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Evidence -Based Ayurvedic Management of Diabetes Mellitus Type ii (Prameha): Case Study

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Abstract - One of the most prevalent illnesses or disorders that people experience over time is prameha. . It is growing daily and being passed down from one generation to the next. since it is a disorder brought on by dietary changes, changes in behaviors, and a sedentary lifestyle. Basically, vitiated vata and kapha are involved in this illness. This has an avarana of vata dosha on kapha dosha. Herbs related to kapha-ghana should be used medicinally to counteract vitiated kapha dosha. Haridrad ghan vati is chosen for this study because she is thought to have kapha ghana qualities. For three months (12 weeks), patients received oral Haridra Ghan Vati 125 mg twice-a-day treatment. A study showed that using haridra as a single medication therapy for diabetes control is both affordable and successful. It highlights Haridra's well-known anti-diabetic properties. This case study concerns a 45-year-old male patient who has been visiting an ayurvedic hospital in Wardha for at least a month. His primary complaints are polyurea, polyphagia, polydipsia, and general debility. Based on physical examination results and further studies, prameha (diabetes mellitus type-2) was diagnosed. Sanshamana aushadhi was used as part of the therapy regimen, which also included dietary and lifestyle changes. For a duration of three months, follow-up visits were conducted on a weekly basis. Substantial improvements were seen after three months of therapy.

Key words: Prameha , Diabetes mellitus, Aushadh , Hardidra ghan Vati ,Lifestyle, Diet.

Introduction

A group of metabolic diseases collectively referred to as diabetes mellitus are characterized by hyperglycemia, which is either due to insufficient insulin action or secretion, or both. Polyphagia, polydipsia, thirst, nocturia, weight loss, exhaustion, and the potential for diabetic ketoacidosis are among clinical features of this disease. A 2023 study by the Indian Council of Medical Research - India Diabetes (ICMR INDIAB) found that 10.1 crore people have diabetes.[1] Diabetes mellitus (DM) is classified by the World Health Organization as a variety of metabolic conditions characterized by prolonged

hyperglycemia and abnormalities in the metabolism of fat, carbs, and proteins.The following metrics are

used to measure blood and urine sugar levels: FBS, PPBS, FUS, PPUS, and Hba1c. Diabetes has side effects that include insulin delivery systems and oral anti-diabetic medications. However, it can be tied to the prameha line of treatment in Ayurveda. This study aims to validate the theoretically proposed treatment plan for prameha in real-world settings. Aim to determine the effectiveness of ayurvedic medicine in lowering blood and urine sugar levels. India is facing an increasing number of cases of diabetes, with 6.7% of people in the 40–70 age range expected to have the disease[2].It is the most prevalent disease in today's modern civilization. The modern lifestyle, which differs greatly from our traditional way of life, is the cause of it. Many factors, including fast urbanization, bad diets, tobacco use, sedentary lifestyles with longer life expectancies, are contributing to the rising prevalence of diabetes. Overweight and obesity are the main risk factors for diabetes. Maintaining a nutritious diet, engaging in regular physical activity, and changing one's behavior can help avoid or delay the effects of diabetes. Ayurveda states that the defining characteristics of prameha include increased volume and turbidity of urine. Urine tastes sweet, like honey in prameha. It can be classified into two types: vata vriddhi resulting from tissue depletion, or dhatu kshaya, and vata vriddhi induced by other doshas obstructing vata pathways. One of the major medications used to treat diabetes is haridra. It is mutra sangrahaniya, trishna hara, medohara, ushna gunatmak, katu, tikta rasatmak, and kledanashaka dravya. Haridra is utilized to treat respiratory conditions because it is a kapha vata nashaka. Since Haridra is Deepana, pachana, krimihara is effective in treating digestive issues. Because of its tiktarasa, it is pittashamaka. It functions as a purifier of blood. Because of its great therapeutic efficacy, it plays a significant role in itself. Numerous organs, including the kidney, heart, eyes, gums, feet, and blood arteries, can be affected by diabetes. One medicine that affects on several systems at once is called haridra. For those with diabetes, it is quite helpful. If diabetes mellitus is not managed, it can lead to a number of issues, including diabetic ketoacidosis, non-ketotic hyperosmolar coma, heart attack, stroke, nephropathy, foot ulcers, retinopathy, cataracts, and glaucoma [3]."Pramehoanushanginam," according to Acharya Charak, can be translated as "that which is present throughout life.As a result, we provide the best vihar, aahar, chikitsa, aushadh, and pathya. As per the Ayurvedic references to dosh—dushya and dehprakriti. It is believed that aahar is a part of the Trayoupasthambha. The primary cause of this illness is pathya aahar, which offers an abundance of proteins, vitamins, and minerals. Ayurveda primarily emphasizes a nutrient-rich diet to treat diabetes. Similar to how ayurvedic prameha can be connected with Type-2 diabetes, Pathya-Apathya also plays a supportive function in Yapya Vyadhi treatment. [4]

