



INTEGRATING AYURVEDIC DIETARY RECOMMENDATIONS WITH MODERN NUTRITIONAL SCIENCE: EVIDENCE-BASED VALIDATION FOR DIABETES MANAGEMENT

Pankaj Sharma*

PG Scholar, Department of Kayachikitsa-Rasayana evam Vajikarana, KAHERs Shri B M Kankanawadi Ayurveda Mahavidyalaya, Belagavi Karnataka*Corresponding Author

Aashish Patel

PG Scholar, Department of Kayachikitsa, KAHERs Shri B M Kankanawadi Ayurveda Mahavidyalaya, Belagavi Karnataka

ABSTRACT Diabetes mellitus (DM) is projected to affect approximately 98 million individuals in India by 2030, highlighting the urgent need for effective management strategies that incorporate diet and physical activity. Ayurveda has recognized Type 2 Diabetes Mellitus, or Madhumeha, and provided comprehensive guidelines for its management. This study reviews classical Indian dietary interventions and evaluates their contemporary relevance for T2DM management. A comprehensive analysis of thirty traditional dietary items, assessed for their nutritional content and glycemic impact, highlights the alignment of ancient recommendations with modern scientific evidence. Key dietary strategies include incorporating low-glycemic index cereals, pulses, fruits, and vegetables while avoiding high-glycemic and processed foods. The study combines traditional Ayurvedic insights with current dietary guidelines, highlighting that integrating a balanced diet, regular exercise, and lifestyle changes is essential for effective T2DM management and improved patient outcomes.

KEYWORDS : Ayurveda, Diabetes Mellitus, Madhumeha

INTRODUCTION

By 2030, diabetes mellitus is projected to impact approximately 98 million individuals in India, as reported in a 2018 study published in The Lancet Diabetes & Endocrinology. This growing prevalence underscores the need for effective management strategies incorporating diet and physical activity. Ancient Indian medical texts, including the Charaka Samhita, Sushruta Samhita, and Ashtanga Hridaya Samhita, have long recognized diabetes – referred to as 'Madhumeha' under the spectrum of 'Prameha' – as a chronic condition necessitating lifestyle modification.¹ These classical texts offer detailed description into the disease's aetiology, pathogenesis, and management, aligning with contemporary research findings.

Modern diabetes risk factors include obesity, sedentary lifestyles, genetic predisposition, and age, with increased risks for women with gestational diabetes. Long-term complications of diabetes encompass cardiovascular disease, neuropathy, nephropathy, retinopathy, and foot damage, while untreated gestational diabetes can result in severe outcomes like preeclampsia and neonatal hypoglycaemia. Combining traditional and modern strategies for early detection and comprehensive management is vital for reducing disease burden and improving outcomes. Key preventive measures include a balanced diet, regular exercise, and weight management. Although medications such as Metformin and Glimperide can help manage Type 2 diabetes, lifestyle changes are crucial and can lead to remission, necessitating ongoing management and regular healthcare monitoring to avoid complications.

METHODOLOGY

The management of diabetes mellitus involves controlling blood glucose, blood pressure, and cholesterol levels to reduce complications. The A1C test, blood pressure, and cholesterol levels are key parameters. Dietary adjustments emphasize a balanced intake of carbohydrates, fats, and proteins, along with physical activity. Patients are advised to follow a diabetes meal plan, engage in 30 minutes of exercise daily, and monitor blood glucose levels. Smoking cessation is also crucial. Medication adherence and regular glucose monitoring are essential to maintaining target levels and preventing long-term health issues.²

This study systematically reviews classical Indian medicine texts, including Charaka Samhita and Sushruta Samhita, to analyse dietary interventions for managing Madhumeha, akin to Diabetes Mellitus (T2DM). A detailed list of traditional food items was prepared, with each item scientifically evaluated for its nutritional content and role in DM management. The study incorporates guidelines from the NPCDCS (Department of Health and Family Welfare, Government of India) and Mission Madhumeha (Ministry of AYUSH, Government of India). Key dietary factors are categorized based on their glycemic index (GI), which measures the impact of foods on blood glucose levels. Foods are classified into low (GI ≤ 55), medium (56-69), and

high GI (≥ 70) groups. The study also examines the Glycemic Load (GL) of these foods, focusing on those that help manage blood glucose effectively and avoid those with high GI or GL, thereby providing a comprehensive dietary guideline for DM management.

