EURASIAN EXPERIMENT JOURNAL OF SCIENTIFIC AND APPLIED RESEARCH
(EEJSAR) ISSN: 2992-4146
©EEJSAR Publications Volume 7 Issue 1

Exploring the Role of Medicinal Plants in Diabetes Prevention and Management

Arionget Jemima

Department of Pharmacoepidemeology Kampala International University Uganda

Email: jemima.arionget@studwc.kiu.ac.ug

ABSTRACT

Diabetes is a growing global health concern, with type II diabetes accounting for the majority of cases. While conventional treatments such as insulin and oral hypoglycemics are widely used, medicinal plants have gained attention for their potential benefits in diabetes prevention and management. Traditional medicine systems, including Ayurveda, Unani, and Chinese medicine, have long utilized plant-based remedies due to their bioactive compounds that enhance insulin sensitivity, regulate glucose metabolism, and reduce oxidative stress. Despite promising results, challenges such as lack of clinical trials, safety concerns, and regulatory issues hinder their integration into modern healthcare. This paper investigates the traditional and scientific perspectives on medicinal plants for diabetes, highlighting their mechanisms of action, key plant species, clinical evidence, and challenges in research and application. Sustainable harvesting, cultural significance, and regulatory frameworks are also discussed to emphasize the importance of preserving traditional knowledge while ensuring safe and effective use of medicinal plants.

Keywords: Medicinal plants, diabetes management, herbal medicine, ethnopharmacology, insulin sensitivity, glucose metabolism, traditional medicine.

INTRODUCTION

Worldwide, diabetes has emerged as a catastrophe to human health. Every 17 seconds, a new instance of diabetes is diagnosed and within next 15 years or so, 50% of victimized humans will undergo worldwide type II diabete. In general term, diabetes mellitus mentions a metabolic disorder of all types of glucose subtypes. The main endocrine disorder turns out to be type I and type II diabetes. Diabetes leads to cardiovascular diseases, nephron damages, blindness, and further negative effects. The dominating treatment processes of diabetes include oral hypoglycemic and insulin therapy. With lots of side effects and contraindicative drugs, herbal medicines are up and doing for diabetes treatment. Plenty of the population out of rural environments relies on plants for medical purposes including the treatment of diabetes. It's estimated that nearly 80% of people in developing countries depend on traditional remedies for their primary health facilities, mainly based on plant origin. Generally, natural plant treatments are seen as harmless, more effective, secure, and tested as a weekend. Plenty of ancient systems of treatments are being used like Ayurveda, Unani, and the Chinese system. Definition of diabetes and its types, epidemiology, causes, and symptoms Type II diabetes covers from 90% to 95% of individuals with diabetes. It becomes an assorted group of diseases linking the defect of both β-cell function, over-abundance hepatic glucose discharges, and insulin insensitivity. The key current model of the cause of type II diabetes is the legacy of genetic susceptibility associated with lifestyle environmental factors, comprising corporeal inactivity and obesity. Nonetheless, it's now stated that it isn't the whole story. Disappointingly, the increase in diabetes meddling is not outspread equal and marginal humans are highly affected [1, 2].

Overview Of Medicinal Plants

A medicinal plant is any plant containing substances that can be used for therapeutic purposes or precursors for useful drugs. Medicinal plants have been used in healthcare since time immemorial. Such plants have been used in all cultures - stone age, ancient, medieval or modern. The literature suggests that plants were employed globally in healthcare, irrespective of sources - medicinal systems. It is evident that, after rigorous trial and observation, empirical knowledge of plants with curative properties was accumulated, resulting in the formulation of botanical medicine. This was the foundation of medicinal plant based traditional medicines. Historical records or myths indicate that plants were used early in this distinct knowledge system. From written records it is certain that ancient Greeks, Romans, Arabic, Indians, Chinese, the indigenous people of Americas, Egyptians, Assyrians, Sumerians, many European and African ethnic groups and ancient civilizations all used plants for remedies. Chinese medical texts emerging from the era of the Emperor Shin Nung record herbal therapy for a variety of syndromes. The Therapeutic Treaties of Charaka and Sushruta in India recorded the medicinal use of 700 plants. The value of medicinal plants is high, as they are the principal items in developing healthcare delivery systems, which range from curative, promotive, rehabilitative, and protective. Bioactive molecules with a therapeutic nature are produced by the synthesizing system of medicinal plants. Various kind of bioactive compounds are present in medicinal plants, such as terpenoids, flavonoids, xanthines, phenolics, alkaloids, saponins, glycosides and polyphenols contribute to the medicinal properties of those plants through various ways. Once ingested, the pharmacological importance of bioactive compounds in medicinal plants could be explained based on their target sites and mechanism of actions, which include insulin receptor activation, inhibition of protein tyrosine phosphatase, enhancement of insulin endogenous secretion, inhibition of beta-cell apoptosis, reduction of glucose secretion from liver, inhibition of glucose absorption from intestine, improvement of glucose uptake by peripheral tissues, inhibition of starch and disaccharide hydrolyzing enzymes, prevention of kidney and retinal abnormalities and correction of insulin signaling pathway molecules. Medicinal plants have been employed since ancient times for the treatment of numerous diseases and secondary metabolites derived from plants have shown potential activities against a wide range of human pathology. Bioactive molecules produced by traditional herbal antidiabetic plants against diabetes mellitus are wide ranging including the stimulation of insulin release as one of the important mechanisms of hyperglycemic control [3, 4].

