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Some issues related to pharmacognosy

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ABSTRACT

This study was designed to discuss some of the important issues related to the subject pharmacognosy, to assess knowledge and attitude about pharmacognosy among pharmacy teachers and professionals in India, which has not been evaluated previously. The contribution of pharmacognosy in pharmacy as well as in research has got wider recognition from ancient times. Pharmacognosy, one of the oldest scientific disciplines is now undergoing major change. Currently plant based drugs are researched and formulated in modern framework of medicine rather than in the form of galenical preparations or conventional dosage. Subject is witnessing transformation from *galenical* to *genomical*. Even in the era of biotechnology and bioinformatics subject holds paramount importance because of its interdisciplinary and flexible approach. This study reports some issues along with the current level of knowledge and attitudes towards subject among teachers, professionals. Participants were 50 persons including teachers, professionals concerning with the subject, who completed a discussion as well as questionnaire measuring subject knowledge. These findings will assist in the development of an education module, to equip budding pharmacognosist, health care personnel to impart accurate and update knowledge and hasten natural product research too.

Keywords: Pharmacognosy, Herbal medicine, CAM, Standardization.

INTRODUCTION

The term 'pharmacognosy' was coined in early 18th century, and has been in use in last 200 years as one of the important scientific discipline. During the last half of the 20th century, pharmacognosy evolved from being a descriptive botanical subject to one having a more chemical and also biotechnological focus. At the beginning of the 21st century, pharmacognosy teaching in academic pharmacy institutions has been given new relevance, as a result of the explosive growth in the use of herbal medicines. Pharmacognosy, a long-established pharmaceutical science is now undergoing major change. Currently plant based drugs are researched and formulated in modern framework of medicine rather than in the form of galenical preparations or conventional dosage. Since last two decades, as herbal wave continues to dominate drug discovery and development, pharmacognosy has gained faster pace. Recent advances in extraction, chromatography, hyphenated techniques, screening of natural product as well as application of biotechnological tools in natural product research has necessitate sound knowledge of pharmacognosy(1). Rapid progress of biotechnology has opened new avenues for pharmacognosist to hasten natural product research. Newer approaches, which are more superior in sensitivity as well as specificity than conventional one, are gaining popularity. Now the subject pharmacognosy embarrasses wide range of diverse techniques(2). Since the nineties, the drug discovery process has been in the throes of a substantial methodological revolution, following rapid ascendancy of molecular biology, genomics, metabolonomics, bioinformatics, nanotechnology, amid high expectations that this would bring remarkable dividends in terms of speed, cost and success rate. Still drugs of natural origin continue to be important for the treatment of many diseases worldwide. Pharmacognosy, one of the oldest scientific disciplines has played a diverse role in the discovery, characterisation, production and standardisation of these drugs. The relevance of this discipline in terms of research and teaching has increased in the last decade as members of the public in developed countries have turned to the use of herbal remedies for the self-medication of minor diseases.

On this background pharmacognosy has long stood out. Herbs can be turned into products. They can be the origin of new synthetic medicines. They can even be the basis of patentable extracts. All these activities can be commercially justified which culminated growing interest of various industries and researchers. However, this picture is by no means complete and there are real concerns for the future. The research record so far is very patchy. Issues related to this need careful consideration. Overwhelmingly, the literature is dominated by laboratory studies with little clinical application. Natural variation in the quality of plants and an unregulated market means that it is difficult to project results from one study onto other medicines sharing the same name. The best clinical research therefore has been produced in countries where herbal medicines are tightly regulated. Commercial investment in clinical trials costing many hundreds of thousands of euros can only be justified if the manufacturer can recover his investment from the marketplace(3). Similarly, many phytomedicines require further investigation for their clinical effectiveness, while others need to be thoroughly investigated for their potential health risks or interactions with prescription drugs(4). Renascence of subject pharmacognosy will be complex

procedure requiring multiple strategies to boost natural product research. Pharmacognosist can provides promise of an alternate way to approach the problem. In coming days, we hope that this subject will demand more interdisciplinary approach and continue to develop.

