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Review Article

CRITICAL REVIEW OF *PRAMEHAHARA DRAVYAS* IN BHAVAPRAKASH NIGHANTU IN MANAGEMENT OF DIABETES MELLITUS

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KEYWORDS: Diabetes Mellitus, Bhavprakash Nighantu, *Prameha*, *Pramehahara Dravyas*, Herbal Medicines.

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ABSTRACT

Diabetes Mellitus (DM) comprises a group of common metabolic disorder that share the phenotype of hyperglycemia. The Worldwide prevalence of DM has risen dramatically over the past two decades. Based on current trends, more than 360 million individuals will have DM by the year 2030. Prevalence of type II DM is increasing worldwide much more rapidly than type I DM because of increasing obesity and reduced activity level and sedentary lifestyles. Six of the top ten countries with the highest rates of DM are in Asia and India is becoming capital of DM.

Diabetes Mellitus can be co-related with *Madhumeha* dealt in Ayurveda classics. It is a type of *Vataj Prameha*. In *Brihatrayee* and *Laghutrayee* various drugs are described for the treatment of *Prameha*. Bhavaprakash Nighantu is the clinically important among *Laghutrayee*; also dealt with various drugs useful for *Prameha*.

Purpose: The purpose of this study is to enlist the herbs useful in DM from Bhavaprakash Nighantu and critically analyze according to the studies done upon them.

Material and Methods: Along with Bhavprakash Nighantu other suitable Ayurvedic literatures, contemporary literatures, journals & internet media were also used for collecting information regarding the topic.

Result and Discussion: Among 426 *Dravyas* dealt in Bhavaprakash Nighantu, 47 *Dravyas* (Herbs) are described as *Pramehahara*. Besides *Takra*, *Tushar jala*, *Jangala Mamsa*, 3 types of *Madhu* and 11 *Pramehahar Dravyas* are described in *Dhatwadi Varga*. Various studies have proven the efficacy of herbal medicines in treatment of DM.

INTRODUCTION

Diabetes Mellitus (DM) comprises a group of common metabolic disorder share the phenotype of hyperglycemia. Depending on etiology of DM, factors contributing to hyperglycemia include reduced insulin secretion, decreased glucose utilization and increased glucose production. The metabolic dysregulation associated with DM causes secondary pathophysiological changes in multiple organ systems that impose a tremendous burden to individual health system. It possess a great risk as far as the morbidity and mortality through various complications like early atherosclerosis, obesity, diabetic nephropathy, diabetic neuropathy and hypertension are concerned. In many, it may remain undiagnosed. It contributes significantly to prolonged ill health and premature death.[1]

The Worldwide prevalence of DM has risen dramatically over the past two decades from an estimated thirty million cases in 1985 to 177 million in 2000 A.D. Based on current trends, more than 360 million individuals will have diabetes by the year 2030 A.D. Prevalence of type II DM is increasing worldwide much more rapidly than type I DM because of increasing obesity and reduced activity level as countries become more industrialized. Six of the top ten countries with the highest rates of DM are in Asia and India is becoming capital of DM.[1] India has more diabetics than any other country in the World, the International Diabetes Federation (IDF) had estimated the total number of people in India with diabetes to be around 50.8 million in 2010, rising to 87.0 million by 2030.[2]

Diabetes Mellitus can be co-related with *Madhumeha* mentioned in Ayurveda classics. It is a type of *Vataj Prameha*.[3-5] Sushruta has described it as *Kshaudrameha* in *Nidansthan* while in *Chikitsasthan Madumeha* is separately mentioned.[4,6] Sushruta has opined that all type of *Prameha* may change into *Madhumeha*.[7] Similarly in Charak Samhita and Asatanga Hridaya *Madhumeha* is well described.[3,5] In Chikitsasthana Sushruta has classified *Prameha* as *Sahaj* and *Aharaj*.[8] By such type of detailed and systemic

description, importance to this disease is established in classics. In *Brihatrayee* and *Laghutrayee* various drugs are also mentioned which are useful for *Prameha*.

Bhavaprakash Nighantu is the clinically important Nighantu among Laghutrayee also dealt with various drugs useful for *Prameha*. Bhavaprakash a treatise in Ayurveda is the legacy of *Bhava Mishra* of 16th century AD and is a noted work in medicinal plants. It is dived into 23 Vargas along with *Anekartha Varga*, a lot of information related to herbs with their specifications like *Puspa Varga* (flower group), *Shaka Varga* (leafy vegetable group) etc. apart from different types of *Mamsa* (meats), *Dhanya Varga* (rice preparations), *Vaari Varga* (water varieties), milk, curd, ghee, etc are found to have been described in various places of Bhavaprakash Nighantu.[9]

Out of total Vargas an attempt is done to sort out and enlist those medicinal herbs which are described as *Pramehaghna* or *Mehaghna* and their efficacy in DM is reviewed by reviewing various research studies done on them.

Materials and Method- Along with Bhavprakash Nighantu other suitable Ayurvedic literatures, contemporary literatures, journals & internet media were also used for collecting information regarding the topic. The following herbs have been sorted out from Bhavprakash Nighantu and compared with latest research studies done on them regarding anti-diabetic effect.

The herbs having *Pramehaghna/ Mehaghna* actions from Bhavaprakash Nighantu are listed below with their reference and their botanical name, family, *Dosh-Karma*, *Guna-Karma* etc.

