

Ayurvedic Management Principles in Madhumeha with Special Reference to Type 2 Diabetes Mellitus: A Narrative Review and Clinical Research Framework

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Abstract

Madhumeha, described within the broader Ayurvedic classification of Prameha, remains clinically relevant because it captures a chronic metabolic pattern that overlaps with type 2 diabetes mellitus, particularly in relation to excessive urination, altered tissue metabolism, Meda and Kleda disturbance, and progressive systemic involvement. Type 2 diabetes mellitus is now a major noncommunicable disease in India and globally. The International Diabetes Federation estimated that 589 million adults aged 20 to 79 years were living with diabetes in 2024, with a projected increase to 853 million by 2050. Indian epidemiological data from the ICMR INDIAB study reported approximately 101 million people with diabetes and 136 million with prediabetes, showing the scale of the metabolic burden in the country. Conventional diabetes care provides essential tools for diagnosis, glycaemic control, risk reduction, and complication screening, yet long-term adherence to diet, physical activity, weight control, stress regulation, and follow-up remains difficult in ordinary practice. Ayurveda offers a broader patient-centred framework through Nidana Parivarjana, Ahara, Vihara, Agni correction, Meda and Kleda regulation, Shamana Aushadha, and individualized clinical assessment based on Dosha, Dushya, Bala, Prakriti, Avastha, and Rogi Pariksha. This article reviews the classical Ayurvedic understanding of Madhumeha, correlates it cautiously with contemporary biomedical knowledge of type 2 diabetes mellitus, synthesizes available evidence on Ayurvedic interventions, and proposes a clinical research framework suitable for Kayachikitsa practice. The review argues that Ayurveda should not be presented as a simple substitute for modern diabetes care, but as a structured, lifestyle-centred and individualized system that may contribute to better metabolic discipline when applied with biochemical monitoring, safety assessment, and transparent research methodology.

1. INTRODUCTION

Madhumeha has always required more than a narrow symptomatic reading. In Kayachikitsa, it is not merely a disorder of frequent urination or sweet urine. It is a long-running disturbance in the way the body receives, transforms, distributes, stores, and eliminates nourishment. The classical description of Prameha gives attention to urine, but the disease field is much wider than urine alone. It involves Kapha, Meda, Mamsa, Kleda, Lasika, Mutra, Agni, Srotas, and the gradual weakening of metabolic steadiness. That is why Madhumeha continues to attract clinical interest in postgraduate Ayurveda. It allows the physician to think about diet, body weight, activity, digestion, sleep, tissue metabolism, hereditary tendency, patient strength, and the chronic nature of disease in one frame rather than treating each feature as a separate event.

Type 2 diabetes mellitus is similarly not a minor biochemical abnormality. It is a chronic metabolic disorder characterized by hyperglycaemia resulting from insulin resistance, inadequate insulin secretion, or both. Over time, uncontrolled diabetes contributes to damage of the heart, blood vessels, eyes, kidneys, nerves, and feet. The World Health Organization describes diabetes as a chronic

metabolic disease and emphasizes that management requires more than glucose lowering alone; blood pressure control, lipid management, foot care, kidney screening, and eye examination are also central to safe care (World Health Organization, 2024). This biomedical understanding is not identical to Madhumeha, and the two should not be forced into a perfect one-to-one equivalence. Still, the overlap is clinically meaningful enough to justify careful comparative discussion.

The scale of the problem makes the subject urgent. The International Diabetes Federation estimated that 589 million adults aged 20 to 79 years were living with diabetes in 2024, and projected that the number may rise to 853 million by 2050 (International Diabetes Federation, 2025). The ICMR INDIAB study reported an estimated 101 million people with diabetes and 136 million people with prediabetes in India, suggesting that the country is facing a very large pool of diagnosed disease, undetected disease, and high-risk metabolic states (Anjana et al., 2023). These numbers should not be read as abstract statistics. They mean more patients in ordinary outpatient departments with fatigue, disturbed sleep, obesity, neuropathic complaints, recurrent infections, uncontrolled appetite, anxiety about reports, and confusion about diet.

In the clinical setting, one of the persistent difficulties in type 2 diabetes care is not the absence of treatment options. Modern medicine has clear diagnostic criteria, glucose-lowering drugs, insulin, cardiovascular risk reduction strategies, and complication screening guidelines. The difficulty often lies in continuity. A patient may understand that diet matters, but routine eating patterns may be shaped by family meals, festivals, shift work, travel, late dinners, or easy access to refined carbohydrates. Another patient may be advised walking, yet knee pain, long working hours, unsafe roads, or low motivation may reduce adherence. A third patient may continue medicines but ignore foot care or eye screening. Madhumeha management in Ayurveda is useful here because it places daily conduct and individualized discipline at the centre of treatment instead of treating lifestyle as a small appendix to pharmacology.

The present article therefore examines Madhumeha as a clinically rich Ayurvedic construct and type 2 diabetes mellitus as a contemporary biomedical disorder with major public health relevance. The aim is not to claim that classical Ayurvedic categories and modern diagnostic categories are identical. A more honest position is that they speak in different theoretical languages about overlapping clinical realities. When this difference is respected, the comparison becomes more useful. Ayurveda can contribute through its attention to Nidana Parivarjana, Pathya Ahara, Vihara, Bala, Prakriti, Agni, Meda, Kleda, and long-term patient behaviour. Biomedical care contributes through diagnosis, glycaemic targets, complication screening, emergency management, pharmacovigilance, and measurable outcomes. A Kayachikitsa research article can be strong only when it brings these two forms of reasoning together without exaggeration.

2. RATIONALE AND NEED OF THE REVIEW

The rationale for reviewing Madhumeha in relation to type 2 diabetes mellitus rests on three connected concerns. The first is epidemiological. India now carries a large diabetes and prediabetes burden, and many people enter clinical care only when metabolic disturbance has already persisted for years. The second concern is clinical. Type 2 diabetes is highly sensitive to diet, weight, physical activity, sleep, stress, and medication adherence. A treatment plan that does not address these everyday factors remains incomplete even if it temporarily improves laboratory values. The third concern is methodological. Ayurvedic clinical practice has many concepts that are relevant to diabetes care, but research writing often weakens those concepts by either making overconfident claims or by reducing Ayurveda to a list of herbs. A more disciplined research article should explain the conceptual basis, discuss evidence, and propose measurable outcomes.

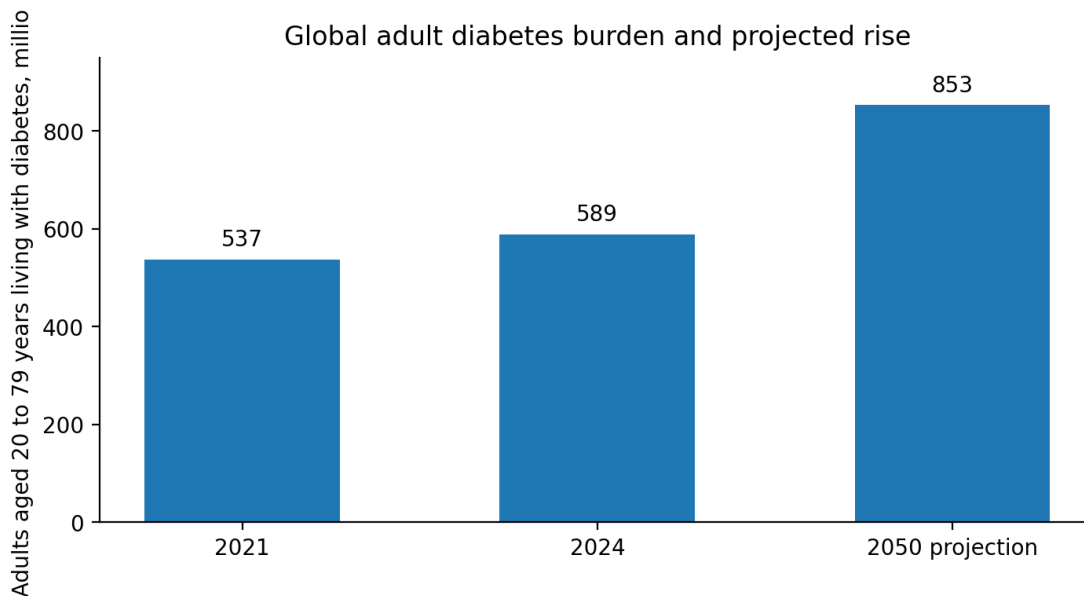
Postgraduate Kayachikitsa research has a particular responsibility in this area because it stands between classical textual understanding and contemporary clinical practice. A topic such as Madhumeha requires more than repeating classical

descriptions or copying biomedical diabetes information. The paper has to show how the Ayurvedic disease concept is structured, how the patient is examined, why certain therapeutic principles are chosen, how safety is monitored, and how outcomes can be measured without distorting Ayurvedic reasoning. For indexed journal publication, this balance matters. Reviewers usually look for conceptual clarity, current references, transparent methodology, cautious interpretation, and clinical relevance. They are less likely to accept broad claims that an intervention is effective without sufficient evidence or unsupported outcome tables.

