



**INTERNATIONAL JOURNAL OF
PHARMACEUTICAL SCIENCES**
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: <https://www.ijpsjournal.com>



Review Article

A Brief Review on Diabetes Mellitus and Role of Medicinal Plants in The Management of Diabetes Mellitus

Kailas Gore, Pratik Bhange, Dr. Megha Salve

Department of Pharmacy, Shivajirao Pawar College of Pharmacy, Pachegaon, Ahilyanagar-413725

ARTICLE INFO

Published: 28 Nov. 2024

Keywords:

Diabetes mellitus, diagnosis, cause and treatment

DOI:

10.5281/zenodo.14236446

ABSTRACT

Diabetes mellitus is a group of metabolic diseases in which there are high blood sugar levels over a continuous period. Diabetes mellitus is widely recognised as one of the leading causes of death and disability. According to W.H.O. 415 million people are suffering from Diabetes mellitus worldwide, which may go up to 435 million in 2030 and may go to 592 million by 2035. Several mechanisms have been proposed to be responsible for insulin resistance, including increased non-esterified fatty acids, inflammatory cytokines, adipokines and mitochondrial dysfunction as well as glucotoxicity, lipotoxicity and amyloid formation of β . cell dysfunction. Diabetic management includes diet, exercise and combinations of antihyperglycemic drug treatment with lipid-lowering, antihypertensive and antiplatelet therapy. Traditionally, there are some medicinal plants believed to treat diabetes as they have been proven in research studies to possess anti-diabetic properties. This review focused on types, Diagnosis, Pathophysiology and the medicinal plants used for the treatment /management of the diabetes mellitus.

INTRODUCTION

As per Ayurveda diabetes also known as Madhumeha is a disease in which improper functioning of Insulin and as a result sugar level in blood increases.[1] As per W.H.O DM is characterised by common features of chronic hyperglycemia with disturbance of carbohydrate, fat and protein metabolism. [2] At this point it is also important to understand another related term, metabolic syndrome (also called syndrome X or

insulin resistance syndrome) Consisting of a combination of metabolic abnormalities which increases the risk of developing diabetes mellitus and the cardiovascular disease. Major features of the metabolic syndrome are central obesity hyperglyceridaemia, low HDL cholesterol, hyperglycemia and hypertension. DM is a leading cause of morbidity and mortality world over. It is expected to continue as a major health problem owing to its serious complications especially end-

***Corresponding Author:** Kailas Gore

Address: Department of Pharmacy, Shivajirao Pawar College of Pharmacy, Pachegaon, Ahilyanagar-413725

Email ✉: kailasgore45@gmail.com

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



stage renal disease.IHD. Gangrene of the lower extremities and blindness in adults. China, India and the US are the countries with highest number of the diabetic population. In India, its incidence is estimated at 7% of adult population largely due to genetic susceptibility combined with changing lifestyle of low-activity and high calorie diet in the growing Indian middle class. Not only biological factors but also psychosocial factors are responsible for diabetes risk.(3) Evidence indicates that diabetes and its complications are strongly related to the psychological and psychiatrically problems.[4] various types of psychosocial factors include depression, poor eating habits, poor exercise and fear of hypoglycaemia. Patients with diabetes from high level of diabetes-specific emotional stress associated with poor adherence to exercise, diet, medications, inadequate glycaemic control, obesity, hereditary, lifestyle includes alcohol consumption, smoking.[5] There are mainly 2 types of diabetes. Type 1 diabetes mellitus (T1DM) which is more common in children and type 2 diabetes mellitus (T2DM) most commonly observed in adults. DM is suspected mainly based on its symptoms. The high blood glucose produces the sign of frequent urination (polyurea) increased thirst (polydipsia) and increased hunger (polyphagia).[6] According to the International Diabetes Federation (IDF) 9.1 of the 4.15 millions patients with DM have Type 2 DM.(7) Type 1 DM stems from the lymphocyte-mediated destruction of pancreatic β -islet cells, involving human leukocyte antigen associated particularly with a strong linkage to DQA and DQB agents. The place at which β -cell deterioration occurs differs among individual of different age groups limiting the body's ability to maintain physiological glucose level.(8) Patients with DM may present with various symptoms like Polyuria, polydipsia and weight loss. DM is diagnosed through criteria such as Fasting blood

glucose levels and oral glucose tolerance test. The pathophysiology of DM involves Inulin resistance and pancreatic β -cell dysfunction leading to elevated blood glucose levels.(9)

