

BASTI (MEDICATED ENEMA) - AN ALTERNATIVE IN PREVENTION AND MANAGEMENT OF DIABETES

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Abstract

Basti is a unique therapy of Ayurveda that has wide clinical spectrum. Its use in metabolic disorders is being highly recognized in recent days. Diabetes is one such condition that can be managed but it is difficult to control the prognosis with conventional diabetes care. Human gut is an interesting functional unit that has wide effect on bodily metabolism. Bacterial extracts of intestinal microbial flora such as the lipopolysaccharides control the tone of the innate immune system thus regulating the general inflammatory status, insulin resistance, and adipose tissue plasticity. Therefore, strategies aimed at controlling the ecological mutualism between intestinal microbial flora and the host should lead to a new era of therapeutic and health benefits. Moreover colon and rectum play a vital role in drug absorption, autointoxication and acts on different organs through enteric nervous system. This study focuses on action of Basti in diabetes that is evident through the multiple actions like colon cleansing, nourishment of microbial flora, action through enteric nervous system and improving absorption of drugs etc. All these effects on the whole make Basti an alternative in prevention and management of diabetes.

Key words: Basti; Diabetes; Colon cleansing; Microbial flora; Insulin resistance.

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INTRODUCTION

India has more diabetics than any other country in the world, according to the International Diabetes Foundation.^[1] The disease affects more than 50 million Indians - 7.1% of the nation's adults - and kills about 1 million Indians a year. Generally, the high incidence is attributed to a combination of genetic susceptibility plus adoption of a high-calorie, low-activity lifestyle by India's growing middle class.^[2] Conventional diabetic care revolves around calorie management, Antihyperglycemic or hypoglycemic drugs and exercise etc. However, Human Gut also plays a vital role in diabetes production and prognosis. Gut microbiota is being increasingly recognized as an important factor connecting genes, environment and immune system. The human gut hosts an enormous number and variety of microorganisms, including at least 10^{14} bacteria belonging to approximately 1,000 species.^[3] Diabetes being a metabolic disorder is highly associated with gut environment. Task of delivering drug through colon and altering the microbial flora of gut simultaneously depends upon multiple factors. Basti is an asset of Ayurveda that has a direct approach to the colon and rectum. Beside glycemic control on virtue of drugs used in Basti, it affects microbial flora of intestine, brings about colon cleansing, alters intestinal permeability and affects enteric nervous system. All these factors have a key role in overall clinical picture of diabetes.

Essential factors/ therapeutic goals in prevention/ management of diabetes

- Prevention of autoimmune diabetes
- Correction of insulin resistance
- Correction of insulin deficiency
- Prevention of β cell exhaustion & toxicity
- Effective management of hyperglycemia through antidiabetic drugs

- Effective management of risk factors like obesity, hypertension etc.
- Dietary modifications to reduce calorie input or use of diet that reduces food intake and prolongs gastric emptying etc.

Role of gut in achieving prevention and management goals in diabetes

In addition to comprising the largest surface area of the body, the intestinal mucosa is constantly exposed to a vast array of microbes, food antigens, and toxins. These factors in turn bring about changes in bodies metabolic functions. Diabetes is one such disorder that is produced as a fate of disturbance in mucosal homeostasis. Some theories that explain positive effect of healthy gut environment on diabetes are as follows:

Intestinal microbiota

Mucosal immune system

Aberrant responses to food, enhanced immunity to wheat and cow's milk have been reported in type 1 diabetic patients.^[4] Some studies suggest that early exposure to wheat-containing food in infancy increases the risk of β -cell autoimmunity^[5] that leads to type 1 diabetes. Changes in the microbiota affect the development of autoimmune diabetes. Calcinario F, et al. (2009) have demonstrated that, Oral probiotic administration induces interleukin-10 production and prevents spontaneous autoimmune diabetes in the non-obese diabetic mouse.^[6]

Regulation of adipose tissue and liver fatty acid composition by gut microbes

Gut microbiota can also affect host metabolism and inflammatory state by modulating the tissue fatty acid composition. mammalian intestinal Lactobacilli and Bifido bacteria can be synthesized from free linoleic acid bioactive isomers of conjugated linoleic

acid, which have antidiabetic, anti-atherosclerotic, immunomodulatory, and anti-obesity properties.^[7]

Gut microbiota modulates gut-derived peptide secretion

Gut microbiota synthesizes a large amount of glycoside hydrolases that break down complex plant polysaccharides to monosaccharides and short-chain fatty acids, mainly acetate, propionate, and butyrate. Beside representing an important source of energy for de novo lipogenesis, these short-chain fatty acids are ligands for two G-protein-coupled receptors, Gpr41 and Gpr43, of gut enteroendocrine cells.^[8] Upon ligand binding, these G-protein-coupled receptors stimulate secretion of Peptides, which inhibits gut motility and slows intestinal transit thereby enhancing nutrient absorption.