According to the *Charaka Samhita* (Ch. Chi. 6. 19-24), dietary management for *Prameha*, which includes Diabetes Mellitus, involves the consumption of *mantha* (a mixture of various corn flours with water), barley powder, and light dishes prepared with barley. Specific recommendations include *yavaudana* (cooked barley without added fats), *vatyā* (barley porridge), and *saktu* (roasted corn flour) combined with broths from game birds and arid-region animals. Additionally, old *shali* rice should be cooked with *mudga* (mung bean) soup and bitter vegetable preparations. *Yavaudana* is prepared by boiling dried, crushed barley grains and retaining the excess water, whereas *vatyā* is made from boiled, dehusked barley grains. Barley should be the primary component of the diet, with foods prepared with barley and honey being particularly beneficial.¹

In parallel, the *Sushruta Samhita*, a foundational text in surgical science, outlines dietary guidelines for diabetes management. It recommends the intake of foods made from old *shali* rice, *shashtika*, *yava*, *godhuma*, *kodrava* or *uddalaka*, complemented by soups containing *chanaka* (chickpeas), *kulaththa* (horse gram), and *mudga* (green gram). Additionally, bitter and astringent vegetables and oils such as *nikumbha*, *ingudi*, *sarshapa* and *atasi* are advised. For patients with urinary obstruction, consumption of lean meat from desert-dwelling animals, without the addition of sour agents or *ghee*, is recommended.²

DIETARY CONSIDERATIONS IN DIABETES MANAGEMENT³

Diabetes Mellitus management necessitates careful dietary choices, with certain foods required to be avoided to prevent exacerbating the condition. Cereals such as newly harvested white rice and aromatic varieties like *basmati* rice, along with *maida* and its products—including bread, noodles, pasta, and biscuits—should be excluded. Additionally, *maida*-based snacks like *murukku*, *chapati*, *burfi*, *puri* and *jalebi* are to be avoided. Pulses such as black sesame, black gram, cowpea, and pea, including preparations like *papad*, *idli*, *dosa*, *dhokla* and *meduvada*, are contraindicated. Non-vegetarian options such as meat soups from domestic, aquatic, or marshy animals, and meats including pork, buffalo, and fish should be omitted. High-sugar fruits like banana, custard apple, jackfruit, grapes, dates, plum, pineapple, mango, papaya, watermelon, guava, and sapota should also be avoided. Tubers including potato, sweet potato, beetroot, and cabbage, especially in preparations like French fries and chips, are discouraged. Furthermore, freshly brewed alcoholic drinks and sweetened alcoholic beverages, along with *varsha ritu jala* (rainwater), soft drinks, cold drinks, and sweet fruit juices, should be avoided. Dairy products such as milk, curd, butter, cheese, ghee, and

milk-based preparations, as well as jaggery and sugar, are to be excluded.

