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Review Article

A Short Consized Note of Current Trends and Future Prospects on Herbal Medicine

Heera Battu[1,*], Nimmathota Madhavi[2]

[1]Department of Pharmaceutics, Adikavi Nannaya University College of Pharmaceutical Sciences, Tadepaliigudem, Andhra Pradesh, INDIA.
[2]Department of Pharmaceutics, CMR College of Pharmacy, Medchal, Hyderabad, Telangana, INDIA.

ABSTRACT

Now a days the usage of allopathic medicine is in large-scale, however the phenomenal development in advanced science and technology came up with new therapies for various disease remedies furthermore the practice is happening and even then, we couldn't improve or to provide better healthcare system. Among the available traditional system of medicine, herbal medicine is considered as one of the rapidly growing healthcare systems around the globe particularly in rural and remote areas. Majorly available Indian traditional systems such as Ayurveda, Unani, Siddha and Homeopathy had a long-lasted history for their effectiveness in the treatment of various diseases. Herbal medicines often provide guidelines in large for the formulation of herbal product in the treatment and control of ailments. As a result, there may be a chance to increase in analysis about the safety, standardization, efficacy, quality, adverse drug reactions, drug interactions, stability testing and preservation of herbal products. The current review focused on the importance of traditional herbal medicine in treating various diseases.

Keywords: Herbal, Traditional, Nature, Disease, Health care.

Correspondence:
Dr. Heera Battu
Assistant Professor, Department of Pharmaceutics, Adikavi Nannaya University College of Pharmaceutical Sciences, Tadepaliigudem-534101, Andhra Pradesh, INDIA.
Email: heera.tony@gmail.com
ORCID ID: 0000-0001-6538-0364

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INTRODUCTION

As the pharmacological effects of medicinal plants have increased in the 21st century, herbal medicine has been considered as a possible alternative to the administration of healthcare. The global trend has recently been moving from synthetic to phyto-herbal medicine, reported "Back to Nature," and since ancient times therapeutic plants have been used and are widely acted as a source of therapeutic agents in the treatment of disease and its prevention. Apart from herbal medicine, other developed traditional medical systems such as Ayurveda, Siddha, Unani, and traditional Chinese medicine are also used in herbal therapies successfully.[1] Herbal medicines are related in several healing experiences and practices of indigenous systems of drugs. Plant-based medicine employs about 75-80% of the world population which includes food supplements, and cosmetics.[2] This is dues to the reason that natural products are being non-toxic, less side effects, less expensive and locally available respectively.[3] According to the World Health Organization (WHO), the usage of natural drug remedies exceeds two to three times than that of conventional medicine.[4]

WHO integrated a new global health policy in the year of 1998 that "health is for all in the 21st century" and to reach health security, increased healthy life and to safeguard admission to quality healthcare.[5,6] Majority of the world population may not have access that depend on true traditional/alternative or complementary systems of medicine in under developed countries.[7] Whereas many developed countries are also benefitted with the herbal medicine. Ayurveda and Siddha medicines are still used by majority of people in India, kampo medicines in Japan, Chinese Traditional Medicine and Unani in Southeast Asia and the middle east.[8] The rich sources of phytochemical ingredients are essential for modern medicinal products which are called herbal plants. The various parts of plants are been recognized for their medicinal properties and those parts are roots, stems, leaves, flowers, fruits and seeds respectively. Nevertheless, several plants have also been noted as toxic and they show adverse effects and not for consumption.[9] A century ago, many allopathic drugs are to be developed from the plant sources and few productive drugs, which are plant-based are included as aspirin (from willow bark), quinine (from cinchona bark), digoxin (from foxglove) and morphine (from opium poppy).[10] Herbal formulations have various therapeutic activities like anti-microbial, anti-diabetic, anti-aging, anti-arthritic, sedative, anti-spasmodic, analgesic, vasodilatory and hepatoprotective activities respectively. Herbal medicines have been documented for almost 4000 years.[11] Therefore, bioactive extract should be standardized and limited to pharmaceutical health measures. In recent years the

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re-discovery of medicinal plants is would be a source of potential drug candidates. The purpose of this study is therefore to explain in brief about the current status and the future prospects of herbal medicine.