Traditional Uses of Medicinal Plants

The use of medicinal plants as a therapy for various ailments is one of the most ancient approaches to healthcare. Many societies around the world used plant material for this purpose and, in many cases, this traditional practice has lasted up to the present time. The heritage of past generations of healers often remains the only tradition of treating primary health problems. Medicinal plants have supplemented human diet from time immemorial and recommended itself among diverse societies and cultures of the world. The age-old relationship between humans and medicinal plants has gradually evolved into an independent branch of study called traditional or ethnomedicine. The knowledge about medicinal plants has been accumulated and developed by the practice of using these plants over generations. Knowledge about medicinal plants, their identification and uses are transferred from one generation to another in most societies around the world. Through this process, a rich knowledge base on herbal remedies has developed over the centuries among different societies around the world. This rich heritage is not only of immense ecological and cultural significance but also forms the basis of maintaining health by providing effective and affordable solutions to primary health problems. There are well-defined roles for herbal medicine in primary health care, diseases prevention and health maintenance in many cultures and traditions. The system of traditional medicine is used by 60-90% of inhabitants in developing countries as primary health care. This traditional knowledge decreases in the population every year as the elders who transfer the knowledge to their children are fast dying. Only a fraction of the information may be transferred, likely by accident, as there is no organised dissemination. The importance of ethnobotany/ethnomedicine is now well recognized for the documentation of indigenous knowledge, information about plant species can be processed and transferred to management, and overall ecosystem and biodiversity importance [5, 6].

Mechanisms of Action in Diabetes Management

Medicinal plants can be used either alone or with other medication to prevent or manage diabetes. There are at least 400 traditional medicinal plants commonly used for this purpose. Body of literatures showed that the active compounds in medicinal plants can activate several biochemical pathways and

physiological responses to reduce blood glucose level, and they are also able to enhance the sensitivity of insulin. The medicinal plants possess a potential benefit on amelioration of metabolic health in terms of controlling the increased fat accumulation and oxidative stress which are resulted from diabetes. Oxidative stress caused by diabetes induction can be controlled using medicinal plant. However, the scientific background supporting the physiological potential benefits of local plants in terms as antidiabetic still limited in Bangladesh. Traditional healers and general people often prescribe medicinal plants to redirect or reduce the present level of blood glucose or suggested how to promote insulin secretion in diabetic patients. An ideal scientific investigation to understand the real curative potential of medicinal plant and its purposes. However, the provided knowledge on the effects of local plants to be consumed for a possible cure in diabetes patient is modest. Thus, there is a need for more investigation to scrutinize the metabolic mode of action of medicinal plants used in traditional medicinal practices as AD is possible caretaker. Body of literatures showed that there are divers of secondary metabolites, including flavonoids, phenolic, and terpenoids, found in medicinal plants that were pharmacologically active as a protective strategy against diabetes complications. These active compounds are exerted either by stimulating peripheral utilization of glucose and by elevating the level of insulin. The later approach leads to decreased insulin resistance, then restore the sensitivity to the level near normal and thereby accelerate the utilization of glucose. Alternatively, the used secondary metabolites are able to eradicate the free radicals, thereby lower the impairment of cells and their synthesized proteins. In traditional therapies, nearly the same compounds and/or plants are used to heal different types of adverse health conditions. However, to some extent, the compounded combination therapy is needed to present the desired effect. Or, treatment with single plants or pharmacologically active constituents is instead more desirable. There are some controversial reports on the adverse effects risen from the medicinal plant. Typically, the use of traditional medicinal plants or their active compounds results in a multi-fold type of approach. Benefits are gained to manage the up a down regulation of numerous metabolisms affected during the diseased state. But there seem to be no animal studies performed on the local plants to understand their action [7, 8].

Key Medicinal Plants for Diabetes

Medicinal plants have long been recognized for their therapeutic properties to treat various diseases. Nowadays, the medicinal use of plants has drawn much attention as being naturally safe and effective in treating and managing different life-threatening diseases among people as herbal medicine. Diabetes mellitus is a debilitating disease affecting most people in every part of the world with a rising prevalence rate. It has been recognized since antiquity. Currently, it is a serious health issue. Natural products derived from plants are safer alternatives compared to synthetic medications available in the current pharmaceutical market. Recently, numerous studies have been conducted to validate the traditional use of medicinal plants in the treatment of diabetes mellitus and manage the disease and associated risk factors to prevent possible complications. Despite remarkable advancement in modern medicine, diabetes mellitus lay largely unrestrained. Herbal plants with antidiabetic potentials are increasingly being used by the populations worldwide. The antidiabetic plants may act through varieties of known mechanisms such as insulin release and vascular activities or by a number of novel pharmacological mechanisms. Most of the cases they act through a combined or a higher method. A convenient mode of administration, better patient compliance and the novelty of action are the major advantages of the plant-derived drugs. Generally, diabetic patients first try traditional medication with the belief that it may not have adverse effects as compared to modern medicines. Anti-diabetic properties of medicinal plants could be due to their hypoglycemic effects. Numerous secondary metabolites like alkaloids, flavonoids, glycosides, saponins, phenols and tannins were detected in different crude extracts of medicinal plants. Many plants were used in the form of decoction, infusion and powder for treatment of diabetes, which may contain active compounds with anti-diabetic activities at effective doses [9, 10].

