



Insights from Ayurveda for Diabetes, Oral Health, and Their Interface

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Abstract

Diabetes-related metabolic disturbances have a negative impact on oral health as well. The reciprocal relationship between periodontal health and glycemic management has been already established. Both these pose important concerns to public health, and need to be addressed carefully. Ayurveda, the Indian Traditional Medicine System, has dealt in detail with the pathophysiology and management of *prameha* (diabetes) as well as various oral diseases including *dantamoola vyadhi* (periodontal diseases). Interestingly, the causative factors for *dantamoola vyadhi* are greatly similar to those of *prameha*. Ayurveda propounds formulations such as *triphala*, which are reported to possess antihyperglycemic activity as well as antimicrobial activity. Hence, such formulations can prove helpful in the management of both these diseases. Considering the global upsurge in research on traditional medicines worldwide, it is the need of the hour to consider the role of Ayurveda in the oral health issues of diabetic patients. The present review discusses the Ayurvedic concepts of diabetes and periodontal health along with their management.

Keywords

- ▶ prameha
- ▶ oral health
- ▶ dantamoola vyadhi
- ▶ pyorrhea

Introduction

In the last few decades, there has been an increased global interest in the traditional systems of medicine. Ayurveda, the traditional Indian medicine system, remains the most

ancient yet is a living tradition. Ayurveda has its unique way to describe pathology and management of diseases. Since there are epistemological differences between Ayurveda and modern medicine, it is not feasible to precisely correlate every Ayurvedic term with modern medical concepts.

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However, understandings from Ayurveda are worth exploring to manage the huge burden of diseases, especially non-communicable diseases such as diabetes. The metabolic disturbances caused by diabetes cause depreciating effects on oral health too. A bidirectional link has been established between glycemic control and periodontal health.¹ A comprehensive study of such pieces of evidence is required as both these issues are of high concern in public health.

Charak Samhita, the oldest treatise of Ayurveda, has dedicated two chapters exclusively on *prameha*, a disease analogous to diabetes. In addition, there are scattered descriptions about diabetes in other chapters of the text. The Ayurvedic knowledge is categorized into eight branches (specialties) and one of these branches is “*shalakya tantra*.” The name of the branch is so called because of the excessive use of “*shalaka*,” meaning probe. It is also known by the name *urdhvanga chikitsa* (management of disorders above the shoulder region/clavicle). The diseases of oral cavity fall under the purview of *shalakya tantra* and include diseases of lips, gums, teeth, tongue, palate, larynx/pharynx, and cheeks.

Although not mentioned explicitly, a distinct association is observed between diabetes and periodontal diseases in terms of causative factors, pathophysiology, and even preference of herbs as treatment. This review gives an overview of the conceptual base regarding diabetes, periodontal diseases, and their interrelationship from an Ayurvedic perspective. A great deal of research is being performed on Ayurvedic drugs and other treatment modalities. However, there is a need for extensive scientific research and generation of evidence. It is expected that this review will generate curiosity and interest among the oral health professional fraternity including periodontists to explore the treatment modalities in their routine clinical practice.

Pathophysiology of Diabetes in Ayurvedic Perspective

Ayurveda has described *prameha*, a group of obstinate urinary disorders including diabetes, along with its etiopathogenesis, types, clinical features, prognosis, prodromal symptoms, complications, and line of treatment. All urinary and systemic diseases that result in copious quantities as well as abnormal (including turbid) quality of urination come under the umbrella of *prameha*.²

According to Ayurvedic physiology, equilibrium of *tridosha* (three basic functional elements), viz. *vata*, *pitta*, and *kapha*; *Sapta dhatu* (seven structural elements), viz. *rasa* [plasma], *rakta* [blood], *mamsa* [muscles], *meda* [fat], *asthi* [bones], *majja* [bone marrow/nerve tissue], and *shukra* [-semen/ova/reproductive tissue]; and *tri mala* (three metabolic waste products), viz. (*sweda* [sweat], *mutra* [urine], *purish* [stool]) brings health, while any discordance among them leads to diseases. *Prameha* is predominantly a disorder of *kapha dosha* and *meda dhatu*, though during the course of the disease, all three *doshas* and all *dhatu*s except *asthi* along with few other body elements (which are watery in nature) get involved.³ Ayurveda also describes *Sahaja* (hereditary)

prameha indicating a role of genetic predisposition in the development of diseases.⁴ However, the focus is more on the *apathya nimittaja* (caused due to faulty life style) type of the disease.

