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Hibiscus and Dandelion as Complementary Therapies for Hypertension and Type 2 Diabetes in African and Hispanic Communities

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ABSTRACT

Hypertension and type 2 diabetes mellitus remain major contributors to morbidity and mortality in the United States. Disproportionately, this affects African and Hispanic communities due to persistent health disparities, barriers to care, and socioeconomic inequities. Complementary and alternative medicine (CAM) play an important role in the management of chronic diseases. Using Hibiscus sabdariffa and Taraxacum officinale as complementary therapies for hypertension and type 2 diabetes, it is important to evaluate the efficacy, safety, pharmacology, cultural significance, and public health implications. Current evidence suggests that hibiscus demonstrates antihypertensive activity through angiotensin converting enzyme inhibition, vasodilation, and antioxidant effects, while dandelion may contribute to glycemic control through modulation of glucose metabolism, which leads towards improved insulin sensitivity, and natural diuretic properties. Despite both herbs exhibiting favorable safety profiles, clinically significant interactions with antihypertensive, antidiabetic, and lipid lowering medications warrant careful patient counseling and healthcare provider oversight. Furthermore, this highlights the cultural importance of herbal medicine within African and Hispanic communities and emphasizes the need for culturally competent care, improved patient provider communication, and additional high quality clinical trials. Integrating evidence based complementary therapies into conventional chronic disease management may improve accessibility, and patient engagement, while maintaining patient safety.

Keywords

Complementary and Alternative Medicine (CAM), Hibiscus sabdariffa, Taraxacum officinale, Hypertension, Type 2 diabetes mellitus, Herb-drug interactions, African American health, Hispanic health.

Introduction

Chronic diseases such as hypertension and type 2 diabetes mellitus are among the major contributors to morbidity and mortality in the United States. According to the Centers for Disease Control and Prevention (CDC), approximately 47.7% of American adults had hypertension between 2021 and 2023, while an estimated 40.1 million Americans, representing 12.0% of the population, were living with diabetes in 2023 [1]. Despite advances in pharmacologic therapy and public health interventions, these conditions disproportionately affect therapy and public health interventions, these conditions disproportionately affect African American and Hispanic communities, where structural inequities, barriers to care, and social determinants of health contribute to disparities in disease prevalence and outcomes. Notably, the prevalence of hypertension among non-Hispanic Black adults reached 58.0%, compared with a national age-adjusted prevalence

of 44.5% [2]. In urban areas such as Philadelphia, these disparities are particularly pronounced. According to the 2022 Regional Community Health Needs Assessment, North Philadelphia-West had a diabetes prevalence of 18.2% compared with 13.1% citywide, while hypertension prevalence reached 42.5% compared with 34.1% citywide.

In response to gaps in accessibility, affordability, and cultural alignment within conventional healthcare systems, many individuals turn to complementary and alternative medicine (CAM). The World Health Organization defines traditional and complementary medicine as a broad set of health practices, knowledge, and beliefs incorporating plant based medicines, spiritual therapies, and manual techniques used to maintain health or treat illness [3]. Similarly, the Centers for Disease Control and Prevention recognizes CAM as medical products and practices not typically part of standard medical care [4]. Herbal medicine remains one of the most widely used forms of CAM in the United States because healing traditions are often passed down through family networks, elders, and community healers [5].

Hibiscus (Hibiscus sabdariffa) and dandelion (Taraxacum officinale) are two botanicals commonly used in traditional healing systems. Hibiscus is often consumed as tea, and has been traditionally used for cardiovascular health and has demonstrated potential antihypertensive effects through mechanisms including vasodilation and diuretic properties [6]. Dandelion, including its roots and leaves, has historically been used to support hepatic function, digestion, and glucose regulation, with emerging evidence supporting possible effects on glycemic control [7]. These herbs are available in teas, tinctures, and botanicas, contributing to their use in community based health practices.

In many populations, beliefs about the natural origin and cultural acceptability of CAM significantly influence usage patterns, including concurrent use with conventional pharmacologic therapies [5]. These practices raise important concerns regarding clinical efficacy, potential herb drug interactions, and implications for adherence to guideline based medical treatments.

This study analyzes the effectiveness and safety of Hibiscus sabdariffa and Taraxacum officinale as complementary treatments for hypertension and type 2 diabetes, with a particular focus on African and Hispanic populations. By integrating epidemiologic evidence, pharmacologic mechanisms, and relevant sociocultural factors, the objective is to assess whether these botanicals can be incorporated into evidence-informed, culturally competent chronic disease management strategies.

Epidemiology & Background

Complementary and Alternative Medicine: Background and Use

Globalization has significantly expanded the exchange and use of traditional medicines across cultures, accelerating the interaction between local and global pharmacopoeias. Increased globalization and economic activity have facilitated the spread of medicinal knowledge and herbal practices through international trade, media, and the internet, allowing "foreign" remedies to become integrated into new cultural contexts. This process has led to the incorporation of traditional medicines into everyday healthcare practices, as well as the blending of local and global medical systems. As a result, medicinal plants and traditional healing methods are no longer confined to their regions of origin but are continuously reshaped through global circulation and cultural exchange. While the use of medicinal herbs can appear to be a safe and effective alternative to some Western medicine, herbal medicines present several biological and medical risk factors that are often overlooked. Research shows that herbal products can interact with prescription drugs, sometimes leading to harmful health effects or reduced treatment efficacy. They may also cause adverse side effects and toxicity, particularly when used improperly or alongside other medications. A major concern is the common misperception that "natural" products are inherently safe; however, scholars emphasize that herbal medicines can still be toxic and pose significant health risks [8]. Furthermore, because many herbal products are not strictly regulated, issues such as inconsistent dosage, contamination, and lack of standardization can increase the likelihood of adverse outcomes. Health literacy plays a significant role in how people understand and use complementary and alternative medicine, including herbal remedies. Individuals with limited health literacy may struggle to interpret information about risks, appropriate dosages, and safe use of treatments, which can contribute to misunderstandings about the safety and effectiveness of "natural" therapies; poor health literacy in alternative medicinal contexts has been linked to increased likelihood of adverse events, improper dosing, and misunderstanding of interactions with other medications. Researchers have noted that inadequate health literacy is associated with differences in patterns of complementary and alternative medicine use and may influence how people combine herbal products with conventional treatments, highlighting the importance of literacy in safely navigating these options [9]. Additionally, studies involving diverse patient populations indicate that those with lower health literacy may be at greater risk of misunderstanding this herbal medicinal information, and that higher literacy is often correlated with more informed decisions about complementary and alternative medicine use, including herbal therapies [9]. These findings suggest that improving health literacy could help reduce risks associated with complementary and alternative medicine use and enable safer, more informed patient choices.

