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Review Article

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Herbal Medicine Practice in Kenya: Challenges, Opportunities, and the Way Forward

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Abstract

Numerous limitations encountered with mainstream Western Medicine, including exorbitant costs, side effects, ineffectiveness and unavailability continue to endear many to alternative herbal therapies. The World Health Organization recognizes the rampant use of herbal medicine, stating that over 80% of the global population uses this form of therapy either alone or alongside conventional therapies. In Kenya, herbal medicine is popular, and, in this review, we share a situational analysis of the industry, taking note of the opportunities and challenges that it offers. Importantly, we provide, in our opinion, easy to implement and financially friendly approaches towards improving the safety and appeal of herbal medicine practice in the country. We anticipate that the Kenyan scenario is replicated elsewhere across the continent and that, therefore, these insights may be similarly applicable.

Keywords: *Herbal medicine, WHO, Safety, Western medicine, Conventional therapies*

1. Introduction

The practice of Herbal Medicine (HM) comprises the use of materials, preparations and finished herbal products that contain, as active ingredients, plant parts or plant materials in the treatment or management of health conditions (World Health Organization, 2004). Humanity has practiced herbal medicine for centuries where the service is usually offered by HM Practitioners (HMPs) who have learnt the art majorly through folklore (Chebii *et al.*, 2020). In their practice of herbal medicine, communities view it as an integral part of their cultural values and social norms (Abdullahi, 2011). Locally, herbal medicine was the dominant healthcare before colonialism and continues to enjoy patronage across a huge proportion of Kenyans who frequently utilize it alongside conventional medicine (Sandiga *et al.*, 1995; Mutie *et al.*, 2020). The practice is especially common in Kenyan rural areas where the conventional medical doctor to patient ratio is extremely low (1:16000) compared to the ratio of HMP to patients (1:378) (Marshall, 1998; Maritim *et al.*, 2022). The healthcare gap is even wider in surrounding East African countries as exemplified by an even lower ratio of conventional

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medical doctor to patients (Sirili *et al.*, 2018). Herbal medicine may also be cheaper and more convenient as some HMPs have negotiable treatment charges which can often be paid in kind (Chebii *et al.*, 2020).

Despite the huge promise and significance of HM, many modern healthcare professionals perceive HM as a medical quagmire where patients, who believe it to be safe, self-prescribe and use it haphazardly without considering its efficacy, potential for herb-herb interactions, or toxicity. This view, although quite skewed and unbalanced, bears some elements of truth that require consideration. There are gaps related to the use of HM which promote distrustful views by conventional medical professionals. The lack of, or inadequately powered, studies showing efficacy and effectiveness of HM is a major hindrance in its application when it comes to rational prescribing (Awodele *et al.*, 2012). Given that herbal products, even those consisting of similar components, are seldom standardized, uniform prescribing remains a hurdle; further disincentivizing the general acceptance of HM in the modern era of pharmacotherapeutics. A key aspect of conventional medicine, that is deficient in HM, is the regulatory approval and accompanying registration, monitoring and evaluation. The lapse in regulatory oversight has been blamed for the blossoming of counterfeits products and quackery in the practice of HM for which many products are easily sold as nutritional supplements. There is also a dearth of safety studies relating to HM despite notable, and frequent, adverse effects and potential herb-herb or herb-drug interactions associated with their use. There is also a constant need for regular clinical studies affirming efficacy and safety of HM, and to not rely only on data from the past (Leung, 2006).

This review aims to highlight the current challenges associated with the practice of HM in Kenya and propose reasonable steps that can be followed to encourage the uptake of HM through evidence-based practices. We contend that observing these will improve the appeal of HM to a wider clientele and offer rewards to genuine HM practitioners in an area already teeming with unregulated herbal products.

