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A Review Article on Ayurvedic Perspective on Diabetes Mellitus (*Madhumeha*): Bridging Ancient Wisdom and Modern Science

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Abstract: *Diabetes Mellitus (DM), a chronic metabolic disorder, has reached epidemic proportions globally, posing significant healthcare challenges. While conventional medicine focuses on glycemic control and complication management, Ayurveda, an ancient Indian system of medicine, offers a holistic understanding of this condition, referred to as Madhumeha. This review article aims to explore the Ayurvedic etiology, pathogenesis, classification, and comprehensive management strategies for Madhumeha, integrating modern scientific understanding with traditional wisdom. It delves into the principles of Ahara (diet), Vihara (lifestyle), Aushadha (herbal medicine), and Shodhana (purification therapies) as described in classical Ayurvedic texts, supported by contemporary research on their therapeutic efficacy. This article highlights the potential of an integrative approach to effectively manage diabetes and improve patient quality of life.*

Keywords: *Diabetes Mellitus, Madhumeha, Ayurveda, Prameha, Lifestyle, Herbal Medicine, Panchakarma, Integrative Medicine.*

I. INTRODUCTION

Diabetes Mellitus (DM) is characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The persistent high blood glucose levels lead to long-term complications affecting various organ systems, including cardiovascular disease, neuropathy, nephropathy, and retinopathy [10]. The global prevalence of diabetes is steadily rising, making it a major public health concern [10]. Despite significant advancements in modern pharmacology, a complete cure for diabetes remains elusive, and lifelong management is often required, often accompanied by side effects from prolonged medication use [11]. In parallel to modern medical science, traditional systems of medicine, particularly Ayurveda, have long recognized a condition strikingly similar to diabetes. In Ayurveda, this metabolic disorder is primarily known as *Madhumeha*, a subtype of a broader group of urinary disorders called *Prameha*. Ayurvedic texts, such as Charaka Samhita, Sushruta Samhita, and *Ashtanga Hridayam*, provide intricate details regarding its causation, symptomatology, prognosis, and treatment modalities, emphasizing a personalized, holistic approach that addresses the root cause of the imbalance rather than just symptom management [1,2,3]. This review aims to consolidate the Ayurvedic understanding of *Madhumeha* and explore its relevance in the Ayurveda describes *Prameha* as a group of 20 urinary disorders characterized by excessive and abnormal urination [1,2,3]. *Madhumeha* is considered the most severe and difficult-to-treat form of *Prameha*. The term *Madhumeha* literally translates to "sweet urine," a hallmark symptom akin to glucosuria in modern diabetes.

Ayurvedic texts classify *Prameha* based on the predominant *Dōsha* (biological humor) involved and the *Dushya* (body tissues/components) affected [1,2,3]:

- *Kaphaja Prameha* (10 types): Primarily due to vitiated *Kapha*, characterized by heavy, turbid, and profuse urine. These are generally curable.
- *Pittaja Prameha* (6 types): Due to vitiated *Pitta*, characterized by urine with various colors (blue, yellow, red), burning sensation, and often associated with fever. These are considered difficult to cure.
- *Vataja Prameha* (4 types): Due to vitiated *Vata*, particularly when other *Prameha* types are left untreated, or due to *Dhatu Kshaya* (tissue depletion). *Madhumeha* falls under this category, characterized by clear, profuse, astringent-sweet urine, often accompanied by *Dhatu Kshaya*. These are generally incurable (*Asadhya*).

II. ETIOLOGY (NIDANA) OF MADHUMEHA

Ayurveda emphasizes the importance of *Nidana* (causative factors) in understanding and managing disease [1]. The *Nidana* for *Prameha*, and thus *Madhumeha*, are broadly categorized into:

- Ahara (Dietary Factors)

- Excessive intake of *Madhura* (sweet), *Snigdha* (unctuous/oily), *Guru* (heavy), and *Sheeta* (cold) foods.
- Consumption of *Navanna* (new grains), *Nava Madya* (newly fermented alcohol), and *Dadhi* (curd) in excess.
- Lack of proper digestion and metabolism of food.

- Vihara (Lifestyle Factors)

- *Avyayama* (lack of physical activity/sedentary lifestyle).
- *Ati Nidra* (excessive sleep, especially daytime sleep or *Divaswapna*).
- *Asyasukham* (comfort of sitting/luxurious lifestyle).
- *Chinta* (excessive worry) and *Shoka* (grief) leading to mental stress.

