

Guidelines for prevention and management of Diabetes



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General Guidelines for the users

- The prescriptions in this document should be judiciously used after proper consultation with Ayurvedic Physicians for diagnosis of the condition and understanding of the treatment.
- This document provides a selective list of medicines which are developed by research. However, the physician may use the medicines which are easily available or well-known even though not mentioned in this book.
- The prescriptions are provided for the specific type/phase/symptoms of a particular disease in this document on the basis of classical reference, research outcome or the ingredients of the formulation. It is advised that the physician may choose single or combination of formulations or procedures as per the need.
- Dose and duration of the treatment though specified in the document, should be decided by the physician based on the clinical findings, tolerance and individual condition of the patient.
- The diet and lifestyle may be advised to the patients as per the need.
- The references of the publication are given for each prescription and anybody interested in detail results of the clinical trials may log on to <http://ayushportal.ap.nic.in> or refer to the respective journals.
- In general, too spicy, salty, chilly, sour, preserved items, fried food, heavy, indigestible, too cold & hot, stale food and the food that do not suit the individual should be avoided.
- Too much tea, coffee, etc. should be avoided. Tobacco, alcohol and drugs should not be taken.
- Mental stress should be tackled by recreation such as medication, prayer, sports, exercises, yoga & other activities of individual's choice.

Background

The history of diabetes (madhumeha) can be traced back in 1000 BC (Caraka Samhita). Descriptions concerning the disease and its management are available in Ayurvedic literature. Caraka Samhita (1000 BC) and Susruta Samhita (1000-600 BC) defined madhumeha as the disease in which the patient passes frequent urine characterized as astringent and sweet. The high blood sugar produces the classical symptoms of polyuria (frequent urination), polydipsia (increased thirst) and polyphagia (increased hunger). The word diabetes comes from Latin "diabetes", which in turn comes from Ancient Greek word which literally means "a passer through" and the word mellitus comes from the classical Latin word mellitus, meaning "mellite" (i.e. sweetened with honey; honey-sweet). Indian physicians identified the disease and classified it as madhumeha or "honey urine".

Ayurveda attributes multi-factorial etiology to the causation of diabetes. It has been described as one among the eight major diseases (asthamahagada) in Ayurveda, which are difficult to cure and refractory in nature.

Diabetes mellitus (madhumeha) is a group of metabolic diseases marked by high level of blood glucose resulting from defects in insulin production, insulin action or both. Diabetes may lead to serious complications in multiple organ systems. Diabetes is of two types- type I or Insulin Dependent Diabetes Mellitus (IDDM) & type II or Non Insulin Dependent Diabetes Mellitus (NIDDM). Complete or near total insulin deficiency is found in type I while type II diabetes mellitus is characterized by variable degree of insulin resistance, impaired insulin secretion and increased glucose production. Type II diabetes mellitus is increasing more rapidly due to obesity caused by sedentary life habits and changed life style. Insulin is the only treatment for type I diabetes and conventional modern medicine provides a number of drugs for controlling the blood sugar level in the patients of diabetes mellitus type II. However, with the prolonged treatment doses of the drugs often need to be increased to control the blood sugar level and a time comes when patient has to be switched over to insulin. Such patients become cases of insulin dependent diabetes mellitus. To handle such a situation time tested treatment available in ayurveda may be adopted

Prevalence

Diabetes is undoubtedly one of the most challenging health problems in the 21st century. It is increasing globally with a rise from about 30 million cases in 1985 to 177 million cases in 2000 and worldwide estimates project that more than 360 million individuals will have diabetes by the year 2030 (Harrison's principle of Internal medicine, 2002). The prevalence of the disease increases with the age.

Introduction

Diabetes mellitus (DM) is one of the most common non-communicable diseases (NCDs) globally. It is the fourth or fifth leading cause of death in most high-income countries and there is substantial evidence that it is epidemic in many economically developing and newly industrialized countries.

It has been narrated in ayurveda that, the long periods of physical inactivity, laziness, sleeping for long hours, excess use of food which is heavy to digest like dairy products, aquatic and marshy animals, sugar/jaggery preparations, fresh grains etc. and similar foods that increase kapha are generalized causes of prameha.