Aim and Objective:
To study the effect of haridra ghan vati followed by dietary and lifestyle changes in the treatment of prameha.

Case :
A 45-year-old male patient was contacted in January 2024 by the OPD of Kayachikitsa at the Mahatma Ghandhi Ayurvedic College & Research Centre Salod, Wardha, Maharashtra, citing signs and symptoms of increased frequency of micturition, burning at the sole, sweet taste in the mouth, excessive hunger, and excessive thirst. He was no stranger to working under pressure or occasional alcohol use.
Physical examination and initial investigations:
Physical Examination: BP -130/90 mmHg, HR -78/min ,Ht-168 cm ,Wt -75 kg ,BMI -26.6
Past history : The patient did not have a history of any kind Hypertension.
Drug history : No any kind of drug history .
Family history : No any kind of diabetes mellitus type ii family history.
Personal history : Based on the patient's medical history, it was found that although the patient is vegetarian, they have a history of eating an excessively rich and greasy diet, as well as a tendency of sleeping during the day. The patient has inconsistent bowel habits, with occasional hard stool and mild constipation occurring once every two days, and has an 5–6 micturition frequency during the day and 4-5 times at night.

Rogi Pariksha : Prakruti: PittaKapha ,Sara: Madhyama ,Satva: Madhyama ,Samhanana: Madhyama ,Kostha: Krura ,Agni: Vishama ,Pramana: Madhyama ,Aharashkti: Madhyama ,Jaranashakti: Madhyama ,Vyayamashakti: Madhyama ,Jihwa: Saama

Ashtavidha pariksha: Nadi : Vata Kapha ,Mutra: 5-6 times (day), 4-5 times(night) ,Mala : 2 time/day ,Jihwa : Saama ,Shabda : Spashta ,Sparsha Samshittoshna ,Druka: Prakruta ,Akruti : Madhyama

Clinical aspects:
The patient has been complaining about increased frequency of micturition, excessive appetite, excessive thirst, burning feeling at the sole, and sweet-tasting tongue. Based on physical examination results and further studies, prameha (type 2 diabetes) was diagnosed. He brought the same complaints and counsel to the Ayurvedic management section of Kayachikitsa OPD.

Study Design: Single case Study.

Material and Methods

Ayurvedic therapy: After carefully reviewing the case, we provided the following Ayurvedic treatment, along with some diatery changes.

Substances & Amount:

- Take two tablets of Haridra ghan vati (125mg) twice a day with warm water after meals.

I.**Particular Pathya:**

- Amalaki ,Yava, Methika,Sahajani, Karjura, Godhoom, Nimba, Kamala Shyamaka Karavellaka, Utpala, Kodrava Patola, Jangal Bajara ,Rasona, Mudga, Udumbar, Purana Sura, and Tikta Shaka ,Ingudi ,Goghrita.