Observation

Among 426 *Dravyas* dealt in Bhavaprakash Nighantu,[10] 47 *Dravyas* are described as *Pramehahara*. Except that *Tushar jala* from *Vari varga, Jangala mamsa* from *Mamsa varga, Kshaudra, Paitik, Chatrajatiyee* and *Daalmadhu* from *Madhu varga* and *Rajat, Vanga, Yasad, Naaga, Lauha, Mandoora, Swarnamakshika, Taarmashika, Shilajatu, Abhraka, Rajavarta* etc. are also described as *Pramehahar dravyas*.[9] The herbs described as *Pramehaghna/ Mehaghna* actions are not specified as *Madhumehaghna* or antidiabetic but among 47 herbs about 43 have been proved as antidiabetic mostly on animal models and few by clinical trials. Most of the herbs mentioned having glycosides, alkaloids, glycans, terpentenes, polysaccharides, vitamins, saponins, glycoprotein, peptides, aminoacids etc. which were responsible for antidiabetic effects.[11,12] Pharmacological screening for hypoglycaemic or antidiabetic action has been done on animal models like fasting rat, streptozotcin induced rats, Alloxan induced rats, adrenaline induced rats or normal rats. In most of the cases water extract or alcohol extracts of plants were used.

Table1: Plants detail

S.N.	Sanskrit Name	Botanical name	Family	*Dosha Karma*	*Guna Karma*	Reference of *Varga* and *Shloka no.*
1.	*Aamalaki*	*Emblica officinalis*	Euphorbiaceae	*Tridoshahara*	*Pramehaghna*	*Haritkyadi Varga- 39*
2.	*Aamra Pushpa*	*Mangifera indica*	Anacardiaceae	*Kapha Pittahara, Vatajanaka*	*Pramehanut*	*AamradiphalaVarga- 2*
1.	*Arkapuspi*	*Holostemma annularis*	Asclepiadeceae	*Kapha, Pittahara*	*Mehajeet*	*Guduchyadi Varga-271*
2.	*Ashtavarga*	-	-	*Vata, Pittashamaka*	*Mehapranut*	*Haritkyadi Varga- 122*
5.	*Atibala*	*Abutilon indicum*	Malvaceae	*Vatashamaka*	*Mehasamana*	*Guduchyadi Varga-146*
6.	*Bakuchi*	*Psoralea corylifolia*	Fabaceae	*Kapha, Vatahara*	*Mehanut*	*Haritkyadi Varga- 208*
7.	*Beejaka*	*Pterocarpus marsupium*	Fabaceae	*Shleshma, Pittashamaka*	*Mehaghna*	*Vatadi Varga- 29*
8.	*Brihanloni*	*Portulaca oleracea*	Portulacaceae	*Kapha, Pittahara*	*Pramehnut*	*Shaka Varga- 21*
9.	*Brahmi*	*Bacopa monnieri*	Scrophulariaceae	*Kapha-vatashamak*	*Pramehahara*	*Guduchyadi Varga-279-281*
10.	*Chirbilva (Karanji)*	*Holoptelia integrifolia*	Ulmaceae	*Pitashamaka*	*Pramehajeet*	*Guduchyadi Varga-124*
11.	*Devadaru*	*Cedrus deodara*	Pinaceae	*Sleshmahara*	*Pramehanuta*	*Karpuradi Varga- 25*
12.	*Dhava*	*Anogiessus latifolia*	Combretaceae	*Pitta, kaphahara*	*Pramehahara*	*Vatadi Varga- 60*
13.	*Dronapuspi*	*Leucas cephalotes*	Lamiaceae	*Pittakrit, Bhedanam*	*Mehahara*	*Shaka Varg-34*
14.	*Gojihva*	*Elephantopus*	Polypodiaceae	*Kaphapittahara,*	*Pramehara*	*Guduchyadi Varga-*