2. Successes and Opportunities of Herbal Medicine

Due to a burgeoning population worldwide, a rise in geriatric population in developed countries and preference for all things natural, the market size for HM is projected to reach nearly $105 bn in the global market by 2026 (Bareetseng, 2022). On the local scene, abundant land, and a suitable climate for growing phytomedicines offers huge potential for exploring HM to even higher levels but this has been hampered by the lack of knowledge on the economic value and income-generating potential of HM, leaving this area greatly unutilized. With greater enlightenment on the medicinal and economic value of herbal medicines, more people are bound to consider growing plants of medicinal use. The cultivation of commonly used herbal plants can contribute to the conservation of wild vegetation which currently serve as the main source of raw materials for herbal products by HMPs (Nankaya *et al.*, 2020).

Over the years, HM has proven effective in managing diverse disease conditions or symptoms of disease manifestations such as pain, headache, skin infections, and some inflammatory conditions (Kimondo *et al.*, 2015). Often, herbal products are used with conventional medicine to lessen the impact of side effects or increase the efficacy of chemotherapeutic drugs (Li *et al.*, 2020). Hypertension, diabetes, and cancer are among the chronic diseases for which HM have been widely applied and in which more empirical research is required to generate reliable data on the dosage, duration of treatment and understanding of the mechanism of action of the therapy. Such information is critical in improving the appeal of HM to mainstream healthcare practice.

There is a flourishing of the prescription of supplements involving herbal medicines from India and China far more than those originating from within Africa. On one hand, this observation lays bare the great distrust with African HM while on the other hand, it may point to the limited development of the practice to match modern standards of healthcare.

3. Pitfalls and Challenges Encountered in Herbal Medicine

3.1. Non-Standardization of Herbal Products

The lack of dose standardization among HM products is a hurdle in facilitating uniform application of these treatments for the same indications. Differences in potency and efficacy are expected from such discrepancies in weights and measures. In addition, there is inherent risk of toxicity especially for products containing active principles which display narrow therapeutic indices or those spiked with adulterants and contaminants.

During ethnobotanical surveys, herbalists often identify medicinal plants by visual observation, based on the experience gained from apprenticeship. Moreover, in combining different plants, or plant parts, to make a concoction, HM practitioners are known to randomly include these portions. Such a subjective approach fails to meet the key requirements for reproducibility which is vital towards standardization and mass production. These limitations increase distrust for HM especially amongst diehard proponents of Western medicine (Mashilo and Peter, 2018; Nankaya *et al.*, 2020).

3.2. Lack of Protocol on Herbal Plant Preparation

Plant species, even when similar, can display diverse pharmacological activities. The protocols for constituting the final HM product from closely related raw materials may also vary across communities. The inconsistencies arising from dissimilarities in the development of the herbal products is baffling, contrasted against the well-organized and standardized good laboratory and good manufacturing practices that characterize modern drug discovery. The Maasai community, for example, are noted for making herbal decoctions from *Acacia* species in water before adding it to meat broth, milk, or blood (Kimondo *et al.,* 2015). In other communities, the preparation of a similar product may entail allowing the product to leach out and partaking it as tea. Others, still, might prefer to rub the herbal product around the affected area (Odongo *et al*., 2018). Understanding the identity and pharmacological actions of the active principles in an herbal product would be useful in rationalizing the differences in the preparation strategies, and modes of administration, adopted. Varied use and application of terminologies related to health and diseases presents another point of controversy between HM practice and Western modern medicine (Fratkin, 1996; Leung, 2006). To appreciate the scope and span of use of HM products calls for the understanding of the language used in the practice. If this is not considered, attempting to extrapolate uses across the fields may breed confusion and inappropriate application (Leung, 2006).

3.3. Geographical and Eological Variability

The pharmacological effects, and hence the traditional and conventional use, of herbal products stems from secondary metabolites of plants (Shaikh and Patil, 2020). The presence and quantity of the secondary metabolites is influenced by the environment in which the plant is located. The type of soil, climatic conditions and related ecological factors alter the quality and quantity of medicinally relevant active principles (Suzuki et al., 2014). As a result, similar plant species found in different geographical locations, and having grown under dissimilar climatic conditions, are likely to have different levels of such substances. When considered to treat a given condition, similar dose measurements will contain different quantities of the pharmacologically relevant components. Seasonal changes, and hence time of harvest and processing of the herbal material from the same species, also result in differences in the quantities of active principles (van Wyk and Prinsloo, 2020). This reality should be recognized in the practice of HM and further emphasizes the need for standardization of weights and measures, supported by quality control, to streamline the field.