The available literature does suggest potential value of Ayurvedic medicines in type 2 diabetes management. A systematic review and meta-analysis by Chattopadhyay et al. (2022) concluded that a range of Ayurvedic medicines showed benefit in improving glycaemic control in patients with type 2 diabetes, while also emphasizing the limitations of existing evidence and the need for high-quality randomized trials. A later guideline development study systematically developed a clinical guideline for Ayurvedic practitioners managing adults with type 2 diabetes (Chattopadhyay et al., 2023). These publications are important because they move the field away from scattered claims and toward structured evidence. At the same time, they do not remove the need for careful clinical research. Instead, they show exactly why better documentation is required.

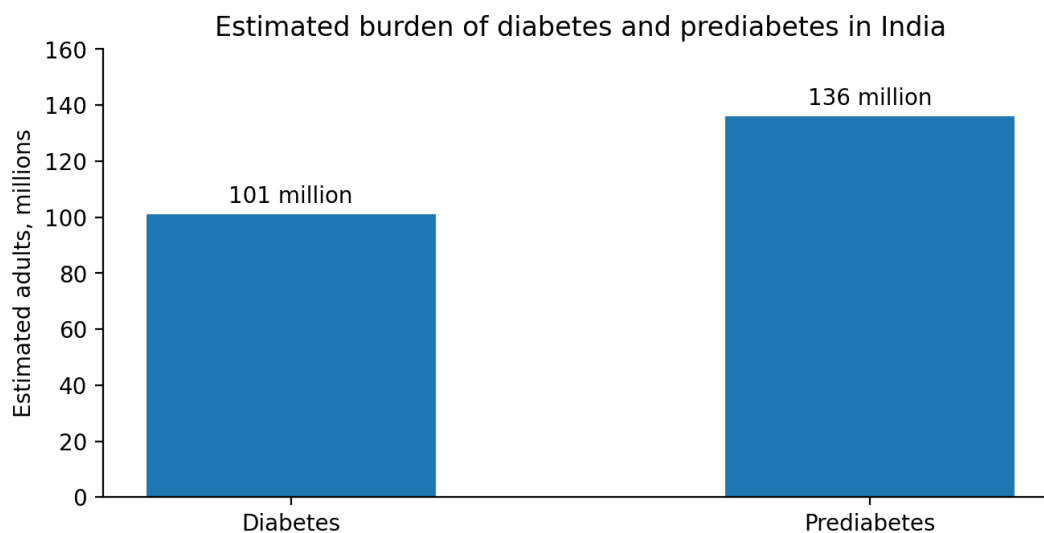
Another reason for this review is that Madhumeha has multiple clinical stages and presentations. A patient with obesity, heaviness, excessive sleep, sedentary habits, and early hyperglycaemia is not the same as a thin, depleted patient with long-standing diabetes, neuropathy, fatigue, dryness, and weakness. In Ayurvedic reasoning, this difference has therapeutic significance. The first presentation may suggest Kapha and Meda dominance with Avarana-like features, while the second may indicate Dhatukshaya and Vata involvement. A single uniform protocol may be easier to publish, but it may not always represent the way Kayachikitsa is practiced. The challenge for research is to document individualization while still maintaining enough standardization for scientific assessment.

This review therefore proposes a practical middle path. It presents Madhumeha through classical Ayurvedic concepts, compares them with type 2 diabetes only where the comparison is reasonable, summarizes key modern and Ayurvedic evidence, and offers a clinical research framework that can be used for future observational studies, controlled trials, or pragmatic outpatient-based research. The framework provides the structure needed for clinical documentation: inclusion criteria, outcome measures, symptom scores, safety parameters, follow-up schedule, and interpretation logic. This makes the article suitable for academic discussion while remaining methodologically transparent.



Data source: IDF Diabetes Atlas, 10th and 11th editions.

Figure 1. Global adult diabetes burden and projected rise based on IDF estimates.



Data source: ICMR INDIAB national report, 2023.

Figure 2. Estimated diabetes and prediabetes burden in India based on ICMR INDIAB data.

3. AIM AND OBJECTIVES

The aim of this article is to review Ayurvedic management principles of Madhumeha with special reference to type 2 diabetes mellitus and to develop a structured clinical research framework suitable for Kayachikitsa-based study design.

The specific objectives are to explain the classical Ayurvedic understanding of Madhumeha within the broader Prameha spectrum; to discuss the conceptual overlap and limits of correlation between Madhumeha and type 2 diabetes mellitus; to synthesize selected contemporary evidence related to diabetes burden, biomedical management, Ayurvedic medicines, and clinical guidelines; to identify clinically relevant Ayurvedic principles such as Nidana Parivarjana, Pathya Ahara, Vihara, Meda and Kleda

regulation, and individualized care; and to propose measurable outcome domains for future clinical research including fasting blood sugar, postprandial blood sugar, HbA1c, BMI, waist circumference, symptom score, quality of life, adherence, and safety parameters.

A secondary objective is to encourage a more careful writing culture in Ayurveda research. Madhumeha papers sometimes move too quickly from classical description to therapeutic claim. A better paper should pause at the reasoning: what type of patient is being discussed, what stage of disease is considered, what is the Dosha-Dushya pattern, how will improvement be measured, what risks are being monitored, and what level of evidence supports the intervention. These questions do not weaken Ayurveda. On the contrary, they make the clinical argument stronger.

4. MATERIALS AND METHODS

This article is designed as a narrative review and clinical research framework. No primary participant data were collected, and no patient-level results are reported. The review draws on classical Ayurvedic concepts related to Prameha and Madhumeha, current diabetes epidemiology, biomedical guidelines, systematic review evidence, and published work on Ayurvedic clinical guideline development. The purpose is not to produce a statistical meta-analysis but to provide an academic synthesis for future Kayachikitsa research and clinical documentation.

The literature considered for the biomedical and epidemiological component included reports from the International Diabetes Federation, World Health Organization, ICMR INDIAB, and American Diabetes Association, along with relevant peer-reviewed articles on diabetes burden and standards of care. The Ayurvedic and integrative component included classical disease concepts from Charaka Samhita, Sushruta Samhita, and Ashtanga Hridaya as interpreted through standard editions, and contemporary peer-reviewed literature on Ayurvedic management of type 2 diabetes. Special attention was given to publications that discussed effectiveness, safety, clinical guidelines, research methodology, and the need for better evidence quality.

The review followed a thematic synthesis approach. The material was organized around six themes: classical disease understanding, contemporary biomedical understanding, points of clinical convergence, Ayurvedic therapeutic principles, evidence and safety, and future research design. This approach was selected because Madhumeha is not merely a pharmacological topic. It includes patient constitution, causative factors, diet, exercise, tissue metabolism, chronicity, adherence, and complications. A thematic method therefore allows the discussion to remain clinically realistic while still being suitable for publication.

The article uses real public epidemiological data for graphical representation. The global diabetes burden graph uses IDF estimates for 2021, 2024, and 2050 projection. The India burden graph uses ICMR INDIAB estimates for diabetes and prediabetes. The remaining figures are conceptual diagrams developed to explain Samprapti, integrated management domains, outcome assessment, and evidence development. These diagrams are not presented as patient outcomes. They are intended to improve clarity and research planning.

The main limitation of a narrative review is that it does not provide pooled effect estimates or formal risk of bias assessment for every included study. That limitation is acknowledged. However, a narrative review is appropriate when the purpose is to integrate classical Ayurvedic reasoning with contemporary clinical research design. Future work can build on this framework through a systematic review, observational study, pragmatic trial, or randomized controlled trial using prospectively collected data.

5. Classical Ayurvedic Understanding of Prameha and Madhumeha

Prameha is described in Ayurveda as a group of disorders characterized by abnormal urination and systemic metabolic disturbance. The term itself directs attention to urination, but the Samprapti extends beyond the urinary system. Classical texts discuss the involvement of Kapha, Pitta, Vata, Meda, Mamsa, Kleda, Lasika, Mutra, and other Dushyas. In early or Kapha-dominant presentations, the patient may show heaviness, excessive sleep, excessive body fat, lethargy, and turbid urination. In chronic or advanced states, Vata involvement and tissue depletion become more prominent. Madhumeha is

generally considered a serious form, often associated with the passage of urine resembling honey in quality and with systemic depletion or deranged tissue metabolism.

The classical description is clinically subtle because it recognizes more than one pathway to Madhumeha. One pathway can be understood through Kapha-Meda aggravation and Avarana, where excessive or improperly processed tissue elements obstruct normal movement and disturb metabolism. Another pathway can be understood through Dhatukshaya, where tissue depletion and Vata aggravation dominate the clinical picture. This distinction matters in treatment. A heavy, obese, Kapha-Meda dominant patient may require Langhana, Rukshana, Lekhana, disciplined diet, and physical activity when appropriate. A depleted patient with weakness, dryness, fatigue, and chronic disease may require a more nourishing and carefully balanced approach. A single treatment logic for all patients would flatten this important Ayurvedic distinction.

Nidana plays a central role in the development of Prameha. Classical descriptions refer to excessive intake of Guru, Snigdha, Madhura, and newly harvested food substances, excessive curd, sedentary behaviour, lack of exercise, day sleep, and other habits that promote Kapha and Meda accumulation. Even without translating every classical dietary reference into a modern nutrient category, the general pattern is recognisable: excess nourishment without proper metabolic transformation, reduced activity, and accumulation of heaviness and moisture in the body. This pattern resembles many contemporary lifestyle risk factors associated with type 2 diabetes, including excess calorie intake, physical inactivity, weight gain, poor sleep rhythm, and metabolic syndrome.