II.**Pathya Vihar (favorable life style)-**

- Walk 3-5 kilometers or work out for 30 to 45 minutes every day.
- Chankramana, mild to moderate vyayama, udvartana, pranayama, yogasana etc.
- Mediation: Breathing exercises and meditation techniques are very helpful in managing stress. Consequently, they work in concert to treat diabetes. Popular inventions in this discipline are meditation techniques like the Sudarshana Kriya of Pandit Sri Sri Ravishankar and the transcendental meditation of Maharshi Mahesh Yogi.
- Yoga asana- following yogasana can be practiced-
- Halasana
- Mayurasana
- Suryananaskara
- Pranayama (Bhastrika).
- Pashchimotanasana
- Kurmaasana [5]

III.**Apathya Vivechana (unfavorable diet)** –

Dadhi, Dugdha, Guda Takra, Urada Ikshuvikara, Anoopa Mansa Madhur-Amla-Naveen Rasadi Sura Lavana Kapha-Meda Vardhak Aahara, Gramya-Audaka, Pista-Anna.

IV.Apathya Vihar (unfavorable life style)-

- Aasyasukha (pleasant sitting on a back-supporting chair or a moveable chair)
- Sukha-Asana,Sukha-Sayana,Diva-Sayana,Ati-Maithuna,Vegadharanad
- Madyapana (alcohol consumption)
- Excessive Shodhana
- Divashswapana (sleeping during the day)
- Ratrijagarana (waking in the night)
- Avyayama (avoidance of activity) [6]

Observations and Results:

For three months, the patient took Haridra ghan vati along with a particular Pathya and adhered to lifestyle adjustment on a daily basis. Follow-ups were conducted once every month. Clinical Symptoms, and other investigations were assessed after 3 month follow up .

Table 1 :Showing Investigations done before and after the treatment

	Normal range	Before Treatment (mg/dL)	After Treatment (mg/dL)
FBS (In mg/dl) Fasting blood Sugar	70-100 mg /dl	160 mg /dl	90 mg /dl
PPBS (In mg/dl) Post prandial blood Sugar	<180 mg /dl	269 mg /dl	160 mg /dl
RBS(Random blood sugar level)	125-200 mg /dl	280 mg /dl	164 mg /dl
HBA1C (in %)	4.4-5.7	7.5	6.0
Urine Sugar	0to0.8 mmol/L (millimoles per liter)	1.5% present	0.6% present