HERBAL MEDICINE

Plants are the primary source of the drug and used in the treatment of various chronic therapies where the usage of long back-established medicinal systems are thereof. Traditional remedy refers to health practices and approaches that are based on knowledge and beliefs that incorporating plants as spiritual therapies and physical therapies respectively to prevent contagion or maintain good health. Adaptations of traditional medicine in developed countries are termed as complementary and alternative medicine.[12] Currently around 80% of antimicrobial, cardiovascular and anticancer drugs are derived from medicinal plants and more than 70% of entities are natural products. Moreover about 25% of drugs are found as derived from the plant source. Between 2005 and 2007 from the plant origin thirteen drugs are licensed in the United States. It was also estimated that among 252 drugs, 11% of the drugs found in the WHO vital drugs list, those are obtained especially from plant source.[13,14] In Indian traditional medicine, a large number of medicinal plants are used in that Ayurveda uses around 1200-1800 plants, Unani utilizes 400-700 medicinal plants, Siddha medicine includes 500-900 plants, and Tibetan medicine uses nearly 300 plants respectively. The classical literature included Charaka Samhita, Astanga Hridaya and Sushruta Samhita mentioned around 526,573 and 902 number of plants.[15-17]

Folklore medicine is the synthesis of the therapeutic experience of generations of practicing physicians of the native system of medicine. According to reports of WHO, herbal products are used by a large number of populations for basic healthcare requirements. Herbal medicine includes herbs, herbal resources (like plant parts) or preparations, processed and finished with active ingredients.[18] At the pharmacodynamic scale, herbal products are categorized as medicinal compounds with confirmed effectiveness with known active compounds and doses.[19] Plants are in rich sources of dietary biomolecules, vitamins and minerals.[20] In addition to the existence of organic metabolites, separated into primary and secondary metabolites, results in the pharmacological effects of plant products. For human development and growth are essential primary metabolites including glucose, lipids, polysaccharides, starch, calcium and nucleic acids. Various secondary metabolites (alkaloids, flavonoids, saponins, terpenoids, glycosides and tannins) protect plant form microbial infections or invasions by insects. The therapeutic effectiveness of herbs is pharmacologically active, attributable to medicinal properties is named as "phytocompounds"[21] and the use of stated chemical compounds had low risk of illnesses such as coronary disease, hepatic, renal, diabetes, cancers and neurodegenerative disorders respectively.

The chemical compound of plant, alkaloids have been identified for anti-malarial, anti-spasmodic and analgesic activities whereas terpenoids are for anti-viral, anthelmintic, anti-bacterial and anti-inflammatory properties. The glycosides are reported for anti-fungal and anti-bacterial properties, phenols and flavonoids are for antioxidant, anti-allergic and anti-bacterial properties.[22,23]

Since ancient days, number of drugs from plant source has been used as Indian traditional medicine. Few are reported in the current review such as bacoside from *Bacopa monnieri*, homoharringtone from *cephalotaxuc*, vasicine and vasicinone from *Adhatoda vasica*, morphine and codeine from *Papaver somniferum*, atropine from *Atropa bellabona*, tinosporic acid from *Tinospora cardifolia*, asiaticoside from *Centella asiatica*, nimbidin from *Azadiracta indica*, vinblastine and vincristine from *Catharanthus roseus* respectively.[15,26,27]

DIFFERENCIATION BETWEEN HERBAL AND CONVENTIONAL DRUGS

Even though both are homogeneous they may have few major differences, that are in herbal plant whole plant is used for medicinal purpose and the extracts that contain several different constituents also possess pharmacological activity. It is believed that these will function synergistically together and it influence entire herb provide greater medicinal effect than the combination of its components. Generally, the principles of synergy and buffering may apply to the various combinations of plants and resulted that merging herbs effectively shown maximum efficacy and reduces adverse effects.[10]