Over-indulgence in the pleasure of sedentary habits, excess sleep, soup of the meat of domesticated and aquatic animals along with animals inhabiting marshy land, milk and its preparations especially curd, freshly harvested food articles, freshly prepared fermented drinks, and preparations of jaggery have been identified as factors responsible for the causation of *prameha*.⁴ These factors are known to produce excess liquefaction of *kapha dosha*, which brings out flaccidity/looseness in *meda dhatu* (adipose tissue). This gradually affects fluid dynamics in the body causing involvement of other tissues and affecting watery component in them. The ultimate outcome is excess urination and turbidity in the urine.

Managing Diabetes—The Ayurveda Way

The management of *prameha* includes three strategies, viz. *nidana parivarjana* (avoiding causative factors), *samshodhana* (removal of imbalanced doshas out of body using cleansing processes known as *panchakarma*), and *samshamana* (alleviation or pacification of imbalanced *doshas* within the body).

The latter two modalities involve different herbal drugs and their formulations such as decoctions, *asavas* (fermented decoctions/plant juices), medicated oils, and *ghee*. The relatively recent texts of Ayurveda have even recommended herbo-mineral formulations especially in the chronic stage of complications. Certain lifestyle modifications are also prescribed, which include eatables prepared from *yava* (barley) and various methods of exercise.⁴

Ayurveda vis-à-vis Modern Medicine in the Management of Diabetes

The deliberations related to diabetes from Ayurvedic texts reveal some interesting facts. At some instances, Ayurveda descriptions go parallel to that of modern medicine. However, at some places, the approach of Ayurveda is completely different from that of modern medicine.

Similarities

- Ayurveda focuses on *meda dhatu* (adipose tissue) as an important target for the management of diabetes.⁴ The classical glucocentric approach of modern medicine is also now recognizing the lipocentric approach due to the importance of adipose dysfunction in the pathogenesis of diabetes.⁵
- Both systems recognize diabetes as a disease that affects multiple organs and systems.²
- Both systems agree upon the role of heredity in the pathogenesis of diabetes and also the fact that it is not a disease that can be cured completely, but needs to be managed effectively.^{4,6}

- Considering the importance of adiposity/obesity in the context of diabetes, both systems recognize the importance of lifestyle modifications pertaining to diet, physical activity, sleep, and stress management.⁴

Differences

- The understanding of the pathogenesis of the disease is significantly different between the two sciences. While Ayurveda understands the pathogenesis in terms of *doshas*, *dhatu*s, and *malas*,² the understanding of modern medicine is based on the principles of molecular biology and biochemistry. Hence, the treatment modalities in Ayurveda are directed toward removal/pacification of the affected *doshas*, while in modern medicine, the approach is to target the physiological/biochemical systems/processes that are impacted.
- While the approach of Ayurveda is to restore the balance of the *doshas* (in turn “health”), modern medicine concentrates its efforts mainly on glycemic control. Therefore, the primary endpoint of modern medicine treatment is reduction in blood glucose with or without other markers of glycemic control, viz. fasting and postprandial blood glucose and glycosylated hemoglobin.⁷ Few other endpoints considered in modern medicine treatment are lipid profile, fasting and postprandial insulin, C-peptide, and C-reactive protein.^{8,9} From an Ayurvedic perspective, improvements in symptoms (frequent and turbid urination), qualitative and quantitative assessment of *meda dhatu*, physiological parameters (appetite, digestion, sleep, etc.), and quality of life are important endpoints.
- The drugs used in modern medicine are synthetic, pure compounds, targeted toward a single biochemical process/receptor (e.g., α -glucosidase inhibition/SGLT2 inhibition) resulting in significantly better control of blood glucose level within a short span of time. On the other hand, Ayurvedic medicines are generally not seen to be potent hypoglycemic agents, but are rather viewed as medicines which help in better overall management of the disease through mechanisms that are perhaps not yet fully understood, although many hypotheses have been proposed by various researchers.¹⁰⁻¹²

Ayurvedic Symptomatology of Diabetes

Ayurveda describes symptomatology of any disease in three phases, viz. *purvaroopa* (prodromal/proclivity symptoms), *roopa* (symptoms), and *upadrava* (complications).

