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EXPLORING MADHUMEHA: AN AYURVEDIC INSIGHT INTO PATHOPHYSIOLOGY OF TYPE 2 DIABETES MELLITUS

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ABSTRACT

Madhumeha, a *Vataja* variety of *Prameha* and one of the *Ashta Mahagada*, closely resembles Type 2 Diabetes Mellitus, a chronic metabolic disorder marked by insulin resistance and progressive beta-cell dysfunction. India carries one of the largest diabetes burdens in the world, and changes in diet and lifestyle are major drivers. This conceptual study of *Madhumeha* with special reference to Type 2 Diabetes Mellitus is based on classical Ayurvedic texts such as the *Brihattrayi*, *Madhava Nidana*, *Sharangadhara Samhita* and *Yogaratnakara*, and on contemporary medical literature, including a standard textbook, the International Diabetes Federation Diabetes Atlas, the American Diabetes Association Standards of Care and key articles. The *Nidana*, *Purvarupa*, *Rupa*, *Samprapti*, *Upadrava* and *Chikitsa* of *Madhumeha* were collated and compared with the risk factors, pathophysiology, diagnosis and complications of Type 2 Diabetes Mellitus. *Madhumeha* corresponds to Type 2 Diabetes Mellitus at several levels. *Santarpana Nidana* and the increase of *Kapha*, *Meda* and *Kleda* parallel overnutrition, obesity and insulin resistance. *Prabhuta Mutrata*, *Pipasa-adhikya* and *Kshudha-adhikya* correspond to polyuria, polydipsia and polyphagia, and the *Upadrava* correspond to the micro and macrovascular complications. The classical concept of *Madhumeha* offers a useful framework for understanding Type 2 Diabetes Mellitus as a disorder of *Kapha-Meda* excess that progresses to *Vata*-predominant depletion.

KEYWORDS: *Madhumeha*, *Prameha*, Type 2 Diabetes Mellitus, *Samprapti*, *Avarana*, *Dhatukshaya*.

1. INTRODUCTION

Health is maintained through the proper practice of *Ahara*, *Vihara*, *Dinacharya* and *Ritucharya*. If it is not attained there will be prevalence of lifestyle disorders and *Madhumeha* is one among them. Because of its chronicity and severity, *Madhumeha* has been included among the *Ashta Mahagada*.[1]

Madhumeha is a *Kapha-pradhana Tridoshaja Vyadhi* involving many *Dushyas*, including *Rasa*, *Rakta*, *Mamsa*, *Meda*, *Kleda*, *Vasa*, *Majja*, *Lasika*, *Shukra* and *Ojas*.[2] On the basis of its clinical features and pathogenesis it is closely correlated with Type 2 Diabetes Mellitus.

Type 2 Diabetes Mellitus is a chronic metabolic disorder characterised by persistent hyperglycaemia resulting from impaired insulin secretion, insulin resistance, or both. It presents with polyuria, polydipsia, polyphagia, recurrent infections and weight loss, and, if uncontrolled, may lead to retinopathy, nephropathy, neuropathy, cardiovascular disease and diabetic foot.[3] According to the International Diabetes Federation (IDF) Diabetes Atlas (11th edition), about 10.5% of adults in India, an estimated 89.8 million people aged 20–79 years, were living with diabetes in 2024, which makes it a major public health concern.[4]

Despite great advances in modern medicine, there is still a need for treatment that controls diabetes effectively, is safe for long-term use and supports the overall health of the patient. A clear conceptual understanding of how the classical description of *Madhumeha* relates to the modern understanding of Type 2 Diabetes Mellitus is important. This article therefore reviews *Madhumeha* in the light of Type 2 Diabetes Mellitus.

The aim of this article is to make a conceptual study of *Madhumeha* with special reference to Type 2 Diabetes Mellitus. Its objectives are to review the *Nidana*, *Purvarupa*, *Rupa*, *Samprapti*, *Upadrava* and *Chikitsa* of *Madhumeha* from the classical texts; to review the epidemiology, pathophysiology, diagnosis and complications of Type 2 Diabetes Mellitus; and to correlate the Ayurvedic concept of *Madhumeha* with Type 2 Diabetes Mellitus and identify points for further research.

Classical references on *Madhumeha* and *Prameha* were compiled from the *Brihattrayi* (*Charaka*, *Sushruta* and *Ashtanga Hridaya Samhitas*), *Madhava Nidana*, *Sharangadhara*

Samhita and *Yogaratnakara*. Modern references were taken from a standard textbook of internal medicine, the International Diabetes Federation Diabetes Atlas, the American Diabetes Association Standards of Care in Diabetes and peer-reviewed articles on the pathophysiology and complications of Type 2 Diabetes Mellitus. The material is arranged under the headings of *Nidana*, *Purvarupa*, *Rupa*, *Samprapti*, *Bheda*, *Sadhyasadhyata*, *Upadrava* and *Chikitsa* and compared point by point with the corresponding modern concepts.