Moreover, it is common to find plants growing in different geographical areas demonstrating related pharmacological actions. The plant *Oxygonum sinuatum,* for example, which has been used by the Ilkisonko Maasai to treat tonsilitis and conjunctivitis, is better known for the management of gonorrhea in another region, the Eastern province, of Kenya. Empirical research revealed anti-inflammatory and antibacterial activity of the extract of the plant, justifying the divergent applications of the plant across ethnic communities (Kimondo *et al.,* 2015). In the absence of such evidence-based results, it would be difficult to reconcile the different uses of the same plant, an observation that would readily be thought as contradictory and further promote cynicism from those who are averse to the practice.

3.4. Adulteration of Herbal Products

Adulteration, the fraudulent addition of other materials besides what the product label claims, is a frequent practice observed with herbal medicine (Abuga, 2021). While such a subtle exercise may be deemed shrewd in other fields and may bear no serious consequences, the repercussions in the context of HM adulteration can be dire (Mwenda *et al.,* 2019). Frequently, synthetic drugs are used to spike the herbal products with claimed benefits for which the Western medicine is approved for. Consequently, when patrons use such adulterated products, often in combination with other medicines and medicinal products, substance interactions are bound to occur.

Intentional adulteration of herbal aphrodisiacs with tadalafil and Chinese herbal contraceptives with levonorgestrel, have been reported in the Kenyan market (Abuga, 2021). Unchecked consumption of these adulterated products keeps users in constant danger or drug-related adverse effects including hypersensitivity reactions. Adulterated HM have also been associated with acute kidney injury and chronic kidney disease in the Kenyan population (Mwenda *et al.*, 2019).

Besides intentional additives, adulteration may happen inadvertently at any of the stages of processing of the herbal product from harvesting and storage to packaging. For instance, laxity in upholding good harvesting standards may lead to the contamination of a product with different parts of the same plant (van Wyk and Prinsloo, 2020). The mixing of different plant parts may not seem alarming but, in the context of variations in qualitative and quantitative aspects of medicinal contents of diverse parts of plants, such adulterations have implications on efficacy and safety.

The above scenario highlights the importance of establishing suitable standard operating procedures in the handling of herbal products to avoid adulteration, whether intentional or otherwise. Inexperienced practitioners, and those who are outrightly rogue, may even substitute plant materials of hard-to-get medicinally useful ones with closely related more readily available species to make up the desired measure (Ichim and Booker, 2021). Such a practice further fans mistrust in the use of HM with related dangers of compromised safety, uncertain efficacy, and elusive reproducibility.

3.5. Quackery

Most traditional societies highly revere HMP where the practitioners are usually older males or females who are either self-taught or have learned the trade through apprenticeship (Chege *et al.*, 2015; Chebii *et al*., 2020). In Kenya, there is no formal training or legally recognized qualifications pertaining to HMPs. The lack of a legal and professional framework to guide and control HM has attracted all without restriction, rendering the field vulnerable to infiltrations by quacks (Ministry of Culture, 2020).

3.6. Herb-Herb and Herb-Drug Interactions

It is often presumed that HM is safe and devoid of toxicity since the users contend that HM is natural. Such an assumption, however, is flawed on several accounts. Investigations reveal that herbal products often contain multiple active metabolites that can interact with different targets in the body.

From a scientific perspective, this polypharmacology is a common basis for drug-drug and, in this case, herb-herb or herb-drug interactions. Multiple pharmacologically active components have, however, been reported to be essential in the synergistic action of herbal products by, for instance, modulation of pharmacokinetics (Caesar and Cech, 2019). A supplement of an isolated product can be inferior to the mixture of active principles contained in an herbal product. Moreover, certain combinations of herbal plants, in appropriate portions, could cause superior efficacy compared to the use of an herbal product from a single plant (Ochwang'i *et al.,* 2018). When not well documented and standardized, such combinations can be subject to diverse interpretations in terms of the individual quantities and the manner of the actual mixing and preparation. The ambiguity presented by this is yet another loophole that may be construed as an obstacle to the reliable use of HM from both efficacy and safety standpoints (Caesar and Cech, 2019).

