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REVIEW ARTICLE

The accessibility and usage patterns of herbal drug information among non-health professionals in Nigeria: A narrative review

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Abstract

Herbal medicine plays a pivotal role in Nigeria's health-care system, particularly among non-health professionals, with many individuals relying on traditional remedies for self-medication and disease management. The review aims to identify sources of information on herbal drugs, types of herbal medications commonly used, reasons for their usage, and associated risks. A comprehensive literature search was conducted using electronic databases, including PubMed, Google Scholar, and local Nigerian journals, complemented by gray literature from government health websites and reports. Key terms such as "herbal medicine," "Nigeria," "non-health professionals," and "information accessibility" were employed to identify relevant studies and reports published between 2000 and 2023. The selected materials were analyzed to extract themes surrounding the knowledge and practices of non-health professionals regarding herbal medicine. Findings reveal that non-health professionals primarily rely on traditional healers, family members, and media sources for information. However, these sources often lack scientific evidence, resulting in potential misinformation. Commonly used herbal remedies include moringa, neem, and various local plants, often endorsed for their perceived efficacy and affordability compared to conventional drugs. Despite the cultural acceptance of herbal medicines, significant safety concerns arise from inadequate regulation, potential toxicity, and adverse drug interactions when used concurrently with pharmaceuticals. This review highlights the need for improved regulation, credible information dissemination, and public education regarding herbal medicines to enhance safe practices. Recommendations include collaborating with health authorities to promote awareness and integrating traditional healers into formal health-care systems. By shedding light on the current state of herbal drug information accessibility and usage, this study underscores the importance of addressing gaps in knowledge to safeguard public health in Nigeria.

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1. Introduction

Herbal medicine has been an essential component of traditional health care in Nigeria, with many individuals relying on plant-based remedies for various ailments.[1] Despite the growing accessibility of modern health-care services, herbal drugs remain a significant part of the health-care landscape, particularly among non-health professionals. This continued use of herbal medicine is often driven by affordability, cultural beliefs, accessibility, and the perception that herbal remedies are safer or more natural than conventional pharmaceuticals.[2] Furthermore, in the absence of sufficient health-care infrastructure, especially in rural areas, many Nigerians turn to herbal remedies for self-medication, disease prevention, and long-term management of chronic conditions.[3]

Nigeria has over 500 ethnic groups, each with unique traditions of healing that involve the use of local plants, animal products, and minerals for medicinal purposes.[4] For many Nigerians, particularly those in rural communities, herbal medicine remains the first choice for managing common ailments such as malaria, coughs, fevers, and even chronic diseases such as hypertension and diabetes.[3]

While herbal drugs are widely used, the sources of information about these remedies and their patterns of usage among non-health professionals are not always well-documented or scientifically supported. Much of the knowledge about herbal medicines is passed down through generations in a largely informal, oral tradition.[4] In recent years, however, the rise of digital platforms such as social media and online health blogs has made herbal drug information more accessible, although this information can sometimes be unregulated or unreliable.[5] The National Center for Complementary and Integrative Health is a United States governmental agency that provides information on herbal products, dietary supplements, and complementary health approaches. In addition, PubMed is a database of scientific articles, including research on herbal medicines, where studies on the efficacy and safety of various herbs can be found.[6] The Herbal Medicine Comprehensive database offers detailed monographs on hundreds of herbal products and supplements, including effectiveness, interactions, and potential safety concerns. The American Herbalists Guild provides resources for herbal practitioners and those interested in herbal medicine, including articles, webinars, and a directory of clinical herbalists. Furthermore, Dr. Duke's Phytochemical and Ethnobotanical Databases under the United States Department of Agriculture Data for Agricultural Plants enable comprehensive searches of plants, chemicals, bioactivities, and ethnobotany using scientific or common names.[7]

In regions where there is a high burden of diseases, whether communicable (malaria and tuberculosis) or non-communicable (diabetes and hypertension), access to modern health-care facilities and medications may be limited. Herbal medicine often provides an accessible alternative, as many communities may have traditional knowledge of local plants and their medicinal uses.[8] Some herbal treatments are believed to have preventive properties, which can be appealing in areas with high disease rates. Individuals may use herbal remedies to strengthen their immune systems or manage symptoms of chronic diseases, thereby attempting to reduce their risk of both communicable and non-communicable diseases.[9]

Non-health professionals – individuals who have not received formal training in medicine – are a significant demographic of herbal drug users in Nigeria. They typically obtain their knowledge of herbal remedies from various informal sources, including traditional healers, family members, local markets, and increasingly, the Internet.[10] However, the lack of formal education in pharmacology, toxicology, and health sciences may contribute to improper usage, including incorrect dosages and unsafe combinations of herbal drugs with conventional medicines.[8] Furthermore, while herbal medicines are often believed to be "natural" and therefore safer, concerns about the safety, efficacy, and quality control of these products persist. A significant number of herbal medicines in Nigeria are produced without standardized guidelines or regulation, raising questions about their safety and potential for adverse effects.[11,12]

Given that many people are now using herbal medicine, safety issues are also becoming a significant concern. Certain herbal medicines have been implicated in several critical adverse events relating to cardio-, neuro-, and nephrotoxicities as well as cancers.[13,14] Toxicity due to herbal medicines may occur, and the severity may vary depending on the herb or herbal material, preparation, and user, ranging from minor to severe, and sometimes fatal. Adulterations and concomitant use of herbal medicines with conventional medicines constitute another area of attention; thus, there is a need for strict regulation, enlightenment, and control.[15]

This narrative review was constructed through a comprehensive literature search using electronic databases, including PubMed, Google Scholar, and local Nigerian journals, complemented by gray literature sourced from government health websites and reports published within 2018 – 2023 to ensure the relevance and currency of information.[16] Sources from different geographic regions and ethnic groups, particularly within Nigeria, were included to capture a comprehensive view of herbal practices. Research focusing on various aspects such as cultural beliefs, preparation methods, regulatory frameworks, and health implications of herbal medicine was incorporated to provide a well-rounded analysis.[16]

This narrative review aims to explore the accessibility of herbal drug information and examine the patterns of herbal drug use among non-health professionals in Nigeria. Understanding these factors is crucial for addressing the potential risks associated with unregulated use and for fostering informed decision-making among herbal drug users.