TRADITIONAL MEDICINE USAGE BY PEOPLE

The evidence of human use of medicinal plants for healing back to the Neanderthal period and it can be used by a greater number of patients. Use of the plant medicines in correct path provides effective and safe treatment for many diseases. The influence of herbal medicines may vary based on growing conditions of herbs, method of harvesting of herbs, exposure of herbs to various environmental conditions, genetic variation of herbs and mode of preservation. There are numerous reasons for patients heading back to herbal therapies. Often cited as a "sense of control, a mental comfort from taking action," which helps to explain that why many people are taking medicinal plants having who are suffering with diseases which are chronic or uncurable such as cardiovascular diseases, diabetes and cancer respectively. In these circumstances, they believe that conventional medicine has failed to achieve the mentioned advantages of herbal systems.[31-33]

HERBAL MEDICINES IN SAFETY ISSUE

Traditional herbal products are heterogenous and many are highly toxic. Herbs is likely to present a risk of unwanted reactions and interactions. They may face wide range of problems in terms of quality management, quality assurance and regulatory process those are like, few herbals (mercury, arsenic, corticosteroids and lead) cause poison[34,35] and ingestion of herbal medication has been reported for hepatic dysfunction. One of the research reported that corneal ulcers in Tanzania and childhood blindness in Nigeria respectively.[36,37] Herbal products may be contaminated, adulterated and misidentified and the patients who are taking herbal formulations should be monitored on regular basis. The interaction of traditional and conventional medicine may be harmful and raised a serious concern among the medical scientists regarding the patient's safety. Recently, one of the research reports stated that after administration of Chinese herb, interstitial renal fibrosis was developed rapidly in the women.[10] One of the medicinal herbs, *Aristolochia fangchi* (Chinese) causes both kidney failure and cancer as well.[34] A group of dietitians found a symptom of renal failure, an examination discovered that Belgian pharmacists used mislabeled Chinese herb to prepare diet pills.[38] When herbal tea stored incorrectly, it allows the growth of *Aspergillus flavus*, a known producer of aphalotoxin mycotoxin.[39]

BIOAVAILABILITY OF HERBAL DRUGS

Bioavailability is one of the important key factors to the medicinal herb. In Ayurveda, long pepper, ginger and black pepper are commonly known as "Trikatu." It must travel from the gastrointestinal tract to the bloodstream before the substance reacts systemically. Hydrastine and berberine like botanical compounds are not easily absorbed after oral intake and hence these should be administered through parenteral route.[40] Cinnabar which is a medicinal herb, it doesn't show desirable solubility and mercury component should not be fully absorbed by the gastrointestinal tract. But the study of oral absorption of cinnabar revealed that mercury concentration is raised in the kidneys and liver of mice.[41] Concomitant use of cinnabar and drugs containing sulphates, bromides, nitrates, sulphides and iodine can increase its toxicity by enhancing gastrointestinal absorption.[42] The absorption enhancers (bile salts, chelating agents' fatty acids, surfactants, salicylates, and polymers) are effective in improving the intestinal absorption.[43,44] Few herbal compounds also used to increase in bioavailability such as quercetin, genistein, glycyrrhizin and nitrile glycoside respectively. Quercetin medicinal compound exhibited a wide range of advantages including antioxidant, radical scavenging, anti-atherosclerotic, anti-inflammatory, anti-viral effects and anti-tumour respectively.[45] Another medicinal compound, quercetin showing bioavailability improvement and efficacy of few drugs including diltiazem, digoxin, and epigallocatechin gallate.[46-49]

COMPLICATIONS TO BE SOLVED BEFORE HERBAL MEDICINE BECOME MAINSTREAM

In the preconception of current practitioners in health care who were not aware about phytomedicine during their undergraduate studies and thus conclude that all of them are ineffective and forms a barrier.[40] Traditional medical professionals must be convinced regarding effectiveness of the drug extract.[50] The use of traditional beliefs and knowledge of folk healers is an alternative route to the discovery and isolation of pharmacologically active compounds.[51] Adulteration, misidentification, faulty collection and preparation, incorrect formulation process affects the quality and purity that reduces the effectiveness of herbal preparation and can be considered as key factors. Nonetheless, intellectual property rights will secure indigenous and cultural information so as to help stop the 'piracy' of both Indian and international drug companies.[52]