Studies affirm that herbal medicine is frequently practiced alongside Western medicine (Rukangira, 2001). In addition, patients rarely inform their healthcare providers of any herbal materials they are consuming (James *et al.*, 2018). On their part, healthcare professionals also, while noting medication history, fail to proactively establish whether their patients are using any alternative medicines beyond inquiring about any other mainstream drugs (James *et al.,* 2018). This scenario demonstrates the glaring danger of deleterious herb-interactions that lurks amongst users of HM as, for example, cases of increased bleeding have been observed when warfarin is administered to patients who are taking *Gingko biloba* or ginger (Tan and Lee, 2021).

3.7. Contamination by Pesticides, Heavy Metals and Microbes

While cultivating medicinal plants for large scale commercial use, chemicals might be applied to control pests and boost production. At the time of harvesting and subsequent processing, the levels of such chemicals

should be established as these may have crucial implications on safety and suitability for human consumption. The WHO has established the maximum residue limit for pesticides in both cultivated and wild medicinal plants as well as outlined the appropriate methodologies for their detection (World Health Organization, 2011). Several national and international pharmacopoeias also contain assay methods for establishing residual limits for organochlorine and organophosphate pesticides which are among the commonest and readily toxic chemicals. Examples of these chemicals include heptachlor, lindane, toxaphene, diazinon, malathion and carbofuran (Klier *et al*., 2019).

Contamination with heavy metals and microbes is another frequently unrecognized deathtrap in herbal drugs. Such contamination may occur due to poor handling practices or from the quality of the soil where the plant may have grown (Nguetti *et al*., 2018). A comprehensive plan to assure of the quality and integrity of herbal products must, therefore, include detection of heavy metals and microbial contaminants (World Health Organization, 2011). Establishing reference laboratories, or partnering with research facilities, which routinely conduct these assays, is a feasible way to progress herbal medicine practice while ensuring acceptable levels of heavy metal contamination.

Previously, it has been revealed that US clients of ayurvedic drugs manufactured in India and Pakistan were exposed to heavy metal content of those products. A study revealed that nearly 1 in every 5 of such products contained lead, arsenic, and mercury beyond the prescribed limit according to the US Pharmacopeia. It remains unclear as to whether the reported contamination was accidental or intentional (Saper *et al*., 2004). A different study, conducted five years apart from the earlier mentioned study, reflects similar risks of heavy lead contamination for the ayurvedic medicines manufactured and distributed by US and Indian companies via the internet (Saper *et al*., 2008). When an economic powerhouse such as the US which sets quality standards to which other countries aspire and adopt is infiltrated by hazardous medicinal products, it is shuddering to imagine the possible flooding of substandard products in countries with far less rigorous regulatory capabilities.

That HM products are not free from toxicity concerns is demonstrated by over sixteen thousand suspected herbal product adverse case reports held in the WHO database. The most reported adverse reactions are hypertension, hepatitis and face oedema. Others include angioedema, convulsions, and thrombocytopenia. In extreme cases, death has occurred (World Health Organization, 1993). A lack of accountability and strict regulation of HM practices often leaves the patient and their families to bear the brunt of such adverse effects. The practitioners involved, either intentionally or ignorantly, absolve themselves of any blame, reiterating that their products are natural and harmless; any untoward effects are quickly ascribed to the patient's failure to observe the instructions for consumption, even when evidence suggests otherwise.