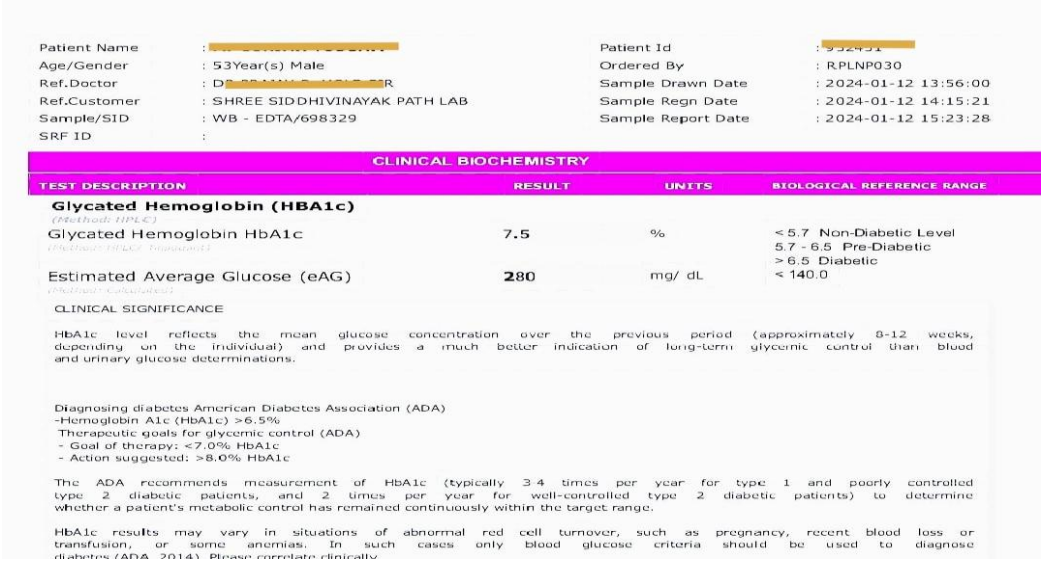
Table 2: Showing Subjective criteria

Symptoms	Before Treatment	After Treatment
Polyuria	5-6 times (day), 4-5 times(night)	3-4 times (day), 2-3 times(night)
Polydipsias	Present	Reduce
Polyphagia	boosted to five to four meals per day	1-3 meals each day with a normal appetite

Weakness	able to perform light duty and exercise	able to perform regular tasks and exercise
Burning and tingling of palms and soles	Tingling and burning sensation	Not burning or tingling

Lab investigation report :

- **Before treatment**



Patient Name	[redacted]	Patient Id	[redacted]
Age/Gender	: 53Year(s) Male	Ordered By	: RPLNP030
Ref.Doctor	: DR [redacted]	Sample Drawn Date	: 2024-01-12 13:56:00
Ref.Customer	: SHREE SIDDHIVINAYAK PATH LAB	Sample Regn Date	: 2024-01-12 14:15:21
Sample/SID	: WB - EDTA/698329	Sample Report Date	: 2024-01-12 15:23:28
SRF ID	:		

CLINICAL BIOCHEMISTRY

TEST DESCRIPTION	RESULT	UNITS	BIOLOGICAL REFERENCE RANGE
Glycated Hemoglobin (HBA1c) (Method: HPLC)			
Glycated Hemoglobin HbA1c	7.5	%	< 5.7 Non-Diabetic Level 5.7 - 6.5 Pre-Diabetic > 6.5 Diabetic
Estimated Average Glucose (eAG)	280	mg/ dL	< 140.0

CLINICAL SIGNIFICANCE

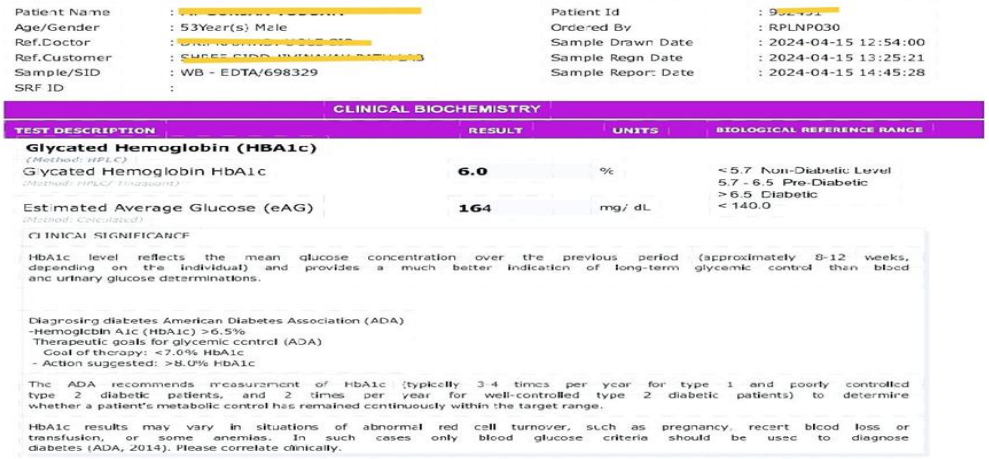
HbA1c level reflects the mean glucose concentration over the previous period (approximately 8-12 weeks, depending on the individual) and provides a much better indication of long-term glycemic control than blood and urinary glucose determinations.