Documentation of old knowledge is important for our future. Books, articles, and literature, particularly these days, the online environment is packed with a flawed source, many of which are written to market a product.[40] Some places simply list herbs and some of their uses address control, protection or efficacy. Research and development on dosage, processing techniques are the key for medicinal drugs, but in the herbal sector it is quite less compared to conventional medicine. Also, a medicinal plant with well-recognized toxicity, such as ephedra, does not have preventive measures.[31] Some imprecise and unreproducible findings have emerged in the literature since doctors recognize at face value the consistency of the herb that has been adulterated. In comparison, the chemical names, the botanicals in the drug checked and the error-free dose administered are not known.[53] Hence safety is a principal issue for herbal remedies and therefore clinical trials are necessary to understand the safety and efficiency of the drugs before introduced them in the global market.

RESEARCH EFFORTS ON HERBAL MEDICINE

As signified by the few scientific research papers it indicated there is an increased attention among pharmacologist, microbiologist, botanist, natural product chemists and biochemist to explore the drugs and dietary supplements form medicinal plants for newer phytochemicals.[54] Most of these research trials cover the areas of extraction, isolation, purification, detection of bio-analytical methodology, and characterization of the bioactive principles of chemical compounds. However, there will be more research efforts are keeping on herbal medicine, which aim to describe their molecular structures, probable mechanism of action and toxicological properties respectively.[55] For instance, employed spectroscopic data to identify five phytosterols, namely, 24-methylene cycloartanol, cycloartanol,

Table 1: Types of Herbal Medicine and Benefits.

Sl. No.	Herbal Medicine	Treatment	Adverse Effects	References
1	Echinacea Purpurea	Snake bites, toothache, skin disorders, bowel pain, chronic arthritis, seizure and cancer.	Asthma, atopy, or allergic rhinitis, abdominal pain, urticarial, nausea, erythematous.	[29]
2	Valerian	Insomnia, Epilepsy, Menopausal, Menstural and Anxiolytic.	Excitability, headache, gastrointestinal complaints and ataxia, chest tightness, and tremors.	[28]
3	St. John's wort	Neuralgia, Excitability, fibrositis, Menopausal Neurosis, sciatica, wounds, depression.	Fatigue, constipation, nausea, vomiting, dry throat, headaches, dizziness.	[28]
4	Ginseng	Diabetes, low cholesterol level, Sexual dysfunction in men.	Agitation and elevation of blood pressure, mastalgia and vaginal bleeding.	[29,30]
5	Garlic	Colds, chronic bronchitis, coughs, respiratory catarrh, bronchitic asthma and influenza.	Burning sensation in the gastrointestinal tract, diaphoresis, nausea, and light headedness.	[29,30]
6	Kava	Soothing nervous illnesses, inducing sleep and relaxation, reducing weight and counteracting fatigue, rheumatism and gonorrhea.	Gastrointestinal discomfort, headaches, high doses may cause scaly, dry skin and discoloration of nails and the skin, eye redness.	[28,30]

Table 2: Potential Interactions between Herbal Formulations and Conventional Drugs.

Sl. No.	Herbal medicine	Conventional medicine	Adverse Effects
1	Ginseng	Phenelzine sulfate.	Headache, tremulousness, manic episodes.
2	Liquorice	Spironolactone.	Antagonism of diuretic effect.
3	Kava	Benzodiazepines.	Sedative effects, coma.
4	St. John's wort	Antiretrovirals, digoxin, theophylline, cyclosporin, oral contraceptives.	Decreased clinical effect.
5	Echinacea	Corticosteroids, cyclosporin.	Antagonistic effects.
6	Valerian	barbiturates.	excessive sedation.

Table 3: Examples of clinical trials conducted on Herbal Medicines.