4. Way Forward

4.1. Tests and Standards

A unique feature with herbal drugs is the fact that a composite of active principles works in concert to yield the overall pharmacological actions and therapeutic benefits (Mera *et al*., 2019). In many cases, the individual isolated compound is unknown or not elaborately characterized. This also hinders the exploitation of the full potential of HM. A reasonable argument floated by experts in HM is that isolation and characterization of single active principles may work against the essence of herbal drugs, contending that synergy may be lost in the course such isolations (Caesar and Cech, 2019). However, it would be useful to identify specific chemical components which can act as marker compounds consistent with the authenticity, quality and integrity of a given herbal preparation. Collectively, these will add confidence about the therapeutic utility of the concerned herbal preparations. When accepted across regions, and analytical methods established to assay them, these markers can pave way for the much-needed standardization of herbal products.

4.2. Developing Monographs

Generating adequate data regarding the use of herbal plants relies on accumulating information from years of use of the product. There should be deliberate efforts to document any existing uses as well as emerging insights into the therapeutic potential of herbal plants and related products. Local registries, as opposed to extrapolating use from other regions of the continent or globe, will provide more accurate indications of the

plant species. There is already an electronic database on natural products from East Africa which has documented plants and some phytochemical compounds therein and can serve as a starting point (Simoben *et al*., 2020). Other details regarding dosages, preparation and administration should be curated for future references. Together with details on toxicity and any other observations of interest during the use of the herbal product, these pieces of information will enrich the repository for the various herbal products in the country (Knöss and Chinou, 2012).

4.3. Pharmacopeial Tests

Monographs for fast, reliable, and reproducible analysis of herbal products is a crucial component in the path to evidence-based practice of HM (Knöss and Chinou, 2012). Microscopy offers a convenient method to investigate plant materials and products across defined criteria and is one of the widely recorded methods in medicine formularies (Ichim *et al*., 2020). The appeal in the use of microscopy is partly due to the small sample size requirement, low costs involved and reliability especially after the operator has gained requisite experience under previous guidance. In addition to the gross characterization and profiling of plant materials, histological examinations can be engaged to reveal the characteristics of tissue structure and cellular features that can be used as markers for species identification and validation (Upton *et al*., 2020). Different modifications to the basic microscopy technique can be considered to reveal further details on structural, cellular, and molecular features of the specimen involved, making it a versatile tool in quality control (Ichim *et al*., 2020). While general skills and competence in generic microscopy techniques may be all that is needed at the beginning, some specialized training and experience is important in handling the more challenging tasks. For example, while macroscopic and microscopic examinations are easy to apply to fresh whole plants or plant parts, it is more difficult to derive useful information from dried plant products, as those typically sold on the market. This is because, during processing and handling of the herbal preparations, several useful diagnostic characteristics and features are lost due to, for example, dehydration (Amiri and Joharchi, 2013). Therefore, systematic profiling of microscopic features, before and after preparations, could be an important part of the examinations of herbal products, acknowledging that some identifiers, such as morphological characteristics, can be lost along the way due to processing (Upton *et al*., 2020). Piecing together the information from the different tests, and considering the limitations that each approach may have, will help analytical centers of the herbal products to set forth a set of criteria to determine sample authenticity and build further confidence in the practice of HM.

4.4. Phytochemical, Microbiological, and Pharmacological Analysis

The active principles in herbal products from plants are classifiable, largely, into any of these major classes: phenols, alkaloids, glycosides, saponins, terpenes, coumarins, proteins / peptides or carbohydrates. There are reliable tests for determining the presence and relative amounts of these substances within an extract (Shaikh and Patil, 2020). Different classes of phytochemicals are notable for certain pharmacological actions (Mera *et al*., 2019). When a product is touted to possess a given activity, tests to ascertain the presence of the phytochemical components associated with that activity can be launched. As discussed previously, spiking of herbal products with Western medicines is common and which bears attendant adverse effects (Mwenda *et al*., 2019). Based on the claimed indication, the common suspects used for spiking should be noted. Then, an analytical method, capable of detecting a range of these drugs, used to identify them. Using analytical standards and comparing with the standard curve, qualitative and quantitative aspects of adulteration can be unraveled.