2. AYURVEDIC REVIEW OF MADHUMEHA

2.1 Nirukti and definition

The word *Prameha* is made of *Pra*, meaning excess, and *Meha*, meaning the passing of urine; it denotes a disease in which urine is passed in excessive quantity and is abnormal in its qualities (*Prabhuta Avila Mutrata*). In *Madhumeha*, *Madhu* (honey) indicates that the urine is sweet and honey-like in its properties, together with the astringent, dry quality that the classics attribute to the *Vataja* type.[1,2] *Madhumeha* is the *Vataja* variety of *Prameha* and is also used as the general name for the condition when it has advanced to the *Dhatukshaya* stage.

2.2 Description in the classics

Acharya Charaka explained the *Nidana*, *Purvarupa*, *Samprapti*, *Lakshana*, *Upadrava* and *Chikitsa* of *Prameha* in detail, and in the *Sutrasthana* gave a unique account of the *Avaranaja Samprapti* of *Madhumeha*.[2,5] *Acharya Sushruta* described the types of *Prameha* and the *Prameha Pidaka* elaborately.[6] *Acharya Vagbhata* included *Madhumeha* among the *Ashta Mahagada* and classified it into *Dhatukshayajanya* and *Avaranajanya* types.[1,7] *Madhava Nidana* describes *Prameha* with *Prameha Pidaka* in a separate chapter[8], *Yogaratnakara* gives *Prameha* and *Madhumeha* with their *Chikitsa* in the *Uttarardha*[9], and *Sharangadhara Samhita* mentions twenty types of *Prameha* in the *Purva Khanda*.[10]

2.3 Nidana (aetiology)

The causes of *Prameha* described by *Acharya Charaka* share one property: they increase *Kapha*, *Meda* and *Kleda* together.[2] They can be grouped as shown in Table 1. The classics also recognise two broad origins of the disease: *Sahaja* (hereditary, from *Beejadosha*) and *Apathyanimittaja* (acquired through faulty diet and lifestyle).[11]

Table 1: Nidana of Prameha and Madhumeha.

Category	**Factors**
Aharaja (dietary)	*Dadhi* (curd), meat-soups of *Gramya*, *Anupa* and *Audaka* animals, *Payamsi* (milk and milk products), *Navanna* (new grains), *Nava Pana* (fresh drinks), *Guda-vaikruta* (jaggery and sugar preparations) and everything that increases *Kapha*
Category	**Factors**
Viharaja (lifestyle)	*Asya-sukha* (sedentary habit), *Swapna-sukha* (excess sleep), *Avyayama* (lack of exercise), *Alasya* (inactivity)
Sahaja (hereditary)	*Beejadosha* from the parents (*Kulaja*), corresponding to family history

These are typical *Santarpana* causes. Over-nourishment produces more *Rasa* than the tissues can use; the unused part stagnates as *Ama*, *Kapha* and *Kleda* and is deposited as loose, unbound *Meda*.[12] *Acharya Charaka* also lists *Atisthula* among the eight constitutions that are censured, and obesity is a recognised ground for *Prameha*.[13]

2.4 Purvarupa and Rupa

The premonitory features (*Purvarupa*) include sticky coating of the teeth, mouth and body (*Danta-adi Malopadeha*), burning of the palms and soles (*Karapada Daha*), dryness of the mouth, palate and throat, excessive thirst (*Pipasa*), a sweet taste in the mouth, matting of the hair (*Kesha Jatilata*), excessive sweating (*Atisweda*), body odour (*Anga Gandha*), lethargy (*Alasya*) and attraction of ants and insects to the body and urine.[2]

The cardinal feature (*Rupa*) is *Prabhuta Avila Mutrata*, the passing of urine that is excessive in quantity and turbid in appearance, and in *Madhumeha* the urine is sweet in taste. When the disease reaches the *Dhatukshaya* stage, the features of *Vata* aggravation and depletion appear that are emaciation (*Karshya*), weakness (*Daurbalya*), increased thirst, and hunger (*Pipasa-adhikya* and *Kshudha-adhikya*).[7]

2.5 Samprapti (pathogenesis)

Charaka names the *Dushyas* of *Prameha* in the following verse[2]:

[illegible]

[illegible]

(Ch. Ni. 4/7)