Epidemiology of Hypertension and Type 2 Diabetes

Hypertension is a chronic cardiovascular condition characterized by persistently elevated blood pressure, which increases the risk of cardiovascular disease, stroke, chronic kidney disease, and other complications. Under current American Heart Association and American College of Cardiology guidelines, hypertension is generally defined as a systolic blood pressure of 130 mmHg or higher or a diastolic blood pressure of 80 mmHg or higher. The condition develops through a combination of genetic,

environmental, and behavioral factors, including obesity, excessive sodium consumption, physical inactivity, chronic stress, and limited access to preventive healthcare. Hypertension is frequently asymptomatic, allowing cardiovascular damage to progress without noticeable warning signs. Consequently, early detection, routine monitoring, and effective management are essential to reducing long-term morbidity and mortality.

Diabetes mellitus is a chronic metabolic disease characterized by elevated blood glucose levels resulting from insufficient insulin production, impaired insulin utilization, or both. Type 1 diabetes is an autoimmune condition in which the immune system destroys insulin-producing pancreatic beta cells, resulting in an absolute insulin deficiency and the need for lifelong insulin therapy. In contrast, type 2 diabetes mellitus, which accounts for approximately 90-95% of diagnosed diabetes cases in the United States, develops primarily through insulin resistance and progressive pancreatic beta cell dysfunction. Risk factors for T2DM include genetic predisposition, obesity, physical inactivity, increasing age, and socioeconomic conditions that limit access to nutritious foods and preventive healthcare. When inadequately managed, chronic hyperglycemia can contribute to cardiovascular disease, neuropathy, nephropathy, and retinopathy. Although both forms of diabetes can contribute to the overall burden of chronic disease, T2DM is particularly relevant to this analysis because of its high prevalence and the investigation of complementary therapies, including *Taraxacum officinale*, for potential effects on glucose regulation.

In the United States, hypertension and type 2 diabetes are some of the most common medical conditions, posing serious public health concerns. Among adults older than 20, a staggering 49.1% measured high blood pressure and/or are taking antihypertensive medication [10]. Furthermore, an estimated 12% of Americans suffer from diabetes, and between 90% to 95% are diagnosed with type 2 diabetes [11]. Additionally, these diseases disproportionately affect marginalized communities. In the case of type 2 diabetes, the prevalence in African-American and Hispanic groups is 12.2% and 11.8%, respectively, whereas the rate in White, non-Hispanic groups is 7.1% [12]. Moreover, hypertension is far more pervasive among African-American adults when compared to other demographics. An estimated 58% of African-American adults have been diagnosed with hypertension, while the rate in White, non-Hispanic adults is an estimated 43.3% [12]. Yet, in a broader socio-economic context, the disparities are even more pronounced. In a 2021 study examining the relationship between area deprivation and hypertension across the US, neighbourhoods with the highest deprivation levels (>55%) were associated with increased prevalence of hypertension, compared with neighbourhoods in the lowest category (≤10%) [13]. In a similar study aimed at analyzing trends in income inequality and diabetes, low-income populations displayed elevated levels of diabetes compared to high-earning counterparts [14].

Health Disparities, Socioeconomic Factors, and Healthcare Access

As a whole, these statistics stem from a variety of contributing factors closely related to low socioeconomic status. For example, poor health-related behaviors and limited access to healthcare as a result of low socioeconomic status are closely linked to diabetes risk in adults as well as adolescents [15,16]. Similarly, hypertension is closely connected to food insecurity, limited access to nutritious foods, adverse living conditions, substandard availability of health systems, and general psychosocial stress [17]. With one of the main contributing factors to the prevalence of both diseases being access to healthcare, feasible alternatives to modern medicine that are safe, effective, and most importantly available to disadvantaged populations have become increasingly investigated in recent years. While there are many possible avenues to explore in terms of developing alternative treatments, applying healing methods of traditional methods–particularly in the context of African-American and Hispanic communities–could prove to be effective in providing marginalized populations with alternative medicine.

Cultural and Historical Use of Herbal Medicine

Hispanic and African communities both possess rich histories of alternative medicine. In each culture, the use of herbal and holistic folk medicine to treat diseases has been the standard practice–especially due to the relative novelty and poor accessibility of modern medicine [18,19]. Even among Hispanics living in the United States, complementary and alternative medicine is frequently utilized to address medical needs [20]. Furthermore, religious goods stores or “Botanicas” serve as herbal pharmacies for underserved Latino communities in the United States–providing access to holistic treatments and psychological support for the areas they serve [21]. Likewise, African-Americans commonly employ complementary and alternative medicines to treat medical conditions [22]. Among the wide variety of herbs used in holistic medicine, hibiscus and dandelion represent two popular herbal remedies within both traditions. Originating in West Africa, Hibiscus (*Hibiscus sabdariffa*) is a herb known for its medicinal properties and therapeutic potential [23,24]. Hibiscus is employed primarily as an antihypertensive, anti-diabetic, and diuretic across multiple African and Hispanic cultures [25,26].