Empirical microbiological and pharmacological assays are useful in offering evidence-based herbal medicine practice. For example, those herbal products intended for the treatment of infections can be subjected to culture and sensitivity tests using a range of bacteria implicated in the diseases concerned. Results of microbial growth inhibition can then be used to support such claims or probe further investigations. Similarly, for herbal preparation touted to control diarrhea, constipation, or uterine smooth muscle activity; basic pharmacological experiments using standard organ bath and kymograph can be used to confirm these actions.

4.5. Heavy Metals, Pesticides, and Microbial Content Determination

Some plant species such as Moringa, a common herbal supplement, are known to sequester heavy metals from the soil (Adefa and Tefera, 2020). Depending on the cultivation environment of the plant and the mode

of administration of the herbal product, heavy metal toxicity may be a great concern (Chen *et al.*, 2021). The atomic absorption spectrophotometer is a useful equipment in assaying heavy metal content. Farmers of commercial medicinally useful plants will benefit from these services and ensure that only quality herbal products are available to the market.

The lack of awareness and implementation of good agricultural practices and subsequent harvesting, processing and packaging renders herbal products particularly prone to microbial contamination. Diarrhea and accompanying stomach ailments are among the most common manifestations of microbial contaminations of oral herbal products (Darkwah *et al.*, 2022). To rule out such incidences, routine microbial load determination involving the commonest bacterial and fungi associated with food contamination should be performed. These tests can be conducted in basic microbiology laboratory and centers and form part of the suite of controls and checks for safe herbal products.

Testing for residual pesticides can be done through targeting detection of total organic chlorine and total organic phosphorous since these are the commonly used pesticides in Africa. This can be accomplished using Gas chromatography coupled with Mass spectroscopy alongside the database of common pesticides (Reyes-Garcés and Myers, 2021).

4.6. Training and Support of HM in Good Practices

To harmonize HM practice across the country, practitioners require training and support in the different stages from cultivation to the processing and storage of the herbal product. Locally, herbalists either grow their own herbs or obtain them from wild sources (Chebii *et al.*, 2020). Accurate identification, and confirmation, of the plant species is the first step towards ensuring that, at the tail end of the cycle, one is dealing with the correct plant. Misidentification may easily go unnoticed especially in a self-regulated practice as HM currently is.

In collaboration with plant experts across research institutions and the National Museum of Kenya, voucher specimen authentication and preservation at the national herbarium is a suitable starting point (World Health Organization, 2011). At this juncture, information on the local uses of the plant, recorded medicinal use from scientific research locally, regionally, or internationally can then be collated and curated. The archiving of these information together with the local names of the plant provide useful references for future investigators.

Just like many farming sectors in the country provide support to farmers to ensure high quality and maximum yields, farmers of medicinal plants require guidance in commercial farming of medicinal products with special attention to concerns including use of fertilizers, pesticides, herbicides, and other chemicals that may impact on the quality (and hence human safety) of the herbal plant. As mentioned previously, farmers need to be informed about the permitted limit of pesticides, herbicides, and other substances in the anticipated herbal product, to comply with national and international regulatory requirements (Nguetti *et al.*, 2018).

Good harvesting practices should be observed to ensure that the timing is appropriate when the secondary metabolites associated with therapeutic activity are at their peak concentration. This would require building on experience and comparing with information from available literature. Advice on proper harvesting practices, for example appropriate timing - when it is not wet or raining -will help to reduce challenges associated with handling wet material. Care must be taken to ensure that the plant matter is well aerated, held away from direct sunlight and protected from pests and animals. Such proper storage practices will also reduce the risk for microbial contamination (World Health Organization, 2003). Further, postharvest, appropriate packaging and storage are prerequisites to minimize the risks for microbial contamination.

4.7. Partnerships with HMPs

According to the convention for biological diversity, it is imperative that the scientific community works hand in hand with the traditional medicine knowledge holders such as HMPs. This will ensure improved utilization of our shared biodiversity, promote poverty eradication, increase food production and, most importantly, enhance medicine development (United Nations, 1992).