The prodromal/proclivity symptoms of diabetes include matting of hair, numbness and burning sensation in hands and feet (neuronal involvement), polydipsia, increased amount of waste excretion from the external orifices (leading to skin infections, especially fungal), adherence of bodily wastes to the orifices of the body (like ear, eyes, nose, and body pores), attraction of insects and ants to the body and urine (significant hyperglycemia causing glycosuria), appearance of turbidity and smell of raw flesh in urine (traces of body tissues), and excessive sleep and continuous drowsiness (electrolyte imbalance).² It is evident from the above list

that the involvement of various organs/systems is seen even at the early stage of diabetes.

As a symptom of *prameha*, Ayurveda describes only one cardinal feature, i.e., excess and turbid urination.⁴ Ayurveda has also mentioned diabetic complications, namely, polydipsia, diarrhea, fever, burning sensation, weakness, anorexia, and indigestion.¹⁴ *Prameha pidakas* (possibly meaning diabetic carbuncles that putrefy muscle tissues, but also including broader pathological conditions) have been also described, which appear during the chronic stage of the disease.

The descriptions of *vidradhi* (abscess) and certain stages of carbuncle resemble the description of diabetic wound. The signs and symptoms of *dushtavrana* (infected wound) mentioned in the Ayurvedic textbooks such as broad base, unpleasant look, pus discharge, foul smell, severe pain, and long lasting with delayed healing are very much similar with the characteristics of diabetic wounds.¹⁵ Further, such wounds are described as *krichrasadhya* (difficult to treat) as per Ayurveda. There are also descriptions of conditions such as *pootimamsa*, which indicates suppuration of muscle tissue pointing toward possible involvement of inflammatory and infective pathophysiology.

Research on Ayurvedic Antidiabetic Drugs and Non-drug Modalities: Current Scenario

Globally, individuals with diabetes have been known to use Complementary and Alternative Medicine 1.6 times more than nondiabetics.¹⁶ In India too, many diabetics continue to seek Ayurvedic interventions.

In recent times, there has been a significant interest in corroborating the experiential knowledge contained in the Ayurvedic texts by applying modern research methodologies.¹⁷ While this is a welcome development, it is a challenge to holistically capture and substantiate the nuances of Ayurvedic epistemology through the use of modern research methodologies.¹⁸

Several research papers have been published on herbal medicines wherein the primary focus has been on studying the antihyperglycemic activity. Papers elucidating the mechanisms of action of these herbs in diabetes are fewer.¹⁸ There are systematic reviews or meta-analyses available on few plants such as *Gymnema sylvest*re,¹⁹ *Aloe vera*,²⁰ *Momordica charantia*,²¹ *Nigella sativa*,²² and Berberine²³ (a constituent from *Berberis aristata*). In 2002, Council for Scientific and Industrial Research (CSIR), Government of India, launched a drug development program for diabetes taking leads from Ayurveda under NMITLI (New Millennium Industrial Technology Leadership Initiative) scheme. This was a multi-institutional program through which extensive work was performed on a plant named *Enicostemma littorale*. In 2016, CSIR launched an Ayurveda-derived drug BGR-34 (a combination of *Berberis aristata*, *Tinospora cordifolia*, *Pterocarpus marsupium*, *Gymnema sylvest*re, *Rubia cordifolia*, and *Trigonella foenum-graecum*), post experimental and clinical evaluation.²⁴ Following this, the Ministry of Ayush (Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy) also developed a drug named AYUSH-82 (a combination of *Momordica charantia*,

Syzygium cumini, *Mangifera indica*, and *Gymnema sylvestre*) with similar purpose.^{25,26} There are some reports on the antihyperglycemic effects of cleansing procedures and lifestyle measures described in Ayurveda.²⁷