Agni is another key concept. In Madhumeha, the problem is not only that the patient consumes unsuitable food; the deeper problem is that digestion and tissue-level transformation become impaired. Mandagni and disturbed Dhatvagni may lead to improper nourishment, accumulation of metabolic residues, and weakened tissue function. In biomedical language, one may cautiously compare this to disturbances in glucose metabolism, lipid metabolism, insulin resistance, inflammation, and impaired energy regulation. Yet the comparison should remain cautious. Agni is not identical to a single enzyme, hormone, or metabolic pathway. It is a broader clinical concept that helps the Ayurvedic physician understand digestion, appetite, tissue nourishment, metabolic clarity, and strength.

Meda and Kleda are central to the disease logic. Meda does not simply mean visible fat, although obesity may be a clinical expression. It refers to a tissue and metabolic domain associated with lubrication, storage, heaviness, and excess when deranged. Kleda indicates excessive moisture or fluidity contributing to abnormal urine and systemic heaviness. In many patients with type 2 diabetes, abdominal obesity, dyslipidaemia, fatty liver, oedematous tendency, recurrent infections, and lethargy may fit a broad clinical picture of Meda and Kleda disturbance. Again, this is a clinical correlation, not a literal equivalence. The value of the Ayurvedic terms lies in helping physicians observe patterns rather than only numbers.

The Mutravaha Srotas is obviously relevant because Prameha presents with abnormal urination. However, a narrow urinary interpretation would be inadequate. Srotodushti in Prameha reflects systemic disturbance expressed through urine. Increased frequency, turbidity, excess quantity, altered colour, and sweetness are outward signs of a deeper internal imbalance. Modern diabetes also uses urine as one route of detection and complication monitoring, as glycosuria, microalbuminuria, and urinary infections can have clinical significance. Ayurveda reached this clinical focus through direct observation rather

than laboratory testing, but the attention to urine remains relevant.

The role of Ojas in Madhumeha deserves careful handling. Some classical interpretations connect Madhumeha with Ojas-like sweetness and systemic loss of vitality. This should not be oversimplified into a laboratory claim. Ojas is not glucose. It is a subtle concept linked with strength, immunity, vitality, stability, and tissue excellence. A patient with long-standing uncontrolled diabetes may complain of fatigue, recurrent infections, poor wound healing, sexual weakness, neuropathic discomfort, and general loss of resilience. These features can be clinically discussed in relation to Ojas Kshaya or impaired vitality, but the paper should avoid saying that Ojas equals blood

sugar. That type of direct equivalence reduces the depth of both systems.

In clinical practice, Madhumeha therefore requires a layered evaluation. The physician must examine whether the patient is Sthula or Krisha, whether Kapha-Meda features dominate or Vata-Dhatukshaya features dominate, whether appetite is excessive or weak, whether thirst and urination are prominent, whether there is numbness or burning, whether digestion is stable, and whether the patient can follow Pathya. A research framework based on Madhumeha should record these features systematically rather than treating all patients as identical cases of diabetes. This is one of the ways Ayurveda can offer a more individualized clinical contribution.

Conceptual Samprapti of Madhumeha in Kayachikitsa

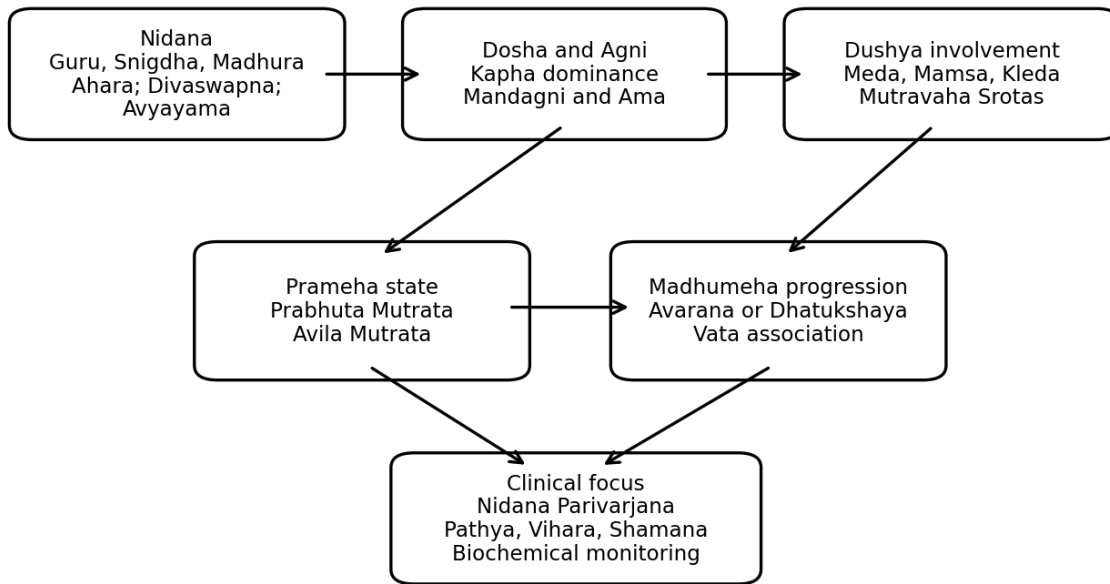


Figure 3. Conceptual Samprapti of Madhumeha for clinical interpretation.

Table 1. Classical Ayurvedic concepts and contemporary clinical relevance

Ayurvedic concept	Clinical meaning in Madhumeha	Contemporary clinical relevance
Nidana	Dietary and behavioural causes such as heavy, sweet, unctuous food, day sleep, and inactivity	Lifestyle risk factors, calorie excess, weight gain, poor routine, low physical activity
Kapha	Heaviness, sluggishness, excessive nourishment, moisture, stability becoming pathological	Obesity tendency, low activity, metabolic slowing, lethargy
Meda	Tissue domain linked with fat, storage, heaviness, and metabolic excess	Adiposity, dyslipidaemia, abdominal obesity, fatty liver tendency
Kleda	Excess fluidity and metabolic dampness contributing to abnormal urination	Polyuria, turbidity, recurrent infections, oedematous tendencies

Agni	Digestive and tissue transformation capacity	Appetite pattern, post-meal heaviness, metabolic regulation
Avarana	Obstruction of normal movement by aggravated Dosha or Dushya	Insulin resistance-like clinical pattern in obese and Kapha-Meda dominant cases
Dhatukshaya	Tissue depletion and chronic weakening	Long-standing disease, weight loss, neuropathic or Vata-dominant symptoms

6. Contemporary Understanding of Type 2 Diabetes Mellitus

Type 2 diabetes mellitus is the most common form of diabetes and is mainly associated with insulin resistance and progressive beta-cell dysfunction. The disease usually develops gradually. In many people, insulin resistance may be present for years before the formal diagnosis is made. During this period, the body initially compensates by increasing insulin secretion, but over time the compensatory capacity becomes insufficient. Blood glucose rises, and persistent hyperglycaemia begins to damage blood vessels, nerves, kidneys, eyes, and other tissues. This gradual progression is one reason why diabetes can be clinically silent for a long time.

The standard diagnostic criteria include fasting plasma glucose, two-hour plasma glucose after oral glucose tolerance testing, random plasma glucose in the presence of symptoms, and HbA1c. The American Diabetes Association standards classify diabetes using thresholds such as fasting plasma glucose of 126 mg/dL or higher, two-hour plasma glucose of 200 mg/dL or higher during oral glucose tolerance testing, or HbA1c of 6.5 percent or higher, when testing is performed using appropriate methods (American Diabetes Association Professional Practice Committee, 2026). These criteria provide measurable diagnostic clarity. Ayurveda did not have these laboratory tools, but clinical observation of urination, body habitus, strength, digestion, thirst, and tissue disturbance played a similar role in disease recognition.

The biomedical understanding of type 2 diabetes has expanded beyond glucose. Many patients have associated hypertension, dyslipidaemia, fatty liver, obesity, chronic inflammation, sleep disturbance, and high cardiovascular risk. The World Health Organization emphasizes that diabetes care often needs glucose control, blood pressure management, lipid management, foot care, kidney screening, and eye examination (World Health Organization, 2024). This broader risk-based approach is compatible with the Ayurvedic idea that Madhumeha is systemic. A patient is not treated only because a report is high; the whole person and long-term consequences must be considered.

Diet and physical activity remain foundational. Even when pharmacological therapy is required, patient behaviour affects glycaemic variability, weight, insulin sensitivity, sleep quality, and cardiovascular risk. Modern diabetes guidelines generally recommend individualized medical nutrition therapy, reduced intake of refined carbohydrates and excess calories, regular physical activity, weight reduction in overweight patients, smoking cessation, and management of blood pressure and lipids. Ayurveda expresses similar concerns through Pathya Ahara, Apathya avoidance, Vyayama, correction of day sleep and sedentary habits, and regulation of food quantity, timing, and qualities.