Sl. No.	Example	Purpose/ Methodology	References
1	Herbal treatment of irritable bowel syndrome.	A double blind randomised controlled trial study conducted to determine whether Chinese herbal medicine is safe in irritable bowel syndrome.	[66]
2	Treatment for the patients of rheumatoid arthritis with the extract of *Tripterygium wilfordil* Hook F.	Ethanol acetate extract of TWHF showed therapeutic benefits for the patients with RA.	[67]
3	Niprisan herbal trial for mild hand foot mouth disease.	A double blind controlled, randomized cross over trial for safety and efficacy of Niprisan.	[68]

Table 4: **Indian Medicinal Plants Parts Exported and Imported.**

Exporting of Herbals		Importing of Herbals	
Botanical names	**Parts used**	**Botanical names**	**Parts used**
Argemone mexicana	Fruit	*Adhatoda vasica*	Whole plant
Acorus calamus	Rhizome	*Aloe vera*	Dried leaf
Curcuma amada	Rhizome	*Cinnamomum iners*	Bark and leaf
Curcuma longa	Rhizome	*Curcuma aromatica*	Rhizome
Glycyrrhiza glabra	Root	*Juniperus communis*	Fruit
Cassia lanceolata	Leaves	*Gloriosa superba*	Tuber and seed
Terminalia chebula	Bark and seed	*Tylophora purpuria*	Root
Zingiber officinale	Rhizome	*Vinca rosea*	Leaf, seed

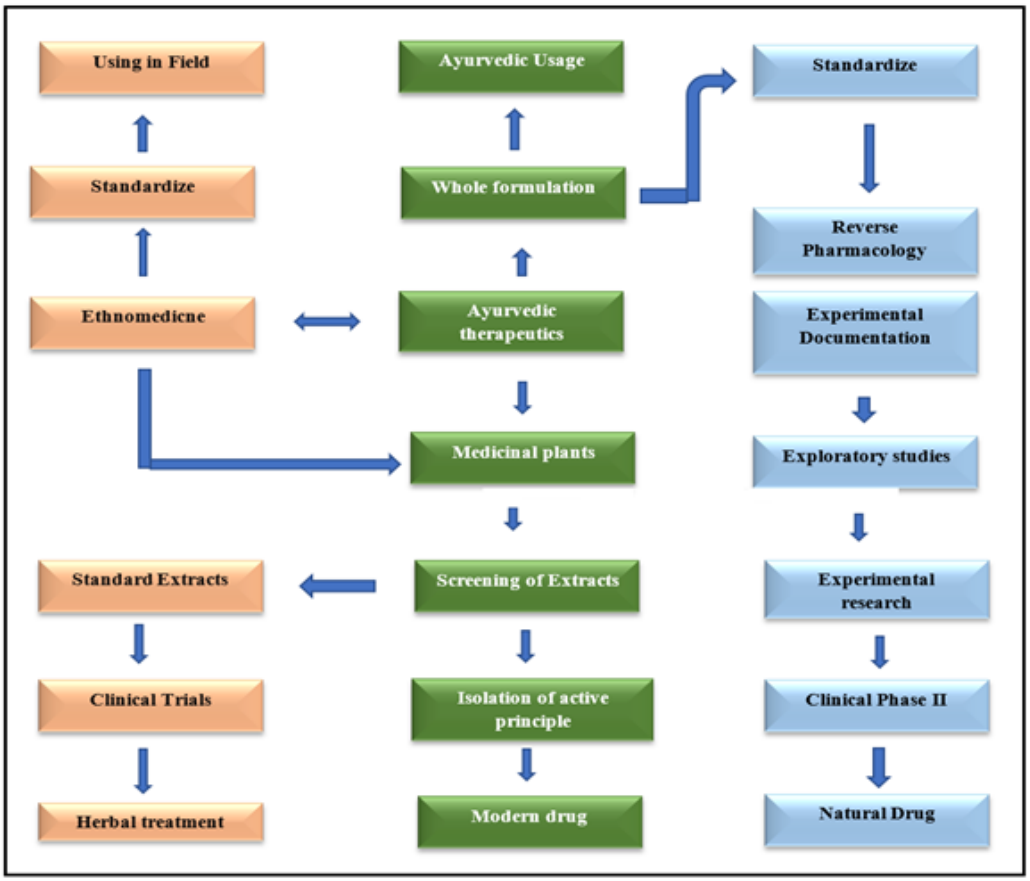

Figure 1: Pathway to research and development of natural products.

