

A REVIEW ON ANTIDIABETIC DRUGS FROM NATURAL SOURCES

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ABSTRACT

Diabetes mellitus (DM), also known as insulin-dependent diabetes mellitus (IDDM) and noninsulin dependent diabetes mellitus (NIDDM), is a common and serious metabolic condition that affects people all over the world. Traditional herbal plants have been utilized to treat diabetes mellitus all throughout the world. Several herbs have been found to treat and control diabetes among numerous medicines and poly herbal plants; they also have no adverse effects. Diabetes mellitus is a horrible disease that affects people all over the world and is becoming a serious danger to humanity's health. Thus, herbal plants may be a possible source of anti-diabetic medicines, with ethno-botanical data indicating that around 800 plants may have anti-diabetic potential. Although synthetic oral hypoglycemic agents/insulin are a popular diabetes therapy and are effective in controlling hyperglycemia, they have significant side effects and do not significantly modify the course of diabetic complications. This is the primary reason why an increasing number of individuals are looking for alternative medicines with fewer or no adverse effects. The botanical name, common name, component, and mechanism of action for anti-diabetic activity were provided in this review study, as well as plant-based commercial poly herbal formulations. The anti-diabetic activity of herbal remedies is mainly due to increased pancreatic secretion of insulin, inhibition of glucose production in the liver. In this study, many authors have collected more information on the plant-based plant compounds that have been studied for diabetes. A few medicinal plants traditionally used for diabetic treatment containing chemical constituents like polyphenols, alkaloids, glycosides, flavonoids, polysaccharides and terpenoids.

Keywords: Diabetes mellitus, Medicinal plants, glucose, herbal plants.

INTRODUCTION

Diabetes mellitus is a chronic condition characterized by inadequate insulin secretion, ineffective insulin action, or a mix of both. Hyperglycemia, a side effect of diabetes, is responsible for most of its negative effects¹. Treatment aims have shifted from preventing death to treating symptoms and regulating glucose levels to avoid complications. Traditional anti-diabetic medicines are expensive and often associated with side effects, making ayurvedic herbs superior². The World Health

Organization supports the use of natural medicines to treat diabetes. Insulin therapy is used to manage diabetes but has disadvantages such as insulin resistance and long-term liver issues. Alternatives for hyperglycemia control include amylin analogues, inhibitors of intestinal alpha-glycosidase, sulphonylureas, and oral antibiotics like metformin and abiguanide. There is a growing interest in the use of therapeutic herbs, but scientific proof is generally insufficient. The WHO recommends further research on traditional plant therapies for diabetes³⁻⁴.

Epidemiology

Diabetes prevalence is expected to rise to 552 million by 2030, with 80% of cases occurring in low- and middle-income countries. By 2031, 439 million people are predicted to have the disease, with rural areas experiencing significant differences. Type 2 diabetes affects all genders equally and occurs in both rural and urban settings. In Africa, only 10% of diabetes cases are type I, with type II diabetes accounting for the bulk. Adult diabetes cases are expected to grow, with developing nations experiencing the most cases⁵.

Types of Diabetes

Diabetes, a fatal and debilitating condition, has been recognized for 2,000 years. Greek physician Aretaeus first described the condition in the 1st century A.D., but it was not yet treated. In the 17th century, Dr. Thomas Willis used urine samples to diagnose individuals with diabetes, determining if they had "honeyed" diabetes if it tasted sweet. Insulin was developed in 1921 to help diabetic individuals near death, bringing their blood sugar levels back to normal. Diabetes was found in two varieties in the 1950s: "insulin responsive" (type 1) and "insulin insensitive" (type 2). The evolution of insulin was discovered during a small lab in Canada, and advancements in medicine have improved the lives of individuals with diabetes. Researchers continue to work on a cure for diabetes, but the path to a cure remains uncertain. Understanding insulin action and glucose metabolism is crucial for understanding diabetes's pathophysiology⁶.

Antidiabetic Medicine

The World Health Organization (WHO) introduced the first widely recognized categorization of diabetes in 1980, presenting two main types: Type 1 (IDDM) and Type 2 (NIDDM). The WHO Study Group 1984 advised against using labels like "insulin-dependent diabetes mellitus" and "non-insulin-dependent diabetes mellitus" as the classification was based more on treatment response than underlying cause. Type 1 diabetes is caused by pancreatic beta-cell loss, leading to ketoacidosis, coma, and death. The best way to manage Type 1 diabetes is through interdisciplinary

health teams and ongoing attention to factors like meal planning, insulin delivery, blood sugar monitoring, and diabetes-related problems screening. Type 2 diabetes is the most common type, diagnosed in a large number of people worldwide but often untreated. In Type II diabetes, cells either don't recognize or don't make enough insulin.