1.1. Rationale for the study

Focusing on non-health professionals in the study of herbal drug usage in Nigeria is significant for several key reasons, particularly the widespread practice of self-medication, the growing popularity of herbal drugs, and the central role of traditional knowledge in shaping health practices. Understanding these factors is crucial for addressing potential risks and improving the safety and efficacy of herbal medicine use in Nigeria.

1.2. Research objectives

The primary objective of this study is to explore the accessibility of herbal drug information and the usage patterns among non-health professionals in Nigeria. Specifically, the study aims to:

(i) Identify and categorize the sources and types of information available to non-health professionals regarding herbal medicines
(ii) Analyze the sociocultural factors influencing how different ethnic groups utilize herbal remedies
(iii) Assess the implications of herbal medicine practices on public health strategies and policies.

1.3. Research questions

The following research questions were constructed to guide the study:

(i) What are the common sources and types of information regarding herbal drugs in Nigeria that are accessible to non-health professionals?
(ii) What are the herbal drug usage patterns among non-health professionals across different ethnic groups in Nigeria?
(iii) What factors influence the choice and application of herbal remedies among non-health professionals?
(iv) How do cultural beliefs and practices shape the understanding and use of herbal medicine within various ethnic groups?
(v) What implications do these practices have for public health and policy in Nigeria?

1.4. Significance of the study

The findings of this research are expected to provide valuable insights into the roles that herbal medicine plays in the lives of non-health professionals in Nigeria. Understanding the dynamics of plant usage can aid public health practitioners, policymakers, and researchers in formulating appropriate strategies that encompass both herbal and conventional medicine. In addition, this research may serve as a foundation for further studies aimed at documenting and preserving traditional knowledge systems, enhancing the status of herbal medicine as a legitimate form of health care, and promoting cultural understanding amid globalization.

1.4.1. Widespread self-medication practices in Nigeria

One of Nigeria's most notable health behavior trends, especially among non-health professionals, is the widespread practice of self-medication. According to various studies, a large proportion of the Nigerian population resorts to self-medication when dealing with health issues, often due to limited access to formal health-care services, high treatment costs, or long waiting times at health-care facilities.[18] For many individuals, especially in rural areas where access to health care is minimal, herbal remedies provide a practical and affordable alternative.

Non-health professionals, who lack formal medical training, often rely on their personal experiences, cultural beliefs, or community knowledge when selecting and using herbal medicines. This can lead to inappropriate self-diagnosis, incorrect dosage, or the misuse of remedies that may interact negatively with other treatments. In addition, the lack of professional oversight in the administration of herbal medicine can result in adverse health outcomes. Understanding how and why self-medication is so prevalent, and how non-health professionals obtain their information, is crucial for identifying potential risks and formulating interventions to promote safer practices.[19]

1.4.2. Growing popularity of herbal drugs

Herbal medicines have become increasingly popular in Nigeria, with many individuals turning to plant-based remedies for their perceived health benefits. This popularity is primarily driven by factors such as the perceived "natural"

properties of herbal remedies, their accessibility, and affordability. As the cost of conventional pharmaceuticals rises and access to formal health-care remains limited, particularly in rural communities, herbal drugs present an attractive alternative.[20] This trend is reflected in the growing number of herbal products available in markets, both local and urban, as well as the increasing use of herbal medicine for managing common ailments such as malaria, respiratory infections, and digestive disorders.[21]

Non-health professionals, who may have limited knowledge of the potential side effects or interactions of herbal drugs, often rely on informal channels such as family members, friends, or local herbalists to guide their decisions. While many herbal remedies have proven therapeutic benefits, their unregulated use without proper guidance can pose risks, such as the ingestion of toxic plants, contamination with harmful substances, or improper dosage.[17] Given that herbal medicine is widely used across Nigeria, especially by non-health professionals, it is essential to focus on this group to understand their motivations, behaviors, and the sources of information they rely on to develop effective education and regulation strategies.[21]

1.4.3. Role of traditional knowledge

In Nigeria, traditional knowledge of herbal medicines is a valuable resource passed down through generations. Indigenous healers, herbalists, and community elders play a vital role in preserving and disseminating this knowledge. Many non-health professionals rely heavily on this traditional knowledge, either from elders in their families or local herbalists who have gained informal expertise through experience. This knowledge base is crucial for understanding how herbal remedies are selected and used, as well as the cultural significance attached to them.[22]

However, while traditional knowledge offers invaluable insights, it is often unverified by scientific research. As a result, herbal medicine usage among non-health professionals can sometimes be based on anecdotal evidence, which may not always be reliable or safe. Furthermore, with the increasing influence of social media and digital platforms, disseminating unverified or misleading information about herbal remedies has become more common.[23] It is more important to study how non-health professionals acquire herbal drug information and how traditional knowledge is integrated into their health-care decision-making.[24]

This study aims to bridge the gap between traditional knowledge and modern scientific understanding by focusing on non-health professionals. Exploring how traditional knowledge guides herbal drug use can provide valuable insights into how Nigerian communities perceive, value, and utilize herbal remedies. It also allows for a better understanding of the need for education, regulation, and standardized practices in using herbal medicines, ensuring that the benefits of traditional knowledge are maximized while minimizing potential risks.[25]

1.4.4. Need for education and regulation

While herbal medicine plays a critical role in the health-care system, especially in underserved regions, there is a significant need for formal education and regulation. Non-health professionals, despite their frequent use of herbal remedies, often lack formal education on the proper use, potential side effects, and safe practices surrounding these substances. They may be unaware of the risks of incorrect dosage, herbal-drug interactions, or potential contamination.[11] By focusing on this demographic, the study can inform policymakers, health-care professionals, and regulatory bodies about the areas where education and regulation are most needed.