Clinical Studies and Evidence

A recent search revealed that up to a half million articles published past two centuries have examined the relationship between plants and diabetes mellitus. The adoption of a Western lifestyle and urbanization is cited as a major cause for the tremendous increase in metabolic diseases such as diabetes mellitus in Africa including Ghana. The available pharmacotherapeutics for diabetes mellitus are often criticised by patients because of issues related to side effects, affordability, efficacy, and perceived toxicity. Reports have suggested patients are turning to CAM for controlling diabetes mellitus and its complications. A pharmaceutical discourse analysis showed 70% of herbal medicines were recommended for diabetes

mellitus control. In North America, 27-51 % of patients with various chronic diseases including diabetes were reported using CAM in the past five years. A review in Europe showed that between 4% and 41 % of adults with chronic disease sought remedies from herbal medicine. Chronic DM patients constitute 25% of all chronic patients in Ghana that sought and were reported using TMP. A wide variety of plant medicines have been used by TMP in treating NCDs and diabetes is one of them. Despite these reports and growing numbers of usages of herbal medicines for diabetes there have been no systematic reviews on the evidence-based medicinal plants used in Ghana to treat diabetes mellitus. There is compelling supporting scientific literature for the management of diabetes with phytomedicines. Though it is necessary, the translational relevance of such studies would be limited by the small samples sizes typically used in experimental studies into the effectiveness of plant medicines. Unlike following encouraging findings from preclinical and clinical studies clinicians advise patients to maintain an unproven drug in light of the absence of evidence from large-scale well-conducted experimental design. This is of particular concern when safety is an issue, as is the case for some traditional plant medicines. Nevertheless, the traditional knowledge and use of plant-based medicines are prominent in many societies where there are few other healthcare options and where even this option is not readily available nor affordable. Although neglected in the Western discourse, it seems wrong to dismiss the knowledge and experiences of great numbers of traditional healers who continue to use plant medicines to cure serious diseases [11, 12].

Safety and Toxicity of Medicinal Plants

Medicinal plants have been widely used for the management and prevention of diabetes. Traditionally, the administration of remedies synthesized from medicinal plants is beneficial. The market offers a large number of single and multi herbal formulations that have therapeutic potential in managing diabetes. Unfortunately, the simultaneous use of medicinal plants and other medications could lead to medicinal plant–medicine interactions. Some medicinal plants affect the modulation of cytochrome P450 or the transporters involved in the absorption, distribution, metabolism, and excretion of conventional drugs, displaying pharmacokinetic interactions. The coming together of selected medicinal plants and/or their bioactive compounds with conventional drugs show pharmacodynamics and pharmacokinetics activities, which are discussed in this article. It is critical that positive benefits are reaped from using medicinal plants by understanding their therapeutic benefits and undesirable interactions or adverse effects on conventional medications. Currently, 78% of prescriptions are in the form of medicines derived from medicinal plants. Nevertheless, the safety of these products is not regulated properly. There have been discussions about the quality control and standardization of these formulations to ensure that they are effective comprehensively, consistently, and not harmful. Despite the deficiency in data on safety and toxicity, some plants may lead to hepatotoxicity, and a few have the potential to release heavy metals. This is one of the safety concerns regarding the use of medicinal plants, since it is presumed that the population may not be fully aware of the negative aspects of the use of these formulations and may be compromising its health [13, 14].

Integrating Medicinal Plants into Modern Medicine

There is increasing recognition that herbal therapies have important medical roles. Patients seek these to complement or as an alternative to conventional therapies but healthcare providers may not recognise such needs. The trend of herbal therapy should be explored alongside the conventional medical management, especially the possibility of integrating the two. Besides traditional healthcare practices, several models on integrating herbal therapy to the modern and pharmaceutical-dominated medical system are also elucidated. These could be medical decisions made by an individual alone, or agreements between a group of medical professionals expressing common grounds, or standard terms stating the intention to refer between groups, or effective interdisciplinary treatment regimens. This is in line with Shaw recommending those involved in the management of diabetic patients to promote integrated medicine approaches. For 22, a specific recommendation as collaborative treatment is made. This entails providing an effective means by which the viewing and treatment of the same patient can occur simultaneously by doctors with different specialities, concurrently by dissimilar or identical systems, or a combination thereof. It is recognised that there have been shortcomings in collaborative treatments and many are yet to be evaluated. Some diabetic patients resort to traditional, complementary medicine without informing their doctor(s). This needs to forge a better working relationship to provide good holistic treatment. How such challenges can be met is also explored in the locally developed South African context. Other considerations, for example involving cultural contexts and improved health system, point to better outcomes for such patient care. Underlying the models described is the necessity

for good communication between health professionals. This may not always be easily initiated, as factors such as a lack of training in a particular practice, scepticism of successful results, or simple unawareness, may hinder referral. The possible benefits of an integrative model have prompted these concern-based recommendations, although it is anticipated that further work is required [15, 16].