Based on the currently available literature, the plants and formulations having relatively strong evidence include *Phyllanthus emblica* (*amla*),²⁸ *Curcuma longa* (turmeric),²⁹ *Eugenia jambolana* (black plum or *jamun*),³⁰ *Momordica charantia* (bitter gourd or *karela*),²¹ *Gymnema sylvestre* (*gurmar/madhunashini*),¹⁹ *Trigonella foenum-graecum* (fenugreek, *methi*),^{31,32} *Azadirachta indica* (*neem*),³³ *Pterocarpus marsupium* (*vijayasara*),³⁴ BGR,²⁴ and AYUSH-82.^{25,26}

It is important to note here that majority of these studies rarely take into account unique concepts and principles of Ayurveda. An Ayurveda physician, who is rarely exposed to intricacies of research methodology, therefore finds a disconnect between his Ayurvedic training and the upcoming evidence. Hence, in spite of emerging evidence, the treatment of diabetes in Ayurveda is still largely based on experiential and anecdotal knowledge or Ayurvedic textual references.

Further, there is a need to examine the evidence generated through these studies thoroughly so as to translate it into practice. It is also important to consider further long-term studies to assess and clearly define the antidiabetic potential of Ayurvedic therapies either as standalone interventions or as adjuvant/supplementary interventions and identify their interactions with modern medicines, long-term effects, etc.

Periodontal Diseases in Ayurveda

The *Shalakya tantra* enlists seven anatomic areas in which 65 different types of oral disorders can occur: 8 on the lips, 15 on the periodontal border, 8 in relation to the teeth, 5 on the tongue, 9 on the palate, 17 in the oropharynx, and 3 in a generalized form. Although diabetes-related metabolic impairment potentially affects the entire oral cavity, here we have focused only on periodontal diseases categorized under “*dantamoola vyadhi*” in Ayurveda.

A total of 15 such *dantamoola vyadhis* and their analogous conditions are mentioned in Ayurvedic texts,³⁵ viz. *sheetada* (spongy gums), *danthapupputaka* (periodontitis), *danthavesh-tak* (pyorrhea), *saushira* (apical/root abscess), *mahashushira* (palatal abscess), *paridar* (bleeding gums), *upakusha* (suppurative gingivitis), *danthavydarbha* (traumatic periodontitis), *vardhana* (supernumerary tooth), *adhimamsa* (pericoronitis/impacted teeth), five *dantanadi* (dental fistula of five types).

The translation/correlation/interpretation of Ayurvedic disease entities with periodontal diseases mentioned here are based on descriptions available in various Ayurvedic texts and not very specific. Hence, all the diseases from *sheetada* to *upakusha* have been considered here under “pyorrhea.”

Pathophysiology of Periodontal Diseases According to Ayurveda

The causative factors for oral diseases bear great similarity with those mentioned for *prameha*, such as consumption of flesh of aquatic and domesticated animals (especially beef

and pork), dairy products, and sugarcane products.³⁶ Neglect of oral hygiene measures has also been conspicuously mentioned. These factors vitiate all *dosha*, especially *kapha*, and lead to various diseases in oral cavity.

The common signs and symptoms of periodontal diseases include inflammation, increased sensitivity, pain, halitosis, loose teeth, etc. which are manifested differentially in varied conditions. The bleeding and/or pus discharge may be there depending upon the severity of gum invasion. According to Ayurvedic pathology, these diseases are caused either by aggravated *kapha* or *pitta dosha* and *raktadhatu*.

General Treatment Modalities for Periodontal Diseases

The treatment of these diseases commonly consists of the following measures:

- *Raktamokshana*³⁵ (bloodletting by applying medicinal leeches on the affected area or venesection of specific veins, nearby the affected area or rubbing leaves of plants with coarse surface, e.g., *Onosma bracteatum* [*gojivha*]): this is known to reduce the inflammation and relieve the pain.
- *Gandusha/kavala* (gargling with the decoctions of herbs having antimicrobial and wound-healing properties, e.g., *Triphala*, a combination of fruits of *Terminalia chebula*, *Phyllanthus emblica*, and *Terminalia bellirica*): this helps to reduce inflammation and halitosis.³⁵
- *Lepa/pratisarana* (application/rubbing of paste or powder of drugs with anti-inflammatory and wound healing properties): this helps to reduce sensitivity and strengthen the gum tissue.³⁵
- *Nasya*³⁵ (nasal instillation of ghee/oil/milk medicated with herbal drugs that possess properties for pacifying of aggravated *kapha/pitta dosha*): this is directed to treat the root cause, i.e., imbalance of *doshas*.