As herbal medicine becomes more widely used, there is an urgent need for government and regulatory bodies to implement stronger oversight mechanisms, such as ensuring the safety, efficacy, and quality of herbal products on the market. Understanding the information-seeking behavior of non-health professionals and their usage patterns will help identify gaps in knowledge and how information about herbal medicine can be better disseminated to the public.[26]

2. Historical, cultural, and social relevance of herbal drugs

The use of herbal medicine in Nigeria dates back thousands of years, with indigenous knowledge passed down through generations. Each ethnic group in Nigeria has its own set of medicinal plants and traditional healing practices.[13] For instance, the Yoruba, Igbo, and Hausa people have rich traditions of herbal therapy, often documented in oral histories, folklore, and ritual practices.[14] Early Nigerian herbalists, known as babalawos (Yoruba) or dibias (Igbo), were revered as experts in the use of plant-based medicine, and many of their practices have survived into the modern era, albeit with evolving methods.[13] Babalawos and dibias are custodians of extensive traditional knowledge of herbal remedies, rituals, and spiritual healing practices. They are pivotal in preserving indigenous medical knowledge, often passed down through generations. In contemporary settings, they may engage in educational efforts to train younger generations about medicinal plants and traditional healing methods.[14] Both roles are essential for maintaining

cultural identity and spirituality. They continue to perform rituals and practices that reinforce community bonds, which are especially important in globalization and the encroachment of Western medical paradigms. Some babalawos and dibias adapt to changes by incorporating modern health practices into their traditional methods. They may work alongside physicians or incorporate conventional health knowledge into their consultations, offering a hybrid form of care that draws on traditional and modern medicine.[15]

Before the colonial period, African societies had developed extensive knowledge of their local flora and fauna, using these resources for medicinal, dietary, and ritual purposes. As Western medicine and colonial influence took hold in Nigeria, herbal medicine continued to coexist with these new systems, often providing an affordable and culturally familiar alternative to pharmaceutical drugs.[17] Colonization resulted in the exchange of botanical knowledge between cultures. European colonizers often documented and adapted traditional remedies encountered in colonized regions, leading to the development of hybrid medicinal systems. For example, many African herbal practices have influenced herbal medicine in the Americas through the transatlantic slave trade, integrating various therapeutic approaches and plants that persist in contemporary use.[18]

In Nigerian society, the practice of herbal medicine is not only a health care option but a deep-rooted cultural practice. It is often tied to family and community life, with remedies being shared among relatives, neighbors, and local healers.[16] In rural areas, where access to formal health care may be limited or prohibitively expensive, herbal medicines remain the first line of defense against illness. In these communities, knowledge of herbal drugs is passed from one generation to the next, typically through oral communication, storytelling, and hands-on mentorship.[20]

Herbal medicines are used to treat many ailments, from common illnesses, such as colds and fevers, to more serious conditions such as malaria, high blood pressure, and diabetes.[18] Plants such as moringa, bitter leaf, and neem have also gained popularity for their purported health benefits, including detoxifying the body, boosting the immune system, and managing chronic diseases.[21] The widespread cultural acceptance of herbal remedies often stems from their integration into religious practices, with many plants having symbolic significance or being associated with spiritual healing.[22] For example, in Hinduism, tulsi (*Ocimum sanctum*) is regarded as a sacred plant, representing purity and divinity. It is often grown near homes and temples. Tulsi is used in meditation and worship practices for its calming effects and is believed to purify the mind and enhance spiritual awareness.[23] *Aloe vera* is regarded as a symbol of health and healing across many cultures. It is commonly called the "plant of immortality" in ancient Egyptian culture.

Socially, herbal medicine is an economic asset in Nigeria, providing livelihoods for many people, including herbalists, farmers, traders, and researchers. The growing market for herbal products has led to the establishment of small-scale businesses, with herbal medicine manufacturers and marketers catering to both local and international consumers. Furthermore, herbal products are often sold in local markets, where they are marketed alongside conventional medications, contributing to a flourishing informal economy.[24]

3. Common types of herbal medicines used in Nigeria

Herbal medicines in Nigeria encompass various plant species, each used for specific therapeutic purposes. Some of the most commonly used herbal remedies are summarized in Table 1.

3.1. Bitter leaf (*Vernonia amygdalina*)

3.2. Moringa (*Moringa oleifera*)

Moringa is often referred to as the "miracle tree" due to its numerous health benefits. The leaves, seeds, and pods of moringa are consumed for their high nutritional value and medicinal properties. It is believed to help improve immune function, lower blood sugar levels, reduce inflammation, and combat malnutrition.[30] Moringa is also used to treat conditions such as high blood pressure, asthma, and digestive issues. However, high doses of moringa leaf powder may cause stomach upset and diarrhea. In addition, the roots of the moringa tree contain compounds that can be toxic if consumed in large amounts. Pregnant women, in particular, should avoid moringa roots as they may cause abortion.[31]

3.3. Neem (*Azadirachta indica*)

Neem, also known as "Indian Lilac," is another widely used plant in Nigeria. It is revered for its anti-bacterial, anti-viral, and anti-fungal properties. The leaves and bark of the neem tree are used to treat a range of conditions, including skin infections, malaria, and as a detoxifying agent.[32] Neem is also used as a natural pesticide, demonstrating its multifaceted uses in Nigerian communities. High doses of Neem leaf extracts have been associated with renal toxicity in experimental settings.[33]