- Other Factors

- *Beeja Dosha* (hereditary predisposition): *Charaka Samhita* mentions a predisposition to *Prameha* if there are defects in the parental *Shukra* (sperm) or *Shonita* (ovum) [1].

Krimija (microbial factors, though their specific role in *Madhumeha* is debated in classical texts, some interpretations exist for certain urinary symptoms).

Pathogenesis (*Samprapti*) of *Madhumeha* The *Samprapti* of *Madhumeha* is complex and involves the vitiation of *Doshas* and *Dushyas* [1,2,3].

- *Kapha and Meda* Predominance: Initially, due to the *Nidanas*, *Kapha and Meda Dhatu* (fat tissue) are aggravated. This leads to *Agnimandya* (weakened digestive fire) and accumulation of *Ama* (undigested toxins).

- Vitiation of *Dushyas*: The aggravated *Kapha* and *Meda* along with other *Dushyas* like *Rasa* (plasma), *Mamsa* (muscle), *Majja* (bone marrow), *Shukra* (reproductive tissue), *Oja* (vital essence), *Ambu* (body fluids/water), *Vasa* (muscle fat), and *Lasika* (lymph) get displaced and travel through the *Mutravaha Srotas* (urinary channels).

- Localization in *Basti*: These vitiated *Doshas* and *Dushyas* localize in the *Basti* (urinary bladder), leading to the characteristic excessive and sweet urination.

- *Vata Prakopa* and *Dhatu Kshaya*: If *Prameha* is neglected or improperly managed, the vitiated *Kapha* and *Pitta* further obstruct the channels, leading to *Vata Prakopa* (aggravation of *Vata*). *Vata*, being mobile and dry, starts to deplete the *Dhatu* (tissues) and *Oja*, leading to severe *Dhatu Kshaya* (tissue wasting) and transforming into *Madhumeha*. This *Dhatu Kshaya* contributes to the characteristic dryness and emaciation seen in some diabetic patients (skin to Type 1 DM or advanced Type 2 DM).

- *Shloka* Reference: *Charaka Samhita, Nidanasthana* 4/44-45 describes how aggravated *Kapha and Pitta* initially block the channels, which then lead to *Vata's* affliction and *Dhatu Kshaya*, culminating in *Madhumeha* [1] When *Vata*, becoming powerful due to *Dhatu Kshaya* in all types of *Prameha*, dries up the *Dhatu*, then it becomes *Madhumeha*."

Prodromal Symptoms (*Purvaroop*) and Symptoms (*Lakshana*) Ayurveda meticulously describes the early warning signs (*Purvaroop*) that can indicate the impending onset of *Prameha*, emphasizing early intervention [1,2,3]:

- General *Purvaroop*: Excessive sweating, body odor, feeling of stickiness all over the body, lassitude, dryness of mouth and throat, burning sensation in hands and feet, desire for cold things, excessive thirst and hunger, frequent urination, appearance of ants around the urine, sensation of heaviness in the body, debility.

- Specific *Madhumeha* *Lakshana*:

- *Madhura Mutrata*: Sweetness of urine, attracting ants.
- *Ati Mutrata*: Excessive urination (polyuria).
- *Karapada Daha*: Burning sensation in hands and feet (neuropathy).
- *Pipasa Adhikya*: Excessive thirst (polydipsia).

- Kshudha Adhikya: Excessive hunger (polyphagia).
- Kleda Adhikya: Excessive moistness/stickiness of the body.
- Sharira Shaithilya: Looseness or flabbiness of the body.
- Daurbalya: Weakness and fatigue.
- Pindaka: Boils and carbuncles (diabetic ulcers/infections).

Modern Understanding of Diabetes and Ayurvedic Correlation Modern medicine classifies diabetes into

Type 1 DM (autoimmune destruction of beta cells, leading to absolute insulin deficiency) and Type 2 DM (insulin resistance and/or relative insulin deficiency) [11]. Gestational diabetes and other specific types also exist.

- Type 2 DM and Kapha-Meda predominance: The Santarpanottha Prameha (diseases due to over-nourishment) described in Ayurveda, especially Sthula Pramehi (obese diabetic) with dominant Kapha and Meda involvement, strongly correlates with Type 2 DM, where obesity and insulin resistance are key features. The initial phase of Prameha in Ayurveda, characterized by Kapha vitiation and accumulation of Meda, aligns with the early stages of insulin resistance [1,3].
- Type 1 DM and Vata-Dhatu Kshaya: The Krisha Pramehi (emaciated diabetic) and the progression to Madhumeha with Dhatu Kshaya (tissue wasting) due to Vata vitiation in Ayurveda resonates with Type 1 DM, where there's significant destruction of pancreatic beta cells leading to tissue depletion [1,3].
- Complications: Ayurvedic descriptions of Prameha Pidaka (diabetic carbuncles/boils), Karapada Daha (neuropathy), and Daurbalya (general weakness) align well with the recognized complications of chronic hyperglycemia in modern medicine [1,2,3].