The sequence can be summarised as follows. The *Nidana* aggravate *Kapha* and weaken *Jatharagni* and *Medodhatvagni*. Weak *Agni* produces *Ama* and an excess of poor-quality *Meda*, which combines with *Mamsa* and *Shariraja Kleda* (*Bahu-abaddha Meda*). This mass vitiates

the *Medovaha* and *Mutravaha Srotas*, reaches the *Basti*, and produces *Prameha* by *Dosha-Dushya Sammurchana*. The classics describe two pathways for *Madhumeha*[5,7]:

- ***Avaranajanya Madhumeha*:** *Vata* is obstructed (*Avrita*) by *Kapha* and *Pitta* along with *Meda*, *Mamsa* and *Kleda*. The mass blocks the *Srotas* and prevents normal *Dhatu Poshana*, and the obstructed *Vata* then draws *Ojas* downwards to the *Basti*. This is the pathway of the *Sthula* (obese) *Pramehi*, produced by *Santarpana*.

- ***Dhatukshayajanya Madhumeha*:** Repeated loss of *Dhatus* and *Ojas* through urine aggravates *Vata* by depletion (*Dhatukshaya*), and *Vata* in turn carries *Ojas* into the *Basti*. This is the pathway of the *Krisha* (lean) *Pramehi*, produced by *Apatarpana* and by chronic disease.

Table 2: Samprapti Ghataka of Madhumeha.

Ghataka	Description
Dosha	*Kapha* (pradhana), *Pitta* and *Vata*; *Vata* predominates in *Madhumeha* and in the *Dhatukshaya* stage
Dushya	*Meda*, *Mamsa*, *Kleda*, *Rasa*, *Rakta*, *Vasa*, *Majja*, *Lasika*, *Shukra*, and *Ojas*
Agni	*Jatharagni* and *Medodhatvagni Mandya*
Srotas	*Mutravaha* and *Medovaha*
Srotodushti	*Sanga* (obstruction) in the *Avarana* pathway and *Atipravritti* (excessive flow) of urine
Adhishthana	*Basti*
Rogamarga	*Madhyama*
Svabhava	*Chirakari* (chronic)
Sadhyasadhyata	*Madhumeha* as a *Vataja Prameha* is considered *Asadhya*; it can be kept under control (*Yapya*) by early and sustained management with *Pathya*

2.6 Bheda and Sadhyasadhyata

Prameha is classified into twenty types according to the *Dosha* involved: ten *Kaphaja*, six *Pittaja* and four *Vataja*.[2,10] *Madhumeha* is the *Vataja* type also known as *Kshaudrameha*. The *Kaphaja* types are *Sadhya*, the *Pittaja* types are *Yapya* and the *Vataja* types are *Asadhya*.[8] This progression from *Kaphaja* to *Pittaja* to *Vataja* describes the natural course of the disease from a state of excess to a state of depletion.

2.7 Upadrava

The complications of *Prameha* include *Trishna*, *Atisara*, *Jwara*, *Daha*, *Daurbalya*, *Aruchi* and *Avipaka*, and the *Prameha Pidaka*, a group of boils and carbuncles that occur at the *Marma*

and in fleshy parts of the body.[6,11]

2.8 Chikitsa

The basic principles of management are *Nidana Parivarjana* (avoidance of causes), *Shodhana* and *Shamana*, chosen according to the strength of the patient and the *Dosha* involved.[7,11] The strong, obese patient with a predominance of *Kapha* and *Meda* (*Balavan, Sthula Pramehi*) is treated by *Apatarpana*, with *Shodhana* followed by *Shamana*. The weak, lean patient with *Dhatukshaya* (*Durbala*, *Krisha Pramehi*) is treated by *Shamana* and *Brimhana*, because strong depleting measures would further aggravate *Vata*. *Pathya* has a central place: barley (*Yava*), green gram (*Mudga*), foods with *Tikta*, *Katu* and *Kashaya Rasa*, regular exercise (*Vyayama*) and *Udvartana* are advised, while *Guru*, *Snigdha*, sweet and *Abhishyandi* foods, curd, new grains, day sleep and inactivity are avoided.[9,11]

3. TYPE 2 DIABETES MELLITUS

3.1 Definition and epidemiology

Type 2 Diabetes Mellitus is a heterogeneous metabolic disorder characterised by chronic hyperglycaemia arising from a combination of insulin resistance and an inadequate compensatory insulin secretory response, and it accounts for the large majority of cases of diabetes.[3,14] India has the second largest number of adults with diabetes in the world, and the IDF Atlas projects a further steep rise by 2050.[4]

3.2 Risk factors

The main risk factors are overweight and obesity (especially central adiposity), physical inactivity, an energy-dense diet rich in refined carbohydrate, family history of diabetes, advancing age, a history of gestational diabetes and certain ethnic backgrounds, including South Asian populations.[3,14]

