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A narrative literary review on design of anti-diabetic (*Prameha*) formulations from various *Ayurveda* treatises

Amulya Kannan, Raghavendra Naik, Kavya N., Monica K. P, Sulochana Bhat

Abstract

Ayurveda texts spanning from 100 BC to 18th AD, which have not been frequently scrutinised for management of *Prameha* (Diabetes mellitus) have been selected. This review is expected to enrich the documentary evidences about classical references on formulations related to *Prameha* (Diabetes mellitus) as add on to future researches. A total of 524 formulations out of 15 *Ayurveda* texts have been considered to observe drug design methods in this review paper. Formulations with *Phalashruti* (verse with indications) of “*Prameha*” were scrutinised. The preliminary data was categorised based on their dosage forms, indications of formulations in accordance to *Doshas* (regulatory functional factors of the body), adjuvants etc and the result have been substantiated. Drugs and formulations most enumerated amongst these 15 texts have been presented. *Kwatha* (decoction) is most enumerated dosage form (241 formulations). Honey is most enumerated adjuvant (172 formulations). *Nyagrodadhi gana* (*kwatha* or *churna*) and *Dhanvantara ghrta* were the most frequently mentioned formulation. *Triphala* was the most enlisted drug amongst 323 formulations (in formulation with less than 10 ingredients). *Vidanga* (*Embelia ribes* Burm.f.), *Arjuna* (*Terminalia arjuna* (Roxb.) Wight and Arn.) *Patha* (*Cissampelos pareira* L.) were most repeated drugs indicated in *Kaphaja Prameha*, *Pittaja Prameha* and *Vataja Prameha* respectively (in formulation with less than 10 ingredients). This review gives comprehensive detail related to formulations indicated in *Prameha* (Diabetes mellitus) compiled from 15 *Ayurveda* treatises.

Keywords:

Ayurveda, diabetes mellitus, formulations, *Prameha*

Introduction

The International Diabetes Federation’s 10th edition of Diabetes atlas estimated that approximately 537 million adults aged 20–79 years are living with diabetes.^[1] The prevalence of diabetes in India has remained at 11.8% in the last four years, according to the National Diabetes and Diabetic Retinopathy Survey (2015–2019) report released by the Ministry of Health and Family Welfare.^[2] Thus a shift in currently practised methodology of generalised treatment to personalised treatment is needed to cater such huge needs in management of

diabetes. *Ayurveda*, with such vast database of drugs and formulations whence validated scientifically may hold the key to this problem. Currently available therapies for diabetes include insulin and oral antidiabetic agents such as sulfonylureas, biguanides, glinides etc. Many of them have a number of serious adverse effects; therefore, the search for more effective and safer hypoglycaemic agents is one of the important areas of investigation.^[3] *Ayurveda* drug database when validated scientifically may help in management of Diabetes holistically. *Ayurveda* documentation in the form of scriptures has transpired over many centuries. Depending on its era, prevalent treatment practises and personal interest

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of the author each scripture/text would have certain unique contributions towards management of *Prameha*. Few attempts on understanding formulations related to *Prameha* have been done previously, consolidated understanding of 15 *Ayurveda* texts other than *Brihatrayis* is a unique attempt.^[4,5] Hence, present review was taken up as an attempt to understand drug/formulation design process in the management of *Prameha* (Diabetes mellitus) through a compilation of data from various *Ayurveda* treatises.

Material and Methods

Fifteen *Ayurveda* texts [Table 1] have been thoroughly scrutinised and various formulations indicated for *Prameha* management were compiled. Texts other than *Brihatrayis* (the great triads of *Ayurveda* i.e., *Sushruta Samhita*, *Charaka Samhita* and *Ashtanga Hridaya*) ranging mostly from medieval period (8th to 15th century AD) to modern period (16th century onwards) were studied due to limited compilation work related to *Prameha* previously done from these texts. Chapters dedicated independently to *Prameha* (diabetes mellitus), *Prameha Pidaka* (diabetic carbuncles), *Sthoulya* (obesity) and *Mutravikara* (urinary system diseases) were thoroughly scrutinised as chances of finding *Prameha* indicated formulations were more in these chapters, and remaining chapters were glanced. In texts with consolidated formulations list like *Sharangadhara*, *Sahasrayoga* etc the whole text was searched for formulations with indication of *Prameha*. Key words searched in *Phalashruti* (verse with indications) included “*Prameha*”, “*Meha*”, “*Madhumeha*” with suffixes like “*Hanti*”, “*Harati*”, “*Jayati*”, “*Jit*”, “*Shanti*”, “*Upashanti*”, “*Moksha*”, “*Nihanti*”, “*Ghna*”. Data was compiled and details like name of text, name of formulation (if provided by author), ingredients of formulation with less than 10 drugs only