Mechanism of action

Antidiabetic medicines are licensed for hyperglycemic treatment in type 2 diabetes mellitus (DM). If lifestyle changes don't reduce HbA1c levels to the goal level, antidiabetic medication should be started. Metformin is the preferred medicine for type 2 diabetes, improving glucose metabolism and promoting weight reduction. Other antidiabetic medications may be used if insulin is contraindicated or poorly tolerated. Antidiabetic medicines should be avoided in patients with renal failure or serious comorbidities ⁷.

Antidiabetic Medicine available in market

Antidiabetic medications, such as sulfonylureas, biguanides, thiazolidinediones, alpha-glucose inhibitors, DPP-4 inhibitors, SGLT2 inhibitors, and insulin, work by increasing insulin secretion, improving insulin sensitivity, and reducing glucose absorption ⁸.

Herbal Antidiabetic drugs

Antidiabetic medications, such as Metformin Sulfonylureas, Meglitinides, Thiazolidinediones, DPP-4 inhibitors, GLP-1 receptor agonists, SGLT2 inhibitors, and insulin, are available in the market to reduce blood sugar levels in diabetics ⁹.

Aloevera- Aloe Vera, a cactus-like plant, is grown in subtropical regions worldwide, particularly in Texas, Mexico, Arizona, and California. It is traditionally used to treat skin issues, improve baldness, and enhance wound healing. Topical application is recommended for acne, lichen planus, oral fibrosis, and burning mouth syndrome, while oral use is for weight loss, diabetes, hepatitis, and arthritis.

Garlic- A popular herbal supplement, is a complex collection of physiologically active chemicals that work together to provide therapeutic effects. Its active constituents include enzymes, sulfur-containing compounds, and compounds derived from alliin. Garlic has been studied for various purposes, including treating high blood pressure, cholesterol levels, diabetes, rheumatoid arthritis, colds, and preventing atherosclerosis and tumor growth. Studies suggest that garlic may have

antimicrobial, antihypertensive, and antithrombotic effects. However, further research is needed to establish its efficacy and determine the best dosage and type of garlic for diabetic treatment.

Babul- It is also known as the gum arabic tree or babul, is a native Indian species valued for its gum, wood, and therapeutic properties. Its bark is used in traditional medicine for oral health, digestive health, wound healing, respiratory system health, anti-inflammatory, and antibacterial properties. Babul extracts have shown antibacterial activity against various pathogens, but it is essential to consult a healthcare provider before using it for therapeutic purposes. Babul has been studied for potential antidiabetic effects, with some parts showing hypoglycemic effects and antioxidant properties ¹⁰.

Other Herbal Medicine- Azadirachta indica, also known as neem, is a tree with antidiabetic properties, including insulin mimicking and promoting glucose uptake. It contains bioactive compounds like nimbolinins and polyphenols, which have hypoglycemic activity. Onion, also known as allium cepa, is a powerful tool against diabetes due to its complex composition of bioactive compounds, including quercetin, which improves insulin function.

Future aspects of Herbal Medicines-

Utilizing herbal medicines as an alternative or complementary treatment for this chronic condition. Herbal antidiabetic medicine or plants have been used for centuries in traditional medicine systems, and research is now shedding light on their potential future implications in managing diabetes.

One promising aspect of herbal antidiabetic medicine is their ability to target multiple pathways involved in glucose metabolism. Unlike conventional antidiabetic drugs that target only one specific mechanism, herbal remedies often contain a complex mixture of bioactive compounds that can act synergistically to regulate blood sugar levels. For example, plants like bitter melon, cinnamon, and fenugreek have been shown to improve insulin sensitivity, enhance glucose uptake in cells, and reduce postprandial glucose spikes ¹¹.

Furthermore, herbal antidiabetic medicines are generally considered safe and well-tolerated, with fewer adverse effects compared to pharmaceutical drugs. This is particularly beneficial for individuals who may experience side effects or resistance to conventional medications. Additionally, herbs often have antioxidant and anti-inflammatory properties, which can help prevent complications associated with diabetes, such as cardiovascular disease and nephropathy.

Research in the field of herbal antidiabetic medicine is ongoing, with scientists exploring new plant extracts and compounds for their potential therapeutic effects. With advancements in technology, such as bioinformatics and metabolomics, researchers are able to identify and isolate bioactive components from plants more efficiently, leading to the development of more potent and targeted herbal remedies.

In the future, personalized herbal medicine for diabetes may become a reality, with healthcare providers tailoring treatment plans based on an individual's genetic makeup, lifestyle factors, and specific type of diabetes. This integrative approach could lead to better outcomes and improved quality of life for patients living with diabetes.

Conclusion

The future of herbal antidiabetic medicine is promising, with emerging research highlighting the potential of plants and natural compounds in managing diabetes. As scientific evidence continues to grow, herbal remedies may play an increasingly important role in the prevention and treatment of this widespread disease. It is essential for healthcare professionals and researchers to collaborate and further explore the therapeutic benefits of herbal antidiabetic medicine to provide more holistic and effective care for individuals with diabetes.

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