Complications are a major reason for early and careful management. Microvascular complications include retinopathy, nephropathy, and neuropathy. Macrovascular complications

include coronary artery disease, stroke, and peripheral arterial disease. Foot ulcers, recurrent infections, sexual dysfunction, fatigue, and poor wound healing affect daily life. For a Kayachikitsa paper, these complications should not be ignored. If Ayurveda is to be discussed responsibly in diabetes care, the paper must recommend regular biomedical monitoring and referral when warning signs are present. A patient with severe hyperglycaemia, ketoacidosis, foot gangrene, progressive kidney disease, or acute coronary symptoms needs urgent biomedical care.

Another modern issue is patient adherence. Many patients understand diabetes in fragments. They may know that sugar is harmful but not understand total carbohydrate load. They may take medicines but skip follow-up. They may reduce rice for a few days and then return to old habits when symptoms improve. They may use herbal medicines without informing their physician, creating risk of hypoglycaemia or interactions. Ayurveda can help by making treatment more connected to daily routine, but it can also become unsafe if used without monitoring. A good article should therefore argue for integrative caution rather than a simplistic competition between systems.

7. Conceptual Correlation Between Madhumeha and Type 2 Diabetes Mellitus

The correlation between Madhumeha and type 2 diabetes mellitus should be described as approximate and clinically useful, not absolute. Madhumeha is a disease concept from Ayurveda, built through Dosha, Dushya, Srotas, Agni, Nidana, Lakshana, and patient constitution. Type 2 diabetes mellitus is a biomedical diagnosis based on glucose metabolism, insulin resistance, beta-cell dysfunction, and risk of complications. The two systems do not use the same ontology. Yet a patient with excessive urination, thirst, fatigue, obesity, sluggishness, poor wound healing, and high blood glucose can be meaningfully discussed through both frames. The strength of the article lies in respecting both frames without collapsing one into the other.

Kapha and Meda dominance in Prameha can be cautiously correlated with obesity, insulin resistance, sedentary behaviour, dyslipidaemia, and metabolic syndrome. This does not mean Kapha equals insulin resistance or Meda equals adipose tissue only. Rather, the observed clinical pattern overlaps: heaviness, excess nourishment, low activity, sluggish metabolism, and accumulation. Similarly, Kleda may be clinically related to excessive fluidity, abnormal urination, turbidity, recurrent infections, and metabolic dampness. These correlations help a clinician explain why diet quality, food quantity, exercise, and weight reduction are central in both traditions.

Vata involvement in Madhumeha can be discussed in relation to chronicity, depletion, neuropathic symptoms, dryness, weakness, weight loss, and progressive systemic involvement. In long-standing diabetes, patients may develop numbness, tingling, burning sensation, erectile dysfunction, constipation, disturbed sleep, anxiety, and loss of strength. These do not

prove a direct equivalence between Vata and nerve dysfunction, but they make Vata-based clinical reasoning relevant. Ayurvedic management must therefore adapt to disease stage. A newly diagnosed overweight patient with high appetite and lethargy should not be handled in the same way as a thin elderly patient with neuropathy and kidney disease.

Agni can be clinically correlated with digestive and metabolic regulation. Patients with type 2 diabetes often have irregular appetite, cravings, post-meal heaviness, constipation, flatulence, and poor meal rhythm. Modern medicine may analyse this through gut hormones, insulin dynamics, liver metabolism, microbiota, or eating behaviour. Ayurveda observes it through Agni, Ama, Ahara Vidhi, and Dhatvagni. Both views can inform practice. A patient who eats late at night, sleeps after meals, eats large portions of refined carbohydrates, and does not move after dinner is violating principles that both modern diabetes care and Ayurveda would consider harmful.

The clinical correlation is especially useful for patient education. When a physician explains Madhumeha only as high sugar, the patient may focus narrowly on avoiding sweets. When it is explained as a broader disorder of diet, inactivity, Meda, Kleda, urination, and tissue strain, the patient may better understand why routine correction matters. Similarly, when modern diabetes is explained only as a report value, the patient may ignore complications. Combining both explanations can produce a more memorable and behaviourally useful counselling style.

However, the correlation also has limits. Type 1 diabetes, gestational diabetes, secondary diabetes, steroid-induced diabetes, pancreatic diabetes, and acute hyperglycaemic emergencies cannot be simply placed under one casual Madhumeha label for research purposes. Even within type 2 diabetes, patients differ in age, duration, complications, medications, and comorbidities. A publication-quality paper should therefore define its scope. The present review focuses mainly on adults with type 2 diabetes mellitus and its Ayurvedic clinical counterpart Madhumeha or Prameha spectrum, especially where lifestyle, Meda, Kleda, Kapha, Vata, and chronic metabolic disturbance are relevant.

8. Ayurvedic Management Principles

The first principle of Ayurvedic management in Madhumeha is Nidana Parivarjana. Without removal or reduction of causative factors, any medicine has limited value. This point is simple, but in practice it is often the hardest part of treatment. Patients may expect a tablet, Kashaya, Churna, Vati, or insulin adjustment to solve the problem while the daily pattern remains unchanged. Ayurveda insists that the cause must be addressed. In Madhumeha, the usual targets include excess Madhura, Guru, Snigdha, and Abhishyandi food, overeating, day sleep, lack of physical activity, frequent snacking, late-night meals, and habits that promote Kapha and Meda accumulation.

Pathya Ahara is not just a diet chart. It is a therapeutic instrument. In Madhumeha, food selection, food quantity, timing, preparation, and compatibility matter. Classical recommendations often favour lighter, drier, less Kapha-promoting foods, barley-based preparations, pulses, bitter and astringent tastes, and controlled intake depending on patient strength. In modern terms, this can be translated into reduced refined carbohydrates, portion control, higher fibre intake, avoidance of sugary drinks, careful use of fats, regular meal timing, and attention to body weight. The translation should be practical rather than mechanical. A patient eating large portions of polished rice at night needs different counselling than a patient skipping breakfast and overeating snacks in the evening.

Apathya is equally important. Patients with diabetes often ask what they should take, but the stronger clinical question may be what they must reduce. Excessive sweets, refined flour, sweetened beverages, fried snacks, heavy dairy preparations, repeated eating without hunger, alcohol excess, and irregular meal timings can aggravate metabolic instability. Ayurveda's language of Guru, Snigdha, Madhura, Abhishyandi, and Ati-matra Ahara provides a useful counselling vocabulary. It helps the patient see that harm does not arise only from white sugar; it may also arise from heaviness, quantity, timing, and digestive burden.

Vihara includes physical activity, sleep, daily routine, and mental discipline. Vyayama is especially important in Kapha-Meda dominant Madhumeha. Regular walking, structured exercise, yoga-based movement, and avoidance of prolonged sitting can improve insulin sensitivity, body weight, mood, sleep, and cardiovascular health. Ayurveda also emphasizes that exercise must be matched to Bala, age, season, disease stage, and associated conditions. An obese middle-aged patient may benefit from brisk walking and supervised strengthening, while a frail elderly patient with neuropathy may require safer, gentler movement. Research protocols should document the type, duration, intensity, and adherence to physical activity.

Shamana therapy includes internal medicines selected according to Dosha, Dushya, Agni, Bala, and disease stage. Commonly discussed Ayurvedic ingredients or formulations in the Madhumeha context include Guduchi, Haridra, Amalaki, Jambu seed, Meshashringi, Vijaysar, Daruharidra, Nisha Amalaki, Chandraprabha Vati, and various classical or proprietary formulations. A publication should avoid presenting a long list of medicines as if all are equally proven or suitable for all patients. Selection must be rational and individualized. It should also acknowledge quality control, dose standardization, potential interactions, contraindications, and monitoring of liver and kidney function where relevant.

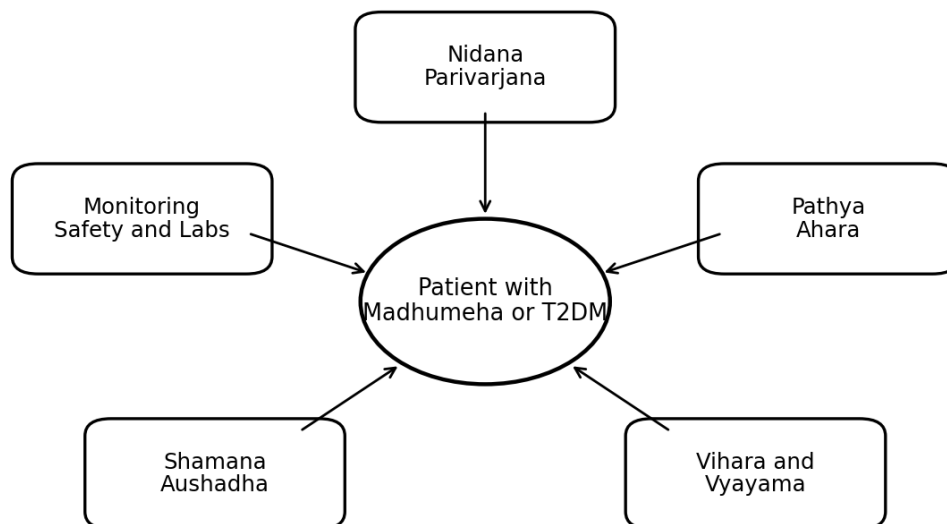
Shodhana may be considered in selected patients when indicated and when the patient has adequate strength. In Kapha-Meda dominant patients, procedures such as Vamana or Virechana are sometimes discussed in classical and clinical contexts, but they require careful assessment, proper preparation, trained supervision, and clear exclusion criteria. In an indexed journal paper, Shodhana should not be recommended casually. If included in a clinical protocol, the paper must state eligibility, contraindications, safety monitoring, rescue medication, follow-up, and adverse event reporting. This is especially important in patients who are already on glucose-lowering medications, anticoagulants, antihypertensives, or have kidney or cardiac risk.

