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ANALYTICAL STUDY ON MEDICINAL PLANT ON DIABTETIC AND NON DIABTETIC CATARACT PATIENTS

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ABSTRACT

Cataracts are clouding of the lens of the eye, brought on by age or diabetes (DM) Patients with senile cataract and senile cataract with diabetes mellitus had their lens capsule fluid tested for Cu,Zn superoxide dismutase activity after cataract surgery. Compared to current pharmaceuticals, traditional medicine made from plant extracts is safer, has fewer side effects, and is less expensive. There has been a lot of recent writing on how the pharmaceutical business may benefit from using the phytochemical components of medicinal plants. A wide variety of beneficial biological properties, such as antiallergic, anticancer, antimicrobial, anti-inflammatory, antidiabetic, and antioxidant, are attributed to plant-derived secondary metabolites, which are small molecules or macromolecules biosynthesized in plants and include steroids, alkaloids, phenolic, lignans, carbohydrates, and glycosides, etc. Hyperglycemia is the hallmark of diabetes mellitus, a chronic condition caused by metabolic abnormalities in the pancreatic -cells.

KEYWORDS:cataract, diabetes mellitus, oxidative stress, superoxide dismutase enzyme

INTRODUCTION

Diabetes mellitus (DM) is a metabolic illness characterized by impaired or absent insulin sensitivity and production and by abnormalities in glucose metabolism. Microvascular issues such blood vessel sclerosis may lead to myocardial infarction, and diabetes mellitus is closely linked to various disorders, including cardiovascular complications, heart attacks, and obesity. Insulin function may be negatively impacted by an oxidative stress response in the pancreatic cell as a consequence of the metabolic abnormalities seen in diabetes. Insulin resistance in type 2 diabetes patients can be caused by a number of factors, including the activation of NF-kB (nuclear factor-kB) and PKC (protein kinase C), which can disrupt insulin signaling pathways and lead to the production of reactive oxygen species (ROS) like hydrogen peroxide and superoxide anions. It is possible that the deterioration of Islets-cells in the pancreas caused by these organisms contributes to the reduced insulin secretion characteristic of diabetes mellitus.

Cataracts are the most common cause of blindness and vision impairment across the globe. Cataracts are more noticeable and develop more quickly in diabetic people. Studies have shown that people with diabetes have a higher-than-normal quantity of thriobarbituric acid-reactive compounds (TBARs), which causes oxidative stress. When there is a discrepancy between ROS production and the antioxidant defense system, oxidative stress may result. In vivo advanced

glycation end products (AGEs) development due to hyperglycemia is a result of the Maillard process. Both the oxidative (glycoxidative) and non-oxidative pathways of glycation produce reactive oxygen species (ROS) and ad carbonyl intermediates, making glycation a key source of these compounds. Together, AGEs production events and oxidative processes cause harmful alterations in tissues. Although free radical generation and AGEs creation may be part of the natural ageing process, several researchers have shown a favorable association between AGEs formation, ROS level, cataract development, and diabetes. Reactive oxygen species and glycation may trigger harmful metabolic processes that cause significant damage to the lens. Both free radical generation and the development of AGEs may be slowed by supplementing with antioxidants such a-tocopherol, deferoxamine, or dimethyl sulfoxide.

LITERATURE REVIEW

ChinthaLankatillake (2019) Overeating and a lack of exercise have led to a worldwide pandemic of Type 2 Diabetes Mellitus. Although current treatments are helpful, they do have certain drawbacks. There is an urgent need for safer, more efficient, and more cost-effective alternative therapies because to these constraints, the alarming rise in diabetes prevalence, and the increasing expense of controlling diabetes and its consequences. There are about 1200 plant species that have been documented in ethnomedicine as being used to treat diabetes, making them a potentially valuable resource for the discovery of new antidiabetic chemicals. Analytical biochemistry techniques for isolating and identifying lead chemicals are essential to the process of assessing medicinal plants for desired bioactivity. The purpose of this article is to serve as a reference for newcomers to the field of antidiabetic plant research by providing a detailed explanation of the current methodologies employed in this area. This review provides a concise summary of the current state of knowledge regarding blood glucose regulation and the general mechanisms of action of current antidiabetic medications, as well as a synthesis of information regarding common experimental approaches for screening plant extracts for antidiabetic activity and the current analytical methods and technologies for the separation and identification of bioactive natural products. approaches for assessing the antidiabetic benefits of plants are described, including cell-based bioassays for screening insulin secretagogues and insulinomimetics as well as more common in vivo animal models, in vitro models, in silico approaches, and biochemical tests. The use of molecular docking and enzyme inhibition tests are also emphasized. The importance of metabolomics, metabolite profiling, and data dereplication in the rapid identification of new diabetes treatments is discussed. Finally, the roles of nuclear magnetic resonance and high-resolution liquid chromatography-mass spectrometry in the dereplication, putative identification, and structure elucidation of natural compounds from evidence-based medicinal plants are summarized.