lophenol, 24-methyllophenol, and 24-ethyllophenol as the major anti-hyperglycemic phytochemicals.[56] One of the cardiac glycoside named as Peruvoside, which is isolated from *Thevetia peruviana* at the Indian laboratory.[57] One more potent chemical compound such as Taxol, obtained from *Taxus brevifolia*, which shows an anti-cancer activity.[58]

Based on evidence-based work, a revolution in clinical standardisation of herbal medicines is taking place in the 21st century. Their efficacy has been supported and proved through many *in vivo* clinical trials[59] and use of certain herbal medicines have also been assessed and recognized for using *in vitro* and *in vivo* systems.[60] The scientists had a great effort to isolate, classify and corroborate the effectiveness of bioactive chemical components. Therefore, extensive empirical evidence from randomized clinical trials has provided positive results for the use of most herbal preparations.[61-63] Furthermore, the mechanism of action of herbal medicinal product was found with the help of

Omic techniques to understand bioactive principles, which may use to modernize and standardize several herbal medicines.[64]

NEED FOR CLINICAL TRIALS

In 1993, Drug Controller General of India was explored the guidelines for safety and efficacy of herbal medicines. Of course, there are several drawbacks are there in developing clinical trials of herbal drugs which are stated based on various laws and regulations.[65] Generally, Randomized Clinical Trials (RCT) have been used for herbal formulations and that design may reduce bias and isolates placebo effects. Usually, RCTs are double-blinded which means neither the investigator nor the subject knows about the treatment allotment. Herbal medicinal products, unable to maintain double-blinded design due to the involvement of multidimensional treatment (counselling, explaining, listening, lifestyle, and dietary advice).[66] Another challenge involved in the RCT of herbal drugs is the selection of controls. Controls are selected such that they closely match with the intervention group as comparator similarity is essential if the trial is intended to provide the evidence of a specific effect of the herbal medicine.[67] It is believed that randomization may abolish the practice of preferences given to the subjects to select a treatment of choice.[68] Brewin and Bradley thereby proposed an approach called partial randomization whereby patients are asked about their choice and are given for treatment.[69]

Thousands of years of traditional use can provide valuable guidance on the selection, preparation and application of herbal formulations. Moreover, it has to be considered that the systematic standards and clinical testing must be applied.[70] A number of herbal marketers have already implemented for a plan to make develop investments on clinical trials. In the current review we have mentioned few, those are grape seed extract (*Vitis vinifera L.*), Schwabe of Germany, performed clinical trials on *Hypericum perforattum* L, Pharmaton in Switzerland, Lichtwer is well known for the study of garlic (*Allium sativum* L.). Nutrilite and Pharmanex in the United States sponsored the analysis of Serenoa repensand for red yeast (*Monascus purpureus* Went), respectively.[40]

MARKET POTENTIAL OF HERBAL MEDICINE

In the last two decades, pharmaceutical industries are showing interest of towards medicinal plants due to awareness and interest in herbals by the public and scientific community. India has been exported around 1200 million herbals yearly. So that the major pharmaceutical companies which are plant-based are increase turnover almost about 15%. Among all the pharmaceutical industries turnover which is of near to 14,000 crores, Indian herbal medicinal industry is giving 2,000-3,000 crores as annual turnover.[65] In USA, the herbal drugs usage is most common on prescription it is around one-fourth (prescriptions). Sale of herbal drugs in the USA is around US$ 4.5 billion (1980) and US$ 15.5 billion (1990). As a result, 119 drugs were obtained from 91 plants (1995).[66] Due to such increasing demand for natural products it was expected that the share of plant-derived prescription drugs would be increased by up to 30% in nearby time (Wilkinson, 2000). According to the 2007 National Institute of Health survey, 4 out of 10 adults and 1 out of 9 children using herbal medicine.[63]