Table 1. Summary of key herbal medicines, their uses, and potential risks

Herbal medicine	Traditional uses	Potential risks
Moringa (*Moringa oleifera*)	Used for treating high blood pressure, diabetes, malnutrition, and inflammation	High doses may lead to digestive issues, electrolyte imbalances, or liver toxicity
Ginger (*Zingiber officinale*)	Commonly used for nausea, digestion issues, and inflammation	It can cause heartburn, gastrointestinal irritation, or interaction with blood thinners
Garlic (*Azadirachta indica*)	Used for treating malaria, skin infections, and as a detoxifier	Excessive use may cause kidney damage, diarrhea, or low blood pressure.
Soursop (*Graviola*)	Believed to treat cancer, inflammation, and digestive problems	Long-term use can cause nerve toxicity and may interact with chemotherapy drugs
Hibiscus (*Hibiscus sabdariffa*)	Used to lower blood pressure, treat fever, and improve digestion	May lower blood pressure, too much can cause dizziness or fainting in some individuals
Bitter leaf (*Veronia amygdalina*)	Commonly used for treating diabetes, malaria, and digestive issues	Excessive consumption may lead to liver toxicity or digestive upset
Turmeric (*Curcuma longa*)	Used as an anti-inflammatory agent for joint pain and digestive issues	It may cause gastrointestinal issues or interact with blood-thinning medications
Peppermint (*Mentha piperita*)	Used to relieve indigestion, headaches, and muscle pain	It can cause heartburn or allergic reactions, especially in people with sensitive skin
Lemon grass (*Cymbopogon citratus*)	Used to treat fever, high blood pressure, and as a calming agent	Overuse may lead to digestive issues or allergic reactions

3.4. Ginger (*Zingiber officinale*)

Ginger is a commonly used herb in Nigerian households, both as a spice in cooking and as a medicinal remedy. It is known for its anti-inflammatory, antioxidant, and anti-nausea properties. Nigerians use ginger to treat digestive issues, alleviate nausea, reduce joint pain, and improve circulation.[34] High doses of ginger can lead to heartburn, diarrhea, and stomach upset. Furthermore, ginger possesses blood-thinning properties and may increase bleeding risk when consumed with anticoagulant medications.[35]

3.5. Garlic (*Allium sativum*)

Garlic is widely used for its anti-microbial and cardiovascular benefits. It is commonly employed in treating colds, flu, and respiratory problems, as well as for managing hypertension and cholesterol.[36] The active compounds in garlic, such as allicin, are believed to have significant health benefits. Garlic has anti-platelet properties, which can increase the risk of bleeding, particularly if taken with anticoagulant medications. High doses of garlic can lead to gastrointestinal distress, including heartburn, gas, and diarrhea. Some individuals may experience allergic reactions to garlic, including skin rashes and respiratory issues.[37]

3.6. African mango (*Irvingia gabonensis*)

African mango, or bush mango, is used primarily for weight management and improving metabolic health. The seeds are believed to help control cholesterol, reduce blood sugar levels, and assist in weight loss. This herb has gained attention in both local and international markets due to its potential anti-obesity properties. High doses of African mango may cause stomach upset and diarrhea.[38]

3.7. Soursop (*Annona muricata*)

Soursop is a tropical fruit tree known for its sweet, tangy flavor and medicinal benefits. Traditionally, the leaves and fruit are used to treat infections, fever, and digestive problems. Soursop is also believed to have anti-cancer properties. It contains acetogenins, which have demonstrated cytotoxic effects against cancer cells.[39] Some studies suggest that soursop may have neurotoxic effects linked to the compounds present in the seeds, which can potentially contribute to neurological disorders, including Parkinson's disease.[40]

3.8. Holy basil (Tulsi) (*Ocimum sanctum*)

Known for its aromatic properties, the holy basil is revered in many cultures for its health benefits.

It is traditionally used for stress relief, respiratory issues, and immunity enhancement. It is often consumed as tea or in powder form. Holy basil contains important phytochemicals such as eugenol and rosmarinic acid, contributing to its adaptogenic and anti-inflammatory properties.[41] Holy basil may have blood-thinning properties, which can increase bleeding risk in individuals taking anticoagulant medications.[42]

3.9. Pawpaw (*Carica papaya*)

The pawpaw tree is indigenous to tropical America but is widely cultivated in Nigeria. Traditionally, pawpaw leaves

are used to treat malaria, whereas the fruit is eaten for its digestive benefits and nutritional value. Pawpaw is rich in enzymes such as papain, which aids digestion.[43] Some individuals may have allergies to pawpaw, leading to skin rashes and gastrointestinal disturbances.[44]

3.10. African bird pepper (*Capsicum frutescens*)

The African bird pepper is a hot pepper widely used in Nigerian cuisine and traditional medicine. It is traditionally used to stimulate appetite, alleviate pain, and treat respiratory ailments. Capsaicin, the active compound in peppers, is known for its analgesic and anti-inflammatory properties.[45] While African bird pepper may help stimulate appetite, excessive consumption may lead to irritation of the gastrointestinal tract, causing pain or discomfort.[45]

3.11. Black cumin (*Nigella sativa*)

Black cumin seeds have been used in traditional medicine for centuries. In Nigerian herbal practices, they are used for various ailments, including asthma, diabetes, and inflammation. Thymoquinone is a prominent bioactive compound in black cumin, known for its antioxidant, anti-inflammatory, and anti-cancer properties.[46] Although generally safe, black cumin may cause allergic reactions in some individuals, including rashes and respiratory issues.[47]

4. Sources of herbal drug information

4.1. Traditional healers and herbal practitioners

In Nigeria, local herbalists and traditional healers often serve as the primary source of herbal drug information for many people. Traditional healers play a central role in disseminating herbal medicine information within communities.[48] They often pass down knowledge through generations and are trusted by many individuals in Nigeria for health advice. However, the challenge is ensuring that the knowledge shared is based on safe practices and accurate information.[49]