Diagnosing diabetes American Diabetes Association (ADA)
-Hemoglobin A1c (HbA1c) >6.5%
Therapeutic goals for glycemic control (ADA)
- Goal of therapy: <7.0% HbA1c
- Action suggested: >8.0% HbA1c

The ADA recommends measurement of HbA1c (typically 3-4 times per year for type 1 and poorly controlled type 2 diabetic patients, and 2 times per year for well-controlled type 2 diabetic patients) to determine whether a patient's metabolic control has remained continuously within the target range.

HbA1c results may vary in situations of abnormal red cell turnover, such as pregnancy, recent blood loss or transfusion, or some anemias. In such cases only blood glucose criteria should be used to diagnose diabetes (ADA, 2014). Please correlate clinically.

- **After treatment**



Patient Name	[redacted]	Patient Id	[redacted]
Age/Gender	: 53Year(s) Male	Ordered By	: RPLNP030
Ref.Doctor	: [redacted]	Sample Drawn Date	: 2024-04-15 12:54:00
Ref.Customer	: [redacted]	Sample Regn Date	: 2024-04-15 13:25:21
Sample/SID	: WB - EDTA/698329	Sample Report Date	: 2024-04-15 14:45:28
SRF ID	:		

CLINICAL BIOCHEMISTRY

TEST DESCRIPTION	RESULT	UNITS	BIOLOGICAL REFERENCE RANGE
Glycated Hemoglobin (HBA1c) (Method: HPLC)			
Glycated Hemoglobin HbA1c	6.0	%	< 5.7 Non-Diabetic Level 5.7 - 6.5 Pre-Diabetic > 6.5 Diabetic
Estimated Average Glucose (eAG)	164	mg/ dL	< 140.0

CLINICAL SIGNIFICANCE

HbA1c level reflects the mean glucose concentration over the previous period (approximately 8-12 weeks, depending on the individual) and provides a much better indication of long-term glycemic control than blood and urinary glucose determinations.

Diagnosing diabetes American Diabetes Association (ADA)
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Discussion:

In India and other Asian countries, diabetes, sometimes referred to as prameha, is a highly prevalent illness. One of the main pramehaHara dravya in ayurveda is the single drug Haridra used in this study. It functions well as kapha pitta nashaka because of its rasa, guna, and virya attributes. It is also referred to as vatanashaka in the RajaNighantu and Nighantu Ratnakara Granthas. It can act as kapha shamaka because of its katu tikta rasa and ushna virya. According to ayurveda, Haridra possesses mahabhuta sanghatan, which combines the qualities of katu rasa vayu agni. As a result, it is extraordinarily wealthy in dravya ruksha, laghu tikshna, and ushna gunas. Prameha is easily affected by it because of its sukshma qualities. Mutra Sangrahana benefits from it because of its tikta rasa qualities. The ruksha characteristic of Haridra facilitates the effective absorption and lowering of meda, kleda, and lasika—which are often implicated in cases of Prameha.As a result, haridra is a highly effective Ayurvedic medication for treating prameha.

Curcumin inhibits hepatic glucose production and glycogen synthesis, which lowers blood glucose and glyacosylated haemoglobin levels. By upregulating the expression of the genes glucose transporter1, glucose transporter2, and glucose transporter3, it also improves the absorption of glucose [7].

Ayurvedic writings recommend amlaki churna and nectar in addition to Haridra powder while treating diabetes. It turns out to be a more effective dietary supplement when taken with milk. Curcuminoids lower lipid peroxidation by more notably preventing the actions of cancer-prevention agent proteins such glutathione peroxidase, catalase, and superoxide dismutase. Curcuminoids, glycosides, terpenoides, and flavanoids are all present in Curcuma longa. Human pancreatic amylase (HPA) was found to be most inhibited by the removal of isopropanol and CH3)2CO, which both reduce the hydrolysis of starch [8].

