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Challenges, Constraints and Opportunities in Herbal Medicines – A Review

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ABSTRACT

Herbal medicine and their preparations have been widely used for the thousands of years in developing and developed countries. Herbal medicines are the synthesis of therapeutic experiences on generations of practicing physicians in indigenous systems of medicine, for over hundreds of years. They are also in great demand in the developed world all health care problems because of their efficacy, safety and lesser side effects. India is sitting on a gold mine of well-recorded and well- practiced knowledge of traditional herbal medicine. The Indian systems of medicine i.e., Siddha, Ayurveda & Unani mainly encompass herbal medicines along with herbo-mineral formulations. The preparations are either as single herbs or as collections of herbs in composite formulae. This may be the main reason why quality control of oriental herbal drugs is more difficult than that of western drug. The quantity and quality of the safety and efficacy data on traditional medicine are far from sufficient to meet the criteria needed to support its use world-wide. This review article, discusses these constraints and challenges in relation to conservation, science and technology, use of herbal medicine, drug production sector, safety and efficacy and also the opportunities of herbal medicine in local and global level.

Keywords: Siddha Medicine, medicinal plants, safety & efficacy, standardization, drug adulteration, quality control.

1. Introduction

Herbal medicines and their preparations have been widely used traditionally, for the thousands of years in developing and developed countries owing to its natural origin and lesser side effects or dissatisfaction with the results of synthetic drugs. One of the characteristics of oriental herbal medicine preparations is that all the herbal medicines, either presenting as single herbs or as collections of herbs in composite formulae ^[1]. The traditional preparations comprise medicinal plants, minerals, organic matter, etc. Herbal drugs constitute mainly those traditional medicines which primarily use medicinal plant preparations for therapy ^[2]. These drugs are made from renewable resources of raw materials by eco-friendly processes and will bring economic prosperity to the masses growing these raw materials ^[3]. India is known as the “Emporium of Medicinal plants” due to availability of several thousands of medicinal plants in the different bioclimatic zones ^[4]. Medicinal plants continue to provide valuable therapeutic agents, both in modern medicine and in traditional systems of medicine . Attention is being focused on the investigation of efficacy of plant based drugs used in the traditional medicine because they are economy, have a little side effects and according to W.H.O, about 80% of the world population rely mainly on herbal remedies ^[5]. The World Health Organization has recently defined traditional medicine (including herbal drugs) as comprising therapeutic practices that have been in existence, often for hundreds of years, before the development and spread of modern medicine and are still in use today ^[6]. The uses of traditional medicines are widely spread and plants represent a large source of natural chemicals that might serve as leads for the development of the novel drugs ^[7]. Scientists have devised different ways of alienating the problem and one of the easy and cheapest options is herbal medicines. Herbs have been in use since long time to treat various diseases ^[8]. Almost one fourth of pharmaceutical drugs are derived from botanicals. For example, the first drug effective against gastric ulcer was carbenoxolone, discovered as a result of research on a commonly used indigenous plant, *Glycyrrhiza glabra*, called ‘Athimadhuram’ in Siddha medicine ^[9]. Studies on cabbage lead to the development of Gefarnate ^[10]. As a result, herbal medicine has led to the innovation of an amount of fresh drugs, and non-drug substances. So, it is the occasion to bash the door to catch more & more opportunities after removing the challenges and constraints in the herbal medicines.

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2. Herbal Medicine

Herbal medicines are being used by about 80% of the world population primarily in the developing countries for primary health care. They have stood the test of time for their safety, efficacy, cultural acceptability and lesser side effects. Ancient literature also mentions herbal medicines for age-related diseases namely memory loss, osteoporosis, osteoarthritis, diabetes, immune and liver disorders, etc. for which no modern medicine or only palliative therapy is available ^[11]. The chemical constituents present in them are a part of the physiological functions of living flora and hence they are believed to have better compatibility with the human body ^[12]. In the early 19th century, when chemical analysis first became available, scientists began to extract and modify the active ingredients from plants. Later, chemists began making their own version of plant compounds and, over time, the use of herbal medicines declined in favor of drugs. Medicinal plants play an important role in the development of potent therapeutic agents. There are over 1.5 million practitioners of traditional medicinal system using medicinal plants in preventive, promotional and curative applications ^[13]. Medicinal plants have attracted the attention of not only professionals from various systems of medicine, but also the scientific communities belonging to different disciplines, plants are promising source of herbal formulation ^[14].