Rasayana and supportive therapy may have a place in chronic Madhumeha, especially where fatigue, tissue depletion, recurrent infection, weakness, or reduced vitality are present. However, Rasayana should not be used as a vague label for any tonic. It must be chosen according to patient condition. In a Kapha-Meda dominant patient with heaviness and obesity, indiscriminate nourishing therapy may be inappropriate. In a depleted patient with chronic Vata features, a carefully selected Rasayana approach may be more relevant. The distinction reflects the clinical sophistication of Kayachikitsa.

The management plan should also include patient education. A patient should understand why daily habits matter, how to identify warning symptoms, why follow-up laboratory tests are necessary, and why stopping prescribed modern medicines without supervision can be dangerous. Ayurveda can support long-term discipline, but it should not encourage reckless discontinuation of essential care. A responsible integrative position is that Ayurvedic treatment can be used with careful

monitoring and coordination, particularly in mild to moderate stable cases, while acute complications and uncontrolled severe hyperglycaemia require timely biomedical management.

Integrated management domains for clinical documentation



The model is a clinical documentation framework, not a substitute for individualized medical judgement.

Figure 4. Integrated management domains for Madhumeha and type 2 diabetes mellitus.

Table 2. Pathya and Apathya framework for Madhumeha counselling

Area	Pathya direction	Apathya to reduce or avoid
Meal pattern	Regular meals, controlled portions, eating according to hunger and digestive capacity	Late-night heavy meals, repeated snacking, overeating
Food quality	Lighter, higher-fibre, less Kapha-promoting food; bitter and astringent taste where suitable	Excess sweet, heavy, oily, fried, refined, and Abhishyandi food
Grain and carbohydrate use	Measured intake; preference for less refined options according to tolerance	Large portions of refined rice, flour products, sweets, sugary drinks
Activity	Daily walking, exercise according to Bala, reduced sitting time	Sedentary routine, day sleep, no post-meal movement
Sleep and routine	Consistent sleep, early dinner where feasible, structured Dinacharya	Day sleep in Kapha-Meda dominant patients, irregular routine
Follow-up	Regular glucose monitoring and review	Stopping medicines or changing doses without supervision

9. EVIDENCE SYNTHESIS

The evidence base for Ayurvedic interventions in type 2 diabetes is promising but uneven. Chattopadhyay et al. (2022) reviewed randomized trials evaluating Ayurvedic medicines for type 2 diabetes and concluded that several interventions may improve

glycaemic control. This is encouraging because it suggests that Ayurvedic treatment has measurable potential. However, the same review also emphasized limitations in available trials, including issues related to study quality, heterogeneity, safety reporting, and the need for better randomized controlled trials. A balanced paper should include both parts of this conclusion. Reporting only the positive effect and ignoring methodological weakness would be academically weak.

The development of a clinical guideline for Ayurvedic practitioners managing type 2 diabetes represents another important step (Chattopadhyay et al., 2023). Guidelines help translate scattered evidence into structured clinical recommendations. They also encourage practitioners to monitor relevant biomedical outcomes and consider safety. For Kayachikitsa, such guideline work is valuable because it does not treat Ayurveda as informal experience alone. It asks how Ayurvedic decision-making can be documented, evaluated, and improved. Still, guideline development does not replace local clinical trials. It provides a foundation on which future studies can be designed.

One recurring issue in Ayurveda diabetes research is the complexity of intervention. Many patients receive a combination of diet advice, exercise advice, one or more formulations, counselling, and sometimes Panchakarma or yoga. From a clinical point of view, this is realistic because chronic metabolic disease rarely improves through one isolated measure. From a research point of view, it becomes harder to identify which component produced the effect. Therefore, future studies must decide whether they are testing a single formulation, a whole-system Ayurveda package, or a pragmatic clinical model. Each choice is valid, but each requires a different design.

Another issue is outcome selection. Some studies report fasting blood sugar and postprandial blood sugar but do not include HbA1c. Others report symptoms but not validated scores. Some do not report adverse events in enough detail. For diabetes research, HbA1c is important because it reflects average glycaemic control over approximately two to three months. FBS

and PPBS are useful but more variable. BMI, waist circumference, lipid profile, blood pressure, kidney function, liver function, and quality of life can add clinical depth. Ayurvedic symptom scores can also be included, but they should be defined before the study begins.

Safety is not a secondary concern. Herbal and herbo-mineral preparations may be safe when properly selected and manufactured, but risk cannot be dismissed. Patients with diabetes may already be taking metformin, sulfonylureas, insulin, SGLT2 inhibitors, GLP-1 receptor agonists, statins, antihypertensives, or antiplatelet drugs. Adding Ayurvedic medicines without monitoring may create risk of hypoglycaemia, interactions, or delayed recognition of complications. A good research article should include liver function tests, renal function tests, adverse event forms, documentation of concomitant medications, and referral criteria.

The evidence should also be interpreted in relation to patient-centred outcomes. A reduction in fasting glucose is meaningful, but it is not the whole story. Patients care about energy, sleep, urinary frequency, thirst, appetite control, body weight, neuropathic discomfort, ability to work, sexual health, and fear of future complications. Ayurveda is well placed to discuss these outcomes because it has always paid attention to lived bodily experience. Publication standards, however, require that such experiences be recorded systematically. That can be done through validated quality of life tools and clearly defined Ayurvedic symptom scores.

In summary, the current evidence supports further research rather than exaggerated certainty. Ayurveda has plausible concepts, long clinical use, and emerging trial evidence in type 2 diabetes. Yet stronger studies are needed, especially with larger samples, proper randomization, allocation concealment, transparent reporting, long-term follow-up, and safety monitoring. This is not a weakness of the topic. It is an opportunity for postgraduate Kayachikitsa research to contribute something genuinely useful.

Evidence development pathway for Ayurveda research in Madhumeha

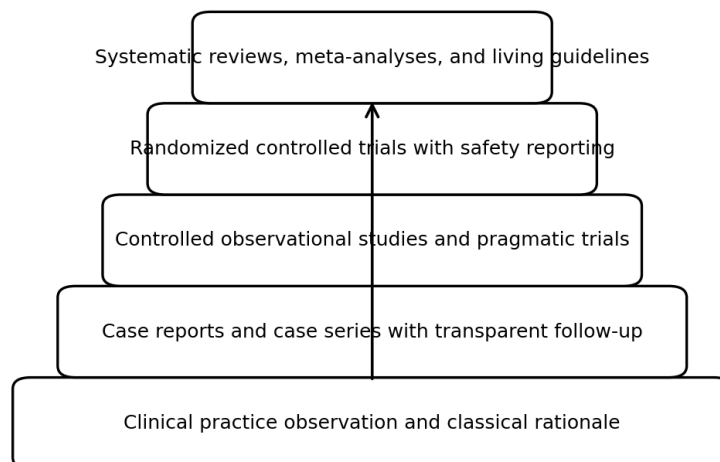


Figure 5. Evidence development pathway for Ayurveda research in Madhumeha.

10. Proposed Clinical Research Framework

A future clinical study on Madhumeha should begin with a clear design. For postgraduate work, three designs are practical: an observational study, a single-arm clinical study with pre-post

comparison, or a randomized controlled trial. The strongest design is usually a randomized controlled trial, but it may not always be feasible because of sample size, resources, ethics, and follow-up. An observational study can still be valuable if it is

transparent and carefully documented. What should be avoided is presenting routine clinical impressions as if they were controlled trial results.

The study population should be adults with stable type 2 diabetes mellitus who can be clinically assessed under the Madhumeha or Prameha spectrum. Inclusion criteria may include age 30 to 65 years, diagnosis of type 2 diabetes according to accepted criteria, stable medication for at least one month, HbA1c within a defined range, and willingness to follow diet and lifestyle advice. Exclusion criteria should include type 1 diabetes, pregnancy, lactation, severe uncontrolled diabetes, diabetic ketoacidosis, severe kidney disease, severe liver disease, active foot ulcer requiring urgent care, recent cardiovascular event, steroid-induced diabetes, malignancy, or inability to attend follow-up.

The intervention should be described with enough detail to allow replication. If the study uses a formulation, the ingredients, manufacturer, dose, duration, batch number, quality certification, and administration method should be stated. If the study uses individualized treatment, the decision rules should be described. If diet and lifestyle counselling are part of the intervention, the paper should provide a schedule, content, and adherence method. Simply writing that patients were advised Pathya is not enough for publication. Reviewers need to know what Pathya meant in practice.

Outcome measures should include both biomedical and Ayurvedic parameters. Biomedical outcomes may include FBS, PPBS, HbA1c, BMI, waist circumference, blood pressure, lipid profile, fasting insulin if available, kidney function, and liver function. Ayurvedic outcomes may include Prabhuta Mutrata, Avila Mutrata, Pipasa, Kshudha, Daurbalya, Anga Gaurava, Alasya, Sweda, sleep pattern, and other symptoms relevant to the patient group. Each symptom should be scored with a predefined scale, for example 0 for absent, 1 for mild, 2 for moderate, and 3 for severe. The same scoring method should be used at each visit.