were recorded for the sake of elementariness (for those formulations with ingredients more than 10 drugs rest of the information were recorded), adjuvants, dosage forms and indications were recorded digitally. In this review paper the formulations names are excluded and analysis through the ingredients (and their inclusion in multiple formulation), dosage forms and indications have been presented.

Results

A total of 524 formulations out of 15 *Ayurveda* texts have been compiled [Table 1].

Discussion

Amongst a total of 524 formulations with *Prameha* (diabetes mellitus) management, *Sahasrayoga* text offered maximum number of formulations followed by *Abhinava Chintamani* text [Figure 1].

Panchavidha Kashaya Kalpana (dosage forms of medicine):

Total count of *Panchavidha Kashaya Kalpanas* (basic 5 dosage forms of medicine) and their related dosage forms were compiled [Table 2]. *Kwatha kalpana* (decoctions) was the highest enumerated dosage form with a total of 241 formulations. This might have been a preferred dosage form because of its better absorption and assimilation in body system and good retaining capacity of water soluble constituents present in raw materials.^[21]

Dosage forms like *Ghrita* (ghee), *Taila* (oils) are mentioned less when compared to other dosage forms. *Ghrita* (ghee) and *Taila* (oil) may have been mentioned as an *apathya* (inconducive diet) in *Prameha* due to its *kleda* (moisture), *snigdha* (unctuous) properties, as it may propel the

Table 1: List of texts, their time period, author and number of formulations

Sl. No	Name of the text	Time line	Author	Number of formulations compiled
1	<i>Bhela Samhita</i>	100–400 BC	Bhela	20 ^[6]
2	<i>Kashyapa Samhita</i>	6 th AD	Kashyapa	1 ^[7]
3	<i>Harita Samhita</i>	6 th AD	Harita	29 ^[8]
4	<i>Kalyanakaraka</i>	9 th AD	Ugraditya	10 ^[9]
5	<i>Chikitsa kalika</i>	10 th AD	Tishata	3 ^[10]
6	<i>Chakradutta</i>	11 th AD	Chakrapani dutta	54 ^[11]
7	<i>Sahasrayoga</i>	12 th AD	K. S. Krishna and S. Gopala Pillai	82 ^[12]
8	<i>Gada nigraha</i>	12 th AD	Shodala	60 ^[13]
9	<i>Shatashloki</i>	13 th AD	Bopadeva	11 ^[14]
10	<i>Sharangadhara Samhita</i>	14 th AD	Sharangadhara	27 ^[15]
11	<i>Bhavaprakasha</i>	15 th AD	Bhava Mishra	60 ^[16]
12	<i>Arka Prakasha</i>	16 th AD	Lankapati Ravana	12 ^[17]
13	<i>Yogaratanakara</i>	17 th AD	Narayana Sekhara	67 ^[18]
14	<i>Abhinava Chintamani</i>	18 th AD	Cakrapani Das	72 ^[19]
15	<i>Abhinava Navajeevanam</i>	Unresolved	Unresolved	16 ^[20]
Total number of formulations compiled				524