For general medicinal purposes, the plant’s calyces are boiled in water and served as a soft drink known as *Zobo* in Nigeria and *Flor de Jamaica* in Mexico [25,27]. Conversely, Dandelion (*Taraxacum officinale*) is a herb native to Eurasia but ubiquitous across North America [28]. Across the globe, Dandelion has been utilized in folk medicine for a variety of different purposes [29,30]. In Mexico, Dandelion is used to treat diabetes due to the herb’s hypoglycemic effect [31]. Research on traditional medicinal systems shows that knowledge about herbal remedies and healing practices, such as those discussed above, is often transmitted through informal social networks rather than formal educational settings [32]. Ethnobiological studies indicate that family members—especially parents and elders—play a central role in passing down knowledge

of medicinal plants and treatments across generations [32,33] and that experienced community members or non-parental adults also serve as important sources of learning in many societies, illustrating multiple paths of cultural transmission [32]. Social network research with migrant populations further finds that individuals cite family, friends, and long-standing community contacts as primary sources for learning about food and medicinal plants [34], highlighting the heaviest reliance on personal relationships for gaining medicinal plant knowledge rather than institutionalized instruction [34]. This body of evidence underscores how family traditions, community healers, and cultural practices collectively support the intergenerational sharing of alternative medicine knowledge.

Complementary Medicine in Philadelphia

Complementary and alternative medicine (CAM) continues to be utilized across diverse patient populations in the United States, According to *Use of complementary health approaches overall and for pain management by US adults*, the percentage of U.S. adults reporting use of at least one complementary health approach increased from 19.2% in 2002 to 36.7% in 2022, demonstrating a substantial increase in utilization over the past two decades. In the Philadelphia region, complementary and alternative medicine is widely used by many patient groups, particularly cancer survivors. About 65 % of cancer survivors have reported using complementary and alternative therapies at some point, reflecting a much higher prevalence than in the general population [35]. Similarly, a 2024 study examining complementary health approaches among cancer survivors found that 40.17% of individuals with a recent cancer diagnosis reported using at least one complementary approach, compared with 37.93% of individuals without a history of cancer. This pattern aligns with national data showing that roughly two-thirds of cancer survivors in the United States have ever used some form of complementary and alternative medicine, and many continue to use these therapies for general wellness, immune enhancement, and symptom management [35]. Despite the high rates of use, research indicates that a substantial proportion of patients do not disclose their complementary and alternative medicine use to their healthcare providers; surveys in oncology settings have documented low levels of patient-physician communication about alternative therapies, with nondisclosure rates historically reported around 60 % or higher [36]. These trends highlight both the popularity of complementary and alternative medicine among certain patient groups in the Philadelphia area and broader national challenges in ensuring safe, integrated care through open communication between patients and clinicians.

In the Philadelphia region, there are several clinics and centers that offer or support alternative medicine approaches. At the community level, Philadelphia Holistic Clinic provides a range of holistic and alternative medical services, including acupuncture, homeopathy, hypnotherapy, and Chinese medicinal herbs, under the direction of clinicians with extensive training in traditional and integrative practices [37]. Beyond private practices, integrative health programs such as those at the Children's Hospital of Philadelphia offer evidence-based complementary therapies like acupuncture, massage, and mindfulness as part of broader patient care strategies [38].

Clinical Analysis

Physician's Perspective: Integrative Approaches to Metabolic Management, Dr. Richard Fleming

Understanding the Clinical Pathophysiology: HTN and T2DM

In the modern world, Hypertension (HTN) and Type 2 Diabetes Mellitus (T2DM) are rarely isolated occurrences; rather, they are the interlinked pillars of metabolic syndrome that we, as clinicians, battle daily.

Hypertension is often misunderstood by patients as a simple "high-pressure" reading, but from a medical standpoint, it is a complex failure of systemic autoregulation. It involves the chronic overactivation of the Renin-Angiotensin-Aldosterone System (RAAS) and a gradual loss of endothelial elasticity. When we see a patient with persistent high blood pressure, we aren't just looking at a number; we are looking at a cardiovascular system under constant mechanical stress.

This stress leads to left ventricular hypertrophy, arterial remodeling, and eventually, end-organ damage in the kidneys and brain. The "silent" nature of HTN is what makes it so dangerous. By the time a patient feels symptomatic, the structural damage is often well underway.

Type 2 Diabetes, on the other hand, is a progressive metabolic exhaustion. It begins long before the first elevated HbA1c reading, starting with peripheral insulin resistance. As a doctor, I view T2DM as a state where the body's "lock and key" mechanism for glucose has rusted and is not functioning efficiently. The pancreas attempts to compensate by pumping out more insulin, but eventually, the beta-cells burn out of exhaustion from repeated long-term glucose spikes. This chronic hyperglycemia isn't just about "high sugar", but also a systemic inflammatory state. It damages the microvasculature, leading to retinopathy and nephropathy, and works in a deadly synergy with hypertension to accelerate atherosclerosis

When these two conditions coexist, which they do in a staggering number of our patients, especially in marginalized communities. The risk of a major adverse cardiovascular event (MACE) doesn't just double, it increases exponentially.

Clinical Observations: The Role of Hibiscus sabdariffa

After reviewing the research compiled by my colleagues, the evidence for Hibiscus sabdariffa as a legitimate clinical tool is compelling. In the clinic, we often rely on ACE inhibitors like Lisinopril or ARBs like Telmisartan to manage RAAS overactivity [22]. Interestingly, the anthocyanins found in Hibiscus appear to mimic this exact mechanism. What stands out to me as a practitioner is not just that Hibiscus lowers blood pressure, but how

it does it. The data shows it acts as a mild, natural ACE inhibitor while simultaneously promoting vasodilation via the nitric oxide pathway [22].

