THE ROLE OF MEDICINAL PLANTS IN PRIMARY HEALTH CARE DELIVERY FOR SUSTAINABLE DEVELOPMENT GOALS (SDG): NATURAL PRODUCT CHEMIST'S VIEW

Ezekiel, S. J.

Department of Chemistry, Umar Suleiman College of Education, Gashua, Yobe State

Corresponding Author's Email: nehemiaheze@gmail.com 08030572978

ABSTRACT

There has been a concerted effort by governments of the world through summits to address global issues. A giant stride in global development has been witnessed through the 15 years of Millennium Development Goals (MDG) which ended in 2015. That led to the adoption of Sustainable Development Goals (SDG) which also addresses global issues including "Universal Health Coverage (UHC)". The need to attain stable health has been a global challenge since the ancient times. Plants have been in use for purposes such as food and herbal medicine. However, in recent times, science of synthetic chemistry and pharmaceutical science produced the allopathic drugs which were preferred to herbal drugs, but because of side effects, addiction and microbial resistance, natural product drugs have become more popular because drugs isolated from plants and scientifically moderated to improve their potency and safety have proved to be more reliable. In order to achieve the universal health coverage as advocated by the sustainable development goals, plants must be conserved and multiplied to create enough raw materials for the isolation, separation and preparation of natural product drugs. It is because of the quality and patronage of such drugs that care must be taken to address the degradation of natural habitats that renders some plant species to be endangered and subsequently extinct. Governments have globally been addressing the menace of human involvement in natural habitat degradation giving rise to increasing number of endangered plant species. Unfortunately, a total adherence to the established laws have not been achieved and hence more and more of the important plant species are being endangered and some are being feared for going into extinction.

Keywords: Medicinal plants, SDG, WHO, Phytochemical

INTRODUCTION

To achieve a global sustainable health care delivery before or by the year 2030 as it is being advocated by the sustainable Development Goals (SDG), no stone would be left unturned in the search for possible ways to achieve the goal. It is in this regard that this paper seeks to relate the impact of the endangered plants species on achieving the goals of the sustainable health care delivery.

In spite of the giant stride made in technological advancement of the 21st century, a large percentage of the global population still rely on plants for health care delivery. The World Health Organization (WHO) estimated that about 75 - 80% of the world population presently use herbal medicine for one form of primary health care or the other (Ahmad *et al*., 2013; Rex *et al*., 2018). It is noted that 35% of all drugs prescribed today are obtained from medicinal plants. In fact, among modern drugs currently in use, 40% are of natural origin (Rex *et al*., 2018).

However, most of the common medicines like aspirin, diclofenac, enoxaparin, ibuprofen, naproxen and warfarin available over the counters are associated with minor (back pain and head ache) to serious side effects (excessive bleeding, haemorrhage and difficulty in breathing) (Nisar *et al*., 2018). In addition, such medications are expensive and are not always within the reach of the larger society. But herbs have been found to contain active principles which act as

drugs. For example, opiates are used as pain relievers; digitalis, act against heart failure and Taxol, is noted as a plant based anticancer. All these drugs are obtained from plants. Some plant chemicals (phytochemicals) also show antioxidant activity with minimal or no side effect,(Nisar *et al*., 2018).

Phytochemicals have played great role as natural drugs for treatment of diseases as well as precursors for semi-syntheses of drugs. It is projected that in the industrialized nations, more than 60% of all medicines are either natural products or semi-synthetic drugs. The history of plant drugs is inextricably intertwined with that of allopathic or conventional drugs, but pharmacologists rather than use the whole plant, identify, extract, isolate, extract and synthesize individual components, thus capturing the active properties as against the herbalists who consider that the power of plant medicine lies in the interaction of all its ingredients (Ahmad *et al*., 2013).

It is apparent that plants are used as drugs but, the problems encountered now is the depletion of the plants that have age-long track record of medicinal importance. Globally, governments have established laws to checkmate the processes responsible for the depletion of plants and rendering some to become endangered plant species. Factors such as geological transformation, climate change and human activities have been pin-pointed as the major reasons for plant depletion and subsequent extinction, (Ahmad *et al*., 2013).