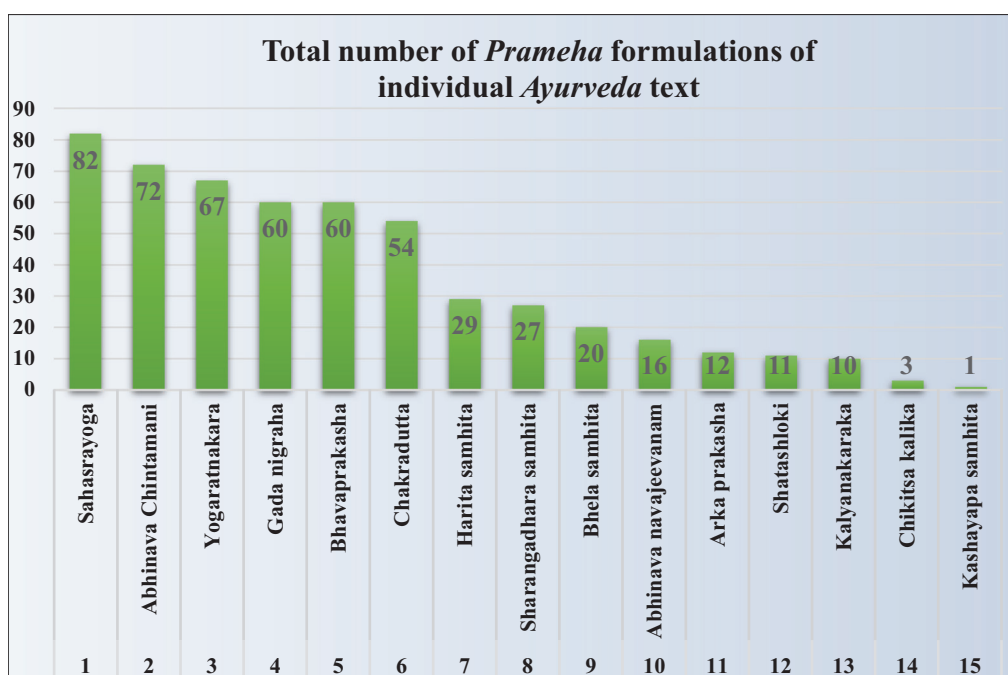


Figure 1: Total number of formulations from individual *Ayurveda* texts

Table 2: List of count of formulations categorised as per dosage forms

Sl.No	Name of text	S	K	C	Kw	P	H	Ark	Kp	L	As	Ar	G	T	Y	V	M	Le	A	R	Total
1	S.Y.			12	20		1			9	7	6	10	3		3			2	9	82
2	A.C.			8	42								1	3	1		1			16	72
3	Y.R.	4	1	5	27		2			4	1		1	1		1		1	1	18	67
4	G.N.	3	2	6	44									2					1	2	60
5	B.P.	1		8	38					2			3	1		1	1		2	3	60
6	C.D.	2		10	34					2			2		1	1				2	54
7	H.S.	1		7	17		1											3			29
8	S.G.	2		3	4						2	4	1	1		6	1			3	27
9	B.S.	1	2	1	7	1	2		2				1						3		20
10	A.N.	1		6	1					1	1		5							1	16
11	A.P.							12													12
12	Shatashloki			3	1					2			2			3					11
13	K.K.		1		4							1				1		2	1		10
14	C.K.				2								1								3
15	K.S.		1																		1
	Total	15	7	69	241	1	6	12	2	20	11	11	27	11	2	16	3	6	10	54	524

(Rows) S.Y: Sahasrayoga; A.C: Abhinava Chintamani; Y.R: Yogaratnakara; G.N: Gadanighraha; B.P: Bhava Prakasha; C.D: Chakradutta; H.S: Harita Samhita; B.S: Bhela Samhita; S.G: Sharangadhara Samhita; A.N.: Abhinava Navajeevanam; A.P: Arka Prakasha; K.K: Kalyanakaraka; C.K: Chikitsa Kalika; K.S.: Kashyapa Samhita.

(Columns) S: Svarasa; Ka: Kalka; C: Churna; Kw: Kwatha; P: Phanta; H: Hima; Ark: Arka; Kp: Ksheerapaka; L: Leha; As: Asava; Ar: Arishta; G: Ghrita; T: Taila; Y: Yamaka; V: Vati; M: Modaka; Le: Lepa; A: Ahara; R: Rasoushadhi.

disease forward.^[22] Although *Ghritha* and *Taila* mentioned in management of *Prameha* are medicated with anti-diabetic drugs, innate nature of base material (ghee and oil) would have remained, hence minimal enumerations.

