

Ethnobotanical Assessment of Herbal Medicine Practices for Cancer Treatment among Traditional Medicine Practitioners in Kenya

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ABSTRACT

Traditional Medicine Practitioners (TMPs) play a vital role in healthcare delivery across Africa, including Kenya. They frequently use herbal remedies to address various ailments, including cancer. However, this practice raises global public health concerns due to the lack of adherence to established policies and guidelines, which poses risks to users. In low-income countries like Kenya, where conventional cancer treatments are often prohibitively expensive, many patients turn to herbal remedies. This situation underscores the need for standardization and monitoring of traditional medicine practices to mitigate risks associated with contamination, improper dosage, and misdiagnosis. Additionally, there is a significant gap in the systematic documentation and scientific validation of these practices. This study aimed to explore the ethnobotanical knowledge and practices of TMPs in Kenya regarding herbal medicine for cancer treatment. The specific objectives were to: Assess the medicinal plants used by TMPs, assess the Practice TMPs' in cancer treatment and Determine TMPs' compliance with WHO guidelines for cancer treatment. A cross-sectional study design, guided by the plant use value theory, was employed. Using purposive sampling, 53 TMPs from five counties were selected in proportion to the county TMP populations. Data were collected through semi-structured questionnaires, observational check list, and Key Informant Interviews. Quantitative data were analysed using SPSS version 28, including descriptive statistics, means, standard deviations, figures, and proportions, presented through graphs and tables. The study identified 58 unique plants from 14 families. Roots were the most commonly used plant parts (20.6%) for cancer management. Decoctions were the primary preparation method (35%), while poultices were the least used (14.7%). Oral administration was the predominant method. TMPs most frequently treated prostate and throat cancers (20.7%), followed by breast cancer (17.2%). Most new patients (76.9%) were referred by others, with minimal use of modern advertising methods such as social media. Women sought TMP services more than men. Most practitioners (92.3%) planned to pass their knowledge to their descendants. However, compliance with WHO guidelines was low, at only 27%. The study highlights the extensive use of herbal remedies by TMPs in Kenya but also reveals significant issues in practice. There is minimal formal supervision and monitoring of traditional medicine practices, and most TMPs lack formal training, relying instead on inherited knowledge. Awareness and adherence to WHO guidelines are notably low. The health act policy no. 21 of 2017 which empowered the department of Health to provide policies and regulatory institutions that guide the practice of traditional and alternative medicine needs to be implemented by Government. Furthermore, TMPs need to be trained by WHO on best practices of usage of herbal medicines in cancer treatment, the regulatory bodies in Ministry of Health under surveillance therein should provide guidance on registration, licensing and standards, and ensure compliance of TMPs.

Keywords: Assessment, Cancers, Ethnobotanical, Herbal Medicine, Kenya, Traditional Medicine Practitioners

I. INTRODUCTION

Cancer poses the greatest burden of cause-specific disability adjusted life years globally, being the second highest cause of mortality; projected to be the leading cause by 2060 (Mattiuzzi & Lippi, 2019). Of the various types of cancers, Lung, liver, and stomach cancers causes the highest mortality in the general population. Prostate and thyroid cancers have the best prognosis, while esophagus, especially pancreatic cancers have the worst prognosis (Mattiuzzi & Lippi, 2019).

At the turn of the century, the long term, over twenty-year, survival rate for cancer patients stood at 51%, attributed to significant improvements in the early detection and management of cancer. However, the global burden of the disease has since grown, with the incidence increasing from 10 million in the year 2000 to 19.3 million in 2020 and fatalities increasing from 6 million to 10 million in the same period (Sung et al., 2021), even with further developments in the field of oncology both in detection, treatment and management. This highlights the need for better drugs and management measures in the prevention, treatment and control of cancers, a situation further complicated by the vast variation observed in the response and recovery from cancer by the site of occurrence as well as across populations. One of the frontiers explored for alternative cancer management, is the use of local herbal medicines, as it has been highlighted that almost 60% of the drugs in use for cancer treatment use compounds derived from plants (Alonso-Castro et al., 2011).