		scaber		*Pittahara*		*298*
15.	*Guduchi*	*Tinospora cordifolia*	Menispermaceae	*Tridoshahara*	*Pramehanut*	*Guduchyadi Varga – 10*
16.	*Guggulu*	*Commiphora mukul*	Burseraceae	*Vata, Kaphasamak*	*Mehahara*	*Karpuradi Varga- 40*
17.	*Gokshura*	*Tribulus terrestris*	Zygophyllaceae	*Vatanut*	*Pramehara*	*Guduchyadi Varga - 46*
18.	*Haridra*	*Curcuma longa*	Zingiberaceae	*Kapha, Pittahara*	*Mehaghna*	*Guduchyadi Varga- 197*
19.	*Haritaki*	*Terminalia chebula*	Combretaceae	*Tridoshahara*	*Pramehahara*	*Haritkyadi Varga- 20*
20.	*Indrayana*	*Citrulus colocynthis*	Cucurbitaceae	*Pitta, Kaphahara*	*Pramehahara*	*Guducyadi Varg – 206*
21.	*Kadali (Pakwa)*	*Musa sapientum*	Musaceae	*Pitta-Vatahara (Apakwa)*	*Mehaghna*	*Amradiphala Varga- 34*
22.	*Kakamachi*	*Solanum nigrum*	Solanaceae	*Tridoshaghni*	*Mehajeet*	*Guduchyadi Varga - 247*
23.	*Kakubha*	*Terminalia arjuna*	Combretaceae	*Kaphapittahara*	*Mehahara*	*Vatadi Varga – 27*
24.	*Kampillaka*	*Mallotus philippensis*	Euphorbiaceae	*Kaphapittahara*	*Mehanut*	*Haritkyadi Varga- 147*
25.	*Karanja Phala*	*Pongamia glabra*	Fabaceae	*Kaphavataghna*	*Mehajeet*	*Guduchyadi Varga- 122*
26.	*Karavellam*	*Momordica charantia*	Cucurbitaceae	*Pittakaphahara*	*Mehaghna*	*Shaka Varga- 63*
27.	*Katabhi*	*Careya arborea*	Lecythidaceae	*Kaphaghna*	*Pramehara*	*Vatadi Varga – 67*
28.	*Kataphala*	*Myrica esculenta*	Myricaceae	*Vatakaphahara*	*Pramehara*	*Haritkyadi Varga- 181*
29.	*Katuki*	*Picrorhiza kurroa*	Scrophulariaceae	*Kaphapittahara*	*Pramehanuta*	*Haritkyadi Varga- 152*
30.	*Kemukama*	*Costrus speciosus*	Zingiberaceae	*Kaphapittahara Vatala*	*Pramehaghna*	*Shaka Varga- 111*
31.	*Khadira*	*Acacia catechu*	Mimosaceae	*Pittakaphahara*	*Mehaghna*	*Vatadi Varga- 32*
32.	*Mahanimba*	*Melia azaderach*	Meliaceae	*Kaphapittahara*	*Pramehahara*	*Guduchyadi Varga- 99*
33.	*Mandookparni*	*Centella asiatica*	Apiaceae	**Kapha-pittashamaka*	*Mehaghna*	*Guduchyadi Varga- 281*
34.	*Manjistha*	*Rubia cordifolia*	Rubiaceae	**Kaph-Pittashamaka*	*Mehanuta*	*Haritkyadi Varga- 191*
35.	*Meshashringi*	*Gymnema sylvestre*	Asclepiadaceae	*Pitta, Shleshmahara*	*Mehaghna*	*Guduchyadi Varga- 255*
36.	*Moorva*	*Marsdenia tenacissima*	Asclepiadaceae	*Tridoshahara*	*Mehanut*	*Guduchyadi Varga- 245*
37.	*Nimba*	*Azadirachta indica*	Meliaceae	*Pittahara, Vatala*	*Mehanut*	*Guduchyadi Varga- 96*
38.	*Palasha*	*Butea monosperma*	Fabaceae	*Kaphapittahara Vatakara*	*Mehaghna*	*Vatadi Varga- 53*
39.	*Pashanabheda*	*Bergenia ligualata*	Saxifragaceae	**Pittashamaka Vatakapha-vardhaka*	*Pramehara*	*Haritkyadi Varga- 185*
40.	*Pippali*	*Piper longum*	Piperaceae	*Vata, Shleshmahara*	*Pramehaghna*	*Haritkyadi Varga- 55*
41.	*Sarjaka*	*Vateria indica*	Dipterocarpaceae	*Kaphahara*	*Mehaghna*	*Vatadi Varga- 21*
42.	*Shitivara*	*Marsilea minuta*	Marsileaceae	*Tridoshahara*	*Mehapranut*	*Shaka Varga- 32*
43.	*Suvarchala*	*Cleome*	Capparidaceae	*Kaphpittahara*	*Mehaghna*	*Guduchyadi Varga-*

		viscose				*286*
44.	*Tinduka*	*Diospyros embryopteris*	Ebenaceae	*Pittahara*	*Pramehaghna*	*Aamradi phalavarga-65*
45.	*Tinisha*	*Ougeinia dalbergioides*	Fabaceae	*Kapha, Pittahara*	*Pramehajeet*	*Vatadi Varga- 76*
46.	*Trikatu*	-	-	*Kaphahara*	*Mehahara*	*Haritkyadi Varga-63*
47.	*Triphala*	-	-	*Kapha, Pittaghna*	*Mehahara*	*Haritkyadi Varga-43*
48.	*Varahikanda*	*Dioscorea bulbifera*	Dioscoreaceae	*Kapha, Vatahara*	*Mehaghna*	*GuduchyadiVarga-179*
49.	*Vasa*	*Adhatoda vasica*	Acanthaceae	*Kapha, Pittahara*	*Mehaghna*	*Guduchyadi Varga-90*
50.	*Vridhdaruka*	*Argyreia speciosa*	Convulvulaceae	**Kaph-vatashamaka*	*Mehapranuta*	*Guduchyadi Varga-*

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Table 2: Number of Drugs According to *Varga*

S.No.	Name of *Varga*	Numbers of drugs
1.	*Haritkyadi Varga*	9
2.	*Karpuradi Varga*	2
3.	*Guduchyadi Varga*	20
4.	*Vatadi Varga*	8
5.	*Aamradi Phala Varga*	3
6.	*Shaka Varga*	5

Table 3: Number of Drugs According to *Doshaghnata*

S.No.	*Doshkarma*	Number of drugs
1	*Tridoshahara*	6
2	*Kaphapittashamaka/Pittakaphashamaka*	23
3	*Vattapittashamaka/Pittavatashamaka*	2
4	*Vattashamaka*	2
5	*Kaphavatahara/Vatakaphashamaka*	8
6	*Pittashamaka*	4
7	*Shleshmahara/Kaphahara*	4
8	*Pittakrit*	1

