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# **Introductory Chapter: Introduction to Herbal Medicine**

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## **1. Herbal medicine**

Herbal medicine (HM) is the fulcrum of complementary and alternative medicine, which in recent times is increasingly gaining widespread popularity all over the world and gradually streaming toward integration into the mainstream healthcare systems [1]. The use of HM cuts across gender, social and racial classes in both developing and developed countries of the world [2–7]. Due to the increasing popularity of HM, stakes in the world markets (local and international) are also rapidly increasing and the annual sale is rapidly approaching US \$62 billion [8]. An important driver in this upsurge in patronage and use includes low cost, the wide acceptance due to its status of being a natural product with the acclaim of low toxicity, efficacy in certain challenging diseases, flexibility in its accessibility, preparation and use.

HM includes preparations of biologically active natural products that consist largely of herbs or herbal materials, some recipes may contain materials such as fungal and bee products, as well as minerals (kaolin, bentonite), ash, shells, insects and animal parts, and are used for the maintenance of health and management of various diseases. HMs can elicit numerous benefits just as some can cause adverse effects. The pharmacologic and most of the toxic effects that are elicited by HMs have been linked to the activities of the secondary metabolites. In many instances, HMs have been appropriately used, misused and sometimes misunderstood. The benefits of HMs as a means of healthcare depends largely on the correct and adequate knowledge, and experiences while misuse as well as misunderstanding have been tracked to the knowledge gap on herbal medicines especially as it relates to their benefits and potential drawbacks by the primary healthcare professionals: doctors, pharmacists, nurses and the public. The attraction to herbal medicine will continue to increase across the globe for various reasons, hence the urgent need for appropriate and enough information on HM especially that which highlights on important topics such as benefits, efficacy, safety, toxicity, research and development, formulation, regulation, analytical techniques, quality control, economic

importance, and so on [9]. This book harnesses important information on various aspects of HM, thus, serving as a compendium to enlighten scientists, healthcare professionals and lay users appropriately.

With many people now using herbal medicine, safety issues are also becoming an important concern. Indeed, certain HM have been implicated in some important adverse events relating to cardio-, neuro- and nephro-toxicities as well cancers [10–12]. Toxicity due to HMs may occur and their seriousness may vary depending on the type of herb or herbal material, preparation and user: varying from minor to severe and sometimes fatal. Adulterations and concomitant use of herbal medicines with conventional medicines constitute another area of attention, thus, the need for a strict regulation and enlightenment and control.

## 2. Benefits of herbal medicine

Herbal medicines (HM) include herbs, herbal materials, herbal preparations and finished herbal products that contain as active ingredients parts of plants, or other plant materials, or combinations and are used especially for the prevention and treatment of diseases [13].

In contemporary times, HM remains a major component of the primary healthcare in many rural African and Asian communities. It also constitutes an integral part of the culture of many societies of the world. Many herbs and herbal recipes have a long traditional history of folk uses and claims of health benefits. Scientific research has shown that HMs contain complex chemical compounds that are responsible for the pharmacological activities, which corresponds to health benefits and/or toxicity they elicit [1]. HMs have been used as prophylaxes for the passive maintenance of health as well as for radical treatment of varieties of mild to serious diseases [14–17].

In contemporary times, HMs are prepared and used in different forms, which also affect their activity outcomes. The dosage form of herbal medicines varies widely depending on such factors as the type of disease to be treated, route of application, patient, culture and even philosophical backgrounds. In homes and traditional medicine clinics, HMs are prepared often from fresh or dried herbs which are commonly made into infusions, decoctions, poultices, powders to be poured into open wounds or incorporated into native beverages, puddings, and so on. Conventional commercial HMs products are commonly available as pills, capsules, tablets, powders/granules, creams, ointments, and so on. The presentation of HMs in pharmaceutical dosage forms is expected to enhance accurate dosing, esthetics as well as compliance by enticing usage.

Safety and efficacy is another important factor overriding the use and commercialization of HMs. The quality of herbal products is essentially dependent on the safety and efficacy of the herbal material in relation to the intrinsic chemical components, type of contaminants as well as the production processing. The chemical compounds that are contained in herbal materials have shown a wide range of benefits in the management of various diseases including challenging diseases/conditions such as HIV/AIDS, cancer, sickle cell disease, malaria and other infectious diseases as well as noninfectious diseases such as diabetes, obesity, infertility, and

so on. Despite the wide acceptance, benefits and sometimes the misconceptions: there is a compelling need for a decisive control of HMs to ensure that enough and correct information on herbal materials and herbal products are always available to especially healthcare providers and the general public particularly on subjects such as identification, quality, safety and efficacy of the HM.

