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Herbal Medicine in Africa-Distribution, Standardization and Prospects

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Abstract: Plants have always been a component of mankind's healthcare system. This is either directly or indirectly. Directly, the plant parts like leaves, fruits, stem bark and roots or even the whole plant are themselves used in the treatment of illnesses. The use of herbal medicines in Africa has greatly elevated and enhanced the primary health care system but the standardization and quantification/dosing of the herbal medicines in the treatment of disease and infections has left much to be desired.

Key words: Herbals, medicines, plants, traditional medicines, drugs, extracts

INTRODUCTION

Herbs can be defined as a plant which lacks permanent woody stem that produces seeds and flowers and dies after a particular season. They are medicinal in nature and can also be used for horticultural purposes. However, in traditional herbal system denotes that a herb is a small, nonwoody, plant treasured for its medicinal, savory or aromatic functions. Herbal medicine therefore is a natural remedy derived from herbs.

Herbalism is a traditional medicinal or folk medicine practice based on the use of plants and plant extracts. Herbalism is also known as botanical medicine, medical herbalism, herbal medicine, herbology and phytotherapy. The scope of herbal medicine is sometimes extended to include fungal and bee products, as well as minerals, shells and certain animal parts (WHO, 1977).

Plants have always been a component of mankind's healthcare system. This is either directly or indirectly. Directly, the plant parts like leaves, fruits, stem, bark, roots etc. or even the whole plant are themselves used in the treatment of illnesses. While indirectly, the plants form a biochemical template for the eventual development of what is referred to as orthodox medicines. Global trends toward the use of herbal medicines have also had an impact on the young generation of Africans (especially in Nigeria, Cameroon) who have accepted the strong yet safe healing power of herbal medicines. The value of the local herbal medicine market has significantly increased creating a good market for indigenous Pharmaceutical industries to strive, most of who are engaged in the cultivation, preparation and marketing of herbal medicines.

Medicinal Plant

The World Health Organization (WHO) defines a medicinal plant as a plant in which some or all of its parts can be used directly in the management of a disease (Acharya and Shrivastava, 2008). Due to the nature of this discussion, It is necessary to give definitions of key words often repeated severally in the field.

A Drug is any chemical used as a medicine. The word drug itself comes from the Dutch word droog (via the French word Drogue), which means dried plant.

Phytochemistry is in the strict sense of the word the study of phytochemicals. These are chemicals derived from plants. In a narrower sense the terms are often used to describe the large number of secondary metabolic compounds found in plants. Many of these are known to provide protection against insect attacks and plant diseases. They also exhibit a number of protective functions for human consumers (Veilleux and Steven, 2006).

History of Herbal Medicine in Africa

The evolution of herbal medicine into modern medicine took place during the last 200 years. Plants have long been used for their medicinal effects. It is difficult to point to an exact time this use of plants was discovered but the earliest time recorded is circa 1770 and 1550 BC in the code of Hammurabi (Babylon) and Egypt, respectively. The Egyptians believed in the potency and efficacy of the plants extended to the afterlife of the Pharaohs. Plants were recovered from the Giza pyramids and are displayed in the Access Excellence Resource Center, Cairo museum (Veilleux and Steven, 2006).

In the written record, the study of herbs dates back over 5,000 years to the Sumerians, who described well-established medicinal uses for such plants as laurel, caraway and thyme. Ancient Egyptian medicine of 1000 B.C. are known to have used garlic, opium, castor oil, coriander, mint, indigo and other herbs for medicine and the Old Testament also mentions herb use and cultivation, including mandrake, vetch, caraway, wheat, barley and rye. The density of these herbal medicinal plants is highest in tropical rainforest zones such as in some African countries e.g., Nigeria. The medical systems in developing countries involve both traditional herbal systems and orthodox medicine. Due to the economic predicament of these countries, the people resort to the traditional herbal system for primary health care. In Africa, particularly West Africa, new drugs are not often affordable thus up to 80% of the population use medicinal plants as remedies (Kirby, 1996; Hostettmann and Marston, 2002). For instance, *Nuclea latifolia* is therapeutically useful in dental caries (Falodun *et al.*, 2007); The World bank data on African development indicators 2003 revealed that the ratio of medical doctors to total population for 1990-2000 in Nigeria was 1: 5208. This condition and the fact that international commercial orthodox medicines are becoming increasingly out of reach for most Nigerians contributed to the dependence of a large percentage of the Nigerian people on local herbal medicine (Sofowora, 1992). Africa, North and South America, together with Asia are the areas containing the world's greatest number of plant species that are not found elsewhere.