If there is severe imbalance, then whole body cleansing procedures such as *vamana* (induced emesis) or *virechana* (induced purgation) need to be administered.

Lately, there are many studies and novel experiments that have been conducted exploring potential of Ayurveda in dentistry especially periodontology. A majority of this work is focused on benefits of brushing/cleaning the teeth with *Salvadora persica* (*miswak*) sticks (fibrous branches of the plant),³⁷⁻³⁹ oil pulling (with sesame oil), mouth rinse/mouth wash (prepared from different plant extracts,⁴⁰ mainly *triphala*), and subgingival irrigations (using varied herbal extracts). Since *triphala* is reported to possess hypoglycemic activity, it can effectively be used in diabetic patients with periodontal diseases.⁴¹ All these studies highlight the potential of Ayurvedic treatments in dental diseases.

Interface between Diabetes and Periodontal Diseases in Ayurveda

Although not mentioned discretely, the association between diabetes and periodontal diseases in Ayurveda is evident. The oral manifestations of diabetes include:

- Sweet taste in the mouth: this is indicative of altered oral pH probably due to change in oral microbiome, which may increase chances of infections in the oral cavity.
- Dryness in mouth, palate, and throat: it is well known that presence of high levels of glucose in blood, which increases plasma osmotic pressure, results in tissue dehydration all over the body, including mouth. A decreased secretion of saliva further adds to the problem of xerostomia. These salivary disorders could be associated with a poor quality of life and could increase the susceptibility to caries and oral infections in diabetic patients, particularly when there has been dehydration and inadequate glycemic control.
- Increase in dental deposits: there is an overall increase in metabolic waste in the body. This is visibly seen in case of teeth, where increased dental deposits (dental plaque) are present.⁴²

According to Ayurveda, every disease is caused by an interplay of vitiated *dosha*, *dhatu*, and *mala*. The pathophysiology of both *prameha* and *dantamoola vyadhi* highlights vitiation of *kapha dosha* along with involvement of *meda dhatu*. While in diabetes, its vitiation is demonstrated as increased flaccidness of body tissues, in periodontal diseases, there is an increase in its metabolic byproduct, the dental plaque. There is a striking similarity between causative factors of both these diseases. Moreover, herbs such as *triphalā*, *khadira*, *haridra*, and *musta* are equally advocated for management of both the conditions.

While the occurrence of *pootimamsa* and *prameha pidaka* in the oral cavity has not been specifically described in Ayurveda, there is reference to the fact that some of the *prameha pidaka* can be external as well as internal. Hence, some of the periodontal diseases can be considered under these metaphors.

Conclusion

Increased life expectancy and decreased lifestyle quality have posed a great burden of diabetes worldwide. Research studies on many Ayurvedic herbs show their promising potential for the management of diabetes. It is possible to extrapolate their use in certain associated conditions such as periodontal diseases. References from Ayurveda demonstrate a perceptible interface between them. Thus, it will be interesting to explore this further and provide new treatment modalities for management of periodontal diseases occurring in diabetic patients.

Conflict of Interest

None.