Enumeration of Drugs with their Experimental/ Clinical Study References

1. ***Aamalaki-*** *Emblica officinalis* Gaertn (*Aamalaki*) is most important drug in Ayurveda used as medicine. The well-known *Chyavanprash* having *Aamla* as a main ingredient and it is an important source of Vitamin C. It is extensively found throughout India and some other Asian countries. The fruits are widely consumed as raw, cooked, or pickled. It is widely used for various therapeutic purposes as well as for households. Its antidiabetic effect has been confirmed through several studies. As per study, fresh juice and hydro-alcoholic extract of *E. officinalis* fruits possesses potential anti-diabetic activity in Steptozotcin-induced type 1 diabetic rats.[13] similarly other parts except fruit have also proven as antidiabetic. As per study, methanolic and aqueous bark extract of *Emblica officinalis* have significant hypoglycemic potential and antidiabetic effect.[14]
2. ***Aamra-*** *Mangifera indica* Linn. (*Aamra*) or mango is very important plant known for its fruits all over the world. In Bhavprakash Nighantu different parts of this fruit is described for different uses. *Aamra Pushpa* (inflorescence), *Aamra Phala* (Fruit), *Pakwa Aamraphala* (ripen fruit), *Aam-Amraphala* (unripen fruit), *Aamrawarta* (peel), *Aamra beej* (Kennel), and *Aamra pallava* (tender leaves of mango) are mentioned for different therapeutic actions.[9] *Aamra Pushpa* is mentioned as *Pramehahara* (antidiabetic effect) but there is no such type of study is done. Even though various studies are done on other parts of Mango for its antidiabetic effect. As per study, 50% ethanolic extract of the leaves of *Mangifera indica* produced a significant hypoglycemic effect at a dose of 250 mg/kg, both in normal and streptozotocin-induced diabetic rats.[15]
3. ***Arkapushpi-*** *Holostema annularis* (*Arkapushpi*) is mentioned as Mehajeet (antidiabetic) in Bhavaprakash Nighantu. Studies have shown that roots of *Holostema annularis* contain β-sitosterol, lupeol, and alpha-amyrin as the main constituents and having both antioxidant and antidiabetic properties. As per study, Chloroform extract of

Holostema annularis and methanol extract of *Holostema annularis* decreased the serum glucose, cholesterol and triglyceride levels of the diabetic mice, suggesting its applicability in DM.[16]

4. ***Ashtavarga-*** *Astavarga* is a group of eight *Dravyas*, which exact botanical sources are not conformed yet. Those are *Jeevaka, Rishavak, Meda, Mahameda, Kakoli, Ksheer Kakoli, Ridhi* and *Vridhi*. Most of the drugs from *Astavarga* are not available nowadays, so their *Pratinidhi* (substitution) are used. *Ashtavarga* is mentioned as *Pramehahara* as combination in Bhavaprakash Nighantu[9] but separately not any one of the drug is mentioned as *Pramehahara* action, studies are also not done to establish the claim.
5. **Atibala-** *Atibala* (*Abuliton indicum)* is described as one of *Balachatushtya* in Bhavaprakash Nighantu and commonly used as *Vatashamaka, Nadiyabalya* (nervine tonic) and as *Balya Dravya*. It is also mentioned as Pramehaghna.[9]As per study, its chloroform fraction (CF) at a dose of 50 mg/kg showed significant reduction in blood sugar level in diabetic rat when compared with diabetic control rats and significant differences were observed in serum lipid profiles, serum insulin, glcosylated hemoglobin, body weight and hemoglobin levels in CF treated group compared with the diabetic control. These results demonstrated that the *Abuliton indicum*has significant antidiabetic activity.[17]
6. ***Bakuchi-*** *Psoralea corylifolia* (*Bakuchi*) is generally used for skin diseases in Ayurveda.. As per study ethanolic extract of seeds of *Psoralea corylifolia* has potential antihyperglycaemic and antioxidant effect in STZ- induced diabetic rats.[18] Another study shows that composite extract of above plant part have more potential antidiabetogenic activities than separate extracts, the composite extract is made with *Trigonella foenum-graecum* L.[19]