The practice of traditional medicine in Africa even today, contains considerable mysticism and secrecy. For example, some traditional medical practitioners use related religious act to find the cause of an illness before treatment is initiated (Twumasi, 1975). The traditional practitioners in Africa include herbalists, traditional birth attendants, bone setters, diviners, traditional surgeons, spiritualists and others (Trease and Evans, 2002). They believed that diseases could arise from physical, psychological causes as it could from spiritual and astral influences.

Treatment offered by traditional herbal healers at the primary health care leveled has greatly sustained the Nigerian Society before and after colonization. Many of the herbal healers used these plants without knowing what it contained. They acted on the knowledge passed down to them by their predecessors (Williamson *et al.*, 1996).

Relevance of Herbal Medicines

The use of herbal medicine is apparently not restricted to humans. Indigenous healers often claim to have learned by observing that sick animals change their food preferences to nibble at bitter herbs they would normally reject (Huffman, 2003).

Scientists have provided corroborating evidence based on observation of diverse species, such as chimpanzees, chickens, sheep and butterflies. Lowland gorillas take 90% of their diet from the fruits of *Aframomum melegueta*, a relative of the ginger plant, that is a potent antimicrobial and apparently keeps shigellosis and similar infections at bay. Researchers from Ohio Wesleyan University found that some birds select nesting material rich in antimicrobial agents which protect their young from harmful bacteria (Ichida, 2004). Sick animals tend to forage plants rich in secondary metabolites, such as tannins and alkaloids (Hutchings *et al.*, 2003). Since, these phytochemicals often have antiviral, antibacterial, antifungal and antihelminthic properties, it can be said that animals living in the wild are proficient in self-medication.

The World Health Organization (WHO) estimates that around 80% of the population in Africa-use traditional medicines. About 85% of traditional medicine involves use of plant extracts (Farnsworth and Soejarto, 1985). This would imply that the reliance on herbal medicine is immense. To appreciate the extent of this dependence, it is estimated that in Sub-Saharan Africa there is one traditional healer for every 500 people, whereas there is only one medical doctor for every 40,000 people. Therefore the importance of herbal medicines in the life of Africans cannot be overemphasized. The re-insurgence of interest of herbal medicines in Africa is backed by several reasons namely, the increasingly expensive and unavailability of orthodox drugs to average income earners (Sofowora, 1992). Another reason is that many ailments are developing resistance to orthodox drugs, for instance, the increasing resistance of malaria parasites to chloroquine which is the cheapest and the most commonly used drugs for treating malaria in Nigeria (Odugbemi *et al.*, 2007). Bacterial resistance to antibiotics is another classical example. The inability of Western orthodox medicine to provide cure for some diseases and infections (e.g., HIV/AIDS) is a possible reason also. The ascendancy of the human immune Deficiency virus has spurred intensive investigation into plant derivatives which may be effective especially for use in developing and underdeveloped nations. The little or no side effects with use of herbal medicines is another factor.

Chemical Components-Secondary Metabolites

Many plants synthesize substances that are useful to the maintenance of health in humans and other animals. These include aromatic substances, most of which are phenols or their oxygen-substituted derivatives such as tannins. Many are secondary metabolites, of which at least 12,000 have been isolated a number estimated to be less than 10% of the total. In many cases, substances such as alkaloids serve as plant defense mechanisms against predation by microorganisms, insects and herbivores. It also serve to secure a survival niche in the face of competition with or among other species. Many of the herbs and spices used by humans to season food yield useful medicinal compounds (Lai and Roy, 2004; Tapsell *et al.*, 2006; Falodun *et al.*, 2005; Falodun and Usifoh, 2006).