In trials, patients with higher baseline blood pressures, the ones we worry about most, saw the most significant reductions [22]. This suggests that Hibiscus isn't just a "health drink," but a bioactive intervention that targets the actual pathophysiology of vascular resistance. However, there is a practical important note to consider here- the half-life. With a clearance rate of about 2.6 hours, a single cup of tea isn't a treatment plan [22]. To achieve a steady state that actually protects the arteries, patients need a consistent, daily dosing schedule which is practical and effective. We also have to be careful with patients already on "water pills" like Hydrochlorothiazide, adding Hibiscus could potentially drop their blood pressure or volume too quickly, leading to dizziness or falls [39].

This same problem also causes a challenge for patients taking another drug called Simvastatin. In clinical practice, we have to protect the ideal plasma concentration of these drugs, the precise concentration where a drug works without becoming ineffective or toxic. When it comes to Simvastatin, the interaction with Hibiscus is a perfect example of why “natural” doesn't always mean “compatible”.

From a pharmacological perspective, Simvastatin is a prodrug that relies on the Cytochrome P450 (CYP450) enzyme pathway in the liver [9,31]. Research suggests that high concentrations of Hibiscus can interfere with these specific pathways. If a patient is using Hibiscus as a daily therapeutic tea, I’m concerned about two major risks-

Reduced Efficacy: If Hibiscus drops the plasma concentration of Simvastatin below the therapeutic window, the patient’s LDL cholesterol isn't being controlled, which essentially defeats the purpose of this medication and leaves them at a higher risk for a cardiovascular event [31]. Metabolic Volatility: Given that Hibiscus has a short half-life, the interaction it causes in the liver fluctuates throughout the day. This makes it almost impossible for a physician to predict how much active statin is actually in the patient's system at any given time.

So in simple practical terms, while I wouldn't forbid an occasional glass of tea, I would strongly advise against daily use for any patient on Simvastatin. If the patients are committed to using Hibiscus daily, we might need to switch to a statin like Pravastatin, which uses different metabolic pathways, or significantly increase the frequency of lipid panel monitoring. Ultimately, our first rule is Primum non nocere (First, do no harm). So therefore mixing potent botanicals with narrow-therapeutic-index drugs like statins requires a level of caution that most patients don't realize is necessary.

Clinical Observations: The Role of Taraxacum officinale (Dandelion)

Dandelion is frequently dismissed as a common weed, but the pharmacological profile of its roots and leaves is sophisticated. Most of my patients with hypertension are on diuretics, and the biggest headache we face is "hypokalemia", as their potassium levels drop, they get muscle cramps and can even lead to adverse effects, and we have to prescribe yet another pill (a potassium supplement) to fix the side effect of the first pill.

Dandelion is a "potassium-sparing" diuretic by nature [9]. While offering a unique potassium-sparing diuretic effect that minimizes common electrolyte complications seen in traditional hypertensive therapy. This is a massive clinical advantage for long-term management.

On the diabetes front, the "GLP-1" mechanism mentioned in the research is particularly exciting. We are currently in an era where injectable GLP-1 agonists (like Ozempic or Wegovy) are changing the way we treat diabetes. To see that Dandelion contains compounds like chlorogenic and chicoric acid, which stimulate that same GLP-1 pathway and trigger GLUT4 transporters to move sugar into the muscles, is significant [31]. It means Dandelion isn't just lowering sugar, it’s actually improving the body's sensitivity to its own insulin [31].

Physician’s Guidance: The "Is it Working?" Verdict

As a physician, I am often asked whether these alternative treatments “Really work?”.

My observation, based on this data, is that they are highly effective adjuncts. For a patient in the pre-diabetic or Stage 1 Hypertension phase, these botanicals, along with lifestyle changes, might be enough to prevent them from ever needing a lifelong prescription of synthetic drugs. For those already on medication, these plants can help stabilize their numbers and potentially allow us to keep their pharmaceutical doses lower, reducing the risk of side effects.

However, we must address the "Quality Gap”. Unlike a 10mg tablet of Lisinopril which is the same every single time, a bag of dried Hibiscus or a Dandelion extract can vary wildly in potency [22]. As a doctor, I can't prescribe "a cup of tea" with the same precision as a pharmaceutical. This is where we need more regulation and standardized extracts.

Clinical Rationale: Addressing Health Disparities in Metabolic Disease

We cannot ignore the socio-economic reality. The clinical urgency for investigating accessible adjunct therapies is highlighted by the documented disparities in disease prevalence across the United States. As previously discussed in the demographic analysis [4,9,12,22,28,31,39], Hypertension (HTN) and Type 2 Diabetes Mellitus (T2DM) do not affect all populations equally.

In my clinical observation, what stands out most is that these diseases don’t hit every community the same way. There is a

documented, heavy burden on African-American and Hispanic populations [4,22]. In my view, this isn't just about genetics; it's about the "social determinants of health"—things like food insecurity, the stress of living in high-deprivation areas, and the simple fact that many people just can't afford or access a primary care clinic [12,40]. Furthermore, research confirms a direct correlation between low socioeconomic status and elevated metabolic risk across all age groups [19,23].

This is why exploring "alternative" treatments like Hibiscus and Dandelion is so important. For many of our patients, especially in Hispanic and African-American communities, herbal and folk medicine aren't new, rather they are part of a rich cultural history that has been the standard of care for generations [2,41]. Even today, many Hispanic patients in the U.S. rely on these complementary treatments to manage their health [10]. By validating the safety and pharmacological efficacy of Hibiscus and Dandelion we are giving every patient a fair shot at managing their chronic conditions.

Final Conclusion

If we can validate a safe, effective, and natural alternative like Hibiscus or Dandelion, we aren't just treating a disease, we are providing a tool for health equity. My opinion is clear- these botanicals are pharmacologically active and clinically relevant. They should be integrated into a holistic treatment plan, provided the patient is monitored for interactions with their existing meds (like Simvastatin or Insulin). We should stop looking at these as "alternatives" and start looking at them as "complementary medicine".