III. AYURVEDIC MANAGEMENT PRINCIPLES (CHIKITSA SUTRA)

Ayurvedic treatment of Madhumeha is multifaceted, aiming to restore Dosha balance, normalize metabolism (Agni), eliminate toxins (Ama), and strengthen tissues (Dhatus) [1,3]. The general principles for Prameha are:

- Apatarpana (Depletion Therapy): For Sthula Pramehi (obese type), reducing excessive Kapha and Meda through therapies that cause depletion.
- Brumhana (Nourishment Therapy): For Krisha Pramehi (emaciated type) or advanced Madhumeha with Dhatu Kshaya, providing nourishment to rebuild.
- Shodhana (Purification Therapies): Detoxification through Panchakarma procedures.
- Shamana (Palliative Therapies): Internal and external medications to balance Doshas.
- Pathya-Apathya (Wholesome and Unwholesome Practices): Strict adherence to dietary and lifestyle regimens.

A. Ahara (Dietary Management)

Diet forms the cornerstone of Ayurvedic diabetes management [1,3]. The focus is on foods that are Ruksha (dry), Laghu (light), Tikta (bitter), Kashaya (astringent), and Katu (pungent).

- Grains: Old Shali (rice), Yava (barley), Godhuma (wheat), Shyamaka (barnyard millet), Kodrava (kodo millet).
- Pulses: Mudga (green gram), Kulattha (horse gram), Chana (chickpea).
- Vegetables: Bitter gourd (Karela), Fenugreek leaves (Methi), Drumstick (Shigru), Turmeric (Haridra), Amla (Amalaki), Neem (Nimba) leaves, leafy greens.
- Fruits: Amla, Jamun (Indian blackberry), Bilva (Bael fruit).
- Avoid: New grains, excessive sweets, jaggery, milk and milk products (especially curd), oily/fried foods, root vegetables (like potato), excessive intake of meat and fish.
- Shloka Reference (Diet for Prameha): Ashtanga Hridayam, Chikitsasthana 12/26 [3]: "Astringent, pungent, and bitter, light foods are beneficial for all Prameha patients; barley, wheat, and shali rice are also beneficial."

B. Vihara (Lifestyle Modifications)

Lifestyle changes are crucial to prevent and manage Madhumeha [1,3].

- Vyayama (Physical Activity): Regular and appropriate exercise, especially brisk walking, yoga, and other physical activities that stimulate metabolism and reduce Kapha and Meda.
- Avoid Divaswapna (Daytime Sleep): Known to aggravate Kapha and Ama.
- Adequate Sleep: Proper night sleep (7-8 hours) is important for hormonal balance.

C. Aushadha (Herbal Formulations)

Ayurveda employs a vast array of single herbs and complex polyherbal formulations [4]. Key categories of herbs used for Madhumeha include:

- Antidiabetic (Pramehaghna):
 - Guduchi (*Tinospora cordifolia*): Known for its immunomodulatory and antidiabetic properties. It helps reduce glucose levels and protect organs [5].
 - Haridra (*Curcuma longa*): Turmeric, well-known for its anti-inflammatory and antioxidant effects, also helps in glucose metabolism [5,6].
 - Amalaki (*Emblica officinalis*): Rich in Vitamin C, antioxidant, and helps regulate blood sugar [4].
 - Jamun (*Syzygium cumini*): Especially the seeds, known to reduce blood glucose and glycosuria [5,7].
 - Karela (*Momordica charantia*): Bitter gourd, directly lowers blood sugar [5,6].
 - Methi (*Trigonella foenum-graecum*): Fenugreek seeds, improve glucose tolerance [5].
 - Gudmar (*Gymnema sylvestre*): "Sugar destroyer," reduces sugar craving and absorption [5,6].
 - Neem (*Azadirachta indica*): Bitter, purifies blood, and helps in sugar control [4].
 - Shilajit (*Asphaltum punjabianum*): A mineral pitch, rejuvenates, and helps manage Prameha and its complications [4].