According to the World Health Organization, traditional medicine refers to the knowledge, skills, and practices which are based on the theories, beliefs, and experiences indigenous to different cultures and used in the maintenance of health and the prevention, diagnosis, improvement or treatment (Gakuya et al., 2020). Ethnobotany on the other hand is the study of a region's plants and their practical uses through the traditional knowledge of a local culture and people. Ethnobotanical applications for cancer management, just like traditional medicinal practices are varied by regional, climatic, communal and cultural differences, often driven by local knowledge and the ease of access to these traditional cures as compared to more conventional methods of cancer treatment.

Herbs like ginger and aloe vera are abundant across several ecological zones, and have been used in the vernacular setting for their anti-cancer characteristics across several cultures such as in India, Iran and Mexico. In the sub-Saharan African countries due to variety of reasons, including limited access to healthcare services, cultural norms, and traditional beliefs (Abdullahi et al., 2011), a significant number of patients in these countries combine traditional medicine with conventional medicine, especially those with chronic diseases (Kigen et al., 2013)

Generally speaking, many techniques for preparation include: Extraction-This is prepared with solvent on a weight by volume basis. Sometimes, the solvent is evaporated to a soft mass. The preparation of the herbal medicines might be a threat to the health of an individual in that most of the medicines are prepared in traditionally way, hence the hygiene in preparation, packaging and storage may not be adhered to and even though the herb can be an effect or causative to other diseases and this is hence a public health concern.

The side effects of herbal medicines extract majorly seems to be relatively safe even though restlessness, nausea, diarrhea, vomiting and dermal sensitivity and headache are some of the most common side effects that have been majorly raised by the clients, this is according to (Mattiuzzi & Lippi, 2019), also these side effects are majorly seen to those who are overdosing. Due to the risk of loss of undocumented indigenous knowledge on medicinal uses as well as extinction of ethnobotanical plants, the assessment study on the plants is crucial in order to protect the plants under *ex-situ* and *in-situ* conservation and to preserve the associated indigenous knowledge in the selected five (5) regions in Kenya to promote health in better practices and adherence to the policies and guidelines of herbal medicines in terms of preparation, packaging, storage and administering of the medicinal plants. The study aimed to assess the practices and compliance of the Traditional Medicine practitioners (TMPs) for better practices in future, the findings will assist to solve the problems forming policies that will ensure good practices and adherence to World health organization (WHO 2023) guidelines and documentation of the plants will assist for further research.

1.1 Statement of the Problem

Traditional Medicine Practitioners (TMPs) in Africa, including Kenya, play a significant role in the treatment of chronic illnesses such as cancer through the use of herbal remedies. However, several gaps persist, posing public health risks and affecting the overall efficacy of these treatments. Despite the widespread use of traditional herbal remedies for cancer management, especially in sub-Saharan Africa, there is a lack of standardization in the preparation, packaging, and administration of these treatments. This is particularly critical in a region where access to conventional cancer treatments is limited due to economic, infrastructural, and healthcare barriers (Abdullahi et al., 2011). In Kenya, with 42,116 new cancer cases and 27,092 fatalities reported in 2020 alone, the growing reliance on traditional medicine highlights the need for regulated practices to ensure patient safety. The rising incidence of cancer in Kenya and across Africa—projected to reach 2.08 million by 2040 (WHO, 2020)—underscores the urgency of addressing these gaps.

While traditional remedies have been used for centuries, there is limited empirical evidence validating the efficacy and safety of many herbal treatments in cancer care. Various studies focus on isolated plant extracts or anecdotal evidence rather than comprehensive clinical trials or pharmacological assessments Cameron et al., (2018). For instance,, the *Asteraceae* family was among the most used anti-cancer families as was identified by (Ochwang’i et al., 2014) in Kakamega. The pattern of utilization of these medicinal plants shows a variation in the families used depending on the abundance of the species. A small overlap is found in the anti-cancer medicinal plants used in the study area and the neighboring countries with similar climatic conditions. Furthermore, another study in Kenya by (Omara et al., 2022) documented ethnobotanical plants from 125 genera, spread across 55 families used for their anti-cancer properties, wherein the most used family of medicinal plants were, in order, from the family: *Fabaceae* with nineteen species, *Asteraceae* with eleven species, *Euphorbiaceae* with eight species, and *Rutaceae* with seven species. Furthermore, side effects such as nausea, vomiting, and skin sensitivity reported by users of herbal medicines are not well-documented in the context of TMP practices (National Toxicology Program Report, 2012). Additionally, studies often overlook the long-term effects of combining traditional and conventional therapies, leaving patients vulnerable to potential adverse interactions.