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References

- 1 Genco RJ, Graziani F, Hasturk H. Effects of periodontal disease on glycemic control, complications, and incidence of diabetes mellitus. *Periodontol* 2000 2020;83(01):59–65
- 2 Charak Samhita, Nidana Sthana, Prameha Nidan, Chapter 4. Accessed at <https://niimh.nic.in/ebooks/ecaraka/?mod=read>
- 3 Chandran S, Mangalasseri P, Patgiri BJ, et al. Diabetes mellitus in Ayurveda WSR to its aetiopathogenesis. *Int J Curr Res* 2017; 9:49173–49177
- 4 Charak Samhita. Chapter 6. Accessed at <https://niimh.nic.in/ebooks/ecaraka/?mod=read>
- 5 Mittra S, Bansal VS, Bhatnagar PK. From a glucocentric to a lipocentric approach towards metabolic syndrome. *Drug Discov Today* 2008;13(5–6):211–218
- 6 Zheng Y, Ley SH, Hu FB. Global aetiology and epidemiology of type 2 diabetes mellitus and its complications. *Nat Rev Endocrinol* 2018;14(02):88–98
- 7 Hardy ML, Coulter I, Venuturupalli S, et al. Ayurvedic interventions for diabetes mellitus: a systematic review. *Evid Rep Technol Assess (Summ)* 2001;41(41):2p
- 8 Unnikrishnan AG, Bhattacharyya A, Baruah MP, Sinha B, Dharmalingam M, Rao PV. Importance of achieving the composite endpoints in diabetes. *Indian J Endocrinol Metab* 2013;17(05): 835–843
- 9 Einarson TR, Garg M, Kaur V, Hemels ME. Composite endpoints in trials of type-2 diabetes. *Diabetes Obes Metab* 2014;16(06): 492–499
- 10 Sharma R, Amin H, Ruknuddin G, Prajapati PK. Efficacy of ayurvedic remedies in type 2 diabetes: a review through works done at Gujarat Ayurved University, Jamnagar. *J Med Nutr Nutraceut* 2015;4:63–69
- 11 Khandelwal N, Dhundi SN, Yadav P, Prajapati PK. Prevention and management of diabetes mellitus in Ayurveda. *Asian J Biomed Pharmaceut Sci* 2011;1:1–6
- 12 Srikanth N, Haripriya N, Singh R, Manjula, Tewari D. Diabetes mellitus (Madhumeha) and ayurvedic management: an evidence based approach. *World J Pharm Pharm Sci* 2015;4:881–892
- 13 Charak Samhita, Chikitsa Sthana, Trishna Chikitsa. Chapter 22. Accessed at <https://niimh.nic.in/ebooks/ecaraka/?mod=read>
- 14 Sen G. Siddhantanidanam: A Textbook of Etiology, Pathology, Symptomatology (Part I and II). Translated by Srikanthamurthy KR. Varanasi: Chaukhamba Sanskrit Series Office; 1924
- 15 Gond P, Singh L. Concept of infected wound (DushtaVrana) in ayurveda. *J Adv Res Ayur Yoga Unani Sidd Homeo* 2017;4:11–15
- 16 Egede LE, Ye X, Zheng D, Silverstein MD. The prevalence and pattern of complementary and alternative medicine use in individuals with diabetes. *Diabetes Care* 2002;25(02):324–329
- 17 Gordon A, Buch Z, Baute V, Coeytaux R. Use of ayurveda in the treatment of type 2 diabetes mellitus. *Glob Adv Health Med* 2019; 8:2164956119861094
- 18 Chauhan A, Semwal RB, Semwal DK. Ayurvedic approaches used in prevention and treatment of type 2 diabetes mellitus. *J Convent Knowl Holist Health* 2017;1:1–15
- 19 Khan F, Sarker MMR, Ming LC, et al. Comprehensive review on phytochemicals, pharmacological and clinical potentials of *Gymnema sylvestre*. *Front Pharmacol* 2019;10:1223
- 20 Radha MH, Laxmipriya NP. Evaluation of biological properties and clinical effectiveness of Aloe vera: a systematic review. *J Tradit Complement Med* 2014;5(01):21–26
- 21 Peter EL, Kasali FM, Deyno S, et al. Momordica charantia L. lowers elevated glycaemia in type 2 diabetes mellitus patients: systematic review and meta-analysis. *J Ethnopharmacol* 2019; 231:311–324
- 22 Ahmad A, Husain A, Mujeeb M, et al. A review on therapeutic potential of *Nigella sativa*: a miracle herb. *Asian Pac J Trop Biomed* 2013;3(05):337–352