Financial and Cost-Benefit Considerations

The financial accessibility of complementary and alternative medicine (CAM) is an important consideration when evaluating the potential integration of *Hibiscus sabdariffa* and *Taraxacum officinale* into conventional treatment plans for hypertension and type 2 diabetes mellitus. Although herbal therapies are often perceived as affordable alternatives to prescription medications, their economic benefits depend on product pricing, insurance coverage, clinical effectiveness, and long-term treatment requirements. These considerations are particularly relevant to African American and Hispanic communities experiencing socioeconomic disparities and barriers to healthcare access.

Commercially available herbal products vary in cost depending on their formulation, concentration, and manufacturer. For example, Traditional Medicinals offers hibiscus tea and dandelion leaf and root tea for approximately $7.49 per 16-count package [42]. Assuming consumption of one tea bag daily, the estimated monthly expense would be approximately $14.04 for either product. However, these estimates do not represent clinically established therapeutic doses, and additional consumption could increase monthly expenditures. In comparison, conventional medications for hypertension and type 2 diabetes are often available as low-cost generics. Discounted prescription prices reported for Philadelphia-area pharmacies include approximately $3.39 for 90 tablets of lisinopril (20 mg), $2 for 30 tablets of hydrochlorothiazide (25 mg), and $2 for 60 tablets of metformin (500 mg), (Senior List, 2025). These examples demonstrate that conventional medications may be less expensive than herbal supplements, particularly when generic formulations and prescription discount programs are available.

Insurance coverage further influences the financial accessibility of these treatments. Prescription medications such as lisinopril, hydrochlorothiazide, and metformin are commonly included in insurance formularies, although copayments, deductibles, and coverage restrictions vary across plans. Conversely, herbal supplements such as hibiscus and dandelion are generally purchased out of pocket because they are marketed as dietary supplements rather than approved prescription treatments. The National Center for Complementary and Integrative Health (NCCIH) emphasizes that insurance coverage for complementary approaches varies and recommends that patients verify benefits directly with their insurers. Consequently, individuals who incorporate herbal supplements into existing treatment regimens may experience additional monthly expenses rather than financial savings.

From a cost-benefit perspective, the potential economic advantages of complementary therapies must be evaluated alongside their demonstrated clinical effectiveness and safety. Although hibiscus has shown promising antihypertensive effects in some clinical studies, available evidence does not establish that it provides equivalent long-term cardiovascular protection compared with standard antihypertensive medications. Similarly, evidence supporting dandelion for glycemic control remains largely preliminary, with insufficient human clinical trials to establish its effectiveness in managing type 2 diabetes. Furthermore, potential herb-drug interactions, inconsistent product concentrations, and the need for additional clinical monitoring may introduce costs that are not reflected in retail prices. Therefore, while hibiscus and dandelion may offer culturally familiar complementary options, their use cannot currently be justified on the basis of cost savings alone. Additional clinical trials and formal economic evaluations are necessary to determine whether their integration into conventional chronic disease management provides measurable health benefits relative to the associated financial costs.

Pharmacology

Hibiscus

Active Compounds ~ Hibiscus

Hibiscus sabdariffa releases a range of compounds that have been studied for their health effects. The most important of these are anthocyanins, a group of polyphenols linked to antioxidant protection, cardiovascular health, and anti-inflammatory activity [43]. The plant also contains organic acids, which contribute to the tartness of hibiscus tea and play a role in some of its pharmacological effects [43].

Mechanism in Relation to Hypertension ~ Hibiscus

Hibiscus has been studied in both animals and humans for its ability

to lower blood pressure, with two main mechanisms proposed: ACE inhibition and vasodilation [43]. ACE is an enzyme that produces angiotensin II, a molecule that causes blood vessels to narrow and blood pressure to rise. Drugs like lisinopril work by blocking ACE, and hibiscus appears to do the same, just more mildly [43]. Vasodilation is the relaxing and widening of blood vessels that contributes by reducing the workload on the heart.

Clinically, two trials found that a standardized daily hibiscus infusion taken for four weeks lowered both systolic and diastolic blood pressure at levels comparable to lisinopril, with no adverse effects reported [43]. Patients with higher starting blood pressure saw the greatest benefit, which makes the results more valid. A separate study also showed that a single dose improved how well blood vessels relaxed after a meal, suggesting hibiscus may support vascular health beyond just resting blood pressure [43].

Mechanism in Relation to Diabetes ~ Hibiscus

Hibiscus has also been studied for its effects on blood sugar. Lab studies show it can block alpha-amylase, the enzyme that breaks carbohydrates down into glucose [43]. Slowing this process allows glucose to enter the bloodstream more gradually, helping to prevent the spike in blood sugar that often follows a meal [44].

Human evidence is still limited but encouraging studies have shown reductions in both fasting blood sugar and LDL cholesterol, though effects on other lipids were less consistent [44]. The fact that hibiscus seems to lower both blood sugar and blood pressure at the same time is particularly relevant as both conditions often go hand in hand. Some early research also hints at possible anti-obesity effects, though more studies are needed before any firm conclusions can be made [44].

Toxicology ~ Hibiscus

The active compounds in hibiscus have a short half-life of about 2.6 hours and are mostly excreted through urine within two hours of ingestion [43]. Because they clear the body quickly, regular daily use seems necessary to maintain any therapeutic benefit.

In terms of safety, hibiscus is generally well tolerated, however Hibiscus should be avoided during pregnancy and breastfeeding due to limited safety data. The most important drug interaction to be aware of is combining hibiscus with blood pressure medications, which could cause blood pressure to drop too low [43]. This is a good reminder of why pharmacists should always ask patients about herbal supplement use.

Dandelion

Active Compounds ~ Dandelion

Dandelion (Taraxacum officinale) has been used in traditional medicine since at least the 10th century. Almost every part of the plant is used medicinally as the leaves are rich in potassium, calcium, iron, beta-carotene, and vitamins C and D [43]. The roots contain inulin, a complex carbohydrate making up nearly 45% of the root along with taraxasterol, beta-sitosterol, and phenolic acids including chlorogenic acid and chicoric acid [7]. These root compounds are the most studied for their antidiabetic properties, while the bitter taste of the plant comes from sesquiterpene lactones, which also carry anti-inflammatory activity [7].