Theories regarding the efficacy of herbal treatments are often rooted in indigenous knowledge systems, which are not always aligned with contemporary biomedical frameworks. There is a need to bridge the gap between traditional medical theories and modern healthcare standards to develop an integrative approach that benefits patients. The absence of a harmonized theoretical framework that encompasses both traditional practices and modern healthcare paradigms limits the ability to effectively regulate and validate TMPs’ contributions to cancer care.

Another significant challenge is the lack of a standardized conceptual framework for assessing the practices of TMPs. In Kenya and Africa at large, TMPs are often guided by informal, unregulated knowledge, which leads to inconsistencies in treatment methods, dosages, and hygiene standards. Moreover, there is a conceptual gap in understanding the socio-cultural factors driving patients to seek herbal remedies despite the availability of conventional treatments Kefale and Kassa (2023). Additionally, little attention has been given to documenting the indigenous knowledge and practices of TMPs in treating cancer, making it difficult to integrate these practices into broader healthcare systems.

Addressing these gaps is crucial to ensuring that traditional herbal remedies contribute meaningfully to cancer care without compromising patient safety. The lack of systematic documentation and adherence to World Health Organization (WHO) guidelines on traditional medicine (WHO, 2023) highlights the need for research that evaluates the practices of TMPs, ensures compliance with health standards, and explores the potential for integrating these practices into formal healthcare settings. With Africa projected to account for nearly 50% of the global childhood cancer burden by 2050, the need for more robust research and policy interventions cannot be overstated

1.2 Research Objectives

- i. To assess the medicinal plants used by TMPs for cancer treatment in five counties through field surveys and interviews.
- ii. To assess the practice of the TMPs in usage of herbal medicines in treating cancer.
- iii. To assess the compliance of herbal medicine by TMPs to WHO guidelines in their practice.

II. LITERATURE REVIEW

2.1 Theoretical Review and Plant Use Theory

This study was guided by Plant Use Value Theory (Phillips O., & A.H. Gentry 1993) which states that the usefulness of a plant that is for medicine, food, construction technology or for trade in a given community is directly relating to its botanical family, life form, local abundance (density) and/or maximum size. in the context of the study, this theory will be applied due to the diversity of plants in the study area. The theory has been used by Albuquerque et al., (2023) on hypothesis testing in ethnobotany; 30 years after Philips and Gentry seminal work also use or applied by Washington Sources Ferreira Junior, Flavia Rosa Santoro also applied the same theory on the role of individuals in the resilience of local medicinal systems based on the use of the medicinal plants hence the theory fits since local abundance is expected to dictate utilization.

2.2 Empirical Review

Plant biogeography determines the abundance and availability of medicinal plants which in turn determine their use by local communities. The knowledge of the traditional cures is culture specific, and is passed from one generation to another, more often from grandparents and parents (Omara et al., 2022). In South East Asia, Singaporeans traditionally have used extracts from fresh leaves from *C. lansium*, *L. indica*, *P. bleo*, *S. crispus*, *V. amygdalina* and *V. trifolia* for

their anti-proliferative action against a range of cancerous cells in the breast, colon, liver, ovaries and even Leukemia (Siew et al., 2019). Due to the glaring lack of scientific laboratory methods in traditional medicine practice, misdiagnosis is a very real threat in treatment of cancer by TMPs. One documented way TMPs use to ascertain cancer diagnosis is by using the medical record of their patients, as has been found in Malawi (Tembo et al., 2021) and Uganda for breast cancer (Lutoti et al., 2023).

Furthermore, there has been observed a high and increasing prevalence of traditional medicine use among cancer patients, with estimates being higher across low- and middle-income countries. In these communities, the relative affordable nature of herbal medicines compared to clinical interventions (Nketia et al., 2022). In 2019, Kenya passed the Health Laws Act No. 5 of 2019, which recognizes traditional medicine as a health product. The act provided for training, registration and licensing of traditional and alternative health practitioners and spelt out regulatory and disciplinary guidelines. It also made provisions for the development of the Traditional and Alternative Health Practitioners Council (TAHPC) with two registered traditional health practitioners with over 10 years of experience as members of the council (Chebii et al., 2020).