Conversely, dietary recommendations for managing diabetes include the incorporation of specific cereals and pulses known for their beneficial effects. Cereal choices should include barley (*Yava*; *Hordeum vulgare*), wheat (Godhuma: *Triticum aestivum*), kodrava (Paspolum scrobiculatum), udalaka (forest variety of kodrava), kangu (Setaria italica), madhulika (Eleusine coracana), vajranna (Pennisetum typhoides), jurnahva (Sorghum vulgare) and shyamaka (Echinochloa frumentacea) along with old rice (Puranshali). Pulses such as red gram (Adhaki), horse gram (Kulatha), green gram (Mudga), lentils (Masoor; *Lens culinaris*), and chickpeas (Chanaka; *Cicer arietinum*) are recommended. Lean meats from birds like pigeon and grey francolin are suitable non-vegetarian options. Beneficial fruits include jamun (*Syzygium cumini*), amla (*Phyllanthus emblica*), kapitha (*Feronia limonia*), parushka (*Grewia asiatica*), vrikshamla (*Garcinia morella*), bilva (*Aegle marmelos*), udumbara (*Ficus glomerata*), oranges (Naranga), lemon (Jambeera), and pomegranate (Dadima; *Punica granatum*). Vegetables such as patola (*Trichosanthes dioica*), bathuva, bitter vegetables like fenugreek (Methika) and bitter gourd (Karavellaka), Amaranthus (Tanduliyaka), mint (Putiha; *Mentha spicata*), drumsticks (Shigru; *Moringa oleifera*), brinjal (Vrintaka; *Solanum melongena*), suran (*Amorphophallus campanulatus*), bottle gourd (Alabu; *Lagenaria siceraria*), onions (Plandu; *Allium cepa*), radish (Mulaka; *Raphanus sativus*), carrots (Grinjanaka; *Daucus carota*), and cucumber (Karkati) are recommended. Oils such as flaxseed (Atasi; *Linum usitatissimum*) and mustard (Sarshapa) are preferable. Dairy options include cow's milk treated with turmeric (go-dugdha) and buttermilk (Takra). Spices such as turmeric (haridra), pepper (maricha), cinnamon (twak), ginger (shunthi), coriander (dhanyaka), cumin seeds (jeeraka), and fenugreek (methika) are also beneficial.

ANALYSIS OF DIETARY ARTICLES

A review of classical texts reveals that many traditional dietary items, long integrated into cultural practices, are still widely consumed. These foods have been subject to scientific scrutiny to assess their suitability for diabetes management and prevention. This analysis focuses on thirty commonly consumed dietary items, prevalent across various socioeconomic and cultural groups, evaluating their nutritional profiles and scientific evidence supporting their efficacy in blood glucose regulation and diabetes management. Each item's contribution to managing diabetes is assessed based on nutritional content and empirical research findings. The outcomes of the review are presented and summarized in Table No. 1.

DISCUSSION

The incidence of Diabetes Mellitus (DM) has increased significantly in recent decades, prompting a review of both historical and contemporary management strategies. In modern terms, DM is classified into Type 1 and Type 2, with Type 1 requiring insulin therapy and Type 2 generally managed with hypoglycemic drugs. Despite advances in treatment, a definitive cure remains elusive. Current management emphasizes blood glucose control to prevent complications. The study reaffirms the importance of dietary management, highlighting those foods such as barley, wheat, and millets, with their low glycemic index (GI) and beneficial components like beta-glucan, are effective in maintaining blood glucose levels. Legumes, including red gram and chickpeas, are noted for their low GI and high protein content. Fruits like jamun and amla offer essential nutrients but should be consumed in moderation due to their natural sugar content. Vegetables with high fiber and antioxidants, such as bitter gourd and carrots, help manage blood sugar levels and reduce insulin resistance. Oils like mustard and flaxseed are preferred for their non-sugar content, while dairy products, particularly cow's milk and buttermilk, have been shown to lower the risk of Type 2 DM. Lean meat provides beneficial nutrients with minimal fat, further supporting DM management. These dietary insights integrate traditional wisdom with modern nutritional science, offering a holistic approach to managing Diabetes Mellitus.²³

CONCLUSION

The prevalence of Diabetes Mellitus is markedly elevated among individuals aged 41 to 60 years, with no significant correlation to sex, marital status, or religion. Key risk factors for DM, also referred to as *Madhumeha* in classical Indian medical texts, include sedentary lifestyles and heightened stress levels. Classified as *Vataja Prameha* in

Ayurveda texts, *Madhumeha* underscores the ancient understanding of DM. Effective management involves medication, structured dietary regimens, and physical activity, enhancing life quality. This study underscores the *Ayurvedic* dietary guideline from ancient Indian texts, when evaluated against modern scientific criteria, remain relevant for DM management. Integrating these traditional practices with contemporary research could substantially improve patient outcomes and support the goal of a healthier society.