It is the aim of this paper to highlight the role of medicinal plants in achieving primary health care delivery and, to also highlight the envisaged setback to this noble cause as it is clearly spelt by the Sustainable Development Goals (SDG). The involvement of medicinal plants in drug development in order to make drugs available and affordable to the teaming global population has also been discussed.

DRUG DISCOVERY AND DEVELOPMENT FROM PLANTS

The Millennium Development Goals (MDG) have shaped global progress in sundry ways through the 8 goals it pursued for 15 years which culminated in 2015. From there the Sustainable Development Goals (SDG) was birthed by different governments at the UN General Assembly in September 2015 to improve on the achievements of the MDG. The third item of SDG explicitly relates to health issues which translates into 13 targets. This paper addresses issues related to the third item of the 13 targets which is "to achieve universal health coverage [UHC]" (Pettigrew *et al*., 2015)

Higher plants have provided the necessities of life such as food, shelter and clothing to humanity from the very beginning of human civilization. In addition to that, they have also been the most important source of medicine for the treatment of various ailments since time immemorial (Rex *et al*., 2018).

The world health organization (WHO) estimated that about 80% of the world population presently use herbal medicines for one form of primary health care or the other (WHO, IUCN & WWF, 1993; Ahmad *et al*., 2013). New drug discovery is facing serious challenges due to reduction in new drug approvals coupled with exorbitant rising cost. Advent of combinatorial chemistry provided new hope of higher success rates of new chemical entities (Katiyar *et al*., 2015).

Despite the recent interest in drug discovery by molecular modelling, combinatorial chemistry and other synthetic chemistry methods, natural product derived compounds from plants are still proving to be invaluable source of medicine for humans.

However, the use of allopathic treatment has become the norm in most societies today. For instance, some common medicines like aspirin, Clopidogrel, Diclofenac, Ibuprofen, Napiroxen and Warfarin are available over the counter but, have been associated with minor (back pain to head ache) to serious side effects, xcessive bleeding, haemorrhage and difficulty in breathing, (Nisar *et al*., 2018). These drugs are mostly synthetic and semisynthetic.

At a time, the synthetic drugs began to replace the herbal drugs but the knowledge of side effects and the cost of accessing such drugs caused patients to revert back to herbal medications. And through scientific research the herbal drugs were subsequently converted into the allopathic drugs by the natural product technology. The natural product drugs are generally scientifically isolated from natural sources and are believed to have less or no side effects because the plants from which they were isolated have long history of use with a proven track record of less or none toxicity (Fostvedt, 2013).

The common sources of drugs are the natural products from fungi, bacteria, marine organisms and plants being the chief source. Whereas some of the drugs are isolated directly from their natural sources, some are synthesized from precursors derived from natural sources.

Discovery of new drugs involves identification of new chemical entities (NCEs). Chemical entities are species of chemicals that possess characteristics of druggability and medicinal chemistry (Katiyar *et al*., 2015). Between 25% and 40% of all prescription drugs in the United States of America contain active ingredients derived from plants. For example, *chinchona ledgeriana* is the source of quinine, the oldest anti-malarial medicine. Morphine a powerful pain medication comes from the opium poppy. Scopolatine a drug used for motion sickness is derived from a plant called *Hyocyamus niger*. Taxol a drug used to treat ovarian cancer, comes from the pacific yew (Graham *et al*., 2000).

Another natural product of note from plant is the steroidal sapogenin produced in the tubers of Dioscorea species (or Mexican yam) that grows in Mexico and Central America. The Diosgenin from Dioscorea species can be converted chemically in several steps into progesterone, a hormone that can be used as a female oral contraceptive (Salim *et al*., 2008).

The solanum alkaloid (Nitrogen analogues of the steroidal sapogenins obtained from many solanum species have also been used in the partial synthesis of steroid drugs such as corticosteroids, the sex hormones and oral contraceptives. These steroid drugs used to be synthesized from bile acids obtained from cattle bile - an expensive process as around 40 cattle had to be slaughtered in order to synthesize sufficient cortisone for one patient (Sofowora, 2008).

Thus, worldwide search for plant steroids was initiated by the United States of America (USA) Department of Agriculture and the phytochemical screening for such compounds (particularly steroid sapogenin) was investigated. Simple test to detect and quantify steroids in plants have since been devised (Sofowora, 2008).