Mechanism in Relation to Hypertension ~ Dandelion

Dandelion's main contribution to blood pressure management is its diuretic effect. A study confirmed that dandelion leaf extract significantly increased urination frequency, supporting its traditional use as a natural diuretic [43]. By helping the kidneys excrete excess sodium and water, dandelion reduces blood volume and lowers pressure on vessel walls.

What makes this effect particularly notable is that dandelion leaves are naturally high in potassium as most diuretic medications cause the body to lose potassium along with excess fluid, which can lead to dangerous electrolyte imbalances [43]. Dandelion essentially replaces what is lost, making it a potentially safer option. While clinical evidence remains limited, its diuretic mechanism and potassium content make it pharmacologically relevant to blood pressure management.

Mechanism in Relation to Diabetes ~ Dandelion

Dandelion works through several pathways to help control blood sugar as the key compounds driving these effects are chlorogenic acid, chicoric acid, taraxasterol, and sesquiterpene lactones. 2 Similar to hibiscus, dandelion inhibits alpha-glucosidase and alpha-amylase, slowing the breakdown of carbohydrates and reducing post-meal blood sugar spikes. 2 Chlorogenic acid also inhibits glucose-6-phosphatase in the liver, reducing the amount of stored glucose released into the bloodstream between meals [7]. At the cellular level, these trigger GLUT4 transporters to move glucose out of the bloodstream and into muscle cells improving insulin sensitivity.

2 Chlorogenic acid also stimulates GLP-1, a gut hormone that signals the pancreas to release insulin and slows digestion, similar to the mechanism behind some newer diabetes medications [7]. Finally, the inulin in dandelion root acts as a prebiotic fiber, feeding beneficial gut bacteria that help regulate blood sugar and improve insulin sensitivity over time [7]. This gut-based pathway is unique to dandelion and adds a complementary mechanism not seen in hibiscus.

Toxicology ~ Dandelion

Pharmacokinetic data on dandelion in humans is very limited, and no specific dosing recommendations are currently supported by clinical trials [43]. Dandelion has a low overall toxicity profile, with animal studies showing no significant harm even at high doses [43]. However, allergic reactions are possible since dandelion belongs to the same plant family as ragweed and chrysanthemum [43]. The most important drug interaction is with insulin, as dandelion may enhance its blood sugar-lowering effect and increase the risk of hypoglycemia [43]. Pregnant women should avoid amounts beyond normal food use due to insufficient safety data.

Policy & Public Health

Hypertension and type 2 diabetes mellitus are among the most prevalent chronic health conditions in the United States, contributing significantly to cardiovascular complications, disability, and premature mortality. Approximately 48.1% of American adults have hypertension, while an estimated 12% of the population has diabetes, including both type 1 and type 2 [45]. Current treatment guidelines emphasize routine screening, lifestyle modifications, and pharmacological interventions. Hypertension is commonly managed through medications such as angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), and other antihypertensive agents. Similarly, type 2 diabetes management includes medications such as metformin, glucagon-like peptide-1 (GLP-1) receptor agonists, and insulin when clinically indicated [39,40]. These evidence-based interventions remain central to preventing disease progression and reducing the risk of long-term complications.

Despite the availability of established treatment guidelines, significant disparities persist in the prevention, screening, diagnosis, and management of these conditions. An estimated 115.2 million American adults have prediabetes, placing a substantial proportion of the population at increased risk of developing type 2 diabetes [46]. Access to preventive healthcare is not distributed equally across socioeconomic and racial groups. Non-Hispanic Black adults experience a higher prevalence of hypertension than non-Hispanic White adults, with reported rates of approximately 58% and 49%, respectively [47]. Educational attainment, income, geographic location, and access to healthcare providers further influence chronic disease outcomes. Additionally, shortages of primary care professionals in underserved communities can delay screening, diagnosis, and treatment [48]. These barriers increase the likelihood that individuals will experience preventable complications, including myocardial infarction, stroke, neuropathy, and kidney disease.

Cultural beliefs, healthcare experiences, and socioeconomic circumstances also influence how individuals approach chronic disease management. Some patients incorporate complementary and alternative medicine (CAM) into their healthcare practices because of longstanding cultural traditions, personal preferences, financial considerations, or previous experiences with conventional healthcare [49]. Rather than replacing prescribed treatments, complementary therapies are frequently used alongside conventional medical interventions. However, certain herbal products may interact with prescription medications, potentially altering their effectiveness or increasing the risk of adverse effects [50]. These concerns emphasize the importance of communication between healthcare providers and patients regarding the use of herbal supplements. Healthcare professionals should acknowledge patients' cultural practices while providing evidence-based guidance about potential benefits, limitations, and medication interactions.

Public health initiatives addressing hypertension and type 2 diabetes should therefore extend beyond the promotion of screening and medication adherence to incorporate culturally responsive patient education. Although organizations such as the Centers for Disease Control and Prevention and World Health Organization emphasize evidence-based treatment and preventive healthcare, implementing these recommendations effectively requires consideration of the social and cultural circumstances influencing patient decision-making. Healthcare systems that encourage open discussions about complementary medicine may improve patient-provider trust, identify potentially harmful interactions, and support informed treatment decisions. Integrating cultural competency into chronic disease management is particularly important for African American and Hispanic communities experiencing persistent barriers to healthcare access.