4.2. Family and peer networks

Many individuals receive information about herbal remedies from family members or friends, particularly in rural areas where formal health care may be less accessible. This knowledge is typically passed down through cultural and familial practices.[50]

4.3. Media (Radio, television, and newspapers)

Media outlets, including radio, television programs, and newspapers, serve as essential sources of information about herbal drugs. These platforms may present both traditional and scientific perspectives on the benefits and risks of herbal treatments.[50]

4.4. Internet and online platforms

With the rise of digital technology, the Internet has become a major source of information on herbal drugs, especially among younger populations. Social media platforms, websites, and online health forums are popular platforms for learning about herbal remedies, though the reliability of the information varies.[51] Many herbal practitioners and researchers have blogs or social media pages where they share insights and recent developments in herbal medicine. Examples include health-focused platforms on Instagram, Twitter, or YouTube. There are several online platforms that provide access to herbal drug information, including articles, research papers, and encyclopedias.[52] The National Center for Complementary and Integrative Health offers resources related to herbal medicines and dietary supplements, including efficacy and safety information. HerbMed is an interactive database of scientific information on herbal medicine, covering various herbs, their effects, and traditional uses. Duke's Phytochemical and Ethnobotanical Database provides detailed information on the phytochemistry and ethnobotany of plants, including their traditional uses. Reputable organizations and governmental agencies often provide guidelines and research on herbal medicines. In addition, the World Health Organization offers reports and guidelines on herbal medicine worldwide.[53]

However, misinformation about herbal medicine persists. This misinformation includes exaggerated claims of efficacy, which involve overstating the benefits of herbal medicines, suggesting they are cures for serious diseases or conditions without scientific backing. Examples include claims that an herb can cure cancer or reverse diabetes. Misinformation can also arise from claims regarding the sourcing and quality of herbal products. For example, some products may be marketed as "100% pure" or "wildcrafted" when they are not. Consumers may inadvertently purchase poor-quality or contaminated products, which can pose health risks. Misinformation about sourcing can undermine trust in herbal practices and lead to skepticism among consumers. Unregulated products are often marketed with little oversight regarding their safety and efficacy. Moreover, consumers might encounter herbal supplements with vague labels and unverified claims. The use of unregulated supplements can lead to health risks due to contamination, incorrect dosing, and inadequate labeling, potentially harming users and eroding trust in herbal medicine.[54]

4.5. Health-care providers (Doctors, pharmacists, and nurses)

Although non-health professionals may not often rely on health-care providers for information about herbal

drugs, some individuals may seek advice from medical professionals, particularly when combining herbal medicines with conventional treatments.[55]

4.6. Books and academic journals

Some individuals, particularly those with higher education or an interest in herbal medicine, may turn to academic publications, textbooks, and other scholarly sources to learn about the use of herbal drugs. However, the accessibility of such resources can be limited in rural areas.[56]

4.7. Government and health agency publications

Government and health agencies are crucial in regulating herbal medicines to ensure safety, efficacy, and proper labeling. Public health agencies, such as the Nigerian Ministry of Health or the World Health Organization, occasionally provide guidelines and reports on herbal medicines. These documents might include safety recommendations and regulatory information, although access to such publications can be limited in some regions.[57] Other key regulatory agencies include Nigeria's National Agency for Food and Drug Administration and Control (NAFDAC), which is responsible for regulating and controlling food, drugs, and herbal products in Nigeria. Its mandate includes ensuring that herbal medicines meet safety and quality standards before they enter the market. Herbal products must be registered with NAFDAC, which involves submitting documentation that demonstrates the product's safety, efficacy, and quality. This includes evidence, trial, or traditional use documentation. NAFDAC enforces good manufacturing practice (GMP) standards for manufacturers of herbal medicines. This ensures that products are consistently produced and controlled according to quality standards. Herbal products must have accurate labeling that includes information on ingredients, recommended dosages, usage instructions, and potential side effects. Claims on the label must be substantiated. In addition, NAFDAC conducts post-market surveillance to monitor the safety and efficacy of herbal products that are already on the market. This includes tracking adverse reactions and ensuring compliance with regulatory standards.[58]

4.8. Workshops and community health outreach programs

Non-professional individuals may also gain herbal drug information through community workshops or health outreach programs conducted by non-governmental agencies, community health workers, or local governments. These initiatives often aim to educate the public on both the benefits and risks of herbal medicine.[59]

4.9. Health fairs and herbal medicine conferences

Health fairs and conferences often feature sessions on the use of herbal drugs, where individuals can learn from experts, including researchers, traditional healers, and product manufacturers.[60]

5. Perceived benefits of herbal medicine

The perceived benefits of herbal medicines in Nigeria are shaped by both traditional beliefs and practical experiences. Many Nigerians view herbal medicine as a safer, more natural alternative to conventional pharmaceutical drugs. There is a widespread belief that herbal remedies are less likely to cause side effects, particularly when compared to synthetic medications, which may be seen as harsh or artificial. For example, plants such as bitter leaf are considered to have purifying and detoxifying properties, making them popular choices for managing chronic illnesses like diabetes and hypertension.[61]

Herbal medicines are also perceived to have cultural and spiritual significance, often used for physical healing and emotional and spiritual well-being. Many herbal remedies are associated with rituals, prayers, and spiritual practices, further strengthening their place in Nigerian society. For instance, herbalists may offer prayers while preparing or administering certain remedies, reinforcing the belief that healing is a holistic process that involves both physical and spiritual elements.[62]

In addition, herbal medicines are often viewed as affordable, with many remedies being freely available in local markets or from family members and community healers. This affordability and accessibility make herbal drugs particularly attractive in low-income and rural communities where people may face financial constraints or lack access to formal health-care services.[63]

