</i> <i>Haritakyadivarga</i> <i>Karpuradivarga</i> <i>Haritakyadivarga</i>	<i>Haritaki</i> <i>Lodhra</i> <i>Musta</i>	<i>Prameha</i> <i>Kaphapitanut</i> <i>Kapha Pittashaman</i> <i>Kaphajwarahar Pramehahar</i>
6	D. N. 205-206	<i>Haritaki</i>	-	<i>Meha, Santarpankritroga hanta</i>
7	K. N. Shloka 225 Shloka 1125 Shloka 1357 1137-1138	<i>Osadhivarga</i> <i>Osadhivarga</i> <i>Osadhivarga</i> <i>Osadhivarga</i>	<i>Haritaki</i> <i>Lodhra</i> <i>Musta</i> <i>Katphal</i>	<i>Mehanasak</i> <i>KaphaPitahara</i> <i>Kaphapita samana</i> <i>Meha</i>
8	Sha. Sa. Ma. Shloka 6/9-11 Sha. Sa. Ma. 2/108 Sha. Sa. Ma. 2/111-114	<i>Triphala Curma</i> <i>Varadi kwath</i> <i>Nyagrodhadi kwath</i>	<i>Haritaki</i> <i>Haritaki, Musta</i> <i>Lodhra, Hartaki</i>	<i>Mehashothaghni</i> <i>Prameha</i> <i>Dahmedovishapaha</i>
9	Yo. Ra. 1-3, P:82 Yo. Ra. P:83 Yo. Ra. P:85 Yo. Ra. P:84	<i>Haritakyadi kwath</i> <i>Usiradi Kwath</i> <i>Vrindatriphaladi Kwath</i> <i>Haritakyadi kwath</i>	<i>Haritaki, Katphal, Musta, Lodhra</i> <i>Lodhra, Musta</i> <i>Haritaki, Musta</i> <i>Haritaki, Katphal, Musta, Lodhra, etc.</i>	<i>Kaphaj Prameha.</i> <i>Pittaj prameha</i> <i>Samanya prameha</i> <i>Kapha Vataj Prameha</i>
10	Gadnigraha 30/47 <i>Pramehachikitsa</i>	<i>Rodhradikashaya</i>	<i>Lodhra, Haritaki, Katphal, Musta</i>	<i>Kaphaj prameha</i>

(Ch. Chi- Charak Samhita, Su.Sa Su. – Sushruta Samhita Sutra sthan, AH- Astang Hrdaya, Ba Ra-Basavrajyam, BPN- Bhava Prakash Nighantu, KN – Kaidev Nighantu, DN- Dhanavantari Nighantu, Sha. Sa. Ma. – Sharangdhar Samhita Madhyam Khand, Yo Ra- Yoga Ratnakar)

Table 2 – Ayurvedic properties of Ingredients of *Lodhradi Kashaya*

Property	<i>Lodhra</i>	<i>Haritaki</i>	<i>Musta</i>	<i>Katphala</i>
<i>Rasa</i>	<i>Kashaya</i>	<i>Kashaya pradhana, Panch rasa</i>	<i>Katu, Tikta, Kashaya</i>	<i>Katu, Tikta, Kashaya</i>
<i>Guna</i>	<i>Laghu, Ruksha</i>	<i>Laghu, Ruksha</i>	<i>Laghu, Ruksha</i>	<i>Laghu, Tikshna</i>
<i>Veerya</i>	<i>Sheeta</i>	<i>Ushna</i>	<i>Sheeta</i>	<i>Ushna</i>
<i>Vipaka</i>	<i>Katu</i>	<i>Madhur</i>	<i>Katu</i>	<i>Katu</i>
<i>Karma</i>	<i>Kapha-Pitta Shamak</i>	<i>Tridoshashamak</i>	<i>Kapha-Pitta Shamak</i>	<i>Kapha-vata shamak</i>

rasa also help in lowering sweetness of body (blood sugar level). So, this formulation seems to have upper hand in management of *Madhumeha* (Diabetes mellitus).