7. ***Beejaka-*** *Peterocarpus marsupium* (*Beejaka*) is well known herbs used for *Madhumeha* in Ayurveda. T phenolic-C-glycosides present in P. marsupium heart wood are the phytoconstituents responsible for the antihyperglycemic activity and validate the claim of antidiabetic activity of heart wood of P. marsupium in STZ-induced diabetic rats.[20]
8. ***Brihanloni-*** *Portulaca oleracea* (*Brihanloni*) has limited formulation and uses. A study suggests that *Portulaca oleracea* has the hypoglycaemic potential and could useful in the management of diabetes. As per study, oral administration of crude *Portulaca oleracea* L. polysaccharide was associated with a significant increase in the body weight, significant improvement in glucose tolerance in the diabetic rats and appeared to significantly reduce fasting blood glucose levels and elevate and fasting serum insulin in diabetic rats.[21]
9. ***Brahmi-*** *Bacopa monnieri* mainly used in neurological disorders like loss of memory, insomnia etc. It has also antidiabetic effect. As per study Brahmi possesses antioxidant and antihyper-glycaemic effect in STZ-induced diabetic rats.[22]
10. ***Karanji* (Chirbilva)-** The study of antidiabetic activity of the stem bark extract of *Holoptelea integrifolia* (Roxb.) (*Karanji*) was investigated in alloxan induced diabetic rats for 21 days and gradual decrease in blood glucose level was seen in the animals treated with the bark extract.[23]
11. ***Devdaru-*** Aqueous extract of *Cedrus deodara* was found to reduce blood sugar level in alloxan induced diabetic rats which could be seen from 5th day after continuous administration of the extract and on 21st day sugar levels were found to be reduced by 40.20%. The results suggest that the *Cedrus deodara* aqueous extract effective in controlling DM.[24]
12. ***Dhava-*** *Anogeissus latifolia* (*Dhava*) is a drug not commonly found in prescriptions of Ayurvedic physicians individually. Antidiabetic effect of this drug is established by studies. As per study, administration of *Anogeissus latifolia* bark extract to rats for six weeks inhibited the disturbance in glucose metabolism in the liver by reducing the accumulation of glycogen in liver, which might be due to induced glycogenolysis and/or inhibited gluconeogenesis.[25]
13. ***Dronpushpi-*** *Dronpushpi* (*Leucas cephalotus*) is commonly used in *Yakrit vikara* (hepatic disorders) and *Jwara* (fever), it is also mentioned as Mehahara.[9] The ethanolic extract of leaves of *Leucas cephalotus* (*Dronpushpi*) is reported to have antidiabetic, anti hyperlipidemic & antioxidant activity. Extract at the dose of 450mg/kg body weight was found to be more potent as comparable to glibenclamide and metformin as an antidiabetic.[26]
14. **Gojivha-** *Elephantopus scaber* (*Gojihva*) is a plant used in Ayurveda combined with other materials. It has antidiabetic effect. It is mentioned as *Pramehahara* and an investigation also suggests that *Elephantopus scaber* leaves and root extract exhibit anti-hyperglycaemic effects. It may also consequently alleviate damage of pancreas and liver associated with alloxan-induced diabetes mellitus in rats.[27]
15. ***Guduchi-*** *Tinospora cordifolia* (Willd.) Miers. (*Guduchi*) is also known as *Amruta*; the word itself describes its importance and wide range of applicability in Ayurveda. It is a potent drug in Ayurvedic system and is used for a various disease conditions. The stem is generally the main parts of used but *Patra* (leaves) and *Panchanga* (plant as whole) is also used along with the processed form called *Guduchi satva* which is an aqueous extract of the plant. A study clearly showed that *Tinospora cordifolia* has significant anti-diabetic activity in diabetic animals and has an efficacy of 40% to 80% compared to insulin. It caused increased hepatic glycogen syntheses and decreased glycogen phosphorylase activity. The probable mechanism by which it may act as an anti-hyperglycemic drug is not through insulin secretion like sulfonylureas. It may be through some peripheral mechanisms, such as