6. Comparison of Internet sources to traditional sources in herbal medicine information

The rise of the Internet as a primary source of information has transformed how individuals access knowledge about herbal medicines. While the Internet offers convenience and a wealth of resources, there are notable differences in reliability when compared to traditional sources such as academic journals, books, and professional medical advice.[64]

6.1. Accessibility and availability

The Internet provides immediate access to an extensive range of information on herbal medicines, including articles, blogs, forums, and research papers. This

accessibility allows users to gather information quickly from multiple perspectives without physical access to libraries and databases.[65] On the other hand, traditional sources such as academic journals and books may require specific access (e.g., subscriptions or physical libraries), as they are curated and peer-reviewed, often providing more authoritative content. This can limit immediate availability but ensures a higher information standard.[66]

6.2. Quality of information

The quality of information on the Internet can vary significantly. Many websites may offer anecdotal experiences or personal opinions rather than scientifically validated information. Factors such as author credentials, publication reviews, and bias must be critically evaluated.[67] Regarding traditional sources, academic journals and books generally undergo rigorous peer review and editorial processes. This enhances the reliability of the information being presented. Traditional sources often include references to empirical research and clinical studies, providing a solid foundation for claims made about herbal medicines.[68]

6.3. Credibility and trustworthiness

On the Internet, websites with information on herbal medicines may lack credentials, and consumers must be vigilant in determining the credibility of the source. Resources such as Wikipedia, personal blogs, or non-professional health websites may present misinformation or unverified claims, leading to potential health risks.[69] In contrast, traditional sources, such as published scientific research and medical literature from reputable institutions, uphold established standards of evidence-based medicine. These traditional sources typically come from professionals with expertise in the field, thereby increasing their trustworthiness.[70]

6.4. Evidence-based information

While some online platforms, such as databases (e.g., PubMed and National Center for Complementary and Integrative Health) and health organization websites (e.g., World Health Organization), provide evidence-based guidance, many internet resources emphasize anecdotal evidence and personal testimonials. This can lead to the promotion of unproven or ineffective herbal medicine.[71] Whereas traditional sources, such as academic publications, prioritize systematic reviews of literature, clinical trials, and empirical evidence. These sources are key to validating the efficacy and safety of herbal products, providing insights grounded in scientific research.[72]

6.5. Bias and commercial influence

Many Internet sources may contain bias – products may be marketed with inflated claims to increase sales. In addition, blogs and websites funded by herbal product companies may present information skewed to favor their product.[73] In contrast, peer-reviewed articles and publications affiliated with academic institutions are generally free from commercial influence. They focus on unbiased evidence to present a balanced view of the subject matter.[74]

6.6. User engagement and community feedback

Online platforms often encourage user interaction through comments and forums, allowing for shared experiences and recommendations. While this can provide valuable insights, it is essential to exercise caution, as personal stories may not reflect broader clinical outcomes.[75] On the other hand, traditional sources typically do not allow for community feedback; their information is presented as established knowledge. While this structure promotes reliability, it may lack the immediate engagement that users find beneficial online.[76,77]

7. Usage patterns of herbal drugs among non-health professionals

The patterns of herbal drug use in Nigeria vary across different demographic groups, but there are several common trends.

(i) Self-medication: A significant proportion of non-health professionals use herbal drugs for self-treatment, particularly for common ailments such as headaches, body pain, coughs, and gastrointestinal issues. This pattern is primarily due to the perceived safety, affordability, and availability of herbal remedies.[78]

(ii) Chronic disease management: Individuals suffering from chronic conditions such as diabetes, hypertension, and arthritis often use herbal remedies either as a primary treatment or as an adjunct to conventional medicine. However, the lack of standardized dosing and quality control in herbal products may lead to safety concerns.[79]

(iii) Preventive health: In some cases, herbal drugs are used for preventive purposes, such as boosting immunity or detoxifying the body. These uses are often based on cultural beliefs and are sometimes promoted by herbal practitioners.[80]

(iv) Cultural beliefs and trust: Traditional healing practices are often trusted more than modern medicine in certain communities. Many people prefer herbal medicine because they believe it is "natural," and therefore safer, or because it is part of their cultural heritage.[81]

8. Challenges in herbal drug information accessibility

Accessing reliable information on herbal drugs remains a significant challenge, especially in resource-limited settings. These challenges are caused by several factors, as discussed below.

(i) Misinformation and lack of regulation. One of the key challenges in Nigeria is the lack of regulation in the herbal drug sector. Many herbal products are marketed with exaggerated claims, and the absence of standardized guidelines means consumers may be exposed to unsafe or ineffective treatments.[82,83]

(ii) Quality control issues. Herbal products in Nigeria are often unregulated, resulting in issues with product quality, contamination, and adulteration. This makes it difficult for consumers to trust the information they receive regarding the safety and efficacy of herbal remedies.[84,85]

(iii) Illiteracy and language barriers. In rural areas, where the majority of herbal drug users reside, illiteracy rates are high. This limits the accessibility of written information, which may be available in formal languages such as English, but is not readily understandable to everyone. This gap exacerbates the reliance on word-of-mouth information, which may not always be accurate.[86]

(iv) Lack of scientific evidence. Many herbal medicine users in Nigeria do not have access to scientific studies or clinical trials that validate the effectiveness of their treatments. The absence of robust scientific evidence makes it harder for non-health professionals to distinguish between effective and ineffective remedies.[87] Research shows that most Nigerians rely on traditional medicine, including herbal remedies. A study by Albrecht and Smith[90] indicated that about 70% of respondents in their survey used herbal remedies regularly. However, they often lack sufficient knowledge about the active ingredients and their effects. This signals a gap in understanding the scientific basis of the herbal medicines they consume. In addition, a survey conducted by Anis and Nasir[91] explored the awareness of herbal medicine among rural and semi-urban populations in Nigeria and reported that many respondents had limited access to detailed information about these remedies. Specifically, they noted that more than 60% of participants relied heavily on traditional knowledge passed down through families rather than scientific studies or literature.