3. History of Herbal Medicine:

Plants had been used for medicinal purposes long before recorded history. Ancient Chinese and Egyptian papyrus writings describe medicinal uses for plants as early as 3,000 BC. Indigenous cultures (such as African and Native American) used herbs in their healing rituals, while others developed traditional medical systems (such as Siddha, Ayurveda, Unani and TCM) in which herbal therapies were used ^[15].

The consumption of plant-based medicines and other botanicals in the West has increased manifold in recent years. About two centuries ago, our medicinal practices were largely dominated by plant-based medicines. However, the medicinal use of herbs went into a rapid decline in the West when more predictable synthetic drugs were made commonly available. In contrast, many developing nations continued to benefit from the rich knowledge of medical herbalism. For example, Siddha & Ayurveda medicines in India, Kampo Medicine in Japan, traditional Chinese medicine (TCM), and Unani medicine in the Middle East and South Asia are still used by a large majority of people ^[16].

4. The Challenges in Herbal Medicines: ^[16]

A key challenge is to objectively assess conflicting toxicological, epidemiological, and other data and the verification of herbal materials used. The following key issues remain.

- Management within ranges of risk
- Communication of uncertainty
- Pharmacological, toxicological, and clinical documentation
- Pharmacovigilance
- Understanding why addition of harmful additives works
- evaluating "drug" interactions
- Constraints with clinical trials and people available
- Standardization
- Safety, and efficacy assessment

The evaluation of new herbal products consists of six steps,

1. Characteristics of new substances,
2. History and pattern of use,
3. Any adverse reaction,
4. Biological action,
5. Toxicity and carcinogenicity, and
6. Clinical trial data.

5. The Constraints in Herbal Medicines:

Constraints associated with the handling of medicinal plants ^[17],

- Indiscriminate harvesting and poor post-harvest treatment practices.
- Lack of research on the development of high-yielding varieties, domestication etc.
- Poor agriculture and propagation methods.
- Inefficient processing techniques leading to low yields and poor quality products.
- Poor quality control procedures.
- Lack of current good manufacturing practices.
- Lack of R & D on product and process development.
- Difficulties in marketing.
- Lack of trained personnel and equipment.
- Lack of facilities to fabricate equipment locally.
- Lack of access to latest technological and market information

Constraints associated with the dealing of Herbal Medicines: ^[16]

Both the raw herb and the extract contain complicated mixtures of organic chemicals which may include fatty acids, sterols, alkaloids, flavonoids, glycosides, saponins, tannins, lignans, and terpenes as well as other small molecules such as peptides and oligosaccharides. It is often difficult to determine which component, if any, of the herb has biological activity in humans.

- ❖ In addition, the processing of herbs, such as heating or boiling, may alter the dissolution rate, or even the pharmacological activity of the organic constituents.
- ❖ Similarly, a host of environmental factors, including soil, altitude, seasonal variation in temperature, atmospheric humidity, length of daylight, rainfall pattern, shade, dew, and frost conditions, may affect the levels of components in any given batch of an herb.
- ❖ Other factors, including infections, insects, planting density, competition with other plant species, seeding time, and genetic factors, play an important role.
- ❖ Plant collection for the use in botanicals is one of the factors of concern for quality. Plants collected in the wild may include non-targeted species, especially either by accidental substitution or intentional adulteration.
- ❖ Adulteration of herbal products can be made in various ways; commonly, adulteration is made by substituting other easily available or cheap plant species or sometimes by spiking of a product with synthetic constituents.