Herbal products are part of US$ 28.7 billion in annual dietary supplement sales in the United States in 2010, according to Nutrition Business Journal. More than 60 million U.S. consumers took herbal remedies. Castor seeds produced in India is about 1,25,000 tons per annum and Terpenoids is about US$ 12.4 billion respectively. Steroids are another medicinal herb group drugs which are showing maximum turn over next to the terpenoids and next place is with glycosides, flavonoids, saponines, anthraquinones and digitalis respectively. It included alkaloids from belladonna, cinchona, camptotheca, poppy, rauwolfia, vinca and others. Other miscellaneous substances of plant-derived herbal compounds are vitamins, salicylates and ephedrine etc. In Germany, plant medicine is identified as the key element of naturopathy, approximately 600–700 herbals are prescribed by 70% of German physicians.[64,65]

CURRENT STATUS OF HERBAL MEDICINE: SOURCE OF MODERN MEDICINE FROM HIGHER PLANTS

According to WHO, nearly 25% of modern medicines have been obtained from plants which are being used as traditional medicine but now, WHO has given statement on herbal medicine that it is a crucial component for primary health care.[71] It has benefited from the objective analysis of medical science and with some impressive credentials.[72] The widespread use of herbal medicine is not constricted to developing countries, as it has been estimated around 70%.[73] The number of patients seeking herbal approaches for treatment is also improving exponentially.[74] Few of herbal drugs have taken to reach modern therapeutics in a long way such as vinblastine from the *Catharanthus roseous* is used in treatment of Hodgkins, leukaemia in children, testicular and neck cancer.[75]

Furthermore, in 1953, a compound named serpentine isolated from the root of *Rauwolfia serpentine* (The Indian snake root) has an active ingredient reserpine interesting discovery in the treatment of hypertension, lowering of blood pressure and also a tranquilizer to treat certain types of mental and emotional problems.[76] It was estimated that about 100 new plant-based medicines, including reserpin, rescinnamine, deserpidine, vinblastine and vincristine were introduced in the US pharmaceutical industry between 1950-1970. From 1971 to 1995 new drugs isolated from plants such as etoposide, e-guggulsterone, artemisinin, plaunotol, Z-guggulsterone, nabilone, and ginkgolides. paciltaxel, gomisin, and topotecan,

occupied their place in pharmaceutical industries.[77] Moreover, recent decades several other chemical compounds are derived from plant sources are including ephedrine, quinine, digoxin, atropine, and colchicine respectively.[78,79]

In a recent study 520 new drugs are approved.[80] Belladonna is used in the preparation of ophthalmological formulations and also in antiseptic medicine. Plants, animal parts and even microorganisms were first used in unmodified form, then as a distilled extract to enhance their strength and quality of operation.[81] Natural product discovery has been rekindled by discovery of novel molecules from aquatic animals such as bryostatin and also the new potent chemotherapy agent that is Taxol. In addition to the above statement, now a days there are many herbal medicinal products which are used in the treatment of cardiovascular disease, insomnia, stress, autism, asthma, neurological disorders, liver disease and other diseases respectively.[82,83]

CONCLUSION

Herbal medications are common for patients with medical diseases such as cardiac attack or cancer, and it should be remembered that herbal side effects are often close to signs of their illness or treatment-related complications, making it difficult to recognize. Herbals like Ayurveda and others have a greater scientific effectiveness. Stick implementation of rules, supervision, and frequent review of regulations are absolutely necessary to promote herbal medicine primarily because they generally persuaded that they have no side effects, cheap, and locally available. Finally, physicians should monitor the discerned benefits and adverse effect of patient-consumed self-prescribed herbal treatments. Additionally, following the current sustained improvements in quality control and regulatory measures in many countries of the world, it is envisaged that in the near future, herbal medicine will be integrated into conventional medical systems.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

WHO: World Health Organization; **RCT:** Randomized clinical trials; **RA:** Rheumatoid arthritis; **TWHF:** *Tripterygium wilfordil* Hook F.

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