### 3. Poly herbal

In contrast to the pharmaceutical drugs which often consist primarily of single chemical entity (pure compounds), HMs are typically made up of numerous compounds usually in the crude, unpurified state. Many finished herbal products are made from folk recipes often containing more than one herbal material as the active component [18]. The polynomial constitution of most HMs may be the reason for many of their benefits [14, 19].

The constituent polynomial ingredients of many HMs as indicated in many folk recipes are often important for the completeness of the product if desired effects are to be produced. The multicomponent ingredients may boost benefits by enhancing simultaneously certain important pharmacological activities such as absorption, distribution, metabolism and elimination of bioactive components. Also, some constituents may act on more than one receptor or physiological system: probably the reason why many HMs show a wide range of therapeutic benefits.

### 4. Efficacy

In general, HMs are used for cure, mitigation, treatment and prevention of diseases especially those endemic to the local environment of the herbs [14, 16, 20]. Numerous plants species with folk claims of health benefits/cure abound, however only few have scientific proof or corroboration of efficacy. All the activities of HMs benefits and toxicities are linked to the presence of especially the secondary metabolites. The increasing attention on HM has also stimulated increased research in this area resulting in more information as far as efficacy and folk claims are concerned. Many research efforts have corroborated claims resulting in the commercialization of many herbal products and their nomination as leads in the development of pharmaceutical drugs. Nevertheless, many native HMs still remain untested and their benefits unauthenticated. The limited knowledge on these products has made information on the therapeutic benefits and side effects very limited thus heightening the doubt of their health benefits. It is also common knowledge that many people use HM concurrently with pharmaceutical drugs and for many HM information on the likely outcome of this practice is not available because no study has been carried out. Hence, there is a need for information regarding the likely outcomes of the interactions of sundry HM and the commonly used conventional medicines. This information should be generated during the research and development stage of all commercialized HM and enforced by regulation. Such interactions should also be disclosed in package inserts of products.

## 5. Secondary metabolites

The pharmacological activities of HMs are responsible for their benefits and for most of their toxicities. These bioactivities are essentially due to the presence of certain complex chemical entities: the secondary metabolites [21, 22]. While some are responsible for the radical active actions, others act as buffers which modulate and modify the pharmacological actions produced by active components to make them less toxic or more active. This is probably responsible for the reason why several plant extracts or recipes may not be reproduced by the isolated purified chemical constituents of the herb or recipe [23]. The various complex compounds elicit a long range of different activities in man and, animal models and cell cultures. In many instances the degree of activities of the active secondary metabolites vary depending on such factors as the plant species, parts of the plant, geographic origin, time of collection, method of preparation, amount ingested, and so on.

Plant secondary metabolites (PSM) are a large group of compounds that are synthesized and concentrated optimally in certain plant species and organ. The primary functions of these compounds in the plants in which they occur includes defense against such adversaries as herbivores, bacteria, fungi and viruses. Many also show variable degrees of antioxidants and UV protectants effect against harmful elements [24], while some also play important roles during pollination (to attract pollinating and seed-dispersing factors or signaling agents. This wide group of chemicals contains reactive functional groups in their chemical structures that are capable of forming covalent bonds with other biocompounds such as proteins, peptides and sometimes DNA [23].

PSMs are primarily organic compounds and can simply be grouped into three major classes, terpenes: volatiles, cardiac glycosides, carotenoids and sterols; phenolics: phenolic acids, coumarins, lignans, stilbenes, flavonoids, tannins and lignin; nitrogen containing compounds: alkaloids and glucosinolates [25].

## 6. Health benefits of herbal medicines

Correspondingly to conventional medicines, the indications of folk HMs are diverse, being employed for the treatment of a wide range of diseases [26]. The indications spread from simple health conditions such as cold, pain, surface wounds to serious conditions such as psychosis, diabetes, malaria, sickle cell disease, tuberculosis, cancer, hypertension, infertility, and so on. In certain communities, HM is a major component of the primary healthcare. Indeed, up to 80% of the rural population in Africa use herbal-based traditional medicines for most of their healthcare. In Ghana, Mali, Nigeria and Zambia, the first line of treatment for 60% of children with high fever resulting from malaria and other diseases is HM, which are often administered at home. Rural South Africa also has a strong culture of traditional medicine that is based on HM. In China and India, HM accounts for about 50% of the total health product consumption. With the increasing attention to HM all over the world, the list of medicinal herbs and products is increasing so also is the consumption rate even in societies

where conventional healthcare is available and easy to access. Also, in the USA, about 40% of the adult population has used herbal medicine [27]. The sales output of HM in Canada [28], Australia [6] and Europe especially in Germany and France is rapidly increasing [29].