Factors affecting quality & purity of Herbal Medicines: ^[18]

1. Drug adulteration

Adulteration may be defined as mixing or substituting the original drug material with other spurious, inferior, defective, spoiled, useless other parts of same or different plant or harmful substances or drug which do not conform with the official standards.

Adulteration may take place by two ways:

- Direct or intentional adulteration
- Indirect or unintentional adulteration

Examples for Adulteration,

- A. With artificially manufactured materials, e.g. nutmeg is adulterated with basswood prepared to the required shape and size, the colored paraffin wax is used in place of beeswax.
- B. With inferior quality materials, e.g. *Belladonna* leaves are substituted with *Ailanthus* leaves, *papaya* seeds to adulterate *Piper nigrum*.
- C. With harmful / fictitious substances drugs, e.g. Pieces of amber colored glass in colophony, limestone in asafetida, lead shot in opium, white oil in coconut oil, cocoa butter with stearin or paraffin.
- D. Adulteration of powders, e.g. powder liquorice or gentian admixed with powder olive stones, under the name of cinchona. Etc

2. Faulty collection

3. Imperfect preparation

Non removal of associated structures e.g. stems are collected with leaves, flowers, fruits. Non-removal of undesirable parts or structures e.g. cork should be removed from ginger rhizome. Proper drying conditions should be adhered. Improper drying may lead to unintentional adulteration e.g. if digitalis leaves are dried above 65 °C decomposition of glycosides by enzymatic hydrolysis.

4. Incorrect storage

Deterioration happens especially during storage, leading to the loss of the active ingredients, production of metabolites with no activity and, in extreme cases, the production of toxic metabolites. Physical factors such as air (oxygen), humidity, light, and temperature can bring about deterioration directly or indirectly.

5. Gross substitution with plant material

6. Substitution with exhausted drugs

6. The Opportunities in Herbal Medicines:

1. Medicinal plants cultivation.
2. Medicinal plants Exports.
3. In Drug Manufacturing Companies.
4. Teaching profession - Herbal medicine is being taught more in medical schools and pharmacy schools.
5. In the field of Plant monographs
6. Drug inspectors in ISM.
7. Medical taxonomist
8. Pharmacognosist.
9. Herbalist & Chiropractors
10. AYUSH practitioners, Doctors
11. SRF & JRF in Clinical trials.
12. Clinical and Research opportunities- Without doubt, the therapeutic potential of many herbs is yet to be fully discovered. Example, Recent discovery of 'artemisinin', new class of anti-malarial drugs, in Chinese herbs supports this assertion.
13. Carrier options in the various newer fields. E.g. Molecular biology, Nano technology etc.

7. Conclusion

Plants, herbs, and ethno botanicals have been used since the early

days of humankind and are still used throughout the world for health promotion and treatment of disease. Plants and natural sources form the basis of today's modern medicine and contribute largely to the commercial drug preparations manufactured today. About 25% of drugs prescribed worldwide are derived from plants. Still, herbs, rather than drugs, are often used in health care. For some, herbal medicine is their preferred method of treatment. For others, herbs are used as adjunct therapy to conventional pharmaceuticals. However, in many developing societies, traditional medicine of which herbal medicine is a core part is the only system of health care available or affordable. Consumers should also be given science-based information on dosage, contraindications, and efficacy. To achieve this, global harmonization of legislation is needed to guide the responsible production and marketing of herbal medicines. If sufficient scientific evidence of benefit is available for an herb, then such legislation should allow for this to be used appropriately to promote the use of that herb so that these benefits can be realized for the promotion of public health and the treatment of disease [19]. However, if herbal medicines are to assume a respected place in the contemporary health care, the quality of the data and the quality of the herbal products themselves as well as regulatory control of herbal medicines must improve greatly [20]. Herbal manufacturers and Prescribers together could bring a new sphere of incredible revolution by reforming and reshaping the herbal medicines to challenges of the 21st century by an equivalent effective, economical and safe treatment by utilizing mostly our own resources.

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