The study in 2018 (Ochwang'i et al., 2018), focused on the *in vitro* cytotoxic potential medicinal plants in Kakamega towards sensitive and multidrug-resistant cancer cell lines. While the study results went a long way to substantiate the traditional use of these plants to treat cancer, it was limited to the county of Kakamega only, as well as heavy leaning towards the phytochemical aspect of the compounds found in a few medicinal plants from the community. This limits generalization of the results to the region on the basis of the small relative sample size. The current study aims to cover a larger area with a proportionately large sample to address this shortcoming. Furthermore, the literary search has not found any study that outlines the process through which the TMPs diagnose cancer. This provides an opportunity for the current study to explore this frontier and add to the known information regarding TMPs' treatment of cancer.

In addition to this, the adaptation and implementation of new policies seeking to integrate traditional into modern medical practice is slow, exposing users of these alternatives to risks such as misdiagnosis. Standards need to be put in place, backed by nationally universal policies to guide diagnosis and prescription as well as reign in on non-qualified TMPs.

III. METHODOLOGY

3.1 Study Area

The study was conducted in 5 counties in Kenya: that is Kakamega, Bungoma, Baringo, Uasin Gishu and Nandi counties due to availability of trees species and tropical rain forest of Kakamega (The Kakamega Forest). The study was conducted in within five counties with plants abundancy according to Kiarie Njoroge 2016 Report on Kenya Forestry Cover. The mean annual rainfall ranges between 1100 and 1700 mm with two peaks in April to May and August to October for Western, South Rift. Temperature ranges between 14°C and 27°C with an average of 21°C. Soils are thin, drain freely, and have layers of cellular iron stone. The main human activities within the study areas include livestock grazing, pastoralism, and crop and dairy farming. Baringo is full of acacia species with little growth, it is in the lowlands area of Kenya. Kakamega has a population of 18 million, Baringo has 666,763, Uasin Gishu over 1.6 million, Bungoma also over 1.6 million and Nandi 885,771.

3.2 Study Design

This study utilized a cross-sectional design employing a mixed methods approach to provide a comprehensive evaluation of the practices of Traditional Medicine Practitioners (TMPs). The quantitative aspect of the ethnobotanical assessment used several indices, including: User Reports (Nur): Measured the prevalence and variety of herbal remedies reported by TMPs. Percentage of Respondents with Knowledge (PRK): Provided the proportion of TMPs knowledgeable about specific herbal treatments. Informant Consensus Factor (Fic): Assessed the level of agreement among TMPs on the use of particular plants. Fidelity Level (FL): Reflected on the consistency in the use of specific plants for treating certain ailments. Percentage Ranks (PR): Ranked herbal remedies based on their reported significance and effectiveness. Direct Matrix Ranking (DMR): Evaluated plants based on criteria such as efficacy, safety, and availability.

3.3 Target Population

Traditional Medicine Practitioners who are practicing and managing cancer client by use of herbal medicine in the five selected counties that is Kakamega, Bungoma, Nandi, Uasin Gishu and Baringo. The study focused on Traditional Medicine Practitioners (TMPs) from selected counties who met the following criteria: Practicing and Registered by any known institution that is the TMPs were required to be actively practicing and registered members of



Traditional Medicine Men in Kenya. Consent: Only those who provided informed consent were included in the study. Access to Herbal Medicine Sources: Participants needed to have access to their own or can show their sources of herbal medicines to ensure they could provide accurate and relevant information about their practices.

3.4 Sample Size Determination and Sampling Procedure

The sample sizing was done according to Fischer’s et, al. (1998).The test was done at 95% confidence interval level. Population proportion was assumed to be 5%, that is 5% of the people in the population are traditional medicine healers or practitioners. Therefore; sample size determination equation will be; E^2

$$n = \frac{Z^2 \times p(1-p)}{E^2}$$

n = sample size.

Z^2 = confidence interval.

E^2 = margin error

P = population proportion, which was assumed to be 3.5% of the people in the population of traditional medicine healers/herbalist.

$$n = \frac{1.96^2 \times 0.035 \times 0.95}{0.05^2} = 51.0933 = 52$$

n (sample size) = 52; attrition of 5 %was added i.e. 5 % of 52 = 2.6, that was 3

Hence sample size was 52+ 3 = 55. The sample was distributed in proportion to the total population of each of the counties as shown in Table 1.