## **7. Reasons for the upsurge in the use of HM**

In recent times, the popularity and use of HMs have cut across geographical, gender, economic and socio-cultural divisions. Indeed, HM is occupying a strategic position in the general healthcare of people worldwide. Some of the probable reasons adduced for this include:

### **7.1. Personal preferences for HM**

The use of HM is an age long tradition which is enshrined in the culture of many societies. In past times, people have relied on it as their primary source of healthcare with much success. Despite modernization and the proliferation of conventional healthcare that hinges on the use pharmaceutical drugs. Some people especially in Africa and Asia still lay personal preferences on HM: this group of people will always prefer HM as their first line of therapy whenever possible irrespective of their economic, educational and social status.

### **7.2. Perception of safety**

Generally, many lay users have the opinion that HMs are safe and carry no risk or side effects. Though HMs are natural products derived from plant materials, minerals and some animal matter, this belief is nevertheless erroneous as many HMs are not totally devoid of adverse effects. While, it is true that many HMs are comparatively more tolerable than pharmaceutical drugs especially in long time use for the management of chronic ailments [30, 31]. Studies have shown that in some countries such as South Africa and Ghana, herbalists far outnumber the conventional medical doctors, whereas in India, China, and Vietnam, the number of herbalists and the conventional doctors are comparable.

### **7.3. Easy accessibility**

Especially in rural African and Asian communities where access to conventional medical services is either expensive or difficult the only reliable, easy and quick access to healthcare is the traditional medical practitioners (TMPs) whose therapy is always based on HM. Even in societies where pharmaceutical products are highly regulated, HM is easily obtained at low cost and without prescriptions.

### **7.4. Low cost**

In many rural communities, the cost of HMs is often low when compared to those of the conventional medicines. The TMPs who provide the services are usually community members who often live in the neighborhood of their clients (patients), as against the long distances to be traversed to reach the conventional medical centers. Most HMs are extemporaneously

prepared or the herbal materials are given to the patient with an oral direction on how to prepare and use. The modalities of payment are usually more flexible as the TMPs, may accept part payments or payment in kind with items such as clothing, chickens, goats, and so on. This is nevertheless in variance to the exotic proprietary herbal products whose prices are often as high as those of the conventional medicines.

### **7.5. Efficacy of treatments**

In recent times, there have been increased research activities to verify claims and determine safety and quality control standards for herbal materials and products. The safety and efficacy of some herbal products have been scientifically evaluated to corroborate claims. The scientific proof of safety and efficacy has contributed to the increasing confidence and popularity of many herbal products. There are also certain diseases where patients have indicated preferences for HM instead of on pharmaceutical drugs [32].

### **7.6. As the last resort**

Sometimes HMs are used as the last resort in the management of certain diseases especially when the conventional drugs have failed to yield the desired results or are accompanied by serious side effects especially in chronic diseases [33].

## **8. Standardization and regulation**

The therapeutic benefits of HM in relation to general healthcare will continue to expand and attract popularity even with increased sophistication of the conventional healthcare systems as associated with genetic engineering and medical biotechnology. In many societies where HM constitutes an integral part of the healthcare system, the scheme to integrate it into the primary healthcare system is still farfetched because of matters that pattern to issues of standardization, quality control and regulation.

The traditional method used for monitoring and assuring quality of HM consists mainly of organoleptic evaluations. These are critically simple and subjective thus not compatible with the modern concept of quality control. In many countries, mandatory regulation of HM now requires scientific-based evaluations that employ high-tech analytical techniques to monitor and control the quality of products [34, 35]. At present, no official techniques or standards are available for the universal evaluation of HM. Many manufacturers of herbal products are either adopting tests and parameters as well as limits used for pharmaceutical drugs or self-determined in-process parameters and limits for their quality control evaluations. Though, these are good shots towards an effective standardization and quality control. In most cases, nevertheless, the techniques are not officially validated according to ISO standards, which is critical for universal acceptance. Standardization of HM using official techniques though doable will be a herculean task because of the complex nature of HMs.

However, the regulation of HM in many countries is less rigorous when compared to those of pharmaceutical drugs. The issues of therapeutic efficacy, safety, or quality are often not strictly regulated. In many of these countries, they are promoted as natural and harmless [36].

## 9. Conclusion

Even in the light of increased sophistication of modern healthcare as enriched by science and technology, the use of herbal medicine will continue to thrive in both poor and rich societies for many and probably different reasons. It is important for stakeholders: governments, farmers, scientists, healthcare providers (physicians, pharmacists and nurses) and biotechnical engineers to give enough attention to herbal medicines and its challenges in a deliberate effort to create for it appropriate niche that will ensure that it develops alongside with conventional medicine. The application of science and technology especially in area of information resources, conservation and cultivation, production, analytical techniques and quality control, clinical trials and regulation should be promoted. These efforts will boost benefits, confidence and safety in the use of HMs and its possible induction into the mainstream healthcare. Though, there are several literatures on HM, this book nevertheless has stooped to collate in a simple, unambiguous and readable manner a wide and indebt information that will be useful to all who have a stake in HM: scientist, healthcare professionals, engineers and the general public.

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