Cultural Perspectives on Medicinal Plants

The World Health Organization recommends the documentation and promotion of traditional knowledge in the field of herbal medicine. Conversation about medicinal plants is often couched in terms of respect for biocultural diversity. As medicinal knowledge is based in the landscape, it is faced with increasing threats, from habitat destruction to biopiracy. Research collaborations with indigenous healers can help capture important information about medicinal plants before the knowledge is ultimately lost. Anthropologists engage with medicinal beliefs and practices in the context of complex sociohistoric frameworks. Medicinal plant research by social scientists emphasizes the rational basis of herbal choices and considers factors from personal preference to environmental determinants. In some societies, like Belize, medicinal beliefs are less about medicinal plants' efficacy and classification than they are about the problems faced by people with T2DM trying to navigate a complex dual-system healthcare system. Recommendations for increased health equity include biomedicine's formal recognition of ethnomedicine therapies. Herbal choices are made in other societies based on medicinal plant classification systems; people might classify plants used as favorable or unfavorable, hot or cold plants. Personal preference is a key factor in the medicinal plant's consumed preparation form. Most people are consuming anti-diabetic remedies in liquid forms. The ripeness of harvested fruits matters because unripened fruits lose efficacy, whereas fully ripe fruits induce weight gain. The day of the gathering the plant affects its potency. Additionally, anxieties about restrictions to market medicinal plants are realized in government efforts in more far-flung places to curb the phenomenon [17, 18].

Future Directions in Research

Current trends and emerging methodologies in future research on medicinal plants and diabetes are discussed, with an emphasis on the need for comprehensive studies to further validate the efficacy and safety of medicinal plants. Recent trends include innovative research approaches, such as pharmacogenomics. More upcoming trends, new methodologies, and research directions are suggested: iridoid analog chemistry with respect to hypoglycaemic activity, the development of the antidiabetic formulation of medicinal plants, pharmacogenomics applied to study the therapeutical activity of herbal products in the treatment of diabetes, and integration of evidence-based methods applied to reviewing ethno-pharmacological information about medicinally used plants for treatment of diabetes are discussed in further detail. Advanced scientific techniques and novel research methodologies have made it possible today to review and understand the traditional use of plants as medicine employing an ethno-pharmacological approach, however traditional knowledge in different cultures is often lost or not accessible to a broader public for centuries. Consequently, regional systems of knowledge about natural resources as well as the people and institutions who hold such knowledge are declining at a rapid rate. Modern scientific use of traditional knowledge for further phyto-chemical investigations are often frustrated because of difficulties in access to data. On the other hand, due to the current interest among bio-prospectors in raw materials for the chemical and pharmaceutical industries, there is widespread fear that the few living tradition practitioners are misused or that the raw materials of traditional medicine are irrevocably depleted. Improved cooperation between scientists, clinicians, and traditional healers could therefore contribute greatly to broadening the basis for productive research, and to enhancing the transfer of relevant and useful knowledge. Apart from being major sources of potential new therapeutics these approaches to bring about greater familiarity with the wealth of undescribed biological and chemical diversity of plant species, including their potential for new therapeutic agents, from various lesser-known floras. Therefore, systematic approaches are needed in the search for new chemical entities and the identification of the potential sources, such as medicinal plants, from which they can be derived [19, 20].

Sustainable Harvesting Practices

Medicinal plants have been used since prehistoric times for their therapeutic properties in treating diseases. Alternative medicine systems like Ayurveda, Unani, Homeopathy, and Siddha highlight the significance of these plants. In developing countries, herbal medicines are prevalent due to the affordability issues of allopathic treatments. India boasts a rich diversity of medicinal and aromatic plants (MAPs) with deep-rooted usage. These plants contain active compounds that alleviate various ailments, and local populations have utilized their topological knowledge for treatment. It is estimated that over

35,000 plant species are used in traditional medicines, with around 16,000 being common. MAPs serve vital roles in the production of essential drugs such as castor oil, quinine, artemisinin, and morphine, and the trade in these plants significantly contributes to the global economy. Ayurveda presents valuable opportunities for agriculture-related enterprises. The essential oils from MAPs are crucial for perfumery, cosmetics, and pharmaceuticals. However, the rising consumption has led to extensive exploitation, ecological imbalance, and a threat to biodiversity. Medicinal plants also provide high-value non-timber forest products, with many exhibiting antimicrobial properties. Increased health consciousness globally drives the demand for MAPs, contributing to environmental harm and reduced biodiversity. Certain plant products like tannins from amla are utilized in the leather industry. Overharvesting has endangered one-fourth of medicinal plants. Unsustainable resource extraction has significantly altered forest ecosystems, impacting around 50 million people who rely on non-timber forest products for their livelihoods. The overexploitation of forest resources jeopardizes the socio-economic interests of these communities. MAPs account for over 40% of commercial drugs and 25% of prescribed drugs in Western countries. Rising raw drug costs compel Ayurvedic professionals to seek alternative species. Sustainable practices are essential to preserve these valuable resources [21, 22].