● Formulations:

- Nishamalaki: A combination of Nisha (Turmeric) and Amalaki (Indian Gooseberry).
- Chandraprabha Vati: A classical formulation used for various urinary disorders, including Prameha [4].
- Vasant Kusumakar Rasa: A potent herbo-mineral formulation used in severe cases of diabetes and its complications [4].
- Triphala: Balances Doshas, detoxifies, and supports overall health [4].

○ Asanadi Kwatha, Lodhradi Churna. Scientific Basis of Herbal Actions

Modern research has corroborated the antidiabetic effects of many Ayurvedic herbs. For example:

- *Gymnema sylvestre*: Contains gymnemic acids that suppress sugar taste receptors and reduce intestinal glucose absorption [6].
- *Momordica charantia*: Contains charantin, insulin-like peptides, and alkaloids that exhibit hypoglycemic activity [6].
- *Curcuma longa* (Curcumin): Improves insulin sensitivity, reduces oxidative stress, and has anti-inflammatory effects [6].
- *Syzygium cumini*: The seeds contain alkaloids, glycosides, and flavonoids that show hypoglycemic and hypolipidemic effects [7].

D. Shodhana (Panchakarma Therapies)

Panchakarma (five detoxification therapies) are crucial for deeply cleansing the body and eliminating accumulated Doshas [1,3]. The choice of Panchakarma depends on the patient's Prakriti (constitution), Vikriti (imbalance), and the stage of the disease.

- Vamana (Therapeutic Emesis): Indicated for Sthula Pramehi with dominant Kapha accumulation. It removes excess Kapha and Ama from the upper gastrointestinal tract.
- Virechana (Therapeutic Purgation): Beneficial for Prameha with Pitta dominance or associated liver/bile disorders. It eliminates toxins through the bowel.
- Basti (Medicated Enema): Particularly useful for Krisha Pramehi or where Vata is highly aggravated and Dhatu Kshaya is prominent. Different types of Basti (e.g., Niruha and Anuvasana Basti) are used to nourish tissues and balance Vata.
- Udvartana (Powder Massage): A dry powder massage that helps reduce subcutaneous fat, improve circulation, and stimulate metabolism, beneficial for Sthula Pramehi.
- Lekhana Basti: Specific Basti formulations aimed at reducing Meda Dhatu.

IV. CASE STUDY

Approach in Ayurvedic Management While specific patient details cannot be provided due to... (text cuts off) ...study for Madhumeha would involve:

- Detailed History Taking: Including dietary habits, lifestyle, family history, mental state, and all symptoms (Ayurvedic and modern).
- Ashta Vidha Pariksha (Eight-Fold Examination): Pulse, urine, stool, tongue, voice, touch, eyes, and general appearance.

- Dasha Vidha Pariksha (Ten-Fold Examination): Constitution (Prakriti), pathological state (Vikriti), essence of tissues (Sara), compactness of body (Samhanana), body measurements (Pramana), adaptability (Satmya), mental strength (Sattva), digestive power (Ahara Shakti), exercise capacity (Vyayama Shakti), and age (Vaya).
- Diagnosis and Prognosis: Based on Dosha-Dushya involvement and Lakshanas.
- Personalized Treatment Plan: Tailored to the individual, including:
 - Panchakarma: If indicated (e.g., Vamana for high Kapha, Basti for Vata aggravation).
 - Shamana Aushadha: Specific herbal or herbo-mineral formulations.
 - Pathya-Apathya: Detailed dietary and lifestyle recommendations.
 - Yoga and Pranayama: Specific asanas (e.g., Paschimottanasana, Ardha Matsyendrasana) and breathing exercises (e.g., Kapalbhata, Nadi Shodhana).
- Follow-up and Monitoring: Regular assessment of symptoms, blood glucose levels, and overall well-being.
- Example Outcome: A patient with newly diagnosed Type 2 DM (Sthula Madhumeha) might respond well to a combination of Vamana, Udvartana, Nishamalaki, Guduchi, and strict dietary and lifestyle changes, showing significant reduction in blood sugar and weight, and improved energy levels [8,9].