Management of Diabetes mellitus with *Lodhradi Kashaya*

Each ingredients of *Lodhradi Kashaya* is having unique pharmacological properties along with their integrated actions that are required for subsiding *prameha*. Previously, *Lodhradi Kashaya Ghana vati* has been reported for antidiabetic effect¹². So, this formulation was selected for further study and its review was done here. Each ingredient of *Lodhradi Kashaya* was also reported for hypoglycemic action through different mechanism of action (Table 3)¹³⁻²⁴. This list of antidiabetic potentials of ingredients are not ends here in Table 3, but there is several researches that support antidiabetic effect of these four plants by different mechanism of action. Other than these reports, bitter and astringent constituents like glycosides, tannins and phenolics are also claimed for hypoglycemic and antidiabetic action. So, *Lodhradi Kashaya* may have upper hand in controlling of blood sugar and may act as all-rounder remedy for diabetic patients.

Management of diabetic complications

Antioxidant and free radical scavenging activity

Hyperglycemia cause increase in free oxygen radical formation and thus causes oxidative stress in human being. It also suppresses the antioxidant mechanism of the biological system²⁵. So, in diabetic patient it is very necessary to control free radical liberation and its accumulation in body tissue and

fluid to avoid complications. Free radicals are very unstable and react quickly with other compounds and thus chain reaction gets started. Once the process is started, it can cascade, and finally results in the disruption of a living cell. Generally, harmful effects of reactive oxygen species on the cell are most often like damage of DNA, oxidations of poly-de-saturated fatty acids in lipids, oxidations of amino acids in proteins, inactivate specific enzymes by oxidation of co-factors. The free radicals formed in our body are combated by antioxidants that safely interact with free radicals and terminate the chain reaction before vital molecules are damaged²⁶.

Ingredients of *Lodhradi Kashaya* are having very good antioxidant potential. *Lodhra* is reported for potential antioxidant agent, its different extracts are having free radical scavenging activity^{27,28,29}. *Haritaki* has been used in many formulations in traditional medicine, in modern research it is also claimed for excellent antioxidant activity³⁰⁻³². Similarly *musta*^{33,34} and *katphala*^{35,36} are also having very good antioxidant potential and that can be utilized against diabetic patient to keep them healthy.

Hepatoprotective activity

DM is due to metabolic disturbance results in production of hepatotoxins, antigens and free radicals that adversely affect liver and raises risk of nonalcoholic fatty liver disease. Liver is one of the most important organs in the body, performing a fundamental role in the regulation of diverse processes, among which the metabolism, secretion, storage, and detoxification of endogenous and exogenous substances are prominent. Damage can be induced by biological factors (bacteria, virus, and parasites) and

Table 3- Reported Antidiabetic potentials of ingredients of *Lodhradi Kashaya*

S No	Ingredients	Antidiabetic Potential	References
1	<i>Lodhra</i>	1. Hexane extract of <i>Symplocos</i> sp. leaves has potential of antidiabetic property to treat type 2 diabetes.	[13] [14]
		2. The ethanolic extract of leaves showed hypoglycemic activity.	[15]
		3. Bark has antidiabetic potential along with insulin like effect on peripheral tissues.	
2	<i>Haritaki</i>	1. Ethanolic extract of fruit have antidiabetic potential.	[16]
		2. <i>T. chebula</i> fruit extract significantly reduced the blood glucose.	[17]
		3. Ethanolic extract of fruit having the pharmacological action against the diabetic condition, even though the mechanism of the action is unknown.	[18]
3	<i>Musta</i>	1. The ethanolic extract of <i>Cyperus rotundus</i> showed the significant decrease in serum glucose level in both oral glucose tolerance test and alloxan induced diabetic rats.	[19,20] [21]
		2. hydro-ethanol extract of <i>musta</i> has been reported for antidiabetic effect.	[22]
		3. <i>C. rotundus</i> extract has a hypoglycemic or anti-diabetic effect by inhibiting intestinal glucose absorption and promoting glucose consumption.	
4	<i>Katphala</i>	1. Methanolic extract of <i>Myrica esculenta</i> leaves showed dose-dependent antidiabetic activity by significant decrease in blood glucose level.	[23]
		2. Antidiabetic action reported.	[24]

autoimmune diseases (immune hepatitis, primary biliary cirrhosis), as well as by the action of different chemicals, such as some drugs (high doses of paracetamol and antitubercular drugs), toxic compounds [carbon tetrachloride (CCl₄), thioacetamide, dimethylnitrosamine (DMN), *D*-galactosamine/lipopolysaccharide (GalN/LPS)]³⁷. Hepatoprotective action has been reported by *Lodhra*^{38,29}, *Haritaki*³⁹, *Musta*⁴⁰ through their several mechanism of action. So, *Lodhradi Kashaya* may play an important role in protecting liver tissues and other vital tissues in Diabetic patients.