In healthy people, 125mg of Curcuma longa increased night time GI and blood sugar, however, are unaffected by blood glucose rates. The results suggest that curcumin may affect insulin secretion. The results suggest that curcumin may affect insulin secretion. Curcuminoids: The active ingredients in the root of the curcumin herb decrease lipid peroxidation and keep antioxidants like superoxide oxidase, peroxidase, and cysteine peroxidase effective at higher rates. Turmeric and its three constituents are crucial to Curcuma longa's oxidative characteristics.When combined with buttermilk, the powdered freeze-dried rhizome of Curcuma longa exhibits antidiabetic, hypocholesterolemic, and neuroprotective properties, suggesting that it could be used as a potentially very beneficial and safe dietary supplement for diabetes.[9]

Curcuma longa has been shown to contain flavonoids, terpenoids, glycosides, and curcuminoids. Human Pancreatic Amylase (HPA) was maximally inhibited by extracts of Curcuma longa in both isopropanol and acetone. Because of the inhibitory effect on HPA, there is less glucose breakdown, which results in lower sugar concentrations.

Sharangdhar says that Haridra is katuka, tikta, rukshya, ushna, kaphavataha, varnya, and panduvarnapah. so that it can be regularly incorporated into the diet.[10] Pathya & Apathya ahaar ,vihaar play very key role in treating prameha . Ayurveda values Yava: for its diuretic, cooling, and digestive qualities. It is thought to assist in balancing out excess Kapha and Pitta doshas, which are frequently linked to Prameha. Barley can help control blood sugar levels, promote renal function, and lessen frequent urination when added to the diet. Methika: Studies have shown that fenugreek seed extracts slow down the pace at which glucose is absorbed, have anti-diabetic properties, and prolong the emptying of the stomach. Its high fiber content, which lowers blood glucose and delays the breakdown of carbohydrates, mostly prevented the small intestine from absorbing as much glucose. Rasona:Blood sugar regulation is one of the benefits of rasona. It has ingredients like allicin, which may help lower blood sugar and increase insulin sensitivity.

Sahijan: Also referred to as the drumstick tree, moringa leaves have been utilized to treat diabetes mellitus in traditional medicine is Rasa-katu. The leaves are rich in many bioactive compounds, such as beta-carotene, vitamins B, C, and E, polyphenols, phenolic acids, alkaloids, tannins, saponins, oxalates, phytates, and antioxidants. According to ayurveda, it balances the elements of vata and kapha and contains the pungent moringa, biting tikta, guna - laghu rooksha teekshna, vipaka - katu, and veerya ushna. Yava: Yava is kashaya, rasa pradhana, madhura, ruksha, sheeta, and guru. It is ideal for krusha and sthoola pramehis since it is kaphahara, sthairyakara, and balya. for this reason, many yava preparations have been suggested.[5] Vyayama: Shareera ayasa is the result of any karma or bodily activity that is the person becomes klama, pipasa, ushna, sheeta, klesha saha, and vyayama is alasyahara, sthoulya apakarshana, and causes sthiratva laghuta & agnideepthi. To avoid injury, vyayama should only be done in accordance with a man's ardhashakti. Thus is best in prameha especially in sthoola & balavan. Most of the pathya in prameha have traits of kaphavatahara, tikta, kasaya, katu, rasa ushna veerya, laghu, ruksa guna, and katu vipaka.Thus, jathragni and dhatwagni's functions become more normalized because to ushna veerya and tikta kashaya rasa [5]. sConsequently, this facilitates the formation of dhatus commensurate with samyak attributes. Laghu Ruksa Guna aids in bahudrava shlesma soshan and the decrease in vitiated meda-kleda. As a result, once these elements return to normal in the body, vata's course becomes evident, halting the loss of essential dhatus and reestablishing normal physiology. Thus,prameha's illness is lessened. Treatment with ayurvedic medicine is beneficial when pathya & apathya ahaar,vihaar is used in accordance with dosha and dehprakriti. The choice of pathya is therefore the most effective subject for pramehi rugna.