Limitations in insurance coverage and regulatory oversight create increasingly large issues for the management of hypertension and type 2 diabetes. Public insurance plans, such as Medicaid, provide crucial coverage for low-income populations, yet issues such as access to preventative care services, nutrition counseling, and complementary therapies can vary in presence depending on the state [51]. CAM therapies are often not covered under Medicaid, with patients paying out of pocket for up-front costs - raising questions about justice and equity among populations. This contrasts to therapies such as acupuncture and chiropractic care, which are increasing in availability across states [51,52]. Simultaneously, regulatory frameworks that govern herbal supplements create additional concerns regarding ethical use and implementation. The Dietary Supplement Health and Education Act of 1994 states that dietary supplements are regulated as foods rather than drugs, meaning manufacturers are not required to indicate safety or efficacy prior to marketing to consumers. Regulatory oversight by the U.S. Food and Drug Administration is primarily post-market, allowing potentially unsafe or mislabeled products to remain available until adverse effects are identified [53]. This gap in regulation creates concerns for individuals with chronic diseases, as unsupervised supplement use can lead to adverse drug-drug interactions with already prescribed medications or delay integrations of effective treatments [50,53]. The interactions between both policy and regulatory issues place the burden of responsibility on the patients themselves, who are already navigating and managing a chronic illness and now are not given ample protections to ensure safety and efficacy.

Risk & Safety

Overall, hibiscus is shown to have a relatively mild safety profile, showing no adverse events in clinical research, although there are a few notable characteristics to be aware of. A study testing the concomitant use of hibiscus with hydrochlorothiazide showed a significant increase in urine volume (9.60±1.99 mL) in 24 hours of rats when at the highest tested dose (40 mg/kg HSE + 10mg/kg HCT) compared to 4.03±0.96 mL for the control group (distilled water) and 6.73±1.03 mL for the low dose group (distilled water + HCT (10mg/kg) [54]. This interaction suggests the possibility of hypovolemic effects, although this has not been demonstrated in

human subjects. This study also estimated the LD 50 to be greater than 5g/kg in the subjects, suggesting hibiscus is unlikely to cause any acute toxicities when consumed as a beverage. Another study pointed to possible interactions between hibiscus and simvastatin, resulting in a decreased plasma concentration of simvastatin when taken together [55]. It is recommended to avoid taking hibiscus alongside simvastatin to prevent possible misdosing. Additionally, one study demonstrated that high concentrations of hibiscus show mild inhibitory effects with several CYP450 isoforms, which can affect the metabolism of an array of drugs, suggesting further caution should be used with concomitant usage [56]. The studies referenced used trial periods of 4 weeks or fewer and the knowledge of longer term effects is limited. Finally, while the dosing was controlled in these studies, there is concern over the consistency of dosing of hibiscus-containing products in the commercial market. Due to lack of regulation and presence of variability in the style of preparation, concentrations of active compounds can vary drastically between products [57].

Dandelion is also considered to have a favorable safety profile, with most of the concern relating to allergies and contact dermatitis. When used as a food or an extract, there is no substantial risk for adverse events. One study showed that certain mixtures of dandelion extract significantly prolonged thrombin times (TT) in vitro, however there is no evidence of this happening in humans [58]. Even though this has not been shown to affect TT in humans, patients who are on anticoagulant medications should take caution when consuming dandelion extract.

Ethical Analysis

Proponents of conventional medicine argue that alternative medicines are unsafe. "There is only scientifically proven, evidence-based medicine supported by solid data, or unproven medicine for which scientific evidence is lacking." [59]. Those who oppose clinical testing and government regulation of complementary medicine therapies argue that the scientific method of randomized controlled trials is simply not applicable to these remedies. These authors agree with the proponents of scientific testing and will argue that failure to attain scientific data is unethical, because it violates the basic principles of bioethics-autonomy, beneficence, nonmaleficence and justice.

The principle of autonomy refers to the right of a person to exercise self-determination. In bioethics it refers to the right of a person to reject unwanted interventions and to make choices that are consonant with their goals, values and beliefs. Therefore, individuals have the right to use those therapies which, they believe, treat existing illnesses or promote health and well-being. There is no disagreement that individuals have the right to reject or accept certain medical therapies according to their values, but to authentically exercise autonomy, one must have sufficient and reliable information to choose among options. The ethical focus regarding alternative medicines centers therefore on informed consent. The elements of informed consent include professional disclosure, comprehension of information, voluntariness and competence to consent. To make an informed decision about alternative medicines an individual would need to be fully informed about the risks, benefits, alternatives and consequences of such therapies. Physicians therefore have an ethical obligation to discuss alternative treatments with their patients in a nonjudgmental manner [60]. Physicians need to be honest about their level of understanding about the alternative treatments and the amount of scientific data that is available about the risks and benefits. Without data about the safety and efficacy of alternative treatments, patients will be unable to make informed decisions.

At present, the data concerning hibiscus and dandelion show that these alternative medications are safe and there are no adverse effects. The exception is hibiscus should be avoided during pregnancy and breastfeeding due to limited safety data. Hibiscus has shown reductions in fasting blood sugars and LDL cholesterol. Dandelion contributes to blood pressure management in its diuretic effect. Physicians have the responsibility to make patients aware of the data regarding these two alternative medicines. This is necessary to ensure informed consent. "The current status quo, which can be described as 'don't ask and don't tell' by physicians, must be abandoned" [61]. Alternative medicine is a reality and is not going away. Patients have a right to expect full disclosure of all possible treatment options from their physicians so they can make informed decisions about their health. The present lack of knowledge about clinical trials and the lack of scientific data and the lack of interest from physicians about alternative medicines can no longer serve as an excuse for physicians' failure to discuss them with their patients. To dismiss a patient's questions about alternative medicine because a physician believes it is "quackery," without any evidence to support the claim, is going to encourage patients to use these therapies without the knowledge of their physicians. This can lead to a breakdown of the basic trust that underlies the physician-patient relationship. Physicians have the responsibility to educate themselves about alternative therapies, helping patients seek similar reliable information about the safety and effectiveness of these treatments, and advocating for additional clinical trials of these therapies through the proper medical associations. Until there is a change in the mind-set of physicians about alternative medications and there is reliable adequate scientific data readily available about the safety efficiency, side-effects and possible interactions with prescribed medications, physicians will remain skeptical about these therapies and patients will be unable to have informed decision making about the use of alternative medicines.