increasing the glycogen storage in the liver or decreasing the glucose release from the liver.[28]

16. **Guggulu-** *Commiphora mukul* (*Guggulu*) is a very common drug useful for management of all sorts of neuro-musculo-skeletal diseases and popularly prescribed in Ayurveda practices. Several compound formulations are widely available and used. *C. mukul* administration significantly increased insulin secretion and normalized the deranged carbohydrate metabolism and lipid metabolism in diabetic rats by enhancing glucose utilization and decreasing hepatic glucose production, thereby exhibiting significant antidiabetic effects.[29]
17. ***Gokshura-****Tribulus terrestris* (*Gokshura*) is one of the *Laghu Panchamoola*, is usually prescribed for urinary disorders. As per study, the extract of *Tribulus terrestris* had shown significant decrease in blood glucose level in normal and alloxan- induced diabetic mice, mainly due to the increased serum insulin level.[30]
18. ***Haridra-*** *Curcuma longa* L. (*Haridra*) is a household item used for coloring the food items as well as cosmetics to medicine. Several human studies have been done, having its anti-diabetic effect single or mixed with *Amla* (*Emblica afficinalis*).[31]As per study showed a significant reduction of 38.2 % (P<0.001) in fasting blood glucose(FBG) and 44.5 % (P<0.001) in post prandial blood glucose(PPG)levels.[32]
19. ***Haritaki-*** *Terminalia chebula* Retz. (*Haritaki*) is a well-known drug in Ayrveda and is an important component of *Tiriphala*. As per study, it showed significant anti-hyperglycemic effect without hypoglycemic action in normal rats, and efficacy was lower than glibenclamide in alloxan model but higher in adrenaline induced model.[33]
20. ***Indrayana-*** *Citrullus colocynthis* (L.) Schrad (*Indrayan*) is a trailing plant of family cucurbitace found in semi desert area. It has become rare due to massive deforestations. As per study, oral administration of two different doses (300&500 mg/kg p.o) of *Citrullus colocynthis* fruit extract exhibited a significant reduction in blood glucose level in diabetic rats.[34]
21. ***Kadali-*** In Bhavaprakash Nighantu *Pakwa Kadali* (ripened fruit of *Musa sapientum*) is mentioned as *Mehaghna* but leaf extract, flower extract, peel of fruit etc. are proved having significant antidiabetic effect rather than ripened fruit.[35,36]
22. ***Kakmachi-****Solanum nigrum* (*Kakamachi*) is commonly used for hepatic problems and respiratory problems in Ayurveda practices. An experimental study revealed that the Methonolic and water extracts from *Solanum nigrum* (100 and 200 mg/kg) orally administered produced a significant decrease in the blood glucose level in the alloxan-induced diabetic rats.[37]
23. ***Kakubha-****Termenilia arjuna* (*Kakubha, Arjuna*) has cardio-tonic (*Hridya*) effect as described in Ayurveda. Oral administration of ethanolic extract of bark (250 and 500mg/kg body weight) for 30 days, resulted in significant decrease of blood glucose. However, in the case of 250 mg / kg body weight of extract, less activity was observed. The study clearly showed that the bark extract of *T.arjuna* possesses potent antidiabetic activity.[38]
24. ***Kampillaka-*** *Phalaraja* (dusty or powdery parts from fruit surface) of *Kampillaka* or *Mallotus philippinensis* is used as *Krimighna dravya* (antihelmenthic) in Ayurveda. As it is also mentioned as *Pramehaghna*, the study revealed that hydroethanolic bark extract showed significant increase in the levels of body weight, insulin and significant decrease in blood glucose, and glycosylated hemoglobin when administered orally for 30 days to STZ induced diabetic rats at a dose of 200 and 400mg/kg body weight. The bark extract contains phenolic which may be responsible to exert antidiabetic activity. Hence it can be used as a drug for diabetes mellitus.[39]
25. ***Karanja Phala-*** Bhavaprakash has mentioned 3 varieties of *Karanja* i.e. *Karanja*, *Ghreeta Karanja* and *Karanji*. Botanical source of *Karanja* is *Pongamia glabra* or *Pongamia pinnata.*[9] As per study, Methanolic extract of pod of *Pongamia pinnata* and a phytochemical derived from chloroform: methanol eluant (97:3) i.e. Pongamia flavonylflavonol showed significant hypoglycemic effect in streptozotcin – induced hyperglycemic rats after oral administration. [40]
26. ***Karvellam-*** *Momordica charantia* (*Karvellam* or *Karela*) is commonly practiced for DM at household level. It is one of commonest ingredient for proprietary Ayurvedic preparations found in market. Its antidiabetic activity is well established by various experimental studies and clinical trials. Oral administration of *M. charantia* seeds to six Type1DM and fourteen Type2DM patients significantly decreased PPBG level in both patient groups. Drinking of an aqueous suspension of the vegetable pulp also resulted in remarkable reduction of FBG and PPBG levels in 86 out of 100 cases with having moderate T2DM. Similarly, fruit juice of *Momordica charantia* was found to significant in improvement of glucose tolerance in 73% of eighteen maturity onset diabetic patients.[41]
27. ***Katbhi-*** *Careya arborea* (*Katabhi*) is a drug which is not abundantly used but it is found as co-ingredient in few formulations. Root bark of *C. arborea* contains a metformin like compound, having hypoglycemic effect.[42]
28. ***Kataphala-*** *Kataphala* (*Myrica esculenta)* is commonly used as *Nasaya* in Ayurveda. As per study methanolic extract of *Myrica esculenta leaves* showed dose-dependent antidiabetic activity by significant decrease in blood glucose level, body weight and blood cholesterol level in extract treated group as compared to the positive vehicle treated group.[43]
29. ***Katuki-*** *Picrorhiza kurroa* (*Katuki*) is a very common item used in Ayurveda mostly for liver disorders. It