Table 1
Sampling Schedule

County	Population	Percentage	Sample proportion
Baringo	666,763	10.91	7
Kakamega	1,800,000	29.43	16
Bungoma	1,600,000	26.16	14
Nandi	885,771	14.48	8
Uasin Gishu	1,163,186	19.02	10
Total	6115720	100	55

3.6 Data Collection Instruments.

To obtain a comprehensive data on ethnobotanical knowledge and practices on Traditional Medicine Practitioners in the selected counties in relation to the use herbal medicine for cancer treatment, a combination of quantitative and qualitative data collection was employed. A semi structured questionnaire was used in that it was designed and administered to the participants that was the TMPs. This tool will include both closed-ended and open-ended questions to collect quantitative data on various aspect, such as the types of medicinal plants used for cancer treatment, their methods of preparation, dosages and treatment outcomes. Additionally, the questionnaire included the sections to assess the knowledge and compliance of TMPs with WHO guidelines in cancer treatment. Data collection team: a team of trained and experienced researchers was responsible for collecting the data using these instruments. They underwent a thorough training to ensure consistency and accuracy in data collection.

3.6 Data Analysis

Objective 1: Once the data was collected, SPSS version 28 was employed for analysis. In this phase, we utilized descriptive statistics to summarize the types of medicinal plants used, their frequency of use, and any additional pertinent information. Specifically, we calculated frequencies, percentages, and means to provide a comprehensive overview of the medicinal plants' utilization by TMPs. Furthermore, we explored associations between variables, such as the types of plants used and the counties in which they are predominantly found, through cross-tabulations and contingency tables.

Objective 2: To analyze the data pertaining to the objectives, we did rely on SPSS version 28. Our analysis began with the computation of frequencies and percentages, allowing us to summarize the responses regarding compliance with WHO guidelines. In addition, we utilized cross-tabulations to discern any patterns or associations between compliance and other variables, such as the type of training received by TMPs, offering valuable insights into the adherence to established guidelines.

IV. FINDINGS & DISCUSSION

4.1 Response Rates

The study consisted of 53 TMPs, of which 18 (40%) were in Kakamega county, 24% were from Bungoma county, 13.2% were from Nandi, while Uasin Gishu and Baringo County had 17% and 11.3% respectively. There were more male TMPs (56%), than females (43%), with a mean of 59 years and a standard deviation of 17 years, however, the mean age among female TMPs was higher ($M = 63.2$, $SD = 15.7$) compared to their male counterparts ($M = 55.3$, $SD = 17.2$). For just over a quarter of the TMPs (28.3%), the income from the practice was the primary source of income, followed by farming $n=14$ (26.4%). The vast majority of the TMPs acquired their knowledge through heredity (71.7%), and the modal years of experience were 1-10 years and 11-20 years, accounting for almost half of the TMPs as shown in Table 2.

Table 2
Demographic Profile

Factor	Frequency	Percent
Gender		
Male	30	56.6
Female	23	43.4
County		
Kakamega	18	34.0
Bungoma	13	24.5
Nandi	7	13.2
Uasin Gishu	9	17.0
Baringo	6	11.3
Education attended		
None	4	7.5
Primary	23	43.4
Secondary	13	24.5
Tertiary	13	24.5
Primary income source		
Traditional medicine	15	28.3
Farming	14	26.4
Business	13	24.5
Formal Employment	11	20.8
Duration of practice		
1-10 years	13	24.5
11-20 years	13	24.5
21-30 years	9	17.0
31-40 years	8	15.1
Above 40 years	10	18.9
Knowledge source		
Hereditary	38	71.7
Apprenticeship	16	28.3

As shown in Figure 1, most of the TMPs had at least a primary level of education $n= 49$ (92.5%), of these, $n= 13$ (26.5%) had a tertiary level of education.