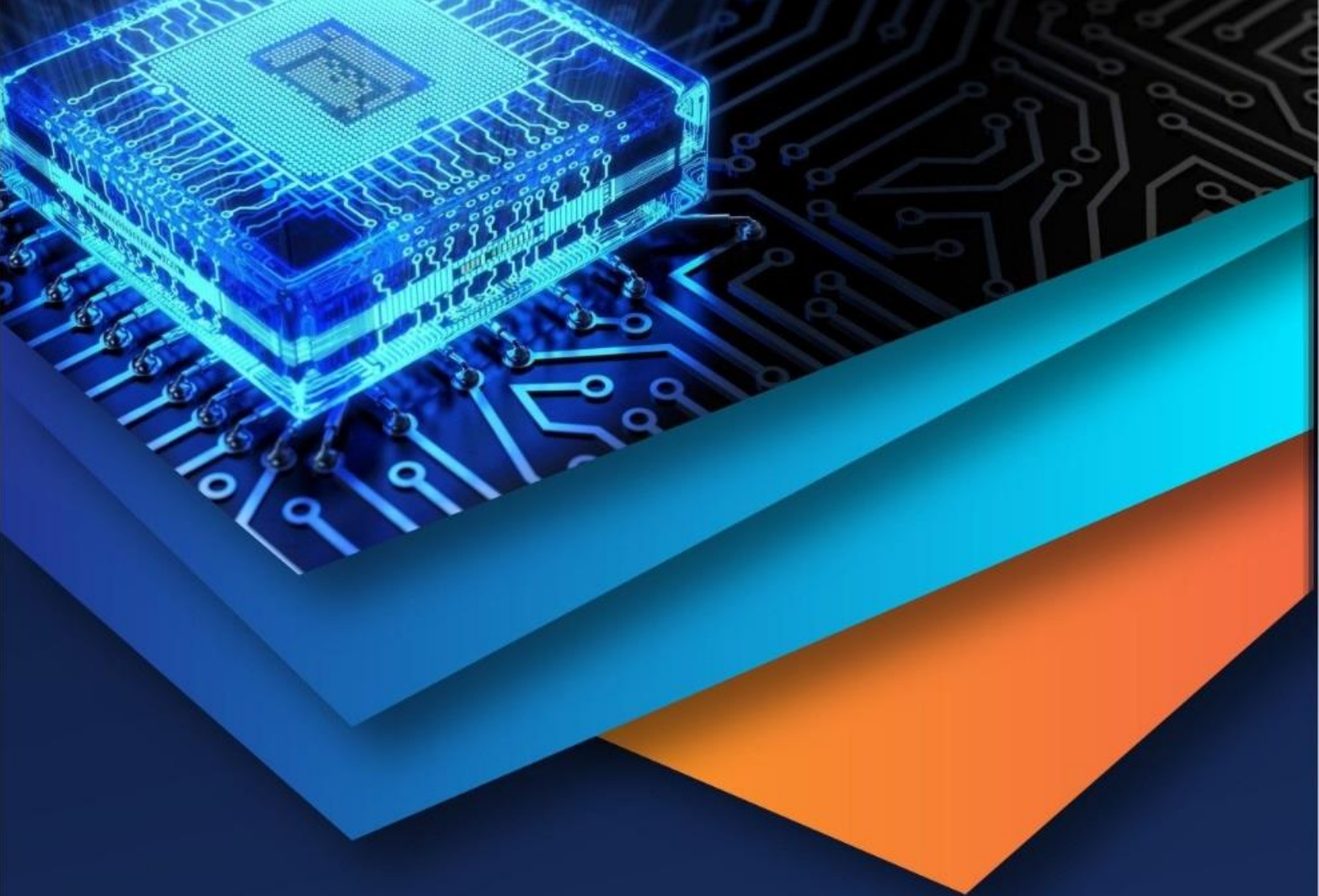
V. CONCLUSION AND FUTURE

Directions Ayurveda offers a profound and holistic understanding of Diabetes Mellitus, viewing it as a complex metabolic disorder rooted in imbalances of Doshas and Dhatus, significantly influenced by diet and lifestyle. The Ayurvedic approach, with its emphasis on personalized treatment, encompasses comprehensive dietary modifications, lifestyle regulations, potent herbal formulations, and deep cleansing Panchakarma therapies.

- 1) Well-designed, large-scale clinical trials to validate the efficacy of specific Ayurvedic formulations and Panchakarma procedures in diabetes management.
- 2) Mechanistic studies to elucidate the pharmacological actions of Ayurvedic herbs at a molecular level.
- 3) Studies on the long-term impact of integrated Ayurvedic-modern approaches on diabetes progression and complication prevention.
- 4) Developing standardized Ayurvedic protocols for different stages and types of Madhumeha that can be integrated into mainstream healthcare. By embracing the wisdom of Ayurveda, we can move towards a more comprehensive and sustainable approach to combat the global burden of diabetes.

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