Regulatory Frameworks for Medicinal Plants

Medicinal plants are known worldwide as natural herbal resources that offer various medicinal properties. They have been known for their biological activities, including hypoglycaemic and antidiabetic properties, and safe use in the management of diabetes. The prevalence of type 2 diabetes is increasing in both developed and developing countries and is mostly affected by urbanization, obesity, genetic predisposition, and sedentary lifestyle. Herbal preparations may become a good solution for this problem. The plants that have been used as antidiabetic agents are Andrographis paniculata, Azardirachta indica, Aegle marmelos, Abelmoschus esculentus, Centella asiatica, Ficus religiosa, Gymenma sylvestre, Momordica charantia, Ocimum sanctum, Pterocarpus marsupium, Syzigium cumini, Trigonella foenum graecum etc. The ability of these plants to regulate blood glucose levels can involve different mechanisms of action, such as increasing insulin secretion, increasing the activity of pancreatic β-cells, decreasing glucose absorption by inhibiting α-glucosidase, and inhibiting gluconeogenesis. In addition to containing phytochemical compounds that have the potential to be antidiabetics, these plants also have the potential to cause teratogenic effects, such as alkaloid, flavonoid, saponin, tannin, and triterpenoid compounds. Therefore, carried out stringent toxicological screening of the active compounds and hair growth tests in vivo and in vitro before the raw material is developed to prevent toxic effects on the body. Indeed, more intensive laboratory experiments are carried out before raw materials grow into multilevel preparations, to reveal all the active compounds contained by the plant, determine the mechanism of action of these compounds, and determine the dosage preparation that will be used. In addition, it is necessary to know the stability of these compounds in combination with other compounds and know the pharmacokinetics and pharmacodynamics of these compounds after administration. Herbal medicine is a product that has the potential for complex chemical compositions that can affect the behavior of the various components of the relevant substances related to their pharmaceutical quality or biological activity and bioavailability, and thus their safety and effectiveness [23, 24].

Public Awareness and Education

Public awareness and education about the relation between medicinal plants and management of diabetes is envisaged as a fundamental tool to underpin broader informed communities and enlightening choices over their healthcare alternatives. The advocates of the medicinal plants field commonly recognize that dissemination of knowledge about medicinal plants and its uses must be disseminated to empower individuals and communities and to promote a culture of health and safety of plant remedies. In addition, there are different educational programs being developed that are aimed at consumers, healthcare professionals and policymakers. Various educational programs about the role of medicinal plants in preventing and managing diabetes mellitus and how to utilise it safely are being developed [25, 26, 27, 28]. The aforementioned programs are being developed under the collaboration of research scientists studying medicinal plants and diabetes, educational institutions and public health organizations in the subject of diabetes. It is become important to educate a community about the importance of medicinal plants on the prevention and management of diabetes, complications related to diabetes including pharmacovigilance related to diabetes and related health systems, and also to educated consumers about the appropriate use of plant products in the management of diabetes. The importance of disseminating the knowledge and use of medicinal plants for disease management and prevention in communities cannot be

overemphasized [29, 30, 31, 32]. Communities and nations that can understand and use properly the plant wealth natural to them are more likely to be healthy than those who cannot. As the internationally accepted goal of "Health for All by the year 2000AD" approaches, smarter commitments and determined health workers throughout the regions are striving to ensure that by the turn of the century everyone will have an adequate coverage of essential health care. In recent years it has been more and more recognised that medicinal plants and traditional practitioners can and must play a decisive role in achieving these aims. This is not a novelty but rather a re-acknowledgement of traditional pharmacopeias that have been used and amassed since prehistoric times. There are a number of instances worldwide where plant drugs stand out the simple symptom of disease, as merely curative to promote health and normalize functions. The high percentage of plant pathogens more plants have caused human beings to strive for remedies and against them [33, 34, 35, 36, 37].