was known that extract of *Picrorhiza kurroa* possess significant anti-diabetic activity in Streptozotocin nicotinamide induced type-2 diabetes mellitus in rats. Therefore it may be effective in management of Type 2 DM.[44]

30. ***Kemuka-*** *Costus speciosus (Koen.) Sm* (*Kemuka*) is also a noted drug used for various diseases like uterine problem and digestive problem etc. and is often used by tribal of Assam. The ethanolic extract showed significant reduction in blood glucose along with other parameters like glycosylated hemoglobin, blood urea, serum uric acid, serum creatinine, triglycerides, total cholesterol etc.[45]
31. ***Khadira-*** *Khadira* (*Acacia catechu*) is described as *Agraya* for *Kushtha* (skin diseases). Its heartwood is used in Ayurveda practices. It is described as *Pramehahara* in Bhavprakash Nighantu which is proved by later researches. As per study, the ethanolic as well as aqueous extracts of the hard wood of *Acacia catechu* showed improvement on oral glucose tolerance post-sucrose load in normal rats and streptozotocin (STZ)-induced diabetic rats.[46]
32. ***Mahanimba-*** *Melia azedarach* (Mahanimba) is used for several disease conditions. The ethanolic extract of leaves of *Melia azedarach* in alloxan induced diabetic rat showed marked decrease in the blood glucose level in the two different doses of 300 mg/kg and 600 mg/kg for 21 days in compare to diabetic control. The effect of extract also showed significant reduction in blood glucose level in glucose tolerance test.[47]
33. ***Manjishtha-*** *Rubia cordifolia* Linn. sensu Hook. f. (*Manjistha*) is widely used for skin diseases in Ayurveda. It is one of major drug for *Varnya* effect. It can be used both externally and internally. A study suggests that *Rubia cordifolia*is a natural anti-oxidant, which might be helpful in management of diseases like diabetes. The study represents root of *Rubia cordifolia* as a potential hypoglycaemic agent.[48]
34. ***Mandookparni-*** *Centella asiatica* (*Mandukaparni*) is a potent drug used for neurological disorders like loss of memory and insomnia etc. As a study conducted, *Centella asiatica* was administered containing 50, 100 and 200 mg/kgb.wt. powder, respectively in 1ml water orally in 3 groups of alloxan induced diabetic rats showed improvement in body weight, water intake as compared to diabetic control rats. In alloxan induced diabetic rats the maximum reduction in BG, TG, TC, HDL, LDL, SGOT and SGPT were observed at a dose level of 50 mg/kg b.wt. The present data indicates that *C. asiatica* juice possesses potential as an antidiabetic action.[49]
35. ***Marich-*** In Bhavprkash Nighantu *Trikatu* is mentioned as *Pramehahara Dravyas* but the all three constituents (*Pippali, Marich* and *Sunthi*) are not mentioned as *Pramehahara* separately. Only *Pippali* (*Piper longum*) is mentioned separately as *Pramehahara*, while *Marich* (*Piper nigrum)* and *Shunthi* (dry rhizome of *Zingiber officinale*)are not mentioned as *Pramehahara*. *Maricha* is basically *Deepan dravya* has also shown antidiabetic potentiality according to latest studies. As per study *Piper nigrum* plays protective effect in alloxan induced diabetic rats and decreases the glucose level.[50]
36. ***Meshashingi-*** *Gymnema sylvestre* (*Meshashringi*) is a large woody, much branched climber with pubescent young parts, found in dry forest up to 600 m height and is bitter, acrid, thermogenic, anti-inflammatory, anodyne, digestive and liver tonic. A study reveals that *Gymnema sylvestre* has significant anti-diabetic activity in alloxan induced and normal fasting rats.[51,52]
37. ***Moorva-*** *Marsdenia tenacissima* (*Moorva*) has antidiabetic effect as per study has shown. As per Study has been done in *Marsdenia tenacissima & Sphaeranthus indicus,* hypoglycemic activity was more in *Marsdenia tenacisima*. The results of the study revealed that the hypoglycemic activity is more prominent in neutral and basic media as compared to acidic medium.[53]
38. ***Nimba-*** *Azadirachata Indica* (*Nimba*) has been shown to possess number of pharmacological effects like cardiovascular, antimicrobial, immuno modulatory etc. One of the properties of *Nimba* has its hypoglycaemic effect. Different parts like seed and leaf extract have been shown to possess hypoglycaemic effect. Study has shown that aqueous extract of *Nimba* leaf extract has a good therapeutic potential as anti-hyperglycaemic agent in IDDM and NIDDM in STZ- induced rats.[54]
39. ***Palash-***. *Butea monosperma* (*Palasa*) is considerably used as anthelmintic. Its antidiabetic activity is also established by various studies. As per study, the oral administration of *B. monosperma* fruit to diabetic and normal subjects for 30 days decreased blood glucose, urine sugar, and plasma glycoprotein levels, as well as the lipid profile and the activity of liver enzymes.[55]
40. ***Pashanbheda-*** *Pasanabheda* (*Bergenia ligulata)*, as the name indicates it breaks the stone or used in case of renal calculus or other urinary tract problems. A study was conducted for evaluating the antidiabetic effect and result obtained that ethanolic extract of root of *Bergenia ligulata* exhibited significant antidiabetic activity in alloxan induced diabetic in rats.[56]
41. ***Pippali-*** *Piper longum* L. (*Pippali*) is a bitter substance and used most often in anti-cough preparations but it has a potent anti-diabetic effect which was known from a study that the result indicates *Piper longum* ethanolic extract has potent hypoglycaemic and anti-lipid peroxidative effects in alloxan induced diabetic rats.[57]
42. ***Shunthi-*** Shunthi is dry form of *Adraka* (*Zingiber officinale*) which is an important material used for medicine and as spices and condiments even it is

taken raw also. It is one of the components of the famous classical formulation *Trikatu*. In Bhavaprakash Nighantu *Shunthi* is not mentioned as *Pramehaghna* but as Formulation of *Trikatu*, it is mentioned as *Pramehahara*. It was found anti-diabetic in a study that shows the ginger (*Zingiber officinale*) extract has hypoglycaemic effect on diabetic rats.[58]