Clinical Features

Common symptoms of diabetes include:

- Polyuria - increased urination
- Polyphagia - excessive appetite
- Polydypsia - excessive thirst
- Unusual weight loss or weight gain
- Fatigue
- Nausea, perhaps vomiting
- Blurred vision
- In women, frequent vaginal infections
- In men and women, yeast infections
- Dry mouth
- Slow-healing of sores or cuts in the skin / mucosa
- Itching of the skin, especially in the region of groin or genitals

Complications

Complication occurring due to diabetes may be broadly categorized as:

A. Acute complications

- Diabetic ketoacidosis (DKA)
- Hyperglycemia hyperosmolar state
- Hypoglycemia
- Diabetic coma
- Respiratory infections

B. Periodontal disease **Chronic complications**

- Physical disabilities
- Cognitive decline
- Retinopathy

- Macroangiopathy
- Neuropathy
- Nephropathy

Laboratory Investigations

- Measurements of the plasma glucose
 - Fasting blood sugar (FBS)
 - Post prandial blood sugar (PPBS)
 - Random blood sugar (RBS)
- Oral glucose tolerance test (OGTT)
- Glycosylated haemoglobin (HbA1c)
- Urine test - Urine glucose, albumin, ketones etc.
- C-Peptide – c-peptide is a simple, cost-effective and non-invasive method in the assessment of beta-cell capacity
- Insulin test
- Blood Urea
- E.C.G.
- Lipid profile
- Serum electrolytes etc.

Diagnosis

As defined by WHO (recommendations 2006):

1. Fasting plasma glucose ≥ 7.0 mmol/l (126mg/dl).or ≥ 110 mg/dl blood glucose (Ref: Diabestes India.com)
2. 2-h plasma glucose ≥ 11.1 mmol/l (200mg/dl).or >180 mg/dl(Ref: Diabestes India.com)

Premonitory signs and symptoms

- Sweet taste in the mouth
- whitish urine with sweetish odor
- Attraction of insects and ants to the urine / person
- Dryness in mouth, palate and throat
- Thirst/drowsiness
- Excessive sweating and foul smelling of the body
- Lethargy
- Unhygienic body
- Excessive deposition of waste products in palate, tongue and teeth etc.
- Matting of the hair
- Abnormal appearance of the urine
- Numbness and burning sensation in hands and feet etc.

Treatment Modalities

Management Approaches

Prevention

Ayurveda emphasized that the first and foremost principle of prevention as well as the treatment of any disease is avoidance of causative factors. This is called the principle of nidana Parivarjanam in Ayurveda.

- Restrict the excessive use of curds, flesh of domestic / aquatic animals and of marshy places, use of milk and milk preparations, water of rivers and tanks during rains and floods, new grains, puddings made of jaggery /sugar and consumption of kapha Dosha exaggerating factors.
- Restrict heavy diets, fatty foods which increase body weight and lipids / cholesterol.
- Avoid sleep during daytime and laziness.
- Various preparations of rice which crops within 60 days yava (barley), Godhuma (wheat), Kodrava (grain variety –*Paspolum scrobiculatum*) Adhaki (red gram-*Cajamus cajan*), Kulattha (horse gram-*Dolichos biflorus*) and Mudga (green gram) with bitter and astringent leafy vegetables should be taken.
- Use the oils of Nikumba (*Danti-Baliospernum montanum*), Ingudi (*Balanitis egyptica*), Atasi (*Linum usitatisimum*), Sarsapa (*Mustard-Brassica campesteris*) is useful.
- Use the meats of animals, which are having anti diuretic properties (badha mutratj), forest animals, forest birds are recommended.
- Navapatala (*Tricosanthus dioica*), raw banana, Tanduleyaka (*Amaranthus spinosus*), Vastukam (Bathuva-*Chenopodium album*), Matsyakshi (*Alternanthera sessilis*), bitter vegetables like Methika (*Trigonella foenum-graecum*), Karavellaka (*Momordica charantia*); Bimbi (*Coccinia Indica*), Marica (*Piper nigrum*), Saindava lavana (rock salt) should be used.
- Practice regular exercise/yoga, increase calorie consuming activities (brisk walking, swimming, cycling, etc.)
- Avoid fruits with high simple sugars like banana, cheeku (sapodilla), grapes, and mango etc.
- Use fruits like orange, watermelon, apple, guava, Jambu (*Syzigium cumini*), Kapitha (*Feronia limonia*), Amlaki (*Phyllanthus emblica*) etc.