9. Potential solutions or mitigation strategies for herbal drug information accessibility challenges

Addressing the challenges associated with herbal drug information accessibility requires a multifaceted approach that involves various stakeholders, including governments, health-care professionals, traditional practitioners, and the community.[90] Below are potential solutions and mitigation strategies for enhancing access to reliable information about herbal medicines.

9.1. Strengthening regulatory frameworks

Implementing strong policy and regulatory frameworks that guide the production, distribution, and use of herbal medicines is essential.

(i) Establish comprehensive regulations. Governments should develop and enforce strict regulations to ensure the safety, quality, and efficacy of herbal medicines. This includes requiring registration of herbal products with health agencies, such as NAFDAC in Nigeria.

(ii) GMPs. Promoting adherence to GMP standards among herbal product manufacturers to ensure consistency and reliability in herbal medicines can increase consumer trust.[91]

9.2. Enhancing public education and awareness

Challenges associated with the accessibility of information on herbal medicines can also be mitigated through public education.

(i) Community education programs. Implementation of educational campaigns about the safe use of herbal medicines. These programs can involve workshops, seminars, and local health fairs to educate the community about the potential benefits and risks associated with herbal remedies.

(ii) Integration into formal education. Incorporating herbal medicine training into medical and health professional curricula can empower future health-care providers to understand and respect traditional practices. This could foster better communication with patients who use herbal remedies.[92]

9.3. Increasing access to research and reliable information

Regarding access to information about herbal remedies, strategies to increase this include:

(i) Digital literacy initiatives. Developing programs to improve digital literacy, particularly in low-income or rural communities, will help individuals access reliable online resources and scientific literature related to herbal medicine.

(ii) Online resource development. This can be achieved by creating centralized online platforms that provide vetted, evidence-based information about herbal medicines, detailing their uses, potential side effects, and scientific research. This could also include partnerships with universities, health organizations, and government agencies.[93]

9.4. Promoting collaboration between traditional and modern medicine

The collaboration between traditional and modern medicine can also facilitate increased access to information about herbal drugs.

(i) Integrating health-care models. Encourage collaboration between traditional healers and health-care providers. Creating integrative health-care models can enhance patient care by blending traditional knowledge with modern medical practices.
(ii) Interdisciplinary workshops. Organizing workshops and forums where traditional practitioners and health-care professionals are able to share knowledge and experiences can lead to mutual respect and understanding.[94]

10. Factors influencing usage patterns

Several factors influence the usage patterns of herbal medicine within the community. These include:

(i) Economic factors. Cost is a significant determinant of herbal drug use. Herbal drugs are often seen as more affordable than pharmaceutical drugs, especially in low-income communities.[95]
(ii) Perceived safety and efficacy. The widespread belief in the effectiveness of herbal medicine, especially in rural areas, plays a central role in its continued use. Many users report that herbal treatments are effective, though these claims are often based on personal experience rather than clinical evidence.[96]
(iii) Accessibility. Herbal drugs are often more accessible than conventional medicines, particularly in remote or rural areas where health-care facilities may be scarce.[97]
(iv) Cultural factors. In many Nigerian communities, herbal medicine is considered a culturally significant practice. This cultural attachment to traditional medicine influences its use and acceptance.[98]
(v) Trust in herbalists. Trust in local herbalists or traditional healers plays a significant role. People often seek advice from these practitioners based on their knowledge, reputation, and the experience of others in the community.[99]

11. Policy and regulatory framework

The Nigerian government has made notable strides in regulating herbal medicine, recognizing its significance in the country's health-care system and the need to ensure safety and efficacy. The recent policy developments and efforts by the Nigerian government, specifically through agencies such as the NAFDAC and other related entities, to regulate herbal medicine[100] are discussed below.

11.1. Regulatory framework enhancement

The enhancement of the regulatory framework is being achieved through two main approaches.

(i) Updated guidelines for herbal medicines. NAFDAC has been actively reviewing and updating its guidelines for registering and regulating herbal products. These guidelines emphasize the need for scientific evidence to support claims made by herbal products and require comprehensive documentation regarding quality control, safety, and efficacy.[101]
(ii) Traditional Medicine Policy. In 2020, NAFDAC and the Federal Ministry of Health unveiled the National Policy on Traditional Medicine. The policy aims to integrate traditional medicine practices, including herbal medicine, into the national health-care system, ensuring that they are recognized, regulated, and practiced safely.[102]

11.2. Collaborative effort with traditional healers

Regarding collaborative efforts, NAFDAC has initiated dialogs and training programs that engage traditional healers and herbal practitioners. These initiatives are designed to educate them on regulatory requirements, quality standards, and safe practices in herbal medicine. This collaboration seeks to enhance the credibility of traditional medicine while ensuring consumer safety.[103]

11.3. Promotion of research and development

In recent years, the Nigerian government has emphasized research into medicinal plants, collaborating with universities and research institutions. These efforts aim to validate the efficacy of traditional remedies and document indigenous knowledge. The government has called for more funding and support for studies focused on herbal medicine to promote evidence-based practices.[104]

11.4. Adverse event reporting and safety monitoring

Nigeria's NAFDAC has been developing systems to monitor the safety of herbal products. This includes making provisions for consumers and health-care providers to report adverse reactions associated with herbal medicines. The emphasis on monitoring aims to improve the safety profile of herbal products and enhance public trust.[105]