Systemic inflammation due to Metabolic endotoxemia

High fat diet is responsible for changes in gut microbial flora that brings about a two- to threefold increase in circulating lipopolysaccharide levels, which is a type of “metabolic endotoxemia” that promotes insulin resistance.^[9] Changes in gut microbiota induced by antibiotic treatment reduces metabolic endotoxemia and thus reduces insulin resistance.^[10]

The intestinal barrier

The intestinal surface barrier is one of the most important components of the innate immune system, separating highly immunogenic agents in the intestinal lumen from a highly immunoreactive submucosa. Before aberrant microbes or other antigens can affect the highly immunoreactive submucosa, they must transduce signals mediated by intestinal epithelial toll-like (or similar) receptors, traverse the intestinal epithelial barrier by either the transcellular or

interepithelial paracellular route, or influence other cells possessing the capacity to traverse this barrier (e.g., intraepithelial lymphocytes and dendritic cells).

Increased intestinal permeability precedes clinical onset of type 1 diabetes. Secondulfo M, et al. have demonstrated that, intestinal samples from individuals at risk for^[11] or already diagnosed with type 1 diabetes showed abnormalities identified with sugar permeability tests^[12] and associated with interepithelial junctions on electron microscopy.^[13] These findings are entirely consistent with the concept that a leaky intestine in the setting of type 1 diabetes would allow for greater exposure of the intestinal immune system to antigens.

Basti in Diabetes

Basti is a type of medicated enema procedure in which the drug prepared according to classical reference is administered through rectal canal, reaches up to the colon, churns the accumulated faecal matter and vitiated Doshā and spreads the unctuousness (potency of the drugs) all over the body and easily comes out along with the churned faeces and Doshā.^[14]

Susruta typically narrated a quotation that precipitation of Shukradosa (disorders of semen) and Prameha is because of the vitiation of subcomponents of Vata i.e. Vyana and Apana.^[15] Madhumeha (Diabetes) is the type of Vataja Prameha having more predominance of vitiated Vata in the pathogenesis.^[16] Basti is considered to be the best treatment for Vata disorders.^[17] Moreover Asthapana Basti is more suitable in Madhumeha as Anuvasana (oil enema) is contraindicated^[18] and only to be used to avoid possible complications arising out of continuous use of Asthapana Basti.^[19] Asthapana Basti is a multidrug formulation prepared by mixing commonly rock salt, honey, oil, paste of herbs and

decoction in quantities as explained in Ayurvedic texts.^[20]

DISCUSSION

Role of Basti in management of Diabetes through Gut

Antidiabetic effect through drug absorption

As a site for drug delivery, the colon offers a near neutral pH, reduced digestive enzymatic activity, a long transit time and increased responsiveness to absorption enhancers.^[21] Basti has direct access to colon. It has quick action as transit time is not an obstructive factor. No enzymatic degradation occurs as in case of oral drugs targeting colon while travelling from upper G.I. tract. Successful delivery through colon also requires the drug to be in solution form before it arrives in the colon or alternatively, it should dissolve in the luminal fluids of the colon, but this can be a limiting factor for poorly soluble drugs as the fluid content in the colon is much lower and it is more viscous than in the upper part of the GI tract. Basti itself is a thick liquid consistency fluid providing enough solution media for drug absorption. Purvakarmas like local Snehana (oil massage), Swedana (sudation) & slightly warm temperature of the Basti may cause increased colonic permeability for some time, thus increasing the absorption.^[22] The drug given through rectum to colon may potentially bind in a nonspecific way to dietary residues, intestinal secretions, mucus or faecal matter but the volume of Basti is considerably large that ensures required dose delivery & the protocol for administration is well designed by Acharyas to avoid faecal matter or dietary residue binding by stating do's & don'ts for Basti administration. All these qualities of Basti brings about effective absorption of antidiabetic drugs administered through Basti.