Line of Treatment

- **Nidan parivarjana (avoidance of etiological factors)**
- **Sodhana cikitsa (bio-cleansing therapies)**
Cleansing of the body by using bio-purification measures is advocated in case of obese diabetics. The selection of the bio-cleansing strategy / measure depends upon dosha

predominance (kapha predominant patients are advised emesis, whereas Pitta predominant patients are advised purgation).

- **Palliative therapy**

The following drugs /formulations have been found to be useful in type II diabetes mellitus. It is hypothesized that most of these drugs work by improving the insulin production and / or increasing the insulin sensitivity. These drugs may be used as an adjuvant to conventional insulin therapy in case of type-I diabetics also with an objective to improve the glycemic control and overall quality of life and to prevent long term complications.

Diet recommended in diabetes

Type of Diet	Name
Cereals	Purana shali (old rice), Shastic Shali (rice which crops within 60 days), <i>Yava</i> (Barley) (<i>Hordeum vulgare</i>), Godhum (wheat), Kodrava (grain variety – <i>Paspolum scrobiculatum</i>)
Pulses	Adhaki (red gram- <i>Cajamus cajan</i>), Kulattha (horse gram) and Mudga (green gram) should be taken with bitter and astringent leafy vegetables.
Vegetables	Navapatola (young <i>Tricosanthus dioica</i>), young vegetables variety of banana, Tanduleyaka (<i>Amaranthus spinosus</i>), Vastukam (Bathuva), Matsyakhshi (<i>Alternanthera sessilis</i>) all bitter vegetables (tiktasakam) like Methica (Fenugreek leaves), Karavellaka (Bitter gourd)
Fruits	Orange, watermelon, apple and guava, Jamb£ (<i>Syzigium cumini</i>) Kapitha (<i>Feronia limonia</i>), Amalki (<i>Phyllanthus embilica</i>) etc fruits.
Flesh	Harina (deer), birds like Kapota (pigeon), Titira (Grey Francolin)
Oils	Nikumba (Danti- <i>Baliospernum montanum</i>), Ingudi (<i>Balanitis egyptica</i>), Atasi (<i>Linum usitatisimum</i>), Sarsapa (mustard).

DRUG THERAPY

Single Drugs

Drugs	Dosage (per dose)	MOA/Vehicle	Duration
Amlaki (<i>Phyllanthus emblica</i>) -Fruit	3-6 gm	Warm Water	90 days
Haridra (<i>Curcuma longa</i>)-Rhizome	1-3 gm	Luke Warm Water	90 days
Jambu (<i>Syzygium cumini</i>)-seed	3-6 gm	Water	90 days
Mesharangi (<i>Gymnema sylvestre</i>)-Leaf	3-6 gm	Water	90 days
Methika (<i>Trigonella foenum</i>)-leaves and seed	3-6 gm	Water	90 days
Kumari (<i>Aloe vera</i>) swarasa-leaf Pulp	10-15 ml	-----	90 days
Neem (<i>Azadirachtha indica</i>)-seeds, Leaf and stem bark	3-6 gm	Water	90 days
Vijayasara (<i>Pterocarpus marsupium</i>)-stem	3-6 gm	Water	90 days
Karavellaka (Bitter gourd- <i>Momordica charantia</i>)-seeds	3-6 gm	Water	90 days