- 23 Liang Y, Xu X, Yin M, et al. Effects of berberine on blood glucose in patients with type 2 diabetes mellitus: a systematic literature review and a meta-analysis. *Endocr J* 2019;66(01):51–63
- 24 Gupta BP, Sharma I, Kohli N, Sharma S, Rathi A, Sharma AK. Preliminary clinical assessment and non-toxicity evaluation of an ayurvedic formulation BGR-34 in NIDDM. *J Tradit Complement Med* 2018;8(04):506–514
- 25 Setia M, Meena K, Madaan A, Srikanth N, Dhiman KS, Sastry JLN. In vitro studies on antidiabetic potential of new dosage forms of AYUSH 82. *J Drug Res Ayurvedic Sci* 2017;2:1–9
- 26 Panda AK, Ratha KK, Rao MM. Efficacy of ayurveda formulation Ayush-82 (IME-9) in newly diagnosed type 2 diabetics: retrospective analysis of individual data. *J Tradit Med Clin Naturop* 2017;6:250
- 27 Pandey RK, Bhatt NN, Singhala TM, Shukla VD. A comparative study of Vamana and Virechana Karma in the management of Sthula Pramehi w.s.r. to Type-2 diabetes. *Ayu* 2011;32(04):536–539
- 28 Chen TS, Liou SY, Wu HC, et al. Efficacy of epigallocatechin-3-gallate and Amla (*Embllica officinalis*) extract for the treatment of diabetic-uremic patients. *J Med Food* 2011;14(7–8):718–723
- 29 Pivari F, Mingione A, Brasacchio C, Soldati L. Curcumin and type 2 diabetes mellitus: prevention and treatment. *Nutrients* 2019;11(08):1837
- 30 Vora A, Varghese A, Kachwala Y, et al. *Eugenia jambolana* extract reduces the systemic exposure of Sitagliptin and improves conditions associated with diabetes: a pharmacokinetic and a pharmacodynamic herb-drug interaction study. *J Tradit Complement Med* 2018;9(04):364–371
- 31 Geberemeskel GA, Debebe YG, Nguse NA. Antidiabetic effect of Fenugreek seed powder solution (*Trigonella foenum-graecum* L.) on hyperlipidemia in diabetic patients. *J Diabetes Res* 2019;2019:8507453
- 32 Najdi RA, Hagrass MM, Kamel FO, Magadmi RM. A randomized controlled clinical trial evaluating the effect of *Trigonella foenum-graecum* (fenugreek) versus glibenclamide in patients with diabetes. *Afr Health Sci* 2019;19(01):1594–1601
- 33 Waheed A, Miana GA, Ahmad SI. Clinical investigation of hypoglycemic effect of seeds of *Azadirachta-inidca* in type-2 (NIDDM) diabetes mellitus. *Pak J Pharm Sci* 2006;19(04):322–325
- 34 Nakanekar A, Kohli K, Tatke P. Ayurvedic polyherbal combination (PDBT) for prediabetes: a randomized double blind placebo controlled study. *J Ayurveda Integr Med* 2019;10(04):284–289
- 35 Amruthesh S. Dentistry and Ayurveda - IV: classification and management of common oral diseases. *Indian J Dent Res* 2008;19(01):52–61
- 36 Ashtanga Hridaya Uttarasthana. Chapter 21, Mukharoga vigyaniya, Verse 1–2. Accessed December 22, 2024 at: <https://vedotpatti.in/samhita/Vag/ehrudayam/?mod=read>
- 37 Ayurvedic Medicine: In Depth, National Center for Complementary and Integrative Health, <https://www.nccih.nih.gov/health/ayurvedic-medicine-in-depth>
- 38 Singh A, Purohit B. Tooth brushing, oil pulling and tissue regeneration: A review of holistic approaches to oral health. *J Ayurveda Integr Med* 2011;2(02):64–68
- 39 Al lafi T, Ababneh H. The effect of the extract of the miswak (chewing sticks) used in Jordan and the Middle East on oral bacteria. *Int Dent J* 1995;45(03):218–222
- 40 Maurya DK, Mittal N, Sharma KR, Nath G. Role of triphala in the management of periodontal disease. *Anc Sci Life* 1997;17(02):120–127
- 41 Akhtar MS, Ajmal M. Significance of chewing-sticks (miswaks) in oral hygiene from a pharmacological view-point. *J Pak Med Assoc* 1981;31(04):89–95
- 42 Sharma H, Chandola HM. Prameha in Ayurveda: correlation with obesity, metabolic syndrome, and diabetes mellitus. Part 1-etiology, classification, and pathogenesis. *J Altern Complement Med* 2011;17(06):491–496