Due to biopiracy, the relationships between HMPs and mainstream scientists are characterized by distrust and antagonism. This creates a dangerous precedence where the HMPs hide their traditional medical

knowledge which ends up being lost in the absence of proactive apprenticeship and recording in referenced literature. A database that preserves the rights of the community and allows both HMP and the community to benefit from any financial gains will allow for access to this information and encourage innovation, conservation, and sustainable use of these resources. There seem to be a glimmer of hope in this direction with the establishment of the East African database computed by informatics on natural compounds found in the region (Simoben *et al.*, 2020).

4.8. Regulation of TAM

A great lack, and which dents the outlook of HM practice, is regulatory control. Kenya has no clear regulatory framework to control, regulate and promote the practice of Traditional and Alternative medicine. There is confusion as to whether HM practitioners are to be considered part of the healthcare workforce and hence under the armpit of the Ministry of Health or, being traditional practitioners, are more suited to belong to a government ministry which oversees cultural concerns of the country (Sifuna, 2022).

To add to the confusion, HMPs in Kenya are registered under the Ministry of Culture while herbal products are registered under the Ministry of Health through the Pharmacy and Poisons Board which also regulates the practice of the mainstream pharmacy profession. This, expectedly, causes an obvious and gaping disconnect that allows quacks to flourish and has been blamed for the massive influx of unregistered and harmful products in the name of herbal products.

Efforts have been ongoing since 2005, with the drafting of the Traditional and Alternative Medicine policy, to ensure that traditional medicine is mainstreamed alongside Western practice of medicine which enjoys greater public appeal. Adoption of this Bill will be a significant step towards harmonizing the regulation of both the practice of, and products related to, HM. We expect to witness thawing of relationships and opinions between proponents of HM and those who subscribe to modern medicine practice, with the understanding that both are working towards the common goal of improved patient health. If well implemented and supported by adequate policing, quacks and other roque merchants can be subdued and sanity instituted in the practice of HM.

Coordination of HM research across the country, with the establishment of a national herbarium would be resourceful in offering authentication and standardization services (National Museums of Kenya, 1902). Over time, the archived data can be used to develop a fingerprint on major plant species, and their phytochemicals, paving way for systematic sample identification and confirmation of phytochemical contents alongside reported pharmacological activities (Upton *et al.*, 2020).

Advances made in Uganda and Tanzania, Kenya's two East African neighbors are testament to the fact that it is possible to wade through current challenges and usher in a new era of properly regulated HM practice. The two countries have already passed Bills and Policies regulating the sale and use of herbal medicines within their borders. Great personal initiative from proponents of HM, and subsequent government support, were key to the progress achieved in Uganda and Tanzania. Dr. Richard Komakech from the Ministry of Health, Uganda spearheaded the Traditional and Complementary Medicine (TCM) policy in Uganda which led to enhanced availability and accessibility of TCM to the public (Ministry of Health, 2020). In Tanzania, the Traditional and Alternative Health Practice Council, headed by Prof. Hamisi Malebo, guided the revision of the national health policy in 2003 to incorporate traditional and alternative medicine into the mainstream healthcare (Mujinja and Saronga, 2022). This move contributed to the de-stigmatization of the public use, or administration, of alternative and complementary medicine. Related regulatory controls also encouraged sanity in the field. The Kenyan journey to incorporating TCM into the mainstream healthcare can borrow from the experiences in her East African neighbors and Ghana, in West Africa (Boateng *et al.*, 2016).

5. Conclusion

In this review we have provided a snapshot of the opportunities and challenges that exist in the practice of herbal medicine in Kenya and by extension, possibly in several African countries. While HM holds undeniable benefits, it would be foolhardy to presume that HM is safe regardless of the way it is practiced. Systematic steps are needed to eliminate identified dangers including product adulteration, contamination with microbes

and heavy metals. Governmental support in establishing and coordinating research and testing centers in herbal medicine and effective regulatory oversight are additional key requirements for restoring sanity in the sector of herbal medicine practice.

Conflicts of Interest

The authors declare no conflict of interest.

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