Case Studies from Different Regions

This paper presents insightful case studies that illustrate the diverse use of medicinal plants in the management of diabetes across various regions around the world. These studies highlight not only cultural practices and methods but also showcase unique plants that exemplify the rich diversity found in traditional medicine. The detailed analysis of the outcomes discusses the effectiveness of these practices and addresses potential concerns that may arise while offering viable solutions for improvement. The use of medicinal plants is particularly prevalent in many developing countries due to their cost-effectiveness and significant cultural importance [38, 39, 40, 41]. This is especially true within the Oromo community, where these plants play a vital role in both disease prevention and treatment activities. Ethnographic knowledge pertaining to these plants remains largely underexplored, despite its incredible relevance to community health. In the context of diabetes prevention and management, lifestyle adjustments often serve as important complements to the use of these easily accessible and widely used medicinal plants. However, scientific validation for such traditional practices may require further extensive studies to confirm their efficacy and safety. It is noteworthy that many individuals in these communities have a greater trust in traditional medicine than in modern pharmaceutical solutions. For example, in Tanzania, a focused study examined consumer practices within the Masasi District, particularly among diabetic patients who utilize traditional medicine [37, 38, 39, 40, 41]. Through engaging face-to-face interviews with a total of 72 diabetic patients, primarily elderly women hailing from low socio-economic backgrounds, the findings revealed an impressive compliance rate of 92.11% with traditional remedies. Various factors contribute to the choice of traditional medicine, including perceived effectiveness, the influence of cultural beliefs, the accessibility of local healers and medicinal plants, and the impact of family traditions on personal health decisions. Furthermore, patients often resort to conventional medicine for immediate relief from symptoms while depending on traditional medicine for more long-term management and potential cures for their condition [13, 27, 28, 29].

Challenges In Research and Application

Plants, herbs, and spices are increasingly recognized for their health benefits and potential in managing diseases, especially diabetes mellitus, which is a global epidemic with significant health and economic repercussions. This urgency has spurred research into herbal remedies and their effectiveness for diabetic care, despite ongoing challenges in funding and regulatory approval for natural medicines. Researchers often struggle to secure necessary funding, and practitioners experience frustration with lengthy approval processes imposed by drug regulatory authorities, which are hesitant to relax stringent regulations for traditional herbal remedies. Moreover, there is skepticism regarding the scientific validity of herbal treatments among the public, compounded by insufficient rigorous scientific evidence. Concern also exists over the potential side effects and the need for standardization in quality and efficacy of medicinal products, as the therapeutic potential of a plant can vary due to factors like soil and climate conditions. Practitioners in herbal medicine may be reluctant to share knowledge, creating barriers for effective collaboration with researchers who often distrust field experts. To harness the therapeutic benefits of medicinal plants, comprehensive scientific assessment and integration of traditional and modern knowledge is essential. This can be achieved through interdisciplinary approaches and collaborations among traditional practitioners, scientists, pharmaceutical firms, regulatory bodies, and local health providers. Interactions between these groups can enhance understanding and advance scientific inquiries into the useful properties of herbal remedies. To address present hurdles, fostering open dialogue among researchers, practitioners, regulators, and the public is crucial for expanding and improving the efficacy of herbal treatments [30, 31, 32].

CONCLUSION

Medicinal plants hold significant promise in diabetes prevention and management, offering natural alternatives to conventional treatments. Their widespread use in traditional medicine underscores their cultural and therapeutic value. However, scientific validation through rigorous clinical trials is essential to confirm their efficacy and safety. Effective integration into modern healthcare requires interdisciplinary collaboration, sustainable harvesting practices, and regulatory measures to standardize herbal medicines. By preserving traditional knowledge and advancing research, medicinal plants can become a valuable component of holistic diabetes care, bridging the gap between ancient wisdom and contemporary medical practices.

REFERENCES

1. Alam S, Hasan MK, Neaz S, Hussain N, Hossain MF, Rahman T. Diabetes Mellitus: insights from epidemiology, biochemistry, risk factors, diagnosis, complications and comprehensive management. Diabetology. 2021 Apr 16;2(2):36-50. mdpi.com
2. Bergman M, Manco M, Satman I, Chan J, Schmidt MI, Sesti G, Fiorentino TV, Abdul-Ghani M, Jagannathan R, Aravindakshan PK, Gabriel R. International Diabetes Federation Position Statement on the 1-hour post-load plasma glucose for the diagnosis of intermediate hyperglycaemia and type 2 diabetes. Diabetes research and clinical practice. 2024 Mar 1;209:111589. diabetesresearchclinicalpractice.com
3. Sivakumar T, Deepa B. A critical review on Antidiabetic Potential of Herbal plants and its their bioactive components. Journal of University of Shanghai for Science and Technology. 2023;25(01):303-14. researchgate.net
4. Ugwu CN, Ugwu OP, Alum EU, Eze VH, Basajja M, Ugwu JN, Ogenyi FC, Ejemot-Nwadiaro RI, Okon MB, Egba SI, Uti DE. Sustainable development goals (SDGs) and resilient healthcare systems: Addressing medicine and public health challenges in conflict zones. Medicine. 2025 Feb 14;104(7):e41535.
5. Ansari P, Akther S, Hannan JM, Seidel V, Nujat NJ, Abdel-Wahab YH. Pharmacologically active phytomolecules isolated from traditional antidiabetic plants and their therapeutic role for the management of diabetes mellitus. Molecules. 2022 Jul 3;27(13):4278. mdpi.com
6. Khadka D, Dhamala MK, Li F, Aryal PC, Magar PR, Bhatta S, Thakur MS, Basnet A, Cui D, Shi S. The use of medicinal plants to prevent COVID-19 in Nepal. Journal of ethnobiology and ethnomedicine. 2021 Dec;17:1-7. springer.com
7. Edyedu I, Ugwu OP, Ugwu CN, Alum EU, Eze VH, Basajja M, Ugwu JN, Ogenyi FC, Ejemot-Nwadiaro RI, Okon MB, Egba SI. The role of pharmacological interventions in managing urological complications during pregnancy and childbirth: A review. Medicine. 2025 Feb 14;104(7):e41381.
8. Hosain MZ, Kabir SL, Kamal MM. Antimicrobial uses for livestock production in developing countries. Veterinary World. 2021 Jan 25;14(1):210.
9. Arifah FH, Nugroho AE, Rohman A, Sujarwo W. A review of medicinal plants for the treatment of diabetes mellitus: The case of Indonesia. South African Journal of Botany. 2022 Sep 1;149:537-58. sciencedirect.com
10. Aradhana S, Manjula BL, Kumar S. Scientific validation of tribal claims on the plants used in diabetes by Santhal community of Mayurbhanj, Odisha, India. Medicinal Plants-International Journal of Phytomedicines and Related Industries. 2022;14(4):604-8. researchgate.net
11. Dubale S, Kebebe D, Zeynudin A, Abdissa N, Suleman S. Phytochemical screening and antimicrobial activity evaluation of selected medicinal plants in Ethiopia. Journal of experimental pharmacology. 2023 Dec 31:51-62. tandfonline.com
12. Salleh NH, Zulkipli IN, Mohd Yasin H, Ja'afar F, Ahmad N, Wan Ahmad WA, Ahmad SR. Systematic review of medicinal plants used for treatment of diabetes in human clinical trials: An ASEAN perspective. Evidence-Based Complementary and Alternative Medicine. 2021;2021(1):5570939. wiley.com
13. Ongesa TN, Ugwu OP, Ugwu CN, Alum EU, Eze VH, Basajja M, Ugwu JN, Ogenyi FC, Okon MB, Ejemot-Nwadiaro RI. Optimizing emergency response systems in urban health crises: A project management approach to public health preparedness and response. Medicine. 2025 Jan 17;104(3):e41279.