For instance, cropping of the bark of the slow-growing pacific yew tree, has been cumbersome and less productive as source of the antitumor drug, paclitaxel (Taxol) to meet the demands of the market. Even though this compound can be synthesized, yet, this method has proved inefficient for large quantity of Taxol. Fortunately, 10-Deacetylbaccatin III can be isolated in relatively large amount from the needles of other related Yew species such as *Yew baccata* L. and converted chemically in several steps into paclitaxel (Salim *et al*., 2008).

NATURAL PRODUCT VERSUS SYNTHETIC DRUGS

Although, there has been considerable development in the areas of synthetic drug chemistry and antibiotic, plants still occupy an important place in the traditional and modern system of medicine. Realizing the toxic effects of the synthetic drugs, the herbal medicine and the foods that derived from plants have become an alternative even in well-developed countries (Rex *et al*., 2018).

It is reported that about 8% of hospital admissions in the United States of America are due to adverse or side effect of synthetic drugs. Approximately 100,000 people each year die due to these toxicities (Karimi *et al*., 2015).

Literature has shown that phytochemicals are safer and largely more effective alternatives with less adverse effects than the synthetic medicines. For this reason, coupled with advancing microbial resistance to the synthetic drugs, natural product chemistry and ethnopharmacognosy is rapidly gaining world recognition (Achilonu and Umesiobi, (2015).

For example, it has been reported that paracetamol, is a well-known synthetic antipyretic drug and it causes liver poisoning as its major side effect. Naproxen causes gastrointestinal side effect while, Ibuprofen is another antipyretic synthetic drug which causes nephrotoxicity including renal failure when given to volume depleted children (Nisar *et al*., 2018).

PROS AND CONS OF NATURAL AND SYNTHETIC DRUGS

Natural drug sources have the advantage of having more structural diversity and novelty compared to synthetic compounds. many natural chemicals are able to interact with proteins and other biological molecules and they are more complex in structure than synthetic molecules. This complexity allows for more selective binding to targets. The disadvantages of natural product drug source are that, they are more time consuming, costlier, may be less stable and they may work differently than expected, once isolated from their sources.

The synthetic drugs have the advantage of being less time consuming, less costly and may be more sustainable. The disadvantage could be that, they tend to have fewer therapeutic effects and many synthetic drugs cause unaccepted side effects.

Literatures are replete with reports and evidences that most important and less toxic drugs are sourced from plants. The natural product chemists and pharmacognocists have devised means for isolating, purifying and synthesizing natural product drugs from plants which are safer and more potent compared to some existing synthetic drugs. This means that, the hope for improved health for all by the year 2030 can be feasible when medicinal plants are made available. To make this happen there must be a concerted effort put in place for the International Union of Conservation of Nature (IUCN) to ensure that the endangered plant species are conserved and multiplied (WHO, IUCN & WWF., 1993).

CAUSES OF THE DECLINING MEDICINAL PLANTS

Plant derived drugs have been shown to be more reliable compared to the synthetic drugs. Therefore, scientist have developed more interest in isolation and separation of natural product drugs. But the destruction of vast expanse of tropical forest at accelerated rate is threatening the survival of many species of medicinal plants. The current pace at which the forests are being destroyed may lead to a precarious decline in the biodiversity. It is therefore estimated by international Union of Conservation of Nature (IUCN), that about 20,000 – 25,000 of the world's vascular plant species are dangerously rare or under threat. Sources of the plant species which were reported to occur commonly or abundantly about half a century ago have at present become rare or very rare due to over exploitation/habitat loss and have fallen into the category of endangered species (WHO, IUCN & WWF, 1993).

Although natural events such as climate change and geological transformation represent about 19% threat to plant life, it is estimated that human activities are the primary cause of risk for 83% of endangered plant species (Ibrahim *et al*., 2013). Some of the most devastating human activities to plant life are; destruction of plant habitats for farming and wild fires, cattle ranching, deforestation for timber and construction of building and infrastructure. With the global population explosion, control of the human activities may be an impossible task.