The causes of DM includes:

- i) Genetic defect in Insulin action (e.g. type A insulin resistance).
- ii) Endocrinopathies (e.g. Acromegaly, Cushing's syndrome, pheochromocytoma).
- iii) Infections (e.g. congenital Rubella).
- iv) Habitual physical activity.
- v) History of cardiovascular diseases. The clear view of this Article is to introduce to the Diabetes Mellitus and the role of medicinal plants in the management of Diabetes Mellitus. (10)

Prevalence

The number of people with diabetes is increasing due to population growth, aging, urbanization, and the increasing prevalence of obesity and physical inactivity. The prevalence of diabetes for all age groups worldwide was estimated to be 2.8% in 2000 and 4.4% in 2030. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030. The prevalence of diabetes is higher in men than women, but there are more women with diabetes than men. The urban population in developing countries is projected to double between 2000 and 2030.[11] The prevalence estimates of Diabetes in India ranges from 5.6% to 12.4% in Urban area and 2.4% to 2.7% in rural area. This difference not only exist across the Indian states because different states India are at diverse stages of demographic transition. [12] Diabetes is chronic disease that occurs either when pancreas does not produce enough Insulin or when the body cannot effectively use the Insulin it produces. The Insulin hormone that produces /regulate blood glucose. Hyperglycemia also called as raised blood glucose /raised blood sugar is a common effect of uncontrolled Diabetes and over time leads to

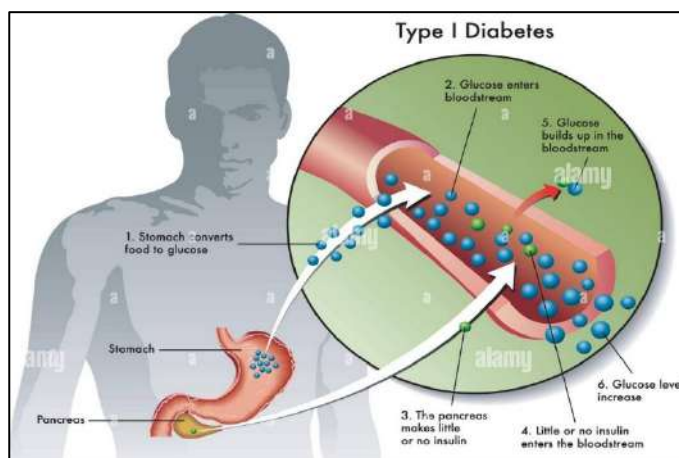


serious damage to many of the body system specially nerves and blood vessels. In 2014 8.5% of adult ,18-year-old and elder persons has Diabetes. In 2019 Diabetes was directly caused 1.5 million deaths and 48% of all deaths due to diabetes occurred before the age of 70 years.[13]

❖ **Classification of Diabetes Mellitus:**

The firstly accepted classification of Diabetes Mellitus was published by W.H. O in the year 1980. [] and was modified in the year 1985.it must be different from secondary Diabetes Mellitus which include from Hyperglycemia associated with identifiable causes in which destruction pancreatic islet is reduced by inflammatory disease. (14)

❖ **Types of Diabetes Mellitus:**



2) **Type 2 DM (NIDDM):** It is non-Insulin dependent Diabetes Mellitus. It is also known as Maturity onset diabetes since it occurs in the middle age group (usually more than 40 years of age. Body does not produce enough Insulin for proper function or the cell in the body do not reacts to insulin (Insulin-resistance).[17]