It has also been reported that a number of interesting secondary metabolites of herbal medicinal plants are products cooperation following the infection by endophytic fungi (Wagner and Clardy, 2001; Brady *et al.*, 2001; Krohn *et al.*, 2001).

Influence on Conventional Medicine

Several drugs known now to orthodox medicine have been sourced from herbs. An example is aspirin: the active ingredient in willow bark, once prescribed by Hippocrates, is salicin, which is converted in the body into salicylic acid. The discovery of salicylic acid eventually led to the development of the acetylated form acetylsalicylic acid, also known as

aspirin, when it was isolated from a plant known as meadowsweet- *Filipendula ulmaria*. *Artemisia annua* gave mankind Artemisinin the current WHO recommended antimalarial agent. Several derivatives have also been gotten from this drug (Katzung (1998). This plant is now been cultivated by Pharmaceutical companies in Nigeria and some African countries. The use of ACT in the treatment of malarial disease in Nigeria is at a higher volume. This could in no future time lead to malaria resistance. Bioactive compounds from some herbal medicines include Reserpine from *Rauwolfia serpentine*). Vincristine from *Catharanthus roseus*, Quinine is obtained from *Cinchona officinalis* bark, Morphine was derived from *Papaver somniferum*, Galantamine from *Narcissus* species (Olaniyi, 2005; Wait and Wijk, 1984; Sarett, 1979).

Limitations of Herbal Medicines

It is necessary here to state that herb medicines have limitations. The most important of these being the minute quantities of biologically active ingredients they contain. Production of ample quantity of the drug for clinical trials and later for general use requires extremely large amounts. This makes the drug, when extracted, expensive and inaccessible to the majority of people who need it. Hence a more convenient means such as total synthesis from sources that would provide higher yields. Another way, is to determine structure-activity relationships and to synthesize structural analogues that frequently have more pharmacological activity than the parent compound (Ekong, 1986; Nworgu *et al.*, 2007).

Herbal-Herbal Interactions

Drug-herbal interactions, herbal-herbal interactions are common phenomenon occurring with herbal medicines usage. Drug-drug interactions is associated with the use of orthodox medicines. The interactions could be pharmacological, chemical and biochemical in nature. In most cases the induction of cytochrome P450 enzyme and the high molecular weight bioactive compounds present in herbal medicines are probable reasons for these interactions. Hence, Pharmacists, Physicians and other care givers are made aware of the use of herbal medicines. The co-prescription of orthodox and herbal medicines, the use of herbal medicines for different ailments and poly-herbal preparations are possible sources of interaction. In Africa, some herbal medicines are contaminated with orthodox drugs with a view to enhancing the efficacy of such preparations. Such sharp practices are unhealthy for the use of herbal medicines in the communities. This can be averted by the monitoring, evaluation and regulating agencies concerned, by ensuring that detailed quality assurance systems are put in place.

Standardization of Herbal Medicines

The standardization of herbal medicines compared to orthodox medicines in Africa by regulating Agencies and health Institutions is comparatively poor. Both the users and the care givers need to be involved in the standardization of the products. The lakadasical altitude displayed by government towards this aspect of herbal medicines is unfortunate. There is practically no obvious reason why the orthodox system of standardization and regulation using official books and monographs such as British Pharmacopeia, BP, United States Pharmacopeia, USP and the US National Formulary cannot be used for herbal medicines. Although, the African Pharmacopeia, AP is available and in use in some African countries but a comprehensive review and update of the procedures for chemical and biological assay is needed. Also there is need for countries in this continent to developed and adopt national Pharmacopeia such as Nigeria Pharmacopeia. This will provide a platform