Follow-up duration should be long enough to capture meaningful change. A four-week study may show changes in symptoms or

fasting glucose, but it is too short to evaluate HbA1c properly. A 12-week study is more suitable for HbA1c assessment, with follow-up visits at baseline, week 4, week 8, and week 12. A post-intervention follow-up at week 16 or week 24 would be even better if feasible. The follow-up schedule should also record adherence, adverse events, rescue medication, and any change in concomitant therapy.

The statistical plan should be defined before data collection. For a pre-post study, paired t-test or Wilcoxon signed-rank test may be used depending on data distribution. For randomized groups, independent t-test, Mann-Whitney U test, repeated measures ANOVA, or mixed models may be appropriate depending on design and sample size. Categorical variables may be analysed using chi-square or Fisher's exact test. The paper should report mean, standard deviation, confidence intervals, p-values, and effect sizes where possible. Statistical significance should not replace clinical interpretation. A small statistically significant change may not be clinically meaningful, and a clinically meaningful trend may need a larger sample to confirm.

Research safeguards are essential. The study should receive institutional ethics committee approval, obtain written informed consent, and ensure that patients are not denied standard care. Concomitant modern medicines should be recorded and adjusted only by qualified physicians. Hypoglycaemia symptoms should be explained to participants. A rescue plan should be available for uncontrolled glucose, infection, dehydration, foot problems, or acute illness. This level of detail makes the paper stronger and protects both patient and researcher.

A clinical research framework should also include documentation of Prakriti, Bala, Sara, Samhanana, Satmya, Ahara Shakti, Vyayama Shakti, and disease duration where possible. These parameters can help explain why some patients respond better than others. For example, a Kapha-Meda dominant patient with strong appetite and obesity may respond well to strict lifestyle correction, while a long-standing Vata-dominant patient with neuropathy may need a different treatment emphasis. Including these variables can make Ayurveda research more authentic rather than forcing it into a purely biomedical template.

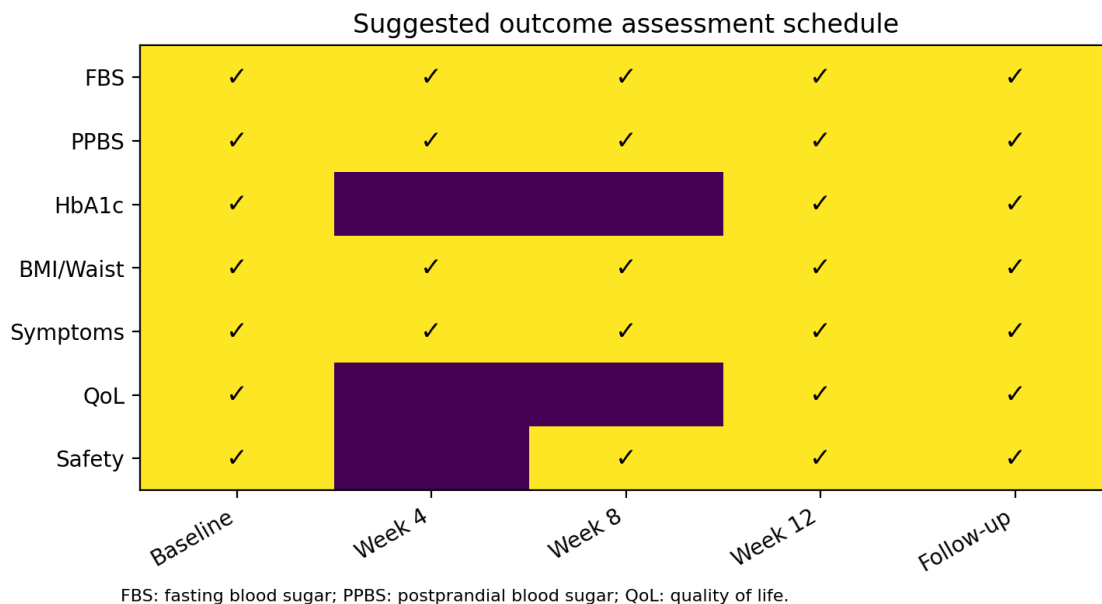


Figure 6. Suggested outcome assessment schedule for future clinical study.

Table 3. Suggested clinical outcome measures for future Madhumeha research

Domain	Parameter	Suggested timing	Interpretation
Glycaemic control	FBS, PPBS, HbA1c	Baseline, week 4, week 8, week 12; HbA1c at baseline and week 12	Primary measure of metabolic change
Anthropometry	Weight, BMI, waist circumference	Baseline and every follow-up	Relevant for Meda and obesity-related assessment
Symptoms	Prabhuta Mutrata, Pipasa, Daurbalya, Anga Gaurava, Alasya	Every visit	Captures Ayurvedic and patient-centred improvement
Cardiometabolic risk	Blood pressure, lipid profile	Baseline and end of study	Important because diabetes risk is systemic
Safety	CBC, RFT, LFT, adverse events	Baseline and as per protocol	Required for clinical safety and transparency
Adherence	Diet, exercise, medicine intake, follow-up compliance	Every visit	Explains response and feasibility
Quality of life	WHOQOL-BREF or diabetes-specific scale	Baseline and end of study	Captures functional and psychological impact

Table 4. Proposed inclusion and exclusion criteria for a clinical study

Inclusion criteria	Exclusion criteria
Adults aged 30 to 65 years with diagnosed type 2 diabetes mellitus	Type 1 diabetes mellitus, gestational diabetes, or secondary diabetes
Clinical features fitting Madhumeha or Prameha spectrum	Pregnancy, lactation, or planning pregnancy during study period
Stable medication for at least one month before enrolment	Severe uncontrolled hyperglycaemia requiring urgent intervention
Willingness to follow Pathya Ahara and Vihara advice	Severe renal, hepatic, cardiac, or uncontrolled endocrine disorder
Written informed consent and ability to attend follow-up	Active diabetic foot ulcer, acute infection, recent cardiovascular event

11. Pathya Ahara and Lifestyle Framework

Dietary counselling in Madhumeha should be practical, culturally realistic, and individualized. Patients are often told to avoid sugar, but that advice alone is too narrow. Many Indian diets contain high carbohydrate load through rice, wheat, potatoes, sweet tea, snacks, bakery items, fried foods, and late-night meals. A patient may avoid sweets but still consume large portions of refined cereals. Ayurveda's attention to Guru, Snigdha, Madhura, Abhishyandi, and Ati-matra Ahara helps widen the discussion. The physician can explain that heaviness, quantity, and timing are as important as sweetness.

Useful dietary principles may include regular meal timing, avoidance of frequent snacking without hunger, reduction of refined carbohydrates, use of higher-fibre foods, portion control, adequate protein where suitable, careful use of fats, and inclusion of bitter, astringent, and lighter food preparations according to tolerance. Classical references to barley and other suitable grains can be translated into contemporary meal planning, but not rigidly. A patient's region, affordability, occupation, digestive capacity, and family eating pattern should be considered. A diet plan that the patient cannot follow is not a treatment plan; it is merely a printed instruction.

Lifestyle correction must address physical activity. Regular walking after meals, daily exercise according to Bala, yoga-based movement, avoidance of long sitting, and gradual weight reduction can be included. In modern terms, physical activity improves insulin sensitivity and cardiovascular health. In Ayurvedic terms, it reduces Kapha and Meda, improves lightness, supports Agni, and counters the harm of Avyayama and Divaswapna. The language differs, but the clinical direction is similar.

Sleep and daily routine also matter. Day sleep is classically recognized as a Kapha-promoting habit and is especially relevant in patients with obesity, heaviness, and sluggishness. Modern research also links poor sleep and circadian disruption with metabolic dysregulation. Patients who sleep late, wake late, eat dinner near midnight, or work irregular shifts often struggle to control glucose. A Madhumeha protocol should therefore record sleep duration, day sleep, meal timing, and work pattern.

Stress is not always foregrounded in classical Prameha descriptions in the same way as diet and inactivity, but in contemporary practice it cannot be ignored. Stress affects eating behaviour, sleep, adherence, sympathetic activation, and self-care. Patients under stress may eat irregularly, skip exercise, miss medicines, or seek quick relief through sweets and snacks. An Ayurveda-based approach may use counselling, Dinacharya, yoga, Pranayama, meditation, and supportive physician-patient communication. These components should be described clearly in research if included.

A realistic lifestyle framework also needs follow-up. Behaviour change rarely happens through one counselling session. Patients need repeated explanation, small goals, family involvement, and monitoring. For example, asking a patient to walk 45 minutes daily may fail if the patient has never walked regularly. A staged plan beginning with 15 minutes after dinner and gradually increasing may be more successful. This practical wisdom is often present in clinical practice but absent from research papers. Documenting it would make Ayurveda research more useful.