Patel DK (2012) Around 2.8% of the global population now has diabetes mellitus, and this number is expected to rise to over 5.4% by the year 2025, making it one of the most prevalent metabolic illnesses. Herbal remedies have been a highly regarded source of medicine for a very long time, and as a result, they have gradually become an integral element of cutting-edge contemporary medicine. Taking these considerations into account, this review presents profiles of plants (65 species) with hypoglycaemic properties, available through literature source from

various database with proper categorization according to the parts used, mode of reduction in blood glucose, and active phytoconstituents having insulin mimetics activity. Review findings point to the Leguminoseae, Lamiaceae, Liliaceae, Cucurbitaceae, Asteraceae, Moraceae, Rosaceae, and Araliaceae as the most likely plant families to contain hypoglycemic agents. Allium sativum, Gymnemasylvestre, Citrulluscolocynthis, Trigonellafoenumgreacum, Momordicacharantia, and Ficus bengalensis are among the most productive plants. Some of the new bioactive drugs and isolated compounds from plants that have been shown to have significant insulinomimetic and antidiabetic activity are discussed in this review. These include roseoside, epigallocatechingallate, beta-pyrazol-1-ylalanine, cinchonainIb, leucocyandin 3-O-beta-d-galactosyl cellobioside, leucopelargonidin-3-O-alpha-L The review concludes that the antidiabetic effect of medicinal plants is caused by their components' ability to lower blood glucose levels. These compounds include polyphenols, flavonoids, terpenoids, coumarins, and others. The review also covers the topic of employing these plants and their active principles for the treatment of diabetes mellitus.

BahareSalehi (2019) The prevalence and death rate from diabetes mellitus continue to rise, making it one of the world's leading health concerns. The health risks associated with improper blood sugar management are substantial. Traditional antidiabetic medications work, but they always come with some unwanted side effects. However, there is a possibility that medicinal plants might provide an additional supply of antidiabetic chemicals. Preclinical and clinical research on medicinal plants with antidiabetic potential are discussed. Each plant matrix's potential benefits are determined by the synergistic interaction of its unique profile of bioactive chemicals.

Ngan Tran (2020) Natural goods, such as those derived from living things, have been found to be beneficial to animal and human health. The World Health Organization estimates that in underdeveloped countries, 80% of the population still relies on traditional medicines or folk medicines, most of which are produced from the plant, for illness prevention and treatment. Compared to current pharmaceuticals, traditional medicine made from plant extracts is safer, has fewer side effects, and is less expensive. There has been a lot of recent writing on how the pharmaceutical business may benefit from using the phytochemical components of medicinal plants. A wide variety of beneficial biological properties, such as antiallergic, anticancer, antimicrobial, anti-inflammatory, antidiabetic, and antioxidant, are attributed to plant-derived secondary metabolites, which are small molecules or macromolecules biosynthesized in plants and include steroids, alkaloids, phenolic, lignans, carbohydrates, and glycosides, etc. Hyperglycemia caused by metabolic abnormalities in pancreatic -cells is the root cause of diabetes mellitus, a lifelong condition. Both insulin resistance and a lack of insulin synthesis in the pancreas may lead to hyperglycemia, although Type 1 diabetes mellitus is the more common form of the disease. Current diabetic mellitus treatments aim to normalize blood glucose levels in the vasculature by regulation and reduction of glucose production. However, most contemporary medications come with a plethora of side effects that may lead to major health issues while being treated. So, traditional medicines have been around for a while and serve a vital purpose as complementary therapies. Some of the novel bioactive compounds derived from plants in recent years have shown antidiabetic action with greater effectiveness than oral hypoglycemic

medications used in clinical treatment. The clinical practice of traditional medicine has been successful, and it seems to have a promising future in the treatment of diabetes mellitus. The World Health Organization has called attention to the importance of preventing diabetes and its consequences as a crucial step toward achieving universal health coverage. Therefore, the purpose of this study is to provide a short overview of the active chemicals and pharmacological effects of a selection of often used plants for the treatment of diabetes. Each species' morphological details from the V-herb database were also added.