Conclusion:

According to the current observational study, prameha is a prevalent illness in India. Haridra used orally is a useful medication for treating prameha. These treatments are readily available, reasonably priced, and used in ayurveda. In order to prevent problems, treatment for prameha, haridra ,should begin as soon as is practical. From the for going information, it can be inferred that appropriate usage of shamana aushadha, along with appropriate dietary and lifestyle modifications, can lead to ayurvedic management of prameha. In this case, shamanic treatments have been very effective; after a week, increased blood sugar levels decreased to the pre-diabetic range, and after 14 days, they were back

within normal range. More studies on a broader population can be conducted in order to validate the treatment plan.

However, further large-scale clinical studies with longer follow-up periods are recommended to validate these findings and establish stronger scientific evidence.

References :

1. The details are available at the followinlink https://www.thelancet.com/journals/landia/article/PIIS2213-8587(23)00119-5/fulltext
2. Heshmati HM. Interactions between COVID-19 infection and diabetes. Front Endocrinol (Lausanne). 2023;14:1306290. [PMC free article] [PubMed
3. Jameson J. Larry, Fauci Anthony S. et al; Harrison's Principles of Internal Medicine, 20th Edition, Volume-II; Diabetes mellitus: Complications, Chapter 398. New York: McGraw-Hill Education, 2018; p.2875.
4. Corresponding Author: Dr. Vinod Kumar Sidar P.G.Scholar, Department of Samhita Evam Sidhhant, Shri Narayan Prasad Awasthi Govt. Ayurved College Raipur (C.G.) Pin- 492001
5. Role of pathya-apathyain the management of prameha(type-2 diabetes mellitus. Mohit Sharma1*, Prem Prakash Vyas2, Harish Kumar Singhal3. Hand book of "Anupanu pathya & apathya" publication of "National institute of Indian medical heritage, Hyderabad. Central council for research in ayurvedic science, department of ayush. delhi.2012.
6. Y.Go. Joshi, charaka samitha pratham khanda vaidmitra prakashan pune.4th Sutrasthansthan, 2009; 17/79-81: 240.
7. Sharma P.Dravyagunavigyam,Vol. 2; 1993. Delhi, India:Chaukhamba Publications.
8. Ghorbani Z, Hekmatdoost A, Mirmiran P. Anti-hyperglycemic and insulin sensitizer effects of turmeric and its principle constituent curcumin. International journal of endocrinology and metabolism. 2014 Oct;12(4)
9. S. S. Hugar and R. Metgud, “Turmeric in Dentistry,” Int. J. Sci. Res., 2015.
10. https://journal.environcj.in/index.php/ ecj/article/view/433: D.K. Goyal and Rubi Rani Agarwal, Clinical evaluation of Haridra amalaki yoga in the management of madhumeha (Diabetes mellitus)
11. Karina Vargas- Sánchez et.al 2019 Effects of Moringa oleifera on Glycaemia and Insulin Levels: A Review of Animal and PMC6950081 www.wjpmr.com Human .
12. Article on Diabetes by WHO year-2019 (link-www.searo.who.int)
13. Mahavakara Madhav nidan English translation by K.R.Shrikant Krishnamurthy 1993 PRAMEHA
14. Vidhyadhara Shukla.Ravidatta Tripathi. Charaka Samhita of Acharya Charaka. Reprinted edition, Varanasi; Chaukhambha Sanskrit Pratishthan;2006.169p .
15. Bramhanand Tripathi.Madhav Nidana of Acharya Madhava.Varanasi;Chaukhambha Surbharati Pratishthana;2011.4p
16. Vidhyadhara Shukla.Ravidatta Tripathi. Charaka Samhita of Acharya Charaka. Reprinted edition. Varanasi; Chaukhambha Sanskrit Pratishthan;2006.168p 9. Bramhanand Tripathi.Madhav Nidana of Acharya Madhava.Varanasi;Chaukhambha Surbharati Pratishthana;2011.4p