Different governments across the globe have established laws to protect and conserve endangered plants and animal species. However, a complete adherence to such laws has not been achieved. The European Union (EU) provided regulations for the enforcement of council regulation on the protection of wild Flora and Fauna which was subsequently amended to accommodate the introduction of controls on the trade in endangered species within European Union.

Similarly, an act to provide for the conservation and management of Nigeria's wild life and the protection of some of her endangered species perceived to be at the danger of extinction as a result of over exploitation as required under some international treaties to which Nigeria is signatory was established in 1985 and subsequently amended. The law was more of conservation of animals than of plants (WHO, IUCN &WWF, 1993).

ENDANGERED MEDICINAL PLANT SPECIES

The endangered species act of 1973 protects listed plants from deliberate destruction or vandalism. However, many conservationists believe that plants receive less protection than animals under the endangered species act (WHO, IUCN & WWF, 1993; Graham *et al*., 2000). Northern India is one of the biodiversity hotspot regions in the world. The region harbours a great diversity of plant resources and is considered

to be the cradle of flowering plants. *Aquilaria malaccensis*, *Gladtsia assamica* and *Gymnocladus assamicus* are trees that are economically very important in India, and due to overexploitation they have been enlisted among endangered plant species (Khan and Choudhury, (2010).

Hedychium coronarium J. Konig belongs to the family Zingiberaceae, it is a rhizomatous herb widely used in India as a febrifuge, eye tonic, anti-rheumatic anthehelmintic and mild tranquilizer in various Ayurvedic medicines. Over-exploitation of its rhizome for medicinal use and consequent degradation of its habitat are reported to be the major threats to the plant (Mishra, 2013)

In Nigeria, conservation of endangered plant species through botanical gardens is not receiving the desired attention. Rather, some of the existing gardens are continually being destroyed to pave way for development of other projects (Gundu and Adia, 2014).

Interaction with some traditional healers in Bade Local Government Area, Yobe state, Nigeria, revealed some realities relating to the disappearance of important medicinal plants. Mallam Mohammed Buba who is 65 years old and a retired military personnel claimed that he has been practicing as an herbalist for over 30 years. According to him, when he was young in the profession, most of the herbs and trees he learnt to use were available around his home town such that there was no need to go far to fetch such plants when there was need. But now he has to traverse not less than two states, about 700 Km before he can find such plants. He said, among the plants he uses are S*ecuridaca longedunculata* (Hausa = uwar magunguna) and *Carissa edulis* (Hausa = lemun tsuntsu). Buba lamented that the way herbalists collect plant parts are some of the reasons for their disappearance. Some do uproot the whole tree in order to fetch the roots for use.

Similarly, Hajiya Salamatu Umar and Alhaji Baba Bello affirmed that the most important herbs they had collected around Yobe state environs such as *Anona senegalensis* (Hausa = gwandar jeji), *Boswelia dalzielii*, *Kochlospermum tinclorium* and *Mitagynna inermis* are no longer available but, one has to travel out or buy the plant parts from colleagues who come from the southern parts of the country.

Although, not much of the endangered plant species have been mentioned, but there is indication that depletion, extinction and the increasing number of endangered plant species is quite glaring. Because of need to sensitise the general public on the need to preserve and conserve some noted medicinal plant species is quite necessary.

CONCLUSION

Plants have served mankind as food, clothing and medicine. Till today a large percentage of the global population still use herbal medicine to meet the demand of their primary health care.

Although the allopathic medicines are the norm in most societies today, the negative development arising from the use of drugs such as Paracetamol, Naproxen and Ibuprofen which cause side effects such liver poisoning, gastrointestinal side effect and renal failure respectively is alarming. The use of plant natural product drugs such as Digoxin to treat heart failure; Paclitaxel as an anticancer and Diosgenin, a contraceptive, have shown to be safe and effective.

Plan rugs are safer and relatively available but it is being faced with severe challenge of depletion ue to climate change and human intervention such as cutting down trees and herbs for agriculture, civil engineering works such building roads, houses ams. Some important medicinal plants have also been destroyed to pave way for the planting of other plants with economic values.

Laws and acts have been put in place by international communities to protect the endangered species of both fauna and flora but, unfortunately, the law enforcing organisations are more concerned with endangered animals and little attention is given to the plants.

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