14. Sylver-Francis RA, Pelkonen O. Medicinal plants as alternatives for the management of hypertension and diabetes in Nigeria: Analysis of the structured interview of Nigerian patients. Phytomedicine Plus. 2025 Feb 1;5(1):100708.
15. Maling S, Kabakyenga J, Muchunguzi C, Olet EA, Namaganda M, Kahwa I, Alele PE. Medicinal plants used by traditional medicine practitioners in treatment of alcohol-related disorders in Bushenyi District, southwestern Uganda. Frontiers in Pharmacology. 2024 Jun 10;15:1407104. frontiersin.org
16. Yedjou CG, Grigsby J, Mbemi A, Nelson D, Mildort B, Latinwo L, Tchounwou PB. The management of diabetes mellitus using medicinal plants and vitamins. International Journal of Molecular Sciences. 2023 May 22;24(10):9085. mdpi.com
17. Adhikari B. Roles of alkaloids from medicinal plants in the management of diabetes mellitus. Journal of Chemistry. 2021;2021(1):2691525.
18. Zhang J, Chen T, Wen Y, Siah KT, Tang X. Insights and future prospects of traditional Chinese medicine in the treatment of functional dyspepsia. Phytomedicine. 2024 May 1;127:155481.
19. Najmi A, Javed SA, Al Bratty M, Alhazmi HA. Modern approaches in the discovery and development of plant-based natural products and their analogues as potential therapeutic agents. Molecules. 2022 Jan 6;27(2):349.
20. Prakash P, Radha, Kumar M, Pundir A, Puri S, Prakash S, Kumari N, Thakur M, Rathour S, Jamwal R, Janjua S. Documentation of commonly used ethnoveterinary medicines from wild plants of the high mountains in Shimla District, Himachal Pradesh, India. Horticulturae. 2021 Oct 1;7(10):351. mdpi.com
21. Turek-Hankins LL, Coughlan de Perez E, Scarpa G, Ruiz-Diaz R, Schwerdtle PN, Joe ET, Galappaththi EK, French EM, Austin SE, Singh C, Siña M. Climate change adaptation to extreme heat: a global systematic review of implemented action. Oxford Open Climate Change. 2021 Jan 1;1(1):kgab005. oup.com
22. Caesar LK, Montaser R, Keller NP, Kelleher NL. Metabolomics and genomics in natural products research: complementary tools for targeting new chemical entities. Natural product reports. 2021;38(11):2041-65. nih.gov
23. Islamaj R, Leaman R, Kim S, Kwon D, Wei CH, Comeau DC, Peng Y, Cissel D, Coss C, Fisher C, Guzman R. NLM-Chem, a new resource for chemical entity recognition in PubMed full text literature. Scientific data. 2021 Mar 25;8(1):91. nature.com
24. Jiang L, Chen Y, Wang X, Guo W, Bi Y, Zhang C, Wang J, Li M. New insights explain that organic agriculture as sustainable agriculture enhances the sustainable development of medicinal plants. Frontiers in Plant Science. 2022 Sep 30;13:959810.
25. Mandal D. Medicinal plants: Consumption, Supply Chain, Marketing, and Trade in India. InMedicinal Plants 2022 Aug 4 (pp. 485-506). Apple Academic Press.
26. Kumar S, Mittal A, Babu D, Mittal A. Herbal medicines for diabetes management and its secondary complications. Current diabetes reviews. 2021 May 1;17(4):437-56.
27. Alqahtani AS, Ullah R, Shahat AA. Bioactive constituents and toxicological evaluation of selected antidiabetic medicinal plants of Saudi Arabia. Evidence-Based Complementary and Alternative Medicine. 2022;2022(1):7123521. wiley.com
28. Jardine MA, Kahleova H, Levin SM, Ali Z, Trapp CB, Barnard ND. Perspective: plant-based eating pattern for type 2 diabetes prevention and treatment: efficacy, mechanisms, and practical considerations. Advances in Nutrition. 2021 Nov 1;12(6):2045-55. sciencedirect.com
29. Nugroho Y, Soendjoto MA, SUYANTO S, Matatula J, Alam S, Wirabuana PY. Traditional medicinal plants and their utilization by local communities around Lambung Mangkurat Education Forests, South Kalimantan, Indonesia. Biodiversitas Journal of Biological Diversity. 2022 Jan 5;23(1). smujo.id
30. Başaran N, Paslı D, Başaran AA. Unpredictable adverse effects of herbal products. Food and Chemical Toxicology. 2022 Jan 1;159:112762.
31. Kasole R, Martin HD, Kimiywe J. Traditional medicine and its role in the management of diabetes mellitus:"patients' and herbalists' perspectives". Evidence-Based Complementary and Alternative Medicine. 2019;2019(1):2835691.
32. Tran N, Pham B, Le L. Bioactive compounds in anti-diabetic plants: From herbal medicine to modern drug discovery. Biology. 2020 Aug 28;9(9):252.