Prevention of autointoxication through colon cleansing

With irregular bowel movements and lack of defecation, faecal wastes start accumulating in the colon, they begun to putrefy and a bacterial load starts to build up and colon fills with toxic substances causing autointoxication which is considered to produce metabolic diseases.^[23] An unhealthy colon affects all the other organs as well. When a colon is stuffed it compresses the liver, disturbing its functions. Basti brings about effective colon cleansing. Besides prevention from autointoxication, one of the major effects of colon cleansing is better absorption that facilitates drugs action.

Effect through contents of Basti

Basti contains honey which is having prebiotic index of 6.89, on virtue of its oligosaccharides.^[24] Because of this honey helps in developing healthy microbial flora. Fructose and glucose, the main carbohydrates in honey, have the same molecular formula but different structural formula.^[25] Studies have shown that fructose reduces hyperglycemia or glucose levels in diabetic patients.^[26] Evidence suggests that fructose prolongs gastric emptying,^[27] which may slow down the rate of intestinal absorption.^[28] In addition to fructose, oligosaccharides such as palatinose (isomaltulose) present in honey have been reported to delay digestion and intestinal absorption of glucose resulting in reduced glycemia.^[29] Besides delaying absorption, evidence suggests that fructose lowers food intake.^[30] Reduced food intake is attributed to delayed gastric emptying.^[31] Reduced food intake due to fructose ingestion has been reported to influence the selection of macronutrients.^[32] Honey significantly increases the C-peptide level which indicates possible stimulatory effect on diseased beta cells.^[33] Honey is having Kaphahara, Ruksha, Kashaya properties and it removes excess Medas as per Ayurveda.^[34]

Meda, Kleda and Kapha are the main vitiated factors in etiopathogenesis of Madhumeha.

Saindhava i.e. rock salt in general is having the properties like, Vishyandi, Sukshma, Tikshna, Ushna and Vataghna and promotes the evacuation of bladder and rectum.^[35] Apart from this, Saindhava (rock salt) destroys the Picchila, Bahula and Kashaya properties of Madhu, and makes close union with it to form a homogeneous mixture.^[36] The diabetics may suffer from acid-base and electrolyte disorders due to complications of diabetes mellitus and the medication they receive.^[37] Use of rock salt thus may prove beneficial in correction of electrolyte imbalance.

Short chain fatty acids present in most of the Sneha used in Basti improve barrier properties of the colonic mucosal layer, inhibiting inflammatory and adhesion irritants, contributing to immune functions.^[38] They also stimulate gene expression of glucose transporters in the intestinal mucosa, regulating glucose absorption.^[39] Hence use of Anuvasana in between Niruha Basti course in Madhumeha is justified. Kalka (Paste of herbs) gives proper viscosity to the Basti that is beneficial for more retention thus increasing absorption of active principles. Kashaya is the measure and active component of any Basti which is composed of drugs that are effective in diabetes.

Stimulation of enteric nervous system

Basti administered in the Pakvashaya (colon) affects the whole body by its Virya (active principles) similarly as the sun in the sky affects the Bhurasa though it is far away.^[40] This example shows Action of Basti is not only dependent upon absorption of the active principle but also it affects the body as soon as these active principles comes in contact with the Pakvashaya. This action can be explained in modern parlance by the direct action of active principles of drug on receptors in the gastrointestinal tract related to the enteric

nervous system. It is recognised that the enteric nervous system (ENS) has a unique ability to mediate reflex activity independently of input from the brain or spinal cord.^[41] This ability implies that the ENS contains sensory receptors, primary afferent neurones, interneuron's, and motor neurones. The events that are controlled, at least in part, by the ENS are multiple and include motor activity, secretion, absorption, blood flow, and interaction with other organs such as the gall bladder or pancreas.^[42] Thus Basti may alter the disarrangements in metabolic activities associated with liver, pancreas etc. in diabetes.

CONCLUSION

Basti is a multidrug formulation that has wide variety of effects. It mainly removes old unhealthy microbial load, helps in developing new healthy microbial flora in gut thereby reduces pathological abnormalities producing metabolic disarrangements in diabetes and also reduces the risk of β cell autoimmunity. Basti brings about effective absorption without degradation of anti-diabetic drugs and maintains bodily homeostasis. Basti also acts through enteric nervous system to improve metabolic activities mainly associated with Pancreas, liver etc. Hence on virtue of this versatile action of Basti therapy it can use as an alternative in preventing and managing diabetes.

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