Bioactive Compounds from Plants Having Type 2 Antidiabetic Activity

Momordicacharantia (MC) is a popular vegetable across the tropics, especially in countries like Vietnam, India, China, East Africa, South and North Asia, and Central and South America. Known as bitter melon or bitter gourd, this plant belongs to the family Cucurbitaceae (Figure 3). MC is often eaten as a vegetable, but it also has medicinal properties and is utilized in traditional medicine. Its anti-inflammatory, anti-oxidant, anti-viral, anti-cancer, anti-bacterial, anti-fungal, and, most notably, anti-diabetic properties. When tested on rats, gerbils, langurs, and humans, Momordicacharantia consistently caused a hypoglycemic effect due to the presence of insulin-like proteins that are similar to human insulin in the plant's fruits, seeds, and callus. For hundreds of years, people in India and China relied on the idea that MC could cure diabetes mellitus. In recent years, several studies have been conducted on its hypoglycemic effects. Numerous studies have revealed that its bioactivities bring about a significant drop in blood sugar levels (Figure 4). The results of these studies showed that bitter melon may improve glucose tolerance not only in normal and diabetic mice, but also in people. Numerous studies demonstrated the significant antidiabetic properties of MC's bioactive components.

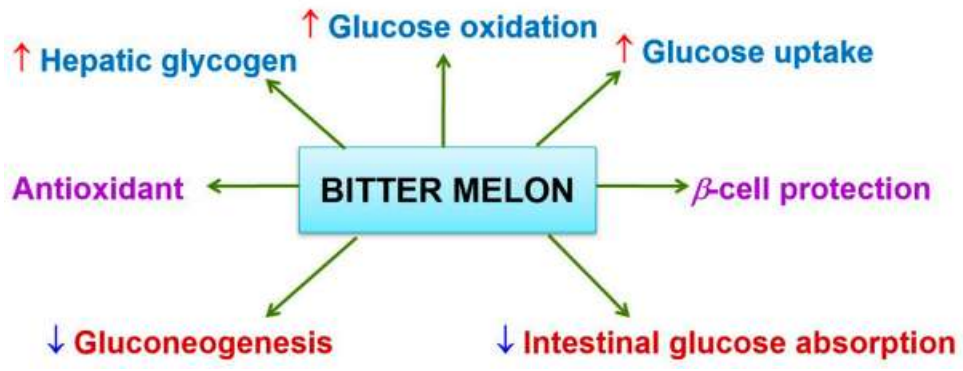

Figure 1. The mechanism in decreasing blood glucose levels of M. charantia.

Medicinal Plants as an Alternative Source of Antidiabetic Agents

In the future of medicine development, natural goods, especially those derived from plants, will be mined for their potentially useful active ingredients. Plant-based preparations are the major essential player of all current medicines, particularly in rural regions, due to their ease of availability, cheap cost, and least negative effects. The bioactive compounds found in many

plants have potent pharmacological effects without the risk of unwanted side effects. Many of the medications that are presently accessible, including those that are prescribed by doctors, were originally derived from plants. By providing a brief overview of botanicals' characteristics, a definition of the study, some examples of novel and a description of existing databases, and highlighting the need for categorization of botanicals as useful tools for health research, Durazzo et al.'s recent review provides a current snapshot of the strict interaction between the main biologically active compounds in plants and botanicals.