for regulation and standardization of herbal medicines. The National Agency for food, drug and administration control, NAFDAC, in the last 6 years has achieved success in the regulation of herbal medicines. In Nigeria for instance, it is difficult to find a product without NAFDAC number. Scientific methods of analysis of drugs and herbal medicines have greatly improved in the last half –century. It is therefore possible for chemical analysis to be carried out. The use of conventional and sophisticated techniques in assay procedures needs to be emphasized. Such equipments as nuclear magnetic resonance NMR (1D, 2D and 3D), Infra red spectrophotometry, high performance liquid chromatography HPLC, Mass spectrometry (ESI-MS, EI-MS, HRS-MS) and X-ray crystallography would be needed. Well trained personnel to handle the sensitive equipment and if this is not done, herbal medicines are in serious danger of loosely monitored and regulated by quacks (Falodun *et al.*, 2009). Pharmacists and other scientists working in the field of herbal medicines should take up this important task of implementing this as they would be reliable sources of objective and scientific opinion.

Specialized training in herbal medicine by Pharmacy and medical schools is essential in achieving this goal. This will help to strengthened and provide formal training to traditional herbal practitioners.

Toxicity Profile and Safety of Herbal Medicines

General, herbal medicinal plants preparations are relatively safer than synthetic orthodox drugs. However, since the use of herbal medicines is dependent mostly on the patient choice of self selection and self administration, then safety and toxicity profiling are of paramount importance. Adulterated products contaminated with potentially harmful ingredients such as heavy metals and toxins from insects and animal products, for example are occasionally encountered and withdrawn from the market (Ang *et al.*, 2004, 2003; Parab *et al.*, 2003; Ostrander *et al.*, 2004).

An array of biochemical and pharmacological mechanisms are involved during the ingestion of a number of herbal medicines, which definitely elicits body responses in order to combat and metabolize the medicines. Oxidation by cytochrome P450 microsomal system is necessary in the metabolism of the herbals preparations. cytochrome P450 is a large group of enzymes involved in the oxidation of mono oxidases. All drugs are detoxified and eventually excreted from the body and many require bio activation to form the active compound. CYPs are the major enzymes involved in drug metabolism and bioactivation, accounting for approximately 75% of the total metabolism (Guengerich, 2008; Chaudhary and Willett, 2006; Strandell *et al.*, 2004). This enzyme could be inhibited by the activity of some natural bioactive compounds from plants leading to toxicity. A classical example is the concomitant use of grape fruits with some medications. Hence, patients are advised not to use drugs with grape fruits (Bailey and Dresser, 2004).

Some herbal preparations are has been reported to cause a kidney failure in some populations. These herbals are known to contain aristolochic acid and furanoditerpenes which are metabolized by the action of cytochrome p 450 enzymes (Fau *et al.*, 1997; Lekechal *et al.*, 1996; Leoper *et al.*, 1994). Some of the patients were later diagnosed with urothelia carcinomas due to the conversion of aristolochic acid to potential carcinogens by the enzyme (Nortier *et al.*, 2001).

Future Prospects

The upsurge of herbal medicines in Africa has bright prospects. The market prediction is great. But this would accelerate faster with promotional plans and government funding for

a biotechnology industry, development of scientific herbal medicine, training and re training of herbal medicine practitioners and establishment and implementation of good policy framework for the regulation and standardization of herbal medicines.

CONCLUSION

Herbal medicines in Africa have come to stay and will continue to metamorphose into different stages and concepts. The concept of herbal medicine and its practice in Africa and the world at large will not go into extinct. The tremendous potential in complementing the use of orthodox medicines will continuously be modified in line with modern trends in therapeutics. The wide distribution of herbal medicinal plants in the tropics especially in Africa, need to be explored and researched into due to the huge economic and socio-cultural advantages it tends to attract to developing countries.

Finally, the regulation and standardization of herbal medicines in these nations will need to be monitored and controlled.

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