Critical role of pharmacognosy

While looking towards newer advents, one can not overlook basic pharmacognosy and its interdisciplinary approach. Reverse pharmacognosy is used to find new biological targets for natural compounds by virtual or real screening and identify natural resources that contain the active molecules. Reverse pharmacognosy and its inverse docking component cannot only be integrated into a program for new lead discovery but is also a useful approach to find new applications for identified compounds(5). Reverse pharmacognosy, with amalgamation of traditional knowledge can address various bottlenecks in new drug discovery, a high risk business, with only about one project in fifty reaching its goal of putting a new drug in the market. It takes pretty long time and a bit of high cost. In addition to this, only one drug in the market brings enough revenue to cover its development cost. Recent arrivals on the fringe are subjects like genomics, metabolonomics are also playing key role (6). Biotechnology, which was previously production of drugs or other useful products by biological means, now encompasses vast array of disciplines. With the renewed interest from Western countries in herbal remedies, and the increasingly urgent need to develop new effective drugs, traditionally used medicinal plants have recently received the attention of the pharmaceutical and scientific communities (7) Results of all, pharmacognosy research areas are continuing to expand, and now include aspects of cell and molecular biology in relation to natural products, ethnobotany and phytotherapy, in addition to the more traditional analytical method development and phytochemistry (8).

Purpose of the study

The present study was designed to assess the current level of knowledge among pharmacognosy teachers, also with intent to carry out thought provoking discussions at full length. Teachers are playing critical roles in imparting quality education and creating interest in the mind of budding students in India. They are the disseminators of knowledge to the future generations and thus, are of utmost importance.

Method design, sample and setting

This study of pharmacognosy teachers can be small part of a larger study designed to examine the knowledge and attitude towards the subject. Study goals and procedures were finalized after through discussion with renowned persons in education and research. Data were collected from 50 participants, 30 pharmacognosy teachers (educators) and 20 pharmacy professionals from all over India. The participants were 3:1(Male: Female) in terms of gender. Individuals were eligible to participate in the study if they had master degree with minimum three years teaching experience of the subject and professionals having doctorate degree with research experience.

Procedure - Data were collected between Nov. 2007 and Jan. 2008. Participants were informed about study aim and protocol. After completing informed consent, participants attended a 60-minute focus group session (total of two), conducted in an auditorium at the Bharati Vidyapeeth University's Poona College of Pharmacy, Erandawane, Pune-38. The focus group sessions were aimed at determining the:

1. Current role and status of pharmacognosy
2. Perspectives and beliefs of teachers about subject
3. Barriers to and facilitators in delivering effective education
4. Applicability of Traditional and current knowledge for future use
5. Implementation of theoretical and practical knowledge in future
6. Finally, any proposed changes to strengthen pharmacognosy research.

In addition to this, participants completed a questionnaire about knowledge and attitudes towards pharmacognosy. Due to the generally smaller sample size required for qualitative studies, the study was powered to detect only large differences between the teachers on dichotomous measures.

Instruments

Subject knowledge and attitudes were assessed by a set of the questionnaire containing 20 questions, which were selected carefully by considering syllabus of some important universities as well as current trends in pharmacognostic research.

Limitations

The results reported here, reflect the quantitative aspects; there are several limitations. First, the sample size is relatively small, including only 30 teachers and 20 professionals and second, may not reflect the knowledge and attitudes of those in more remote areas.

Discussion

This study was designed to assess knowledge and attitudes for the purpose of developing a more effective training program, to create penchant for the subject. Findings revealed the knowledge, the status of the subject and some of the issues related to pharmacognosy which we have discussed here. The lack of knowledge was not surprising given that these participants verbalized in the previous focus groups; in fact, most of the participants had not received any training and, therefore, demonstrated limited knowledge of subject. Clearly, education might assist with more information about the subject and to arouse the interest about the subject.

There are multiple reasons why this study is important. First, India has one of the wealthiest traditional yet living systems of medicine, Ayurveda and also Sidhha, Homoeopathy, Unani and others too. This rich traditional knowledge has helped pharmacognosy to prosper. Because of this background pharmacognosy has strong base in majority of colleges and universities. Second, it has got large pool of scientist and students working in the arena of natural products, also gifted with rich and varied biodiversity. Additionally, WHO is also promoting traditional systems of medicine as strategy to lesson the burden on mainstream. These drugs are relatively inexpensive; which is particularly important for developing countries, where drugs are still not widely available free of charge. As complementary and alternative therapies are

considered, in a recent study, the subject hold promise for the future, the plea for ongoing evidence-based information is needed. Thus, need to perform global assessment and major activities to strengthen the subject pharmacognosy. Also necessitates attempt to develop critical and effective training program and in turn attitude as well as knowledge thus leading the way to further knowledge development and integration into mainstream clinical practice settings.