33. Aja PM, IO Igwenyi, PU Okechukwu, OU Orji, EU Alum. Evaluation of anti-diabetic effect and liver function indices of ethanol extracts of Moringa oleifera and Cajanus cajan leaves in alloxan induced diabetic albino rats Global Veterinaria 14(3) 439-447 (2015).
34. Offor CE, OPC Ugwu, EU Alum. The anti-diabetic effect of ethanol leaf-extract of Allium sativum on Albino rats. International Journal of Pharmacy and Medical Sciences, 4, (1), 01-03 (2014).
35. Enechi OC, H Ikenna Oluka, PC Okechukwu Ugwu. Acute toxicity, lipid peroxidation and ameliorative properties of Alstonia boonei ethanol leaf extract on the kidney markers of alloxan induced diabetic rats. African journal of biotechnology, 13, 5 (2014).
36. Adonu CC, OP Ugwu, A Bawa, EC Ossai, AC Nwaka. Intrinsic blood coagulation studies in patients suffering from both diabetes and hypertension. Int Journal of Pharmaceutical Medicine and Bio Science, 2 (2), 36-45 (2013).
37. Okechukwu Paul-Chima Ugwu, Esther Ugo Alum, Michael Ben Okon, Patrick M Aja, Emmanuel Ifeanyi Obeagu, EC Onyeneke Ethanol root extract and fractions of Sphenocentrum jollyanum abrogate hyperglycaemia and low body weight in streptozotocin-induced diabetic Wistar albino rats Oxford University Press 2(2) 10 (2023).
38. Mariam Oyedeji Amusa and Adeyinka Olufemi Adepoju Okechukwu P. C. Ugwu, Esther Ugo Alum, Emmanuel I. Obeagu, Michael Ben Okon, Patrick M. Aja , Awotunde Oluwasegun Samson Effect of Ethanol leaf extract of Chromolaena odorata on lipid profile of streptozotocin induced diabetic wistar albino rats. IAA Journal of Biological Sciences, 10, (1), 109-117 (2023).
39. Alum EU, GU Umoru, DE Uti, PM Aja, OP Ugwu, OU Orji, BU Nwali, NN Ezeani, N Edwin, FO Orinya HEPATO-PROTECTIVE EFFECT OF ETHANOL LEAF EXTRACT OF Datura stramonium in ALLOXAN-INDUCED DIABETIC ALBINO RATS. Journal of Chemical Society of Nigeria, 47, 5 (2022).
40. Ugwu Okechukwu P.C. and Amasiorah V.I. The effects of the crude ethanol root extract and fractions of Sphenocentrum jollyanum on hematological indices and glycosylated haemoglobin of streptozotocin-induced diabetic. INOSR Scientific Research, 6, (1), 61-74 (2020).
41. Enechi OC, IH Oluka, OPC Ugwu, YS Omeh Effect of ethanol leaf extract of Alstonia boonei on the lipid profile of alloxan induced diabetic rats. World Journal of Pharmacy and Pharmaceutical Sciences (WJPPS), 2013, Vol. 2, No. 3, 782-795(2012).

CITE AS: Arionget Jemima. (2025). Exploring the Role of Medicinal Plants in Diabetes Prevention and Management. EURASIAN EXPERIMENT JOURNAL OF SCIENTIFIC AND APPLIED RESEARCH, 7(1): 45-54.