Asava and *Arishta* (medicinal herbs alcoholic preparations) also have been mentioned less. Alcoholic preparations like *Sura* (cereal's fermentation), *Souvira* (de-husked barley's fermentation) and *Shukta* (vinegar fermentation) have been mentioned as *Apathya* (inconducive diet) in

Prameha.^[23] *Kalyanakaraka* text mentions, *Asava* (herbal fermentations without boiling ingredients) and *Arishta* (herbal fermentations from boiled ingredients) as *apathya* (inconducive diet) too.^[24] *Madya's* (alcohol) *ushna* (hot) and *teekshna* (penetrating) properties may not be suitable to flabby condition of body diseased through *Prameha*. *Amla* (sour) being a common taste of any alcoholic preparation could also contribute in weakening the body tissues. *Asava* and *Arishta* have longer shelf life, quick absorption and maximum bioavailability, hence in

preserving certain drugs for longer time or in condition of quick relief this dosage form can be opted.^[25]

Guda (jaggery) and *Sarkara* (sugar) are considered *Apathya* in *Prameha*.^[23] In total 20 *Avaleha kalpana* (semisolid preparation with jaggery or sugar as its base ingredient) are recorded in the compiled data which includes *Upakalpanas* (derivable forms) of *Avaleha* like *Paka* (sugar granules). *Yogaratanakara* mentions *Puga paka*, *Ashvagandha paka*, *Salam paka* and *Draksha paka*. *Sahasrayoga* enumerates highest count of *Leha Kalpana*, 9 formulations in total. *Agastya rasayana*, *Gandira rasayana*, *Dashamoola Leha*, *Bahushala guda*, *Madhusnuhi rasayana* (two varieties), *Shatavari guda* (two varieties). Exploring of *Avaleha kalpana* in management of *Prameha* both experimental and clinical will help in understanding the therapeutic capabilities, as not much work has been done in this regard. *Avaleha* is usually opted as *Rasayana* (rejuvenators) line of treatment or to increase body's strength, when some of famous *Avaleha's* indications are observed. Use of *Avaleha* as strength promoter in debilitating diabetic cases can be explored. *Avaleha kalpana* can be compared with nutraceutical supplement in a diabetic with controlled glucose levels.^[26]

Arka prakasha has enumerated 12 *Arka* (distillate of drugs) formulations in the management of *Prameha* (Diabetes mellitus). Each of these formulation has been mentioned with a single drug as its ingredient. *Guduchi* (*Tinospora cordifolia* (Thunb.) Miers), *Gokshura* (*Tribulus terrestris* L.), *Sthambini* (source not clear), *Pippali* (*Piper longum* L.), *Amalaki* (*Phyllanthus emblica* L.), *Aragvadha* (*Cassia fistula* L.), *Katphala* (*Myrica esculenta* Buch.-Ham. ex D.Don), *Haridra* (*Curcuma longa* L.), *Vasa* (*Justicia adathoda* L.), *Murva* (*Marsdenia tenacissima* (Roxb.) Moon) and *Arka* (*Calotropis procera* (Ait.) R.Br. *Arka* has good potency, less dose, more shelf-life, and easy absorption due to volatile components and patient compliance due to its tastelessness.^[27] This review may help in further exploration of this dosage form in management of *Prameha*.

In *Kashyapa samhita* only one formulation, *Lashuna kalka* (paste of garlic) with *Prameha* indication was found. Although this text is predominantly based on paediatric science, garlic has been contra-indicated for a child dependant on milk only (*Ksheerapa*). Hence efficacy of garlic in a child accustomed to eating food other than milk (*Ksheer-annada* and *Annada*) in form of food and medicine can be explored to be validated scientifically in management of juvenile diabetes.^[28]

Most repeated formulation

Amongst formulations with a designated name by the author himself (not all formulations were designated a name), most enumerated formulation were scrutinised. *Nyagrodadhi gana* (drugs of this group either in the form of *churna* or *kwatha*) and *Dhanvantara ghrita* were the most repeated formulation (8 formulations each). *Gokshuradi guggulu* was second highest (5 formulations). These formulations are already clinically practised widely and proven scientifically too.^[29,30]

Adjuvant

Madhu (honey) has been mentioned majorly as an adjuvant in 172 formulations, *Kshoudra* (honey collected from small type of honey bees) in 57 formulations, *Makshika* (honey collected from red variety of honey bees) in 18 formulations, *Sita/Sarkara* (sugar candy) in 12 formulations in the available compilation. *Madhu*, *Makshika* and *Kshoudra* are synonymous terms referring to honey, synonyms indicating collection from different sources. Honey may have been opted as a prime adjuvant due to its proven anti-diabetic activity,^[31] subject to the availability of pure and authentic honey.