Antimicrobial activity

Diabetic ulcers are a common complication of diabetes frequently associated with the presence of *Staphylococcus aureus*. Furthermore, invasive *staphylococcal* infections such as endocarditis or bacteremia are more prevalent in diabetic than in non-diabetic patients. Invasive group B streptococcal infections are also more common in diabetes. Furthermore, there is increased prevalence of urinary tract infection (UTI) and 1.4 times higher recurrence rate in women with DM. Host susceptibility factors contributing to increased risk of different bacterial infections in DM will undoubtedly be multifactorial, depending on tissue tropism, the type of protective immune response required and the unique life cycles of various pathogens⁴¹. *Lodhra*⁴², *Haritaki*⁴³, *Musta*⁴⁴, *Katphala*⁴⁵ are having very good antimicrobial properties reported in contemporary researches, so if they were present in the formulation will help in possible microbial infections due to elevated blood sugar and complications.

Adaptogenic action

Adaptogenic properties of drugs help to improve anti-stress, anabolic and immunomodulatory activity of biosystem. Thus it promotes physical and mental health, improve immune system and enhance longevity⁴⁶. *Lodhradi Kashaya* is having four ingredients of excellent antioxidant activity that help to fight against stress induced free radicals and having its tonic effect over nerves. They also enhance immune system of the body.

Hypolipidemic and hypocholesterolemic and cardio protective

Insulin insufficiency causes lipase activation resulting into increasing LDL cholesterol with decrease in HDL cholesterol level. It also creates cardiovascular disease

by different mechanism. LDL and VLDL increase is directly associated with atherosclerosis resulting into cardiac problems²⁵. Diabetic patient with mild fasting hyperglycemia commonly has mild hypertriglyceridemia due to overproduction of TG-rich lipoproteins in the liver, associated with decreased high-density lipoprotein (HDL) cholesterol levels. The more hyperglycemic patients have mild to moderate hypertriglyceridemia due to decreased adipose tissue and muscle lipoprotein lipase, (LPL) activity. These patients also have decreased HDL cholesterol levels associated with defective LPL catabolism of TG-rich lipoproteins⁴⁷. *Lodhra*²⁸, *Haritaki*⁴⁸, *Musta*⁴⁹ and *Katphala*⁵⁰ are showing very good hypolipidemic action in hyperlipidemia patients as well as it helps to increase HDL cholesterol level. Contemporary researches show that these ingredients also help to decrease adipose tissues and muscle lipoprotein lipase activity. So, these properties of ingredients may be utilized in management of diabetes and related complications in patients.

Wound healing activity

Delayed wound healing occurs especially in the DM patient. In addition, hyperglycemia caused by decreased insulin availability and increased resistance to insulin can affect the cellular response to tissue injury. Studies of the immune cells necessary for wound healing, such as PMN leukocytes and fibroblasts, as well as studies of damaged tissue suggest that there is a delayed response to injury and impaired functioning of immune cells in diabetes mellitus⁵¹. Diabetes may affect the musculoskeletal system in a variety of ways. The metabolic perturbations (metabolic disturbance) in diabetes (including glycosylation of proteins; microvascular abnormalities with damage to blood vessels and nerves; and collagen accumulation in skin and peri-articular structures) result in changes in the connective tissue. *Lodhra*⁵², *Haritaki*⁵³, *Musta*^{54,20} are having wound healing properties and thus they repair tissue damage and may also act as cytoprotective. They help the body to fight against less insulin availability and tissue damage caused due course.

Conclusion

Diabetes is grasping the human population in accelerated manner due to disturbance in lifestyle, mind status and genome. Diabetic complications are needed to be addressed with more emphasis along with controlling the blood sugar level. So management of *Prameha* in

ancient era has been highlighted here with selecting *Lodhradi Kashaya* mention in *Ayurveda* for treatment of *Madhumeha* with the name of *Madhumehajeet*. *Lodhradi Kashaya* has been selected to analyses ancient wisdom of combining multiple drugs within a single formulation for treatment. Since different ingredients of *Lodhradi Kashaya* separately reported for many of pharmacological action that may be utilized in management of diabetes and its complications. So *Lodhradi Kashaya* may be considered as all rounder medicine for management of DM.

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