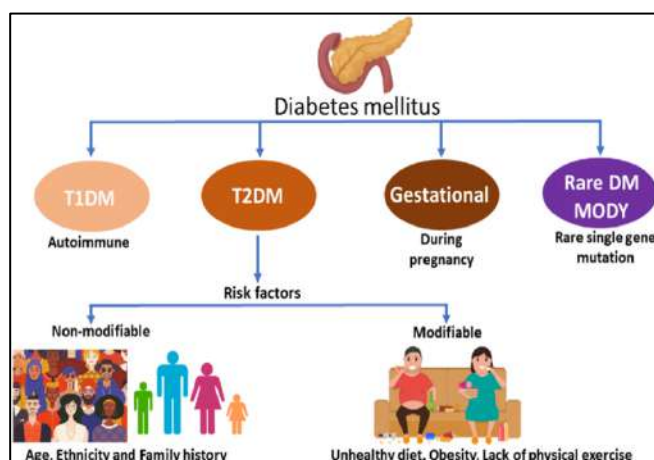
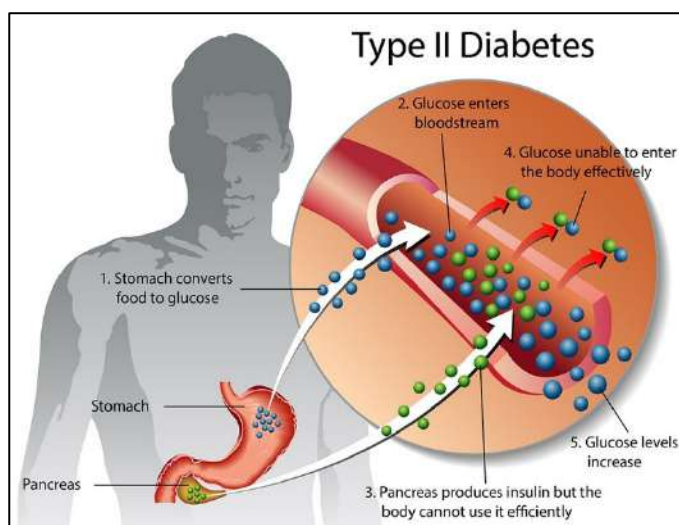


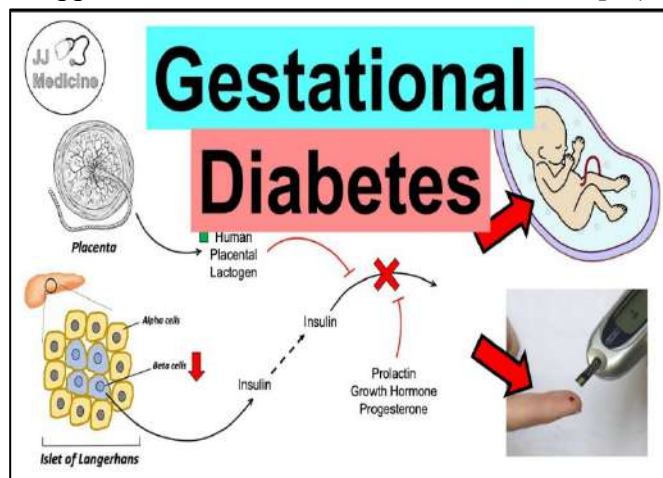
Fig no.01

1) **Type 1 DM (IDDM):** Type 1 DM is also known as Insulin Dependent Diabetes Mellitus or Juvenile diabetes or early-onset diabetes because it usually appears in the childhood or in young age group commonly less than 40 years of age. (15)The individual may also seek with other Autoimmune disorders such as Graves' disease and Thyroiditis disorder.[16]



3) **Gestational Diabetes:** This type affects female during the pregnancy. Some women have very high levels of glucose in their blood.(18) In pregnancy hormonal changes occurs which are responsible for the body to use Insulin which results in development of carbohydrate in tolerance. Gestational Diabetes Mellitus

disappears after the childbirth.[19]



is impaired; may progress to B cell failure. 1251 The theory of principal in micro vascular disease leading to neural hypoxia, and the direct effects of hyperglycemia on neuronal metabolism. [21]