3.3 Pathophysiology

Type 2 Diabetes Mellitus results from two linked defects: insulin resistance in muscle, liver and adipose tissue, and a beta-cell insulin response that cannot compensate for it. Resistance usually comes first, but diabetes appears only when insulin secretion becomes inadequate.[15] Both arise from inherited susceptibility acting with obesity (especially central obesity) and inactivity, through raised free fatty acids, inflammatory adipokines and fat deposited in the liver and muscle.[3,15]

In the early stage the beta cell compensates with extra insulin, so glucose stays normal. Later

the early-phase response to meals is lost and post-prandial, then fasting, glucose rises, helped by excess hepatic glucose production, a reduced incretin effect and raised glucagon.[15] Persistent high glucose and free fatty acids (glucotoxicity and lipotoxicity), loss of beta-cell mass and islet amyloid damage the beta cell further, so the disease progresses from prediabetes to overt diabetes.[3,15]

3.4 Diagnosis

The diagnosis of diabetes and prediabetes follows the criteria of the American Diabetes Association (ADA) given in Table 3, which are based on glycated haemoglobin (HbA1c), fasting plasma glucose, 2-hour plasma glucose during a 75 g oral glucose tolerance test (OGTT) and random plasma glucose.[14] In the absence of unequivocal hyperglycaemia, diagnosis requires two abnormal test results, from the same sample or from two separate samples.

Table 3: ADA Criteria for Diabetes and Prediabetes (Standards of Care in Diabetes–2025).

Test	Diabetes	Prediabetes
HbA1c	≥ 6.5%	5.7–6.4%
Fasting plasma glucose	≥ 126 mg/dL (7.0 mmol/L)	100–125 mg/dL
2-hour plasma glucose, 75 g OGTT	≥ 200 mg/dL (11.1 mmol/L)	140–199 mg/dL
Random plasma glucose	≥ 200 mg/dL with classic symptoms of hyperglycaemia	—

3.5 Clinical features and complications

Classic symptoms are polyuria, polydipsia, polyphagia, fatigue, and weight loss, with recurrent skin and urinary infections; many patients are asymptomatic for years.[3] Chronic hyperglycaemia damages small and large vessels. The microvascular complications are retinopathy, nephropathy and neuropathy, and the macrovascular complications are coronary, cerebral, and peripheral arterial disease, which together with neuropathy and infection give rise to diabetic foot.

3.6 Management

Management rests on lifestyle measures (medical nutrition therapy, physical activity and weight reduction), glucose-lowering drugs started and escalated stepwise, regular monitoring of HbA1c, and screening for and treatment of complications and cardiovascular risk factors.[3,14] Long-term drug therapy is limited by adverse effects, cost, adherence and the progressive course of the disease, which is why complementary approaches are being explored.

4. CORRELATION OF MADHUMEHA WITH TYPE 2 DIABETES MELLITUS

The causes named in the classics, rich, sweet, and dairy-heavy food, no exercise and too much sleep, describe modern life, and *Sahaja Prameha* matches the way diabetes runs in families. *Santarpana*, taking in more than the body needs, is what modern medicine calls over-nutrition leading to excess fat and insulin resistance.[3,12,15]

The classical journey from *Kaphaja* to *Pittaja* to *Vataja Prameha* mirrors the move from insulin resistance to exhausted beta cells, and calling *Vataja Prameha Asadhya* reflects how hard the disease is to reverse once the tissues are damaged. This is a good reason for early care.[15] Behind these words is a real person who is thirsty, passes urine often and is hungry yet weak (*Pipasa-adhikya*, *Prabhuta Mutrata*, *Kshudha-adhikya*), with burning feet and boils that heal slowly (*Karapada Daha*, *Prameha Pidaka*), much like the nerve damage and infections of diabetes.

The classical plan treats the person and not only the disease: *Nidana Parivarjana*, then *Apatarpana* for the strong and heavy and *Brimhana* for the weak and thin. Modern care is similar, with weight reduction and exercise for the obese and early attention to nutrition and insulin in the lean.[11,14] The value of classical drugs and *Kashaya* formulations must still be shown in well-designed trials that use current diagnostic criteria, HbA1c and glucose values, and group patients as *Sthula* or *Krisha*. These correlations come from literature and are conceptual, not exact equivalents, and *Prameha* is a wider group than diabetes.

5. CONCLUSION

Madhumeha and Type 2 Diabetes Mellitus share a comparable set of causes, a similar course from excess to depletion, a closely matching clinical picture and a similar list of complications. The classical understanding of *Kapha-Meda-Kleda* excess leading to *Avarana*, and later to *Dhatukshaya* with *Vata* aggravation, offers a useful framework for explaining why Type 2 Diabetes Mellitus presents differently in *Sthula* and *Krisha* patients and why it progresses.

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