Key points or main challenges

Some of the important aspects are revealed through the discussion with all candidates are as follows:

Pharmacognosy can play major role in drug discovery as well as development. Majority of participants believe there is lot of scope to explore the Complementary and Alternative Medicine (CAM), study of which can become main branch in future. Flexible nature of the subject has actually helped to evolve the discipline. Interdisciplinary nature of subject should be kept as such to accommodate newer trends, which in turn hasten further development. CAM is becoming increasingly more prominent in the scientific establishment especially in natural products. By so doing, we are able to re-think theories and hypotheses that have been long accepted, and have the courage to embark on a new search that will eventually lead to new and exciting healing modalities with a firm evidence base (9). The use of CAM has increased from 34% to 42% in adults in the year 1990 to 1997. Lot of researchers all over world working in the domain of CAM are giving preference to evidence based alternative and complementary medicines. To our opinion pharmacognosy in true sense includes the study of CAM.

During the last decade, popularity of alternative medicine increased significantly world wide with noticeable trends in the United States in particular. This in turn accelerated the global trade of herbal raw materials and herbal products, and created high scope for the Asian countries, which are the major suppliers of herbal raw materials in the world as major pharmaceutical giants have revived their strategy in favor of herbal drugs. Herbal medicine is still the mainstay of about 75–80% of the world population, mainly in the developing countries, for primary health care because of better cultural acceptability, better compatibility with the human body and lesser side effects. This situation, in turn highlights the importance of pharmacognosy. Two decades ago, WHO referred to traditional health systems (including herbal medicine) as 'holistic' – that of viewing man in his totality within a wide ecological spectrum, and of emphasizing the view that ill health or disease is brought about by an imbalance or disequilibrium of man in his total ecological system and not only by the causative agent and pathogenic evolution, probably implying that the indigenous system drugs (including herbal medicine) restore the imbalance or disequilibrium leading to the cure of ill health or disease. Such an attitude sent signals that WHO as an organization is promoting leadership to establish traditional systems of medicine, which provide health care to about 80% of the world population (10). Consumer concerns about quality cropped up in the late 1990s, as many companies rushed to bring herbal products to mainstream markets. Consumers grew confused by the flood of new brands. Widespread newspaper reports of deaths and other serious adverse reactions, scandals over product labels that misrepresented ingredient content, the discovery of contaminants such as heavy metals, and mixed results in efficacy trials further dampened public enthusiasm. Nevertheless, botanical supplements are still popular. On this background one needs to understand basic science of pharmacognosy and its newer relations to modern techniques.

In future years, it will be difficult to meet demand of raw material because of limited resources. Actually lack of proper supply of genuine raw material is underlying cause to encourage adulteration. As demand for herbal products is increasing in coming years there will be serious problems regarding supply of raw material. Systematic plantation and cultivation on large scale will be required to meet increased demands in future. If this problem will not be tackled, the most important fact is that this will encourages substitution. Considering the need of industry there is pressing need for large-scale cultivation and Good Agricultural Practices (GAP) to ensure the constant supply of raw material. The importance of GAP is rightly recognized by WHO which has culminated in development of guidelines for good agricultural and collection practices (GACP) for medicinal plants. Quality control directly impacts the safety and efficacy of herbal medicinal products. Good agricultural and collection practices for medicinal plants is only the first step in quality assurance, on which the safety and efficacy of herbal medicinal products directly depend upon, and will also play an important role in the protection of natural resources of medicinal plants for sustainable use. Until now, only the European Union and a few countries, such as China and Japan have developed regional and national guidelines for good agricultural and collection practices for medicinal plants. There is also reason to believe that more countries will develop their own guidelines for the quality control of medicinal plants based on the guidelines developed by WHO (11).

Eighty percent of the participants have said need to change in syllabus to accommodate newer techniques like advances in extractions, chromatography, newer screening techniques, DNA fingerprinting etc. Most of participants believe that subject should be more industry oriented. Standardization by using chemical marker seems to popular area in pharmacognostic research, as standardization is main concern of industry much work is needed in this direction. While only ten percent believe that more emphasis should be given to botany and other basics of the subject. Eighty percent of candidates have suggested use of visuals in the form of pictures to make learning more effective and to generate the interest about the subject. Also, there should be correlation between theoretical and practical knowledge. Visit to medicinal plant garden, examples of commonly used home remedies that can be given to understand the drugs in theory are some of the ways to make learning more effective. Participants answered majority of knowledge-based questions correctly. At the same time ten percent participants were not sure about 'father of pharmacognosy'. A few items also

revealed wide discrepancies between teachers. Use of Soxhlet and Clevengers apparatus for extraction of phytoconstituents, basic in subjects is still not clearly known to some teachers.