Formulations with less than 10 drugs:

Amongst 524 formulations compiled, those formulations with less than 10 ingredients were grouped separately counting up to 323 formulations. Ingredients were listed for individual formulation to observe drugs which were most included [Table 3]. Formulations with fewer ingredients are modest to understand, economical to prepare and easy to procure, keeping this

Table 3: List of most enumerated drug in formulations with less than 10 ingredients

Sl. No	Drug name	Botanical name	Total number of formulations
1	<i>Triphala</i>	<i>a. Phyllanthus emblica</i> L., <i>b. Terminalia bellerica</i> L., <i>c. Terminalia chebula</i> L.	69
2	<i>Musta</i>	<i>Cyperus rotundus</i> L.	46
3	<i>Arjuna</i>	<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	44
4	<i>Daruharidra</i>	<i>Berberis aristata</i> DC.	42
5	<i>Haritaki</i>	<i>Terminalia chebula</i> L.	35
6	<i>Amalaki</i>	<i>Phyllanthus emblica</i> L.	33
7	<i>Patha</i>	<i>Cissampelos pareira</i> L.	31
8	<i>Haridra</i>	<i>Curcuma longa</i> L.	30
9	<i>Guduchi</i>	<i>Tinospora cordifolia</i> (Thunb.) Miers	23
10	<i>Khadira</i>	<i>Senegalia catechu</i> (L.f.) P.J.H.Hurter & Mabb.	22

view formulations with less than 10 ingredients were scrutinised.

Triphala (combination of three fruits; *Phyllanthus emblica* L., *Terminalia bellerica* L., and *Terminalia chebula* L.) was included as one compounded ingredient, as in majority references it was enumerated as a single unit. Numerous experimental researches have been carried out to understand the drug action of *Triphala* in Diabetes mellitus.^[32] *Triphala* contains active ingredients like menthol and sorbitol which is believed to have hypoglycemic effect.^[33]

The alcoholic and aqueous extracts of the tubers of *Musta* (*Cyperus rotundus* L.) possess lipolytic action and reduces obesity by releasing enhanced concentrations of biogenic amines from terminals of the brain which suppress the appetite centre. Isocyperol is said to play important role in lipid metabolism.^[34]

Arjuna (*Terminalia arjuna* (Roxb.) Wight and Arn.) possess anti-diabetic activity which can be understood by its activity of enhancement of granulocytes count and decrease in free haemoglobin content in diabetic human whole blood and plasma samples.^[35]

Daruharidra (*Berberis aristata* DC.) possesses active principle called as berberine. This has shown its efficacy in the reduction of fasting blood glucose, HbA1C, and triglycerides in patients with Diabetes mellitus – II. Berberine lowers blood glucose in type 2 diabetes mellitus patients through increasing insulin receptor expression.^[36]

Haritaki (*Terminalia chebula* Retz.) possess hypolipidemic as well as immunomodulatory properties, thus beneficial in management of diabetes mellitus.^[37]

Pharmacological research reports on *Amalaki* (*Phyllanthus emblica* L.) reveals its antidiabetic^[38] and nephroprotective^[39] activities which shows the drug's potency in management of diabetes.

Patha (*Cissampelos pareira* L.) has proven its efficacy in management of diabetes through experimental *in-vivo* models.^[40]

Clinical evaluation of *Haridra* (*Curcuma longa* L.) in lowering postprandial plasma glucose and significant effect on insulin secretion has been validated.^[41] Thus its holistic effect in diabetes can be deduced.