The principle of beneficence in bioethics involves the obligation to prevent, remove, or minimize harm and risk and to promote and enhance the good of a person. Beneficence includes nonmaleficence, which prohibits the infliction of harm, injury, or death upon others. For a physician, beneficence entails the duty to act in the patient's best interest, which takes preference over any self-interest. If physicians allow patients or prescribe alternative medications without knowing their safety, effectiveness, or possibility of interaction with conventional medicine, they place their patient's live sin potential danger. Beneficence is a moral obligation not

only of individual physicians and health care systems in general, but it is a foundational value of any social union whatsoever. Without adequate reliable information on the interaction among conventional and alternative therapies, risks increase and benefits decrease. Unfortunately, the federal government is not even meeting its mandate with respect to information on conventional drug therapies. Beneficence thereby reinforces society's and physician's obligations to acquire sufficient reliable, verifiable information on alternative therapies and their interactions with one another and with conventional therapies.

To minimize potential risks to patients, physicians must become more knowledgeable of what alternative medicine therapies are available and inquire about use by their patients. Unless physicians are aware of the medications and therapies their patients are taking, they will be unable to give the guidance needed for appropriate patient decision-making. This is critical because some alternative medicine therapies have been shown to be harmful by making other, more serious, treatable conditions [62]. To maximize the benefits of alternative medicine, researchers must be given the adequate funds required to perform the high-quality, controlled clinical; trials for alternative medicine therapies in order to determine their risks and benefits. As with all medications, risks are inevitable. However, when these risks can be significantly reduced through scientific research, then there is an ethical responsibility to obtain such data. The current situation regarding alternative medicine in the United States does not prevent or remove harm nor promote the good of the person by minimizing the risks and maximizing the benefits incurred to patients. Instead, it exposes individuals to unnecessary risks that have the potential for injury, harm, and even death. Those responsible have not only failed the test of beneficence concerning alternative medicine, but also have the potential for failing the test of Nonmaleficence.

Finally, the principle of justice recognizes that all people should be treated fairly and be given what they are due. "Fairness suggests that patients have fair access to alternative medical therapies as well as conventional therapies that are known to be safe, effective and appropriate for these conditions. Nevertheless, because little clinical; research has evaluated alternative medicine, few data support claims for fair access to these therapies" [62]. Given the fact that some alternative therapies have been proven and will prove to be beneficial for patients, it is imperative that controlled clinical trials be initiated on them so that physicians are better able to evaluate their effects and integrate them into conventional medicine. Skeptics will claim that scientific testing is a waste of scarce research dollars and will only encourage the consumer public to invest funds in sources of false hope [62]. However, even though there is no official federal statistic reporting a single average per-person out-of-pocket cost specifically for alternative medicine in 2025, broad national benchmarks provide context on total and individual spending. Federal data from the National Center for Complementary and Integrative Health (NCCIH) estimates that Americans spend an overall total of $30.2 billion out-of-pocket annually on complementary and alternative medicine [63]. Appropriate scientific data would ensure a better use of consumer dollars because harmful and useless therapies would be identified and abandoned. Allowing American consumers to spend money on therapies that are possibly useless and even harmful, when their effectiveness and safety could be evaluated scientifically, is clearly an injustice.

Concerns about effectiveness, costs, and adverse effects of conventional medicine are driving consumers in the United States to seek alternative therapist prevent and manage their illnesses. Ethically, consumers have the right to use alternative medical therapies, but they also have the duty not to harm themselves. To ensure their safety, alternative medicine therapies must be evaluated in regard to safety, and efficacy. It is the role of the federal government to protect its citizens. If this is true, then the FDA has an ethical obligation to begin a coordinated effort to critically access alternative medicine therapies like hibiscus and dandelion, in order top protect the common good. Without a critical, high quality scientific assessment of these therapies, we risk developing a health care system that costs more, is less safe, and fails to address the management of chronic disease in a publicly responsible manner [64]. This directly violates the ethical principles of autonomy, beneficence, nonmaleficence and justice.

Recommendations

Current evidence suggests that Hibiscus sabdariffa and Taraxacum officinale may provide beneficial complementary effects in the management of hypertension and type 2 diabetes when used alongside evidence based medical treatment. However, Hibiscus sabdariffa and Taraxacum officinale should not replace conventional therapies, particularly for patients with moderate to severe disease or those at high risk for cardiovascular and metabolic complications. It is important for healthcare providers to routinely ask patients about their use of herbal medicines as well as dietary supplements during clinical examinations. The provider and patient having open communication can help identify potential herb drug interactions, improve the usage of medication, and allow clinicians to develop culturally sensitive treatment plans that respect patients traditional health practices while maintaining patient safety.

Patients should be aware and have an understanding of the idea that natural herbs do not always mean safe. Hibiscus may potentiate the effects of antihypertensive medications and interact with medications such as hydrochlorothiazide and simvastatin, while dandelion may increase the risk of hypoglycemia when combined with insulin or other glucose lowering therapies. Individuals should consult their healthcare provider before initiating herbal therapies, especially if they are taking prescription medications, are pregnant, or have chronic medical conditions.

In a public health perspective, expanding education on complementary and alternative medicine within medical and pharmacy curriculum would improve healthcare providers ability to counsel patients on the safe integration of herbal therapies into

chronic disease management. Lastly, future initiatives should focus on reducing health disparities by incorporating evidence based complementary medicine into culturally competent healthcare programs serving African and Hispanic communities. When supported by scientific evidence and appropriate clinical supervision, herbal medicines such as hibiscus and dandelion have the potential to enhance patient engagement, improve accessibility to care, and complement existing strategies for managing hypertension and T2DM.

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