43. ***Sarjaka-*** *Vateria indica* Linn. (*Sarjaka*), family Depterocarpaceae is one of the member of *Asnadi gana*. Carbohydrate, tannin, phenols and flavonoid are phytoconstituents found in aqueous and ethanolic extract. Petroleum ether extract of stem bark showed the presence of phytosterols.[59] Even though it is mentioned as *Pramehaghna dravya* in Bhavprakash Nighantu, studies have not confirmed it as it.
44. ***Shitivara-*** *Marsilea minuta* Linn. (*Shitivara*) is widely used as a leafy vegetable and having flavonoids. Flavonoids mainly act as antioxidant ant antidiabetic. As per study, the ethanolic leaf extract of *Marsilea minuta* Linn has significant antidiabetic effect in alloxan induced diabetic rat.[60]
45. ***Suvarchala-*** *Cleome Viscose* (L.) (*Suvarchala*) commonly Called "Sticky Spider Flower", is a terrestrial, annual, erect, aromatic herb. The Plant has high medicinal value as it is traditionally used for its antiemetic, wound healing, antimicrobial, hepatoprotective and anti-oxidant properties. As per study, methanolic extract of Cleome viscose has significant ability to reduce diabetic complications in alloxan induced diabetic rats.61
46. ***Tinduka-*** There is controversy about source plant of *Tinduka*. Dr. K.C. Chunekar mentioned *Diospyros embryopteris* as *Tinduka*. There are other species of Diospyros, they are *D. peregrine, D. malabarica, D. atrata., D.melanoxylon* etc.[9] As per study methanol extract of bark of *Diospyros malabarica* showed significant hypoglycemic activity on normal rats. The extract also exerted significant antihyperglycemic effect in alloxan-induced hyperglycemia.[62] Similarly, methanol extract of matured fruits of *Diospyros peregrine* showed significant antidiabetic potential of extract in terms of reduction of fasting blood glucose level in diabetic rats.[63] But the antidiabetic effect of *D. embryopteris* is not established yet.
47. ***Tinisha-*** Dr. K.C. Chunekar in Hindi commentary of Bhavprakash Nighntu has mentioned *Tinisha* as *Ougeinia dalbergioides* Benth. is a native plant of India. As per study, Ethanolic extract of Ougeinia oojeinensis showed significant antihyperglycemic and hypolipidemic activity as compared to diabetic control having beneficial effects on blood glucose and urine glucose level.[64]
48. ***Trikatu-*** The combination of *Piper longum* (*Pippali*), *Piper nigrum* (*Maricha*) and dry *Zingiber officinale* (*Shunthi*) is known as *Trikatu*. This combination is famous for its *Deepan, Pachana, Kasahara* actions. Separately all the three components of *Trikatu* are proved as antidiabetic in animal models but *Trikatu* as a combination, no such type of studies were carried out, even though it is mentioned as *Pramehahara* in Bhavaprakash Nighantu.
49. ***Triphala-*** *Triphala* is commonly and frequently used formulation in Ayurvedic practices. It contains fruits of *Terminalia chebula, Terminalia belerica* and *Embelica officinalis.* They each separately proved as antidiabetic effect. Bhavprakash Nighantu mentioned *Triphala* as *Pramehaghna* and as per study conducted as single blind comparative study done in 60 patients having 30 in each group, one group was treated with *Triphala churna* 5 g with lukewarm water as *Anupana* and other group treated with *Triphala churna* 5 g with honey as *Anupana*, the second group showed more beneficial result.[65]
50. ***Varahikanda-*** *Varahikanda* (*Dioscorea bulbifera)* is basically used as tonic and aphrodisiac, its antidiabetic effect is also established. As per study, aqueous extract of *Dioscorea bulbifera* tubers has potent antihyperglycemic and antidyslipidemic activity and may prove to be effective in the treatment of diabetes mellitus and dyslipidemia.[66]
51. ***Vasa-*** *Vasa* (*Adhatoda vascica,* or *Justicia adhatoda)* is commonly used plant in Ayurvedic practices. It is used in respiratory diseases and bleeding disorders. Antidiabetic effect of this drug is also well established. As per study, oral administration of 50 and 100 mg/kg of ethanolic extracts of *Justicia* leaves to normal and experimental diabetic rats produced a significant reduction in blood glucose levels as compared to the root extract of *J. adhatoda* and glibenclamide.[67]
52. ***Vibhitaki-*** *Vibhitaki* (*Terminalia bellerica)* is a one of the component of the famous formulation *Triphala*. In Bhavprakash Nighantu, *Triphala* is said to be *Pramehaghna*, not the *Vibhitaka*. Even though studies have established the antidiabetic effect *Terminalia bellerica.* As per study, continuous administration of 75 percent dried methanolic extract of fruit of *Terminalia bellerica* in alloxan induced diabetic rats showed significant antidaiabetic and antioxidant activity.[68]
53. ***Vridhadaruka-*** *Argyreia speciosa* (*Vridhadaruka*) is poorly available drug nowadays. As the study has shown that the ethanol and water extract of *Argyreia speciosa* root has endowed with anti-diabetic (single-dose one-day study and multi dose fifteen-day study), anti-hyperlipidaemic activity in standardized STZ-induced diabetic rats, justifying its use in DM.[69]

RESULT & DISCUSSION

50 *Dravyas* are listed in the Table but among them *Ashtavarga*, *Trikatu* and *Triphala* are groups of drugs. Except these three *Varga*, 47 single herbs are *Pramehahara Dravyas*. Among these drugs maximum number of drugs are from *Guduchayadi Varga* and maximum number of drugs having *Kaphapittashamaka* properties. *Pramehahara Dravyas* are mentioned as *Pramehaghna, Mehaghna, Pramehanut, Mehanut, Mehahara* etc. but none of them are given the name *Madhumehaghna*.

Among 47 single herbs, 43 are proven as antidiabetic as per studies done on animal models and human. Studies upon *Sarjaka* (*Vateria indica)*, *Tinduka* (*Diospyros embryopteris)* aren't done to confirm them as antidiabetic. *Amra Pushpa* (inflorescence of *Mangifera indica)* is mentioned as *Pramehahara* but such type of studies aren't done. Even though leaf extract of *Mangifera indica* has significant antidiabetic effect. Similarly *Pakwa Phala Kadali* (ripened banana) is mentioned as *Pramehahara* but has not be established even though it's peel and unripen fruit are proven as antidiabetic. Among *Triphala, Trikatu, Astavarga*, *Triphala* is proven as beneficial in DM clinically but studies aren't done upon *Trikatu* and *Astavarga*. Most of the herbs having active principles like glycosides, alkaloids, terpenes, saponins, etc. which were responsible for hypoglycaemic actions or antidiabetic effects but their mode of actions were varied. Some of them were beneficial in insulin resistance cases, some acted on beta cells, few of them were responsible for increase glucose tolerance, few drugs acted by inhibiting gluconeogenesis, few increasing the glycogen storage in the liver or decreasing the glucose release from the liver, while few had insulin mimetic actions.

CONCLUSION

Prameha is classified on the basis of color and characteristics of *Mutra* (urine). *Madhumeha* (Diabetes Mellitus) is a type of *Vataj Prameha*, which is more prevalent in present era. The drugs mentioned as *Pramehahara/ Mehaghna* etc. in Bhavaprakash Nighantu are not specifically mentioned as *Madhumehaghna* but their actions as antidiabetic are proven by various experimental and clinical studies. It is conceptualized that most of the *Mehaghna/Pramehaghna* drugs of Bhavaprakash Nighantu are identical for anti-diabetic properties and useful for management of Diabetes mellitus. These drugs could be taken for higher studies in term of clinical validation in future.

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