1) **Reduced sensitivity of peripheral tissues to insulin:** reduction in number of insulin receptors, down regulation of insulin receptors. Many hypersensitive and hyperinsulinemia, but normal glycemic; and have associated dyslipidemia, hyperuricemia, abdominal obesity. Thus there is relative insulin resistance, particularly at the level of liver, muscle and fat. Hyperinsulinemia has been implicated in causing angiopathy,(22)

2) **Excess of hyperglycemia hormone (glucagon) etc. obesity;** causes relative insulin deficiency the B cells lag behind. Two theories have demonstrated abnormalities Oxide metabolism, resulting in altered perineural blood flow and nerve damage,

3) Other rare forms of diabetes mellitus are those due to specific genetic defects (type 3) like “maturity onset diabetes of young” (MODY) other endocrine disorders, pancreatectomy And gestational diabetes mellitus (GDM),(23)

4) Due to imbalance of specific receptor can cause diabetes mellitus. Some specific receptors are Glucagon-like peptide-1(GLP-1) receptor, peroxisomes proliferators- activated (y) receptor (PPARy), beta3 (33) ardent-receptor some enzymes like a glycosidase, dipeptidyl peptidase IV enzyme etc. (24)

5) Current research on diabetic neuropathy is focused on oxidative stress, advanced gyration-end products, protein kinase C and the polyol pathway, [24]

❖ **Pathophysiology**
Current treatments for Diabetes Mellitus and their side effects.²⁵

4) Other specific type (Monogenic types)

The most common form of monogenic types of diabetes is developed with mutations on chromosome 12 in a hepatic transcription factor referred to as hepatocyte nuclear factor (HNF)1a. They also referred to as genetic defects of beta cells(20). These forms of diabetes are frequently characterized by onset of hyperglycemia at an early age (generally before age of 25 years). They are also referred to as maturity onset diabetes of the young (MODY), 181 maturity- onset diabetes in youth or with defects of insulin action; persons with diseases of the exocrine pancreas, such as pancreatitis or cystic fibrosis; persons with dysfunction associated with other endocrinopathies (e.g., acromegaly); and persons with pancreatic dysfunction caused by drugs, chemicals or infections. Some drugs also used in the combination with the treatment of HIV/ AIDS or after organ transplantation. Genetic abnormalities that result in the inability to convert proinsulin to insulin have been identified in a few families, and such traits are inherited in an autosomal dominant pattern. They comprise less than 10% of DM cases.

Causes of diabetes mellitus: Disturbances or abnormality in gluco-receptor of B cell so that they respond to higher glucose concentration or relative B cell deficiency. In either way, insulin secretion

| Sr. No. | Drug | Action | Side effect |
|---------|--------------------------------|---|--|
| 1) | Metformin | Lowering glucose production in the liver improve body sensitivity to insulin. | Nausea, bloating and abdominal pain. |
| 2) | Sulfonylureas | Help to body secrete more insulin. | Low blood sugar level and weight gain |
| 3) | Thiazolidinediones (Glitanide) | Make body tissues more sensitive to insulin. | Risk of CHF, bladder cancer, bone fracture, cholesterol. |
| 4) | Glinides (Biguanide) | stimulate pancreas to secrete more insulin. | Low blood sugar level and weight gain. |
| 5) | DPP 4 inhibitors | Help to reduce sugar level. | Risk of pancreatitis and joint pain. |
| 6) | SGLT 2 inhibitors | Inhibit the return of glucose is excreted in the urine. | Risk of amputation, bone fracture, vaginal yeast function, high cholesterol and urinary tract infection. |

Medicinal plants used for the treatment and management of Diabetes mellitus.^[26]