11.5. Consumer awareness campaign

To combat misinformation and educate the public about herbal medicine, NAFDAC has initiated campaigns to raise awareness of the importance of quality and safety in herbal products. These campaigns provide information about the proper use of herbal medicines, potential interactions with conventional drugs, and the importance of purchasing registered and verified products.[106]

11.6. Collaborations with international organizations

The Nigerian government has sought collaboration with the World Health Organization to align its regulations and practices with international standards. This partnership aims to enhance the credibility of Nigerian herbal medicines globally and improve the quality and safety of herbal treatments.[107]

11.7. Comparison of Nigeria's regulatory framework with international guidelines

Nigeria's regulatory framework for herbal medicine in comparison with international guidelines (notably those from the World Health Organization) and regulatory frameworks in other African countries reveals similarities and differences.[108] NAFDAC regulates herbal medicines in Nigeria by creating guidelines that require herbal products to be registered, manufactured following GMP, and labeled accurately.[109]

The World Health Organization has established the *Traditional Medicine Strategy 2014 – 2023* to promote the safe and effective use of traditional medicine globally. Key components of these guidelines include:

(i) Integration. Encouraging the integration of traditional medicine into national health systems
(ii) Safety and quality. Emphasizing the need for safety, efficacy, and quality through regulation and standards
(iii) Research promotion. Supporting research and development to validate traditional practices and promote evidence-based approaches
(iv) Global standards. The World Health Organization provides guidelines for regulating herbal medicines, advocating for harmonization to facilitate trade and consumer safety.[109]

Regulatory frameworks in other African countries include the South African Health Products Regulatory Authority, which oversees the regulation of medicines, including herbal products.[110] The Medicines and Related Substances Act governs the registration and authorization of herbal medicine. The Kenya Pharmacy and Poisons Board regulates herbal medicines under the Medicines Act.[111] Specific provisions for herbal products require registration and compliance with safety standards. Kenya has developed a National Policy on Traditional Medicine, emphasizing the need for evidence-based development and integration of traditional medicine into health-care services. The Food and Drugs Authority in Ghana regulates herbal medicine by requiring registration and stringent quality control measures.[112-114]

12. Conclusion

This review examines the complexities of herbal medicine within the context of Nigeria, highlighting the regulatory frameworks, cultural significance, and challenges faced in ensuring safe and effective use. By synthesizing current knowledge and identifying gaps in accessibility, regulation, and public understanding, this review contributes to the existing literature in several significant ways.

First, it underscores the critical need for a well-defined regulatory framework for herbal medicines in Nigeria, aligning with international guidelines while considering local cultural contexts. By analyzing Nigeria's regulatory efforts in comparison to successful frameworks established in other African countries, this review provides a roadmap for strengthening existing policies. Consequently, it advocates for implementing practices that can improve safety and consumer trust in herbal products.

Second, this review recognizes the implications of misinformation and the underutilization of traditional knowledge among health-care providers and consumers. It identifies a growing need for educational initiatives to increase awareness and understanding of herbal medicines, ensuring that individuals can access accurate, evidence-based information. This focus on education enhances the discourse surrounding herbal medicine and encourages a more informed public.

Third, this review contributes to ongoing discussions about integrative health approaches by highlighting the vital interplay between traditional practices and modern health care. It advocates for collaborations between traditional healers and health-care professionals, promoting a more comprehensive health-care model that respects cultural heritage while ensuring patient safety.

Finally, the review points toward future research directions, emphasizing the need for empirical studies that evaluate the efficacy and safety of popular herbal medicines. Such research is crucial for validating traditional practices and informing policy decisions.

13. Recommendations

13.1. Clinical efficacy studies

Conducting randomized controlled trials can scientifically validate the efficacy of widely used herbal

remedies for common ailments, such as malaria, diabetes, and hypertension. Research should focus on popular herbs such as *V. amygdalina* (bitter leaf) and *M. oleifera t*o establish evidence-based guidelines for their use. In addition, comparative effectiveness studies can compare the effectiveness of herbal treatments against conventional medical treatments. This research could help determine the best integrative approaches for specific health conditions.

13.2. Safety assessments and toxicology

Monitor the adverse effects by investigating the potential herb-drug interactions of common herbal medicines using pharmacovigilance methods. This is especially important for herbs frequently consumed by patients alongside conventional medications. Moreover, research on the toxicity levels of less-studied herbs and their long-term effects on health, especially those used in high doses or with limited scientific backing, can be conducted to assess the safety of herbal medicine.

13.3. Phytochemical analysis

Identifying and characterizing the active phytochemicals in popular herbal remedies can increase the understanding of the compounds and their mechanisms of action, enhancing the application of these herbs in treatment protocols. In addition, developing methods for standardizing herbal extracts ensures consistency in potency and safety.

13.4. Cultural practices and perceptions

Comprehensive ethnobotanical surveys can be conducted to document the traditional uses of herbal medicines across different ethnic groups in Nigeria. These surveys should focus on understanding how cultural beliefs shape the selection and application of herbal remedies. Moreover, studying public perceptions of herbal medicine, including trust levels, knowledge gaps, and barriers to using herbal remedies, can increase the understanding of these attitudes. This understanding can inform educational campaigns and health interventions.

13.5. Integration with modern health care

Research into effective models for integrating herbal medicine with conventional health-care systems can be performed. Case studies of successful integration in Nigeria and abroad offer insights into how such integration can enhance health practices. In addition, examining the efficacy of training programs that educate health-care providers about herbal medicine is essential, particularly those focusing on the benefits of collaboration with traditional practitioners.

13.6. Community engagement and education

The effectiveness of community health education interventions that promote the understanding of herbal medicine's benefits and risks should be assessed to evaluate how such interventions affect consumer behavior regarding herbal products. Furthermore, there must be an engagement in research methodologies that involve the community in the design and implementation of studies on herbal medicine, ensuring that local knowledge and practices are respected and integrated.

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