Compound Formulations

Drugs	Dosage (per dose)	MOA/Vehicle	Duration
Triphala Churna	3-6 gm	Warm Water	90 days
Amalki swarasa	10-15 ml	-----	90 days
Phalatrikidi kvith	25-50 ml	-----	90 days
Gokhuradi guggulu	3-6 gm	Water	90 days
Vyoshadi guggulu	3-6 gm	Water	90 days
Chandraprabha Vati	250-500 mg	Water	90 days
Lodhrasava	10-20 ml	Water	90 days
Deodarvarishta	10-20 ml	Water	90 days
Dhanvantara ghrita	20-40 gm	Warm water	10 days
Kshira Baba taila	3-6 gm (orally) also used for abhya'ga	Warm water	10 days
Saptamrita lauha	250-375 mg	Milk/ghrita	10 days

Some research based drugs

The safety and efficacy of Ayurvedic interventions have been demonstrated through several experimental and clinical studies and extract of few studies are as follows:

Experimental studies

Aegle marmelos

- Biochemical studies in streptozotocin-induced diabetic rats confirmed the potent hypoglycaemic activity of an aqueous extract **Aegle marmelos** Diabetes Mellitus and Ayurvedic Management: An appraisal Research on Bilva leaves and suggested it to be an oral substitute for insulin.(Bhavapriya, 2000)
- Albino rats were treated with ethanol extract of two varieties (sweet and bitter) of (Bilva)leaves and their blood glucose lowering effect was studied using glucose oxidase assay method. Both the varieties exhibited hypoglycaemic activity in a dose dependent manner. Sweet variety (250 and 500 mg/kg) produced maximum blood glucose reduction at 6 hour, while the bitter variety at the same dose levels showed maximum reduction at 8 hour and this continued upto 24hour (Rao, Babu, Rao, Nimmi, 2002).
- Oral administration of aqueous extract of *Aegle marmelos* (Bilva) seeds (250 mg/kg) was found to decrease blood glucose level by 35.1% in normal healthy rats 6h after administration, by 41.2% in subnormal and by 33.2% in mild diabetic rats in glucose tolerance test after 2h. Treatment of severely diabetic rats for 14 days with a dose of 250 mg/kg reduced the fasting blood glucose level by 60.84%. It also brought about a fall in the level of total cholesterol with an increase in HDL-Cholesterol and a decrease in LDLCholesterol and triglycerides.
- Aqueous extract of *Aegle marmelos* (Bilva) seeds was thus proved to possess anti-diabetic and hypolipidaemic effects in diabetic rats (Kesari, Gupta, Singh, Diwakar, Watal, 2006). •

Cinnamomum tamala (Tejapata)

- Oral Administration of an ethanol (50%) extract of ***Cinnamomum tamala* (Tejapata)** leaves significantly lowered the plasma glucose levels in normoglycaemic and streptozotocin-induced hyperglycaemic rats. The extract also showed anti-hypercholesterolaemic and antihypertriglyceridaemic activity in streptozotocin-induced diabetic rats (Sharma, Dwivedi, Swarup, 1996).

Cinnamomum zeylanicum (Tvak)

- Water extract of ***Cinnamomum zeylanicum* (Tvak)** bark significantly reduced blood glucose value at 1h during glucose tolerance test. When diabetic animals with fasting blood glucose were treated with cinnamon extract (200mg/kg, b.w.) once daily for 2

weeks, the fasting blood glucose level came down (Prachi, Murali, Murthy, Tandon, Chandra, 2004).

***Coccinia indica* (Bimba)**

- The juice and decoction of leaves and stems of *Coccinia indica* (Bimba) (20ml/kg) showed significant hypoglycemic response in fasting rabbits. The decoction of the fruits of the plant also showed similar activity (Pillai, Ghosh, Uma, Kumar, 1980).
- The blood sugar lowering effects of ethanol extracts of whole plant and root of *Coccinia indica* (Bimba) were tested in different experimental models. While the plant-extract reduced the blood sugar levels of fasted, glucoseloaded and streptozotocin-induced diabetic albino mice to different degrees, root extract reduced the blood sugar only of glucose-loaded animals (Mukherjee, Chandrasekar, Mukherjee, 1988).