- 1) *Fenugreek seeds*: (Trigonellafoneum-graecum) Fenugreek seeds are high in soluble Fiber, which helps lower blood sugar by slowing down digestion and absorption of carbohydrates. This suggests they may be effective in treating people with diabetes.
- 2) *Curcuma longa* (Turmeric):- It helps as adjuvant therapy for the prevention and treatment of diabetic encephalopathy. Its active ingredient is curcumin.(27)
- 3) *Cassia Fistula* (Green tea) - It exhibits hypoglycemic, glucose oxidizing, and insulin-mimetic activities. Its active ingredient is Catechin.
- 4) *Momordica charantia* (bitter gourd):effects in various animal models. Momordica charantia is commonly used as an antidiabetic and antihyperglycemic agent. Extracts of fruit pulp, seed, leaves, and the whole plant were shown to have hypoglycemic effects in various animal models.(28)
- 5) *Ocimum sanctum*(holy basil) :- It is commonly known as Tulsi. It showed a significant reduction in blood sugar levels in both normal and alloxan-induced diabetic rats. Significant reduction in fasting blood glucose, uronic acid, total amino acid, total cholesterol, triglyceride, and total lipid indicated the hypoglycemic and hypolipidemic effects of Tulsi in diabetic rats.
- 6) *Cinnamomum zeylanicum*:- It is commonly known as Cinnamon, is harvested by growing the tree for two years then coppicing it. They mainly constitute volatile oils, containing cinnamaldehyde. Cinnamon ingestion reduced total plasma glucose responses International Bulletin of Drug Research. Cinnamon supplementation may thus be important in vivo glycaemic control and insulin sensitivity in humans, and they also appear to be sustained for 12 hours.
- 7) *Lawsonia inermis*:- It is commonly known as Henna or Mehendi, is a much-branched glabrous shrub or small tree, cultivated for its leaves is found to constitute carbohydrates, proteins, flavonoids, tannins, phenolic compounds, alkaloids, terpenoids, quinones, coumarins, xanthenes, and fatty acids. Ethanol (70 %) extract of L. inermis showed significant hypoglycaemic and hypolipidemic activities in alloxan-induced diabetic mice after oral administration.(29)
- 8) *Psidium guajava*: - It is commonly known as Guava or Amrood, is a semi-deciduous tropical tree in north India and is widely grown throughout India for its fruits. It is found to contain a high percentage of vitamin C,



carotene, Vit B1, B2, B6, and free sugars (glucose, fructose, and sucrose).

- 9) *Eugenia jambolana*: - It is commonly known as Jamun or black plum, is being widely used to treat diabetes by traditional practitioners over many centuries.
- 10) *Murraya koeingii*:- It is commonly known as Kurrupatta, it showed hypoglycemic effects associated with increased hepatic glycogen content due to increased glycogenesis and decreased glycogenolysis and gluconeogenesis. (30)

CONCLUSION

Diabetes mellitus is a complicated health condition with multiple causes and many treatment options. Various myths may influence diabetics' health-seeking behaviour, and they may use traditional medicines, which include normal foods and herbs, for primary health care. The synthetic formulation against the diabetes mellitus is available in market. They are showing excellent clinical and pharmacological activity in diabetic patients, but they have significant adverse effect. So, it is necessary to aware the people who are suffered from type 2 diabetes mellitus to treat this disorder by using herbal/medicinal preparation which is showing antidiabetic action. In this article we have provided the information of Diabetes Mellitus and some medicinal plants which are safe and helpful in the treatment and management of Diabetes Mellitus.

REFERENCES

1. verma, madhu Gupta, Haravinder popli, Geeta Agarwal. Diabetes mellitus treatment wing herbal drugs April 2018 Internation Journal of phytomedicine 10 (1): 01.
2. Achimsetty kumar, Desireddy Reddy, Gudipati Jahnavi, Garlapati Bhavya A comparitive study DM management in complications opposite genders.
3. Debarh Assimwe, Godfrey o mauti, Ritah kiconoco,prevelance and risk factor associated

with type 2 diabetes elderly patients age 45-80 year at kanunga district, Journal of Diabetes research 2020, 2020-1-5