According to discussion main hurdles to popularize herbal drugs are lack of standardization, improper marketing, non-transparency, absence of comprehensive authoritative book, extremely unorganized trading. China has been successful in acquiring the single largest share in this export market because of its well-designed national policy on the traditional Chinese medicine. Ginseng is the major item of the Chinese export (12,13) According to Hildebert Wagner, in Germany, there are two reasons phytopharmaceuticals are of high standard and are classified primarily as conventional drugs by law. One reason is that during the last 50 years both medical practitioners and the increasing interest of patients have kept traditional medicine alive in herbal drugs. The other reason is that shortly after World War II the pharmaceutical industry specialized in and relied on herbal drugs and also developed and supported projects aimed at optimizing the quality of herbal drugs by standardization and scientific basic research. This development was paralleled by an intensified evaluation of herbal drugs and a search for the active principles of phytopreparations (14). Regarding improvement in the subject, majority of participants believe in implementation of Good Manufacturing Practice (GMP), Good Agricultural Practice (GAP) and validation of instruments as well as protocols. Natural absence of several species of demand in the wild, and bad harvesting/marketing practices are some of the major factors, which have helped to more or less neutralize the quantitative impact of the global trend in herbal trade on the medicinal plants. However, cases of overexploitation are there. Of late, commercial cultivation of some species is becoming a craze for some people who are lured by the market forces, but cases of failure are not rare. On the other hand, qualitative impact of the global trend has been noticed. Authenticated raw material is the basic starting point for the development of a botanical product. However, harvesting, storing, processing and formulating methods may dramatically affect the quality and consistency of the final product by altering the desired marker components or by increasing the possibility of unwanted contaminants. Thus, validated methods to ensure quality control in manufacturing and storage are required tools for optimal efficacy and safety of the products. These controls are also critical for the evaluation of pharmacological, toxicological and clinical studies of the botanical supplements (15).

Most burning problem of standardization has to be addressed carefully. One has to consider the intrinsic nature of these herbal remedies variation in chemical constituents. Although lack of standardization in the allopathic way creates difficulty for the herbal drugs in getting a Government nod in the west, the hope lies in the OTCs (Over the Counter drugs). When marketed as dietary supplements, these items have a comparatively better scope of marketing. Also there was consensus that there should not be comparison with allopathic or modern medicine system as both branches have many differences. Meanwhile sales in the largest herbal market, the USA, are based entirely on a status for herbs as dietary supplements, where clinical evidence can be useful but is not required, and there is no product protection for any such investment. Moreover, there is need for significant efforts utilizing traditional knowledge and the subject. A large proportion of the population of developing countries uses traditional medicine alone, or in combination with Western drugs to treat a wide variety of ailments. There has seldom been effective collaboration between the traditional and Western medical practitioners, largely due to the perception that the use of traditional and herbal medicines has no scientific basis. As herbal drugs are so deeply integrated in our lives that we have to consider them while treating patient with modern system of medicine. In this regard we have to consider pharmacognosy of particular drug in detail. Although many ethical herbal medicine manufacturers are thought to be producing high-quality products with careful identification procedures, batch-to-batch standardization, and assays for impurities, it is difficult to identify which brands and products meet even basic quality standards. In the absence of generic equivalents and regulatory standards of quality, consumers and healthcare professionals must research companies and their products individually. On this background, proper application of pharmacognosy knowledge will definitely help to tackle this serious issue.

CONCLUSION

Market is flooded with herbal medicinal and cosmetic products; research in natural product is demanding more inputs, despite of this there is decreasing interest in the subject in recent years. Many students are hesitant to choose this branch. Mere change in syllabus will not work, despite there should in attitude too. In particular, there is a need to impart focused training and counseling about subject. Moreover, it is imperative to educate and train the educators and practitioners of the traditional system of medicine, keeping in mind the rising interest in herbal drugs. The training module for such purposes must address burning issues like standardization of herbal drugs, monograph preparation, scientific validation of traditional claims, better methods for extraction and characterization will remain major thrust areas. This training must be supplemented with continued education on these areas. In the future, longitudinal studies on large scale should be conducted to track the knowledge and attitudes of this significant group of providers to determine the efficacy of changing educational curricula on both students and educators. While newer books being compiled, it is expected that efforts will continue for better knowledge of the subject. The old methods and practices are being transformed with the awareness of newer technologies for the need of more precise dosage of herbal remedies. It is hoped that increase awareness and collaborative interdisciplinary research will help to develop better future for the subject and betterment of mankind. On such background, pharmacognosist should be better equipped to take the upcoming challenges. As there are many colleges teaching this subject and much more researchers in India who could have a significant impact on disseminating knowledge about pharmacognosy, these professionals could be very

useful in creating interest in upcoming students and to get maximum benefit of this knowledge to mankind.

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