Various studies on *Guduchi* (*Tinospora cordifolia* (Thunb.) Miers)) demonstrates amelioration of experimental diabetic neuropathy and gastropathy in rats, reduction of blood sugar, increase in glucose tolerance in rodents, increase in glucose metabolism and significant hypoglycemic effect in experimental models.^[42]

Aqueous and ethanolic extract of *Khadira* (*Senegalia catechu* (L.f.) P.J.H.Hurter and Mabb.) shows reduction in hyperglycaemia and hypercholesterolemia.^[43]

Drugs in accordance with *Doshaja* (regulatory functional factors of the body) classification of *Prameha*

Amongst 524 formulations compiled, those formulations with specific *doshaja* indication were grouped separately counting up to 205 formulations. 100 formulations were indicated in *Kaphaja Prameha* (diabetes due to *Kapha Dosha* as origin), 79 formulations in *Pittaja Prameha* (diabetes due to *Pitta Dosha* as origin) and 26 formulations in *Vataja Prameha* (diabetes due to *Vata Dosha* as origin) were grouped separately and the drugs based on their highest number of enumerations are enlisted [Table 4].

Most repeated drugs in accordance to *Doshas* may help in targeting the specific causative factor and thus resulting in quick management. Complimentary *Rasapanchaka* (five attributes of *Dravya* (drug) viz., *Rasa* (taste), *Guna* (qualities), *Virya* (potency), *Vipaka* (bio-transformed rasa), *Prabhava* (exceptional activity)) towards the specific causative *Dosha*, innate nature of drug to act through the specific pathological pathways leading to the disease *Prameha* (diabetes mellitus), preferred dosage form,

Table 4: List of most repeated drug in accordance to *Doshaja* classification

Sl. No.	<i>Kaphaja Prameha</i>			<i>Pittaja Prameha</i>			<i>Vataja Prameha</i>		
	Drug name	Botanical name	Formulations	Drug name	Botanical Name	Formulations	Drug name	Botanical Name	Formulations
1	<i>Vidanga</i>	<i>Embelia ribes</i> Burm.f.	22	<i>Arjuna</i>	<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	19	<i>Patha</i>	<i>Cissampelos pareira</i> L.	8
2	<i>Arjuna</i>	<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	20		<i>Phyllanthus emblica</i> L.	10	<i>Guduchi</i>	<i>Tinospora cordifolia</i> (Thunb.) Miers	7
3	<i>Katphala</i>	<i>Myrica esculenta</i> Buch-Ham	10	<i>Abhaya</i>	<i>Terminalia chebula</i> L.	8	<i>Murva</i>	<i>Marsdenia tenacissima</i> (Roxb.) Moon.	6

combination with other drugs etc matter in classification of management of *Doshaja Prameha*. If laboratory studies are to be considered in proving anti-diabetic activity like inhibition of glucose uptake etc, even *Kushmanda* (*Benincasa hispida* Thunb.) is proven to have anti-diabetic properties^[44] although mentioned to be an *apathya*^[45] (inconducive) in *Prameha*.

Vidanga in *Kaphaja Prameha* (diabetes with *Kapha* origin) is most enumerated with a count of 22 formulations. Indicated in *Pishta meha* (urine with paste like consistency), *Jala meha* (urine similar to water), *Sikata meha* (urine with powdery material), *Lavana meha* (urine with salt like material and taste) by *Bhavaprakasha*. Remaining references as indication in *Kaphaja Prameha*. In all these references *Vidanga* has been enumerated with combination of other drugs and never as single drug management.

Arjuna is most repeated in *Pittaja Prameha* (diabetes with pitta origin), in 19 formulations. *Yogaratanakara* has indicated in *Rakta Meha* (urine with reddish colour). *Arjuna* too has been mentioned in a combination with other drugs in all references. In remaining references *Arjuna* has been indicated in *Pittaja Prameha*.

Patha (*Cissampelos pareira* L.) is most repeated drug in *Vataja Prameha* with 8 formulations. It has been mentioned in *Sarpi meha* (urine with ghee like consistency) and *Hasti meha* (urine with huge quantity, like an elephant's) in all the references and has been mentioned in a combination with other drugs only.

As no clear understanding of clinical differentiation between 20 types of *Prameha* (with respect to *dosha* involvement and urine analysis) has been arrived till date through research activities, considerations of these drugs to act against predominant *Dosha* (regulatory functional factors of body) causative factor will be more beneficial.