***Gymnema Sylvestre* (Meshasringi)**

- Administration of *Gymnema Sylvestre* (Meshasringi) extract decreased serum glucose concentration in dexamethasone induced hyperglycaemic animals. The effects were comparable to the standard corticosteroidinhibiting drug, ketoconazole (Gholap, Kar, 2003).

***Momordica charantia* (Karavellaka).**

- Experimental and clinical studies revealed anti-diabetic and adaptogenic properties of the aqueous extract of *Momordica charantia* (Karavellaka). The aqueous extract of the fruit was more effective in diabetes than the powder of the dried fruit (Srivastava, Venkatakrishna-Bhatt, Verma, Venkaiah, 1993).
- The effect of varying doses of alcoholic and aqueous extracts of *Momordica charantia* (Karavellaka) on body weight, serum glucose, insulin and triglycoside was investigated in fructose fed rats. Serum glucose and insulin levels were significantly increased following feeding of fructose for 15 days.
- Administration of an aqueous extract of *Momordica charantia* (400mg/d) markedly prevented high fructose diet-induced hyperglycaemia and hyperinsulinaemia (Vikrant, Grover, Tandon, Rathi, Gupta, 2001).

***Pterocarpus marsupium* (Vijayasar),**

- Administration of ethyl acetate-soluble fraction of ethanol extract of *P.marsupium* wood to alloxan-induced diabetic rats for 5 days significantly reduced the blood sugar levels along with an increase in insulin levels (Ahmad et al., 1991).
- The effect of the anti-diabetic plant, *Pterocarpus marsupium* (Vijayasar), on the development of cataract was assessed in rats. An aqueous extract of *Pterocarpus marsupium* (Vijayasar (1g/kg/day) was given to alloxan (120 mg/kg)-induced diabetic rats until the development of cataract.
- Administration of the plant extract exerted a favorable effect on body weight, blood glucose and anti-cataract effect as evident from decreased opacity index (Vats, Yadav, Biswas, Grover, 2004)

***Tinospora cordifolia*(Guduchi)**

- Oral administration of the root extract of *Tinospora cordifolia*(Guduchi) for 6 weeks resulted in significant reduction of blood and urine glucose and of lipids in serum and tissues in alloxan-induced diabetic rats (Prince, Menon, 2003).

***Trigonella foenum graecum* (Methi)**

- Extracts of *Trigonella foenum graecum* (Methi), tested for their hypoglycaemic effect in rabbits, the alkaloid-rich fraction showed maximum effect within two hours of its administration (Jain, Lohiya, Kapoor, 1987).
- Supplementation of the diet with *Trigonella foenum graecum* (Methi) leaves showed a significant effect on hyperglycaemia, hypoinsulinaemia and glycosylated haemoglobin in streptozotocin- induced diabetic rats.
- Methi leaves improved the body weight and liver glycogen and also showed a significant effect on key carbohydrate metabolic enzymes in diabetic rats.
- The effect of fenugreek leaves was found to be similar to that of glibenclamide (Devi, Kamalakkannan, Prince, 2003).
- Oral administration of an alcoholic extract of *Trigonella foenumgraecum*(Methi) seeds significantly reduced the blood sugar levels of normal as well as of alloxan-induced diabetic rats (Vats, Grover, Rathi, 2002)

Clinical Studies:

- **Vijayasara (*Pterocarpus marsupium*) in NIDDM:** A flexible dose open trial was conducted in four centres in India to evaluate the efficacy of *Vijayasara* in the treatment of newly diagnosed or untreated NIDDM. By the 12 weeks, control of blood glucose had been attained in 69% patients studied. The mean Hb Ac was decreased significantly ($P < 0.001$) to 9.4% at 12 week from the initial mean of 9.8%. Other laboratory parameters remained stable and no side effects were reported (Flexible dose open trial of *Vijayasara* in cases of newly diagnosed non-insulin dependent Diabetes mellitus–ICMR collaborating centers, Central Biostatistical Monitoring Unit, Chennai and Central technical Coordinating unit, ICMR, New Delhi)
- **Ayush-82 and Shuddha Shilajit :** In a clinical trial (n=80) of NIDDM, an Ayurvedic formulation named Ayush-82, 5gm thrice daily and *Shuddha Shilajit*, 500mg twice daily was given for 24 weeks. Fasting and postprandial blood sugar levels were estimated at 6th weekly intervals. There was statistically significant reduction in both fasting and postprandial blood sugar (Pandey *et al.*, 1995)
- ***Coccinia indica* :**In a controlled clinical trial (n= 30)of NIDDM, tablets made from aqueous extract of *Coccinia indica* twice daily were given before meal for 3 months. The drug was found to be significantly attenuated the lipid fraction almost to normal range with the control of hyperglycemia (Kamble *et al.*, 1996)
- **Ayurvedic Therapy in Diabetes Retinopathy:** A Combination of therapy viz.*tarpana* with *Patoladi ghrita* and internal administration of *Dhanvantara Kwatha* 20ml, *Punarnavasava* 25ml, *Candraprabhavati* 250mg and *Nisamalaki* 5 gm twice a day in the subjects of Diabetes retinopathy showed remarkable improvement in visual acuity. There was no further visual loss, no further focal haemorrhages and no neovascularisation was observed (Srikanth, 2005).
- **Ayush-82 –An Ayurvedic Hypoglycemic formulation :** Consisting of *Amra bija* (seeds of *Mangifera indica*), *Karavellaka bija* (seeds of *Momordica charantia*), *Jambu beeja* (seeds of *Syzygium cumini*), *Gudmara* (leaves of *Gymnema sylvestre*) was tried on a fairly large sample size (n=350) in a control clinical study revealed statistically significant reduction in fasting and postprandial blood sugar in Non insulin Dependent Diabetes Mellitus (CCRAS Research–An Overview, 2002).
- **Nishamalaki :** In an open clinical trial 100 patients of NIDDM (n=100) in the age range of 31-70 years with normally blood sugar elevated cases i.e. 100mg or more in FBS were put on the drug Nishamalaki 1 gm twice daily with water for 6 weeks between. The results showed that the drug has got moderately good hypoglycemic effect (Nanda, Chopra, Sahu, and Padhi, 1998).
- **Amrita-Pippali-Nimba Yoga :**A series of 50 patients of diabetes mellitus divided into three groups Group A (n=15): *Amrita-Pippali-Nimba Yoga*; Group B(n=14): Add on

treatment with *Amrita Pippali*, *Nimba Yoga* and Group C(n=8): Placebo were studied. The *Amrta-Pippali-Nimba Yoga* has showed significant improvement in both fasting and postprandial blood sugar levels in group A and B when compared to placebo (Mehra, Singh, 2001).

- ***Coccinia cordifolia* extract on Newly Detected Diabetic Patients:** In a double-blind, placebo-controlled, randomized trial Sixty newly detected type 2 diabetic patients (n=60) were randomly assigned into the placebo and experimental group (1 g alcoholic extract of *Coccinia cordifolia* administered for 90 days). The significant decrease (at day 90) in fasting blood glucose and postprandial blood glucose was observed with a mean change of 15.6% and 18.5% respectively in the experimental group (Rebecca, Ramaswamy, Ganapathi, Anura, 2008).

Counseling – Advise the patient to:

- Do physical exercise according to body condition, at least 30 – 60 minutes daily.
- Restrict intake of sweets containing refined / white sugars.
- Increase the use of barley, wheat, green gram and roasted bengal gram in diet.
- Limit the use of potato, rice, milk products and oily foods.
- Take utmost care of personal hygiene especially of feet and hand.
- Avoid injuries and immediately consult in case it happens.
- Avoid alcohol and tobacco consumption in any form.
- Regular medical checkup and monitoring of blood glucose level
 - a) Glycosylated haemoglobin (HbA1c) test at least twice in a year
 - b) Eye examination annually, especially fundus examination
 - c) Foot examination at least twice in year
 - d) Renal function screening at least yearly
 - e) Blood pressure assessment at least monthly
 - f) Lipid profile at least annually
 - g) Cardiac checkup at least annually

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