12. Safety, Contraindications, and Integrative Care

Safety must be treated as part of the treatment, not as an afterthought. Diabetes patients may have hidden kidney disease, liver dysfunction, cardiovascular risk, neuropathy, retinopathy, or foot problems. Some may be taking multiple medicines. Adding any intervention without proper assessment can create risk. Before beginning Ayurvedic management, a clinician should record current medicines, duration of diabetes, recent glucose values, HbA1c, kidney function, liver function, blood pressure, lipid profile, symptoms of hypoglycaemia, neuropathy, eye screening status, and foot status where possible.

Hypoglycaemia risk is particularly important when Ayurvedic medicines are used alongside sulfonylureas or insulin. If blood glucose improves, the patient may require adjustment of modern medicines by a qualified physician. The Ayurvedic practitioner should not ignore symptoms such as sweating, tremor, hunger, dizziness, confusion, or faintness. Patient education should include what to do when hypoglycaemia is suspected. In research, all such events should be recorded, graded, and reported.

Quality control of Ayurvedic medicines is another major issue. Formulations used in research should come from reliable sources with proper manufacturing standards. Batch number, expiry date, composition, dose, and quality testing should be documented. Herbo-mineral formulations require special caution and should not be used without appropriate expertise and safety justification. Publication reviewers increasingly expect this information, and rightly so. A paper that does not mention medicine quality is incomplete.

Contraindications must be respected. Pregnant women, lactating women, patients with type 1 diabetes, severe renal or hepatic impairment, active diabetic foot ulcer, recent myocardial infarction, uncontrolled hypertension, severe infection, acute dehydration, and very high uncontrolled glucose may not be suitable for routine outpatient Ayurvedic research unless special protocols and safety supervision exist. These patients require urgent or specialist care. Ayurveda has a strong tradition of clinical judgement, and that judgement should be visible in research design.

Integrative care should be presented in a mature way. The goal is not to create opposition between Ayurveda and biomedicine. In diabetes, patients benefit from accurate diagnosis, laboratory monitoring, complication screening, and emergency care. They may also benefit from individualized lifestyle counselling, dietary discipline, and Ayurvedic therapeutic reasoning. A responsible article should recommend communication between practitioners, documentation of all medicines, and referral when warning signs appear. This is not a compromise of Ayurveda. It is good clinical care.

Responsible publication also requires honest reporting. If a study is a review, it should be presented as a review rather than as primary clinical research. If a study is a trial, outcomes should be reported transparently and completely. If adverse events occur, they should be included. If the intervention does not improve HbA1c but improves symptoms, that should be reported honestly. Research becomes credible when it accepts complexity. Diabetes is a long-term disease, and no single paper can settle the entire question.

Table 5. Safety monitoring and referral triggers

Clinical situation	Action required
Symptoms of hypoglycaemia such as sweating, tremor, confusion, faintness	Immediate glucose correction and review of medication plan
Very high glucose with dehydration, vomiting, altered sensorium, or ketone suspicion	Urgent referral to emergency care
Foot ulcer, black discoloration, spreading infection, or loss of sensation	Immediate diabetic foot evaluation and specialist care

Rising creatinine, reduced urine output, or severe oedema	Renal evaluation and modification of treatment
Severe abdominal pain, jaundice, or abnormal liver function	Stop suspected medicine and evaluate liver status
Chest pain, breathlessness, weakness of one side, or acute neurological symptoms	Emergency referral for cardiovascular or neurological event

13. Interpretation of Graphs and Conceptual Figures

Figure 1 presents the global rise in adult diabetes burden using IDF estimates. The change from 537 million adults in 2021 to 589 million in 2024, with a projected rise to 853 million by 2050, shows that diabetes is not a marginal clinical issue. For Ayurveda researchers, this creates both opportunity and responsibility. The opportunity is that Madhumeha is highly relevant to contemporary metabolic health. The responsibility is that claims must be proportionate to evidence because the disease affects millions of people and poor advice can cause harm.

Figure 2 presents Indian estimates from the ICMR INDIAB report: approximately 101 million people with diabetes and 136 million with prediabetes. The prediabetes figure is especially important. Ayurveda may have a valuable preventive role in high-risk metabolic states because its focus on Nidana Parivarjana, Pathya, Vyayama, sleep, and body habitus can be applied before irreversible complications develop. Future studies should therefore not focus only on diagnosed diabetes. They may also study Prameha Purvarupa or high-risk prediabetic states, provided the inclusion criteria are carefully defined.

Figure 3 gives a conceptual Samprapti diagram of Madhumeha. It begins with Nidana such as heavy, unctuous, sweet diet, day sleep, and lack of exercise; moves through Kapha, Agni, Meda, Kleda, and Srotas involvement; and ends in clinical Madhumeha and monitoring. The diagram is intentionally schematic. It does not claim to replace classical textual detail. Its purpose is to make the disease pathway understandable for modern readers and to help structure research variables.

Figure 4 presents an integrated management model. The patient is placed at the centre, surrounded by Nidana Parivarjana, Pathya Ahara, Vihara and Vyayama, Shamana Aushadha, and monitoring. This structure is useful because it prevents the common mistake of presenting Ayurvedic diabetes care as only a formulation. In real practice, medicine without lifestyle correction is often inadequate. Likewise, lifestyle correction without monitoring may be unsafe if glucose remains uncontrolled.

Figure 6 shows a suggested outcome assessment schedule. FBS and PPBS may be checked more frequently, while HbA1c is more meaningful at baseline and after approximately 12 weeks. BMI, waist circumference, symptoms, adherence, and safety markers should be recorded periodically. The schedule can be adapted to local resources, but the principle remains the same: a Kayachikitsa study must measure both subjective and objective change.

Figure 5 presents an evidence development ladder. Classical rationale and clinical observation are important but not sufficient for high-level evidence. Case reports, case series, observational studies, randomized controlled trials, systematic reviews, and guidelines each have a place. Ayurveda research should not reject modern evidence hierarchy, but it should adapt it intelligently so that individualized treatment is not lost. A strong research culture

can respect classical knowledge while still demanding transparent methods.

14. DISCUSSION

Madhumeha is a strong topic for Kayachikitsa because it allows the physician to combine disease understanding, patient education, diet, lifestyle, internal medicine, chronic care, and measurable outcomes. The disease is not limited to a laboratory report, and Ayurveda is not limited to a prescription. The best discussion of Madhumeha should therefore be clinical, not merely textual. It should ask how a patient becomes metabolically disturbed, how daily choices sustain the disease, how body habitus and tissue state influence treatment, and how improvement can be measured honestly.

One major strength of the Ayurvedic framework is its insistence on causative factors. Modern diabetes care also recognizes lifestyle modification, but in routine practice it may become secondary to medication escalation. Ayurveda keeps Nidana Parivarjana at the centre. This is clinically valuable because many patients with type 2 diabetes remain trapped in the same pattern that produced the disease: excess calorie intake, low movement, late meals, day sleep, stress eating, and irregular follow-up. A treatment system that repeatedly brings the patient back to cause removal has practical relevance.

Another strength is individualization. Type 2 diabetes is heterogeneous. Some patients are obese and insulin resistant. Some are relatively lean. Some have early disease. Others have long-standing complications. Some have strong appetite and heaviness. Others have weakness and depletion. Ayurveda's categories of Sthula, Krisha, Kapha-Meda dominance, Vata association, Avarana, Dhatukshaya, Agni, Bala, and Prakriti allow nuanced clinical judgement. For research, the challenge is to document that nuance without making the study impossible to analyse.

The review also shows that Ayurvedic diabetes research must become more careful in its claims. It is tempting to write that a formulation controls diabetes or reverses Madhumeha, but such statements require strong evidence. Diabetes is chronic, relapsing, and influenced by many variables. Improvement in FBS over a few weeks is not the same as long-term remission. Reduction in symptoms is not the same as prevention of complications. A rigorous academic paper should use measured language: may support, may contribute, appears promising, requires further research, and should be monitored. Such phrasing keeps the argument precise without weakening it.

There is also a need to improve how Ayurvedic symptom outcomes are recorded. Symptoms such as Prabhuta Mutrata, Avila Mutrata, Pipasa, Kshudha, Daurbalya, Anga Gaurava, Alasya, and Sweda are clinically meaningful, but they must be scored consistently. If one physician records "improved" and another records "mild improvement," the data become difficult to interpret. A predefined symptom scale can preserve Ayurvedic language while improving research quality. The

appendix in this manuscript provides a model that can be modified for future studies.

The integration of biomedical outcomes is not a threat to Ayurveda. FBS, PPBS, HbA1c, BMI, waist circumference, lipid profile, blood pressure, RFT, and LFT help quantify change and monitor safety. A patient may feel better but still have high HbA1c. Another patient may have improved glucose but rising creatinine. Without laboratory monitoring, the physician may miss important risks. Ayurveda values Pramana and direct assessment. In the contemporary clinic, laboratory investigation is one form of necessary assessment.

A major limitation in the field is the short duration of many studies. Diabetes requires long-term care, yet many trials run for only 30, 45, or 60 days. Such studies may have value for early signals, but they cannot fully evaluate HbA1c, complications, durability of response, or long-term safety. A 12-week minimum is more appropriate for glycaemic outcomes, and six-month follow-up would be stronger where feasible. Pragmatic outpatient studies could provide useful evidence if they are well designed.