Although the data mentioned in these 15 *Ayurveda* treatises are compiled and analysed, scientific clinical analysis behind drug/formulation design is yet to be validated. Network pharmacology, omics-technologies and concept of synergy are promising strategies too in understanding complex formulations targeted at multiple systems.^[46,47] Such advanced technologies help to explore the mode of action of combinatory drug formulations.

Conclusion

The present review may be of help in further scientific studies about the efficacy of these formulations or drugs in prevention or management of *Prameha* (diabetes

mellitus). Fifteen *Ayurveda* texts were thoroughly scrutinised to compile 524 formulations in management of *Prameha*. *Sahasrayoga* text had maximum enumerations of drugs/formulations (82 formulations) in management of *Prameha* followed by *Abhinava Chintamani* (72 formulations). *Nyagrodadhi gana* (*kwatha* or *churna*) and *Dhanvantara ghrita* were the most frequently mentioned formulation (8 formulations each). *Triphala* (69 formulations) was the most enlisted drug amongst 323 formulations (in formulation with less than 10 ingredients). In formulation with less than 10 ingredients; *Vidanga* (22 formulations) was most repeated drug indicated in *Kaphaja prameha*, *Arjuna* (19 formulations) in *Pittaja prameha* and *Patha* (8 formulations) in *Vataja prameha*. Detailed laboratory and clinical analysis of these formulations/drugs may yield understanding in definitive usage of such varied choices of management in *Prameha* (Diabetes mellitus).

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Conflicts of interest

None.

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हिंदी सारांश

विभिन्न आयुर्वेद ग्रंथों से मधुमेह विरोधी (प्रमेह) योगों के अभिकल्पना पर एक कथात्मक साहित्यिक समीक्षा

100 ईसा पूर्व से 18वीं ईस्वी तक के आयुर्वेद ग्रंथों का चयन किया गया है, जिनकी प्रमेह (मधुमेह) के प्रबंधन के लिए अन्वेषण नहीं की गई है। इस समीक्षा से प्रमेह से संबंधित योगों पर शास्त्रीय संदर्भों के बारे में दस्तावेजी साक्ष्य समृद्ध होने की उम्मीद है, क्योंकि यह भविष्य के शोधों में शामिल है। इस समीक्षा पत्र में औषधि अभिकल्पना विधियों का पालन करने के लिए 15 आयुर्वेद ग्रंथों में से कुल 524 योगों पर विचार किया गया है। "प्रमेह" के फलश्रुति (संकेतों के साथ पद्य) के साथ योगों की जांच की गई। प्रारंभिक आंकड़ों को उनके खुराक रूपों, दोषों (शरीर के नियामक कार्यात्मक कारक), सहायक आदि के अनुसार योगों के संकेतों के आधार पर वर्गीकृत किया गया और परिणाम की पुष्टि की गई है। इन 15 ग्रंथों में से सर्वाधिक वर्णित औषधियों और योगों को प्रस्तुत किया गया है। क्वाथ (काढ़ा) सर्वाधिक वर्णित खुराक रूप (241 योग) है। शहद सर्वाधिक सहायक (172 योग) है। न्याग्रोदधि गण (क्वाथ या चूर्ण) और धन्वंतर घृता सर्वाधिक उल्लिखित योग थे। लिफला 323 योगों (10 से कम अवयवों के निर्माण में) के बीच सबसे अधिक सूचीबद्ध औषधि थी। विडंग (एम्बेलिया रिब्स बर्म.एफ.), अर्जुन (टर्मिनलिया अर्जुना (रोक्सब.) वाइट और अर्न.) और पाठा (सीसम्पेलोस परेरा एल.) सबसे अधिक दोहराई जाने वाली औषधियाँ थीं, जिन्हें (10 से कम सामग्री सहित योग में) क्रमशः कफज प्रमेह, पित्तज प्रमेह और वातज प्रमेह में दर्शाया गया। यह समीक्षा 15 आयुर्वेद ग्रंथों से संकलित प्रमेह (मधुमेह मेलिटस) में संकेतित योगों से संबंधित व्यापक विवरण देती है।

शब्दकुंजी: आयुर्वेद, मधुमेह मेलिटस, योग, प्रमेह