Table 1: Nutritional Analysis of Dietary Items and Their Impact on Type 2 Diabetes Mellitus (per 100 g)

S. No.	Dietary Articles	Calorie s (K Cal)	Fat (g)	Cholesterol (mg)	Carbohydrates (g)	Dietary Fibers (g)	Sugar (g)	Protein (g)	Remarks
1.	Barley ⁵⁶	354	2.3	0	73	17	0.8	12	β - glucan portion in Barley help in DM Management.
2.	Wheat ⁷	327	1.54	0	71.18	12.2	0.41	12.61	As Semolina (rava), Steamed preferred over roasted.
3.	Barnyard Millet ⁸	353	1.4	0	65.9	9.0	1.7	8.3	Dehulled and heated Millet had lower GI.
4.	Foxtail Millet ⁹	351	04	0	59.1	19.11	1.7	11.7	Low GI, Increase Blood glucose less than rice.
5.	Finger Millet ¹⁰	378	1.3	0	59.0	19.1	1.7	7.3	Low GI help in DM management.
6.	Red Gram	343	1.5	0	63	15	0	22	Glycemic Index Low-22
7.	Horse Gram ¹¹	321	0.50	0	57.2	5.3	0	22	Dietary fibers help in blood glucose modulation
8.	Green Gram	347	1.2	0	63	16	07	24	High amount of fiber in hypoglycemic.
9.	Lentils ¹²	352	1.06	0	63.35	10.7	1.8	24.63	Pulse intake improve glucose tolerance.
10.	Chick Pea	364	06	0	61	17	11	19	Low sugar and High Dietary fiber value.
11.	Jamun ¹³	60	0.2	0	15.6	02	07	0.7	Jamun seed powder lowers blood sugar level.

12.	Indian Gooseberry ¹⁴	58	0.2	0	15.6	3.4	0	0.5	Chromium and flavonoids have hypoglycemic effects.
13.	Wood Apple	124	3.7	0	18.1	05	0	7.1	Sugar level is zero.
14.	Parushaka	90.5	0.1	0	21.1	5.53	14	1.57	Low Glycemic Index fruit.
15.	Bael	137	0.3	0	31.8	2.9	10.4	1.8	Reduce oxidative stress and hence reduce serum glucose.
16.	Orange ¹⁵	47	1.5	0	12	2.4	09	0.9	Vitamin C and Fiber stabilizes Blood glucose level.
17.	Pomegranate ¹⁶	83	1.2	0	19	2.4	14	1.7	Reduces insulin resistance and reduce blood sugar level.
18.	Patola	19	0.7	0	3.52	01	0	1.89	Sugar level is zero.
19.	Amaranth	371	7.02	0	65.25	6.7	1.69	13.56	Slow release of sugar maintains blood sugar level.
20.	Bitter Gourd ¹⁷	34	0.2	0	07	1.9	01	3.6	Increase cellular uptake and improved Glucose tolerance.
21.	Brinjal	25	0.2	0	06	03	3.5	01	Phenols and antioxidants control blood sugar level.
22.	Onion	40	0.1	0	09	1.7	4.2	1.1	Vitamin C, Fibers and antioxidants manage blood sugar.
23.	Radish ¹⁸	16	0.1	0	3.4	1.6	1.9	0.7	Extract showed an advantage in the hypoglycemic response.
24.	Carrot ¹⁹	41	0.2	0	10	12.8	4.7	0.9	Beta carotene reduced risk of Type 2 DM.

25.	Cucumber	12	0.2	0	2.2	0.7	1.4	0.6	Low carbohydrate and sugar vegetables.
26.	Flaxseed Oil ²⁰	884	100	0	0	0	0	0.1	For Prediabetic, Type 2 and Type 1 Diabetics.
27.	Mustard Oil	884	100	0	0	0	0	0	Maintains an optimum ratio of different fats in the diet.
28.	Cow's Milk	42	01	5	05	0	05	3.4	Consumption associated with 11% lower risk of T2DM.
29.	Butter milk ²¹	40	0.9	4	4.8	0	4.8	3.3	80 g/day associated with a 14% decreased risk of T2DM.
30.	Lean Meat ²²	217	11.8	0	0	0	0	26.1	Vitamin B3, Antioxidants & Selenium maintain DM.

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