4. Ambody Ramachandran know the sign and symptoms of diabetic Indian Jimed. Res. 2014.140-155
5. Wang A, Green jB Halperin JL, piccini, Jp sr Atrial Fibrillation and diabetes mellitus Jack review of week, JAM Coll Cardiol Atrial fibrillation and diabetes mellitus 2019 14:1107-1115 10.1016/j.jace-2019.07.20
6. American diabetes association, Diagnosis and classification of DM Diabetes Care 60.10.2337/dc08-5055, 2008: 1:55
7. <https://pubmed.ncbi.nlm.nih.gov/32872570/>
8. <https://pmc.ncbi.nlm.nih.gov/articles/PMC4166864/>
9. Wu, Y., Ding, Y., Tanaka, Y. and Zhang, W. (2014) Risk Factors Contributing to Type 2 Diabetes and Recent Advances in the Treatment and Prevention. International Journal of Medical Sciences, 11, 1185-1200.
10. Piere Ray Tito Rodriguez1, Faris Fayyaz2, Dr. Dharani Swarna Deiveegan, Dr. Aleena Arif, Dr. Husnain Bukhari5 Dr. Gopi Sairam Reddy Mulaka, Navya Pillikunte diabetes mellitus and role of Atrial fibrillation a review recommendation sept 2023 vol.28
11. SARAH WILD, GOJKA ROGLIC, DIABETES CARE, VOLUME 27, NUMBER 5, MAY 2004
12. Amos AF, McCarty DJ, Zimmet P: The rising global burden of diabetes and its complications: estimates and
13. Amos AF, McCarty DJ, Zimmet P: The rising global burden of diabetes and its complications: estimates and
14. Amos AF, McCarty DJ, Zimmet P: The rising global burden of diabetes and its complications: estimates and Projections to the year 2010. Diabet Med 14 (Suppl. 5): \$1-\$85, 1997. 12

15. Norris JM, Yin X, Lamb MM, et al. Omega-3 polyunsaturated fatty acid intake and islet autoimmunity in children at increased risk for type 1 diabetes. *JAMA* 2007; 298: 1420e8.
16. National Diabetes Fact Sheet (NDFS), United States (http://www.cdc.gov/diabetes/pubs/pdf/ndfs_2005.pdf) (Accessed on November 10, 2009)
17. Ostenson CG. The pathophysiology of type 2 diabetes mellitus: an overview". *Acta Physiologica Scandinavica*, 171, 241-247, 2001
18. American Diabetes Association, Diagnosis and classification of diabetes mellitus, *Diabetes Care*, 2014: 1.
19. Verge CF, Gianani R, Kawasaki E, Yu L, Pietropaolo M, Jackson RA et al., Predicting type I diabetes in first-degree relatives using a combination of insulin, GAD, and ICA512bdc/IA-2autoantibodies *Diabetes*, 1996; 45: 926-33.
20. Ciofeta, M., Lalli, C., Del, S. P. Contribution of postprandial versus interprandial blood glucose to HbA1c in type I diabetes on physiologic intensive therapy with lispro insulin at mealtime. *Diabetes Care*, 1999; 22: 795-800.
21. National Institutes of Health. *Diabetes in America*, Bethesda, MD: National Institutes of Health, (NIH Publication no, 1995; 2: 95-1468.
22. *Insulin Basics*". American Diabetes Association. Archived from the original on 14 February 2014; 14: 24.
23. Staeva-Vieira T., Peakman M., von Herrath M. Translational mini-review series on type 1 diabetes: immune-based therapeutic approaches for type 1 diabetes. *Clin Exp Immunol*. 2007;148:17-31.
24. Lecompte P.M. Insulinitis in early juvenile diabetes. *AMA Arch Pathol*. 1958;66:450-457.
25. Miller CD, Phillips LS, Ziemer DC, Gallina DL, Cook CB, El-Kebbi IM. Hypoglycemia in patients with type 2 diabetes mellitus. *Arch Intern Med* 2001;161:1653-9
26. <https://www.sciencedirect.com/science/article/pii/S075333222030901X>
27. <https://onlinelibrary.wiley.com/doi/full/10.1002/kjm2.12800>
28. <https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=51a92e37c4a16a1be06ab4616c7acc9ca3dc0cd0>.

HOW TO CITE: Kailas Gore, Pratik Bhange, Dr. Megha Salve, A Brief Review on Diabetes Mellitus and Role of Medicinal Plants in The Management of Diabetes Mellitus, *Int. J. of Pharm. Sci.*, 2024, Vol 2, Issue 11, 1567-1573. <https://doi.org/10.5281/zenodo.14236446>