Because of the high expense of standard diabetic medications, medicinal plants are increasingly being utilized to treat the disease, especially in underdeveloped nations. Flavonoids, terpenoids, saponins, carotenoids, alkaloids, and glycosides are only some of the phytoconstituents found in medicinal plants that may have antidiabetic effects and are thus suggested for use in the treatment of diabetes and other disorders. This may be the first step toward comprehending the biological actions and beneficial activities of plants, as noted by Durazzo et al., who also noted that the combined action of biologically active substances leads to the possible beneficial qualities of each plant matrix. Current methods for investigating phytochemical interactions may be broken down into three broad categories: (i) the creation of interaction model systems; (ii) the investigation of extractable and non-extractable compounds; and (iii) the characterization of extracts rich in biologically active compounds.

The rising prevalence of diabetes is a serious cause for worry in both the medical and general communities. Diabetic patients might sometimes find relief from their condition by using medicinal herbs rather than conventional antidiabetic medications. Therapeutic alternatives for the treatment of diabetes are limited, but include herbal medications and plant components with low toxicity and no adverse effects. Studies consistently show that medicinal herbs with hypoglycemic qualities help diabetics control their condition. The mechanisms of natural products as antidiabetic agents were discussed, and compounds of high interest were highlighted, including fukugetin, palmatine, berberine, honokiol, amorfrutins, trigonelline, gymnemic acids, gurmarin, and phlorizin. Anti-diabetic, anti-hyperglycemic, hypoglycemic, anti-lipidemic, and insulin-mimetic activities have been identified in 81 plants native to Asian nations, and these plants have been classified and discussed in the present study by Bindu and Narendhirakannan.

Phytochemicals with Antidiabetic Potential

Since hundreds of millions of people throughout the world are looking for improved ways to control their diabetes, the discovery of novel natural antidiabetic medications might hold significant potential. In this context, the past several decades have seen development in the study of phytochemicals responsible for antidiabetic actions. Plant extracts, in either their combined or isolated form, have been studied for their potential anti-diabetic effects. Many different types of phytochemicals found in medicinal plants are being studied for their potential anti-diabetic properties. These include alkaloids, phenolic acids, flavonoids, glycosides, saponins, polysaccharides, stilbenes, and tannin. Phytochemicals' positive effects may be brought about in a number of ways. These include, but are not limited to, modulating glucose and lipid

metabolism, increasing insulin secretion, activating cells, blocking the gluconeogenic enzymes, and protecting cells from reactive oxygen species (ROS).

Pharmacological Agents for the Treatment of Macular Edema Following Cataract Surgery

Leakage of fluid from perifoveal capillaries into the macular region's extracellular space is thought to be facilitated by proinflammatory prostaglandins. Topical nonsteroidal anti-inflammatory drugs (NSAIDs) have been shown to reduce the incidence, duration, and severity of cystoid macular edema by blocking the cyclooxygenase enzymes responsible for prostaglandin production. This is accomplished by preventing the release and breakdown of the blood-retina barrier.

Clinical studies have been performed lately to investigate the effectiveness of the topical NSAID nepafenac in lowering the occurrence of macular edema after cataract surgery. Amfenac, the active metabolite, is formed from the prodrug by intraocular hydrolases in the retina, ciliary body epithelium, and choroid, and is then quickly absorbed through the cornea.

In a retrospective research, 240 patients treated with topical prednisolone for 4 weeks and 210 patients treated with prednisolone and nepafenac for the same time period were compared for the incidence of macular edema after uneventful phacoemulsification. Macular edema was more common in individuals given topical prednisolone alone, the investigators found, compared to those given nepafenac in combination.

Conclusion

Patients', families', and society's financial well-being are all thought to be negatively impacted by diabetes mellitus. In addition, diabetes may cause permanent vision loss, kidney failure, and heart failure if it is not managed properly. Studies on novel antidiabetic drugs are being conducted to address this issue. Traditional remedies have come to light as a result of the unintended consequences of contemporary therapy. Additionally, modern herbal extracts may be used with conventional medications to provide synergistic therapeutic effects. The active components in several herbs have been shown to reduce blood sugar levels and prevent diabetic complications. The separation, purification, and characterization of plant bioactive compounds will be the focus of future studies. With any luck, the data gathered in this review will be useful in diabetes care. In this article, we provide a comprehensive catalog of anti-diabetic plants culled from the Vietherb database. Anti-diabetic functional food and medication development may benefit greatly from the isolation and identification of bioactive phytochemicals from these plants.

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