The discussion of Ayurvedic medicines should also become more evidence-sensitive. Not every classical formulation used in Madhumeha has the same level of research support. Some ingredients have pharmacological studies, some have clinical trials, and others are supported mainly by textual tradition and clinical experience. A mature paper can mention this hierarchy without disrespecting tradition. It can say that classical rationale supports use, preliminary evidence is promising, but better trials are needed. Such wording is more likely to be accepted by indexed journals.

Patient education may be the most underreported component of Madhumeha care. In real practice, the physician's explanation often determines whether the patient follows treatment. A patient who understands that day sleep, heavy dinners, and lack of walking aggravate his disease may change behaviour more readily than a patient who only receives a list of medicines. Future research should record counselling content, family involvement, adherence barriers, and patient understanding. These variables may explain why the same medicine works well in one patient and poorly in another.

Finally, the article supports a middle path between uncritical traditionalism and uncritical biomedical reduction. Ayurveda should not be reduced to "herbal hypoglycaemic agents." It is a system of clinical reasoning with its own concepts of causation, digestion, tissue state, body constitution, and daily conduct. At the same time, Ayurveda research must not ignore modern diagnostic criteria, safety monitoring, and complication care. Madhumeha is precisely the kind of topic where both depth and discipline are required.

15. Future Directions for Kayachikitsa Research

Future Kayachikitsa research on Madhumeha should move toward pragmatic and patient-centred designs. Highly controlled trials are useful, but they sometimes remove the very features that make Ayurveda clinically distinctive. In routine practice, physicians individualize diet, activity, medicines, and counselling according to the patient. A pragmatic trial can preserve this clinical realism while still measuring outcomes in a disciplined way. For example, patients may be treated according to a predefined Ayurvedic decision framework rather than one identical prescription for all. The analysis can then examine whether the whole-system approach improves glycaemic control, symptoms, quality of life, and adherence when compared with usual counselling or standard care.

Another promising direction is early intervention in prediabetes and high-risk Prameha states. The ICMR INDIAB estimate of 136

million people with prediabetes in India indicates a large population that may benefit from structured prevention. Ayurveda is particularly well placed here because Nidana Parivarjana, Pathya, Vyayama, sleep correction, and weight management can be started before severe complications develop. A well-designed preventive study could include people with impaired fasting glucose, impaired glucose tolerance, obesity, abdominal adiposity, family history, or classical Prameha Purvarupa. The outcome could include progression to diabetes, change in HbA1c, waist circumference, symptom score, and adherence to lifestyle change.

There is also a need for better qualitative research. Numbers are necessary, but they do not fully explain why patients follow or fail treatment. Interviews with patients can reveal barriers such as family food habits, work timing, cost, fear of medicines, misunderstanding of diabetes, low motivation, or social pressure during meals. Interviews with Ayurvedic physicians can explain how they decide between Langhana and Brimhana, how they identify Avarana or Dhatukshaya, and how they counsel patients. Such qualitative findings can improve the design of future clinical trials and make them closer to real practice.

Digital follow-up may also strengthen Madhumeha research. Simple tools such as WhatsApp reminders, diet logs, walking records, home glucose records, and monthly telephonic follow-up can improve adherence and reduce missing data. These tools should not replace clinical examination, but they can support continuity. A future study could compare routine advice with structured follow-up reminders and assess whether adherence improves. Since diabetes is a long-term condition, the method of follow-up may be as important as the initial prescription.

Finally, Ayurveda research should develop better reporting standards for individualized treatment. A future Madhumeha paper should clearly state the patient profile, Ayurvedic diagnosis, treatment logic, formulation details, diet advice, lifestyle advice, monitoring schedule, adverse events, and reasons for withdrawal. When such details are consistently reported, the field will become more credible. The real strength of Ayurveda is not exaggerated certainty. Its strength lies in careful observation, individualized reasoning, and long-term correction of causative factors. Future research should make that strength visible in a format that modern journals can evaluate.

16. LIMITATIONS

This article is a narrative review, not a systematic review or meta-analysis. It does not provide pooled effect sizes for individual Ayurvedic interventions, and it does not conduct a formal risk of bias assessment of every clinical trial. The purpose is conceptual synthesis and research framework development. Therefore, conclusions about efficacy are deliberately cautious.

Another limitation is that classical Ayurvedic concepts are interpreted through contemporary clinical language. Such interpretation is useful, but it can never fully capture the original textual and philosophical context. Terms such as Agni, Meda, Kleda, Ojas, Avarana, and Dhatukshaya should be interpreted within Ayurvedic clinical reasoning rather than treated as exact equivalents of modern biochemical markers. They are clinical concepts that may overlap with modern observations but retain their own meaning.

The proposed framework also requires adaptation before use in a specific institution. Sample size, available laboratory facilities, formulation selection, follow-up duration, ethics committee requirements, and patient population may differ. The symptom score and case record format provided in the appendix are models, not mandatory instruments. They should be validated or at least pilot-tested before formal research use.

Despite these limitations, the review provides a practical and methodologically sound foundation for postgraduate Kayachikitsa work on Madhumeha. It uses public epidemiological data for graphs and offers a structured pathway for future clinical research.

17. CONCLUSION

Madhumeha remains one of the most clinically relevant disease concepts in Kayachikitsa because it brings together diet, lifestyle, digestion, tissue metabolism, urination, body habitus, chronicity, and patient discipline. Type 2 diabetes mellitus, in contemporary medicine, is a chronic metabolic disorder with major public health impact and serious long-term complications. The two systems are not identical, but their clinical overlap is substantial enough to justify careful comparative research.

Ayurveda can contribute to diabetes care through Nidana Parivarjana, Pathya Ahara, Vihara, Vyayama, individualized

assessment, Meda and Kleda regulation, Shamana therapy, and long-term patient counselling. These strengths are especially relevant because many patients struggle with daily adherence rather than diagnosis alone. However, Ayurvedic management should be supported by objective monitoring, safety evaluation, and appropriate referral. It should not be presented as a substitute for emergency care, complication screening, or necessary biomedical treatment.

Future research should move beyond broad claims and produce well-documented evidence. Studies should define patient type, disease stage, intervention details, outcome measures, safety parameters, statistical methods, and follow-up duration. A strong Kayachikitsa study on Madhumeha can preserve Ayurvedic reasoning while meeting contemporary standards of clinical research. That is the direction in which the field can become both academically credible and clinically useful.

18. Tables for Clinical Documentation

Table 6. Proposed Ayurvedic symptom score for Madhumeha research

Symptom	0	1	2	3
Prabhuta Mutrata	Absent	Mild increase	Frequent urination affecting routine	Marked frequency including night disturbance
Pipasa	Absent	Occasional thirst	Frequent thirst requiring repeated water intake	Excessive thirst disturbing daily activity
Daurbalya	Absent	Mild fatigue	Fatigue after routine work	Marked weakness limiting work
Anga Gaurava	Absent	Mild heaviness	Persistent heaviness	Severe heaviness with lethargy
Alasya	Absent	Occasional laziness	Reduced motivation for activity	Marked inactivity or sleepiness
Avila Mutrata	Absent	Occasional turbidity	Frequent turbidity	Marked turbidity or associated urinary discomfort

19. DECLARATIONS

Ethics approval: Not applicable for this narrative review because no primary human participant data were collected and no patient-level information is reported.

Consent for publication: Not applicable.

Conflict of interest: None declared.

Funding: None declared.

Data availability: The epidemiological data used for figures are available from the cited public sources. The conceptual figures and tables were developed for this manuscript.

Clinical caution: The discussion of Ayurvedic management principles is intended for academic and clinical research purposes. Individual treatment must be decided by a qualified physician after complete assessment and appropriate monitoring.

Appendix A. Suggested Case Record Framework

Patient identification code, age, sex, occupation, residence, socioeconomic background, diet pattern, sleep pattern, physical activity pattern, family history of diabetes, duration of diabetes, current medications, history of hypoglycaemia, complications, and comorbid conditions should be recorded at baseline.

Ayurvedic assessment may include Prakriti, Vikriti, Bala, Agni, Koshtha, Sara, Samhanana, Satmya, Ahara Shakti, Vyayama Shakti, Srotas involvement, Dosha-Dushya assessment, Sthula or Krishna status, and whether the clinical picture suggests Kapha-Meda dominance, Avarana, or Dhatukshaya.

Laboratory assessment may include fasting blood sugar, postprandial blood sugar, HbA1c, complete blood count, liver function test, renal function test, lipid profile, urine routine and microscopy, urine albumin where available, blood pressure, weight, BMI, and waist circumference.

Follow-up records should include changes in symptoms, adherence to diet and exercise, medicine compliance, adverse

events, changes in concomitant medication, laboratory values, and physician assessment.

Appendix B. Suggested Visit Schedule

Appendix Table 1. Suggested visit schedule for Madhumeha clinical study

Visit	Assessment	Main purpose
Baseline	Consent, history, Ayurvedic assessment, FBS, PPBS, HbA1c, BMI, waist, safety labs, symptom score	Eligibility, baseline status, treatment planning
Week 4	FBS, PPBS, symptom score, adherence, adverse events	Early response and safety
Week 8	FBS, PPBS, symptom score, selected safety labs where needed	Mid-course review
Week 12	FBS, PPBS, HbA1c, BMI, waist, symptom score, QoL, safety labs	Final intervention outcome
Follow-up	FBS, PPBS, symptoms, adherence, delayed adverse events	Durability and safety

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