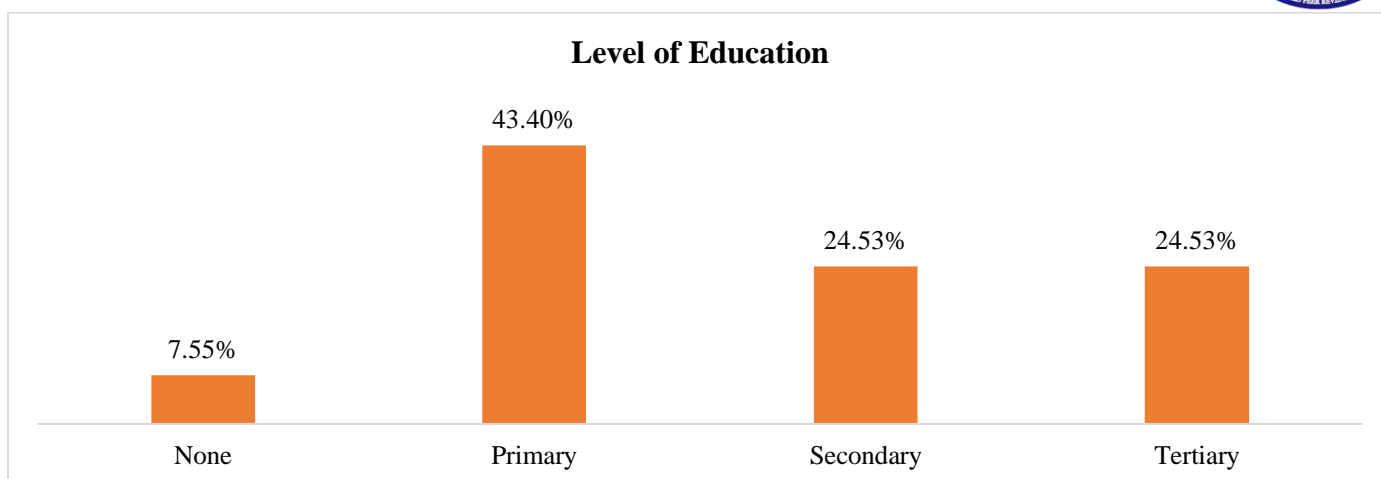


Figure 1
Education Level of TMPs

From this study, a total of 58 unique plants from 14 families as shown in Table 3. The *Rutaceae* family was the most represented, followed by the *Asteraceae* and *Fabaceae* families.

Table 3
Medicinal Plant Families Used in Cancer Treatment

Location	Plant name Local	Plant name Scientific	Cancer type	Part used	
Baringo	Sinendet	<i>Periplocaceae linearifolia</i>	Breast, cervical, prostate	Roots	
	Sirwo	<i>Rhus natalensis</i>	General	Roots	
	Sirwop boiyon	<i>Rhus longispes</i>	General	Roots	
	Kelwon	<i>Acokanthera schimperi</i>	General	Fruit	
	Kelelwa	<i>Croton dichogamus</i>	General	Not specified	
	Timonwo	<i>Prunus Africana</i>	General	Not specified	
	Cherabonyet		General	Not specified	
	Embunya	<i>Clausena anisata</i>	Prostrate	Leaves,Bark	
	Enguu	<i>Microglossa pyrifolia</i>	General	Leaves	
	Kumunyakasia		General	Not specified	
	Pineeapple	<i>Ananas sativus</i>	General	Leaves	
	Kakamega	Shingululusi	<i>Zanthoxylum rubescens</i>	Prostrate, lung	Bark
		Munyama	<i>Trichilia emetica</i>	General	Bark
		Libungu Lihali		General	Not specified
Honey		<i>Apis mellifera</i>	Breast, throat	Not specified	
Kigplia		<i>Kigelia africana</i>	General	Not specified	
Omupeli		<i>Albizia grandibracteata</i>	Skin,testicular,General	Flowers,leaves, bark, roots	
Omutali		<i>Prunus Africana</i>	Prostate,breast,skin	Bark	
Omurabe		<i>Gigalia Africana</i>	Breast, General	Bark	
Omtembe		<i>Erithria Melanacantha</i>	Prostate,breast	Root,stem	
Omwilima		<i>Diospyros</i>	General	Not specified	
Bungoma	Eshikhuma	<i>Zanthoxylum usambarensis</i>	Breast, cervical,prostate	Bark,Fruit	
	Emucherera khunga	<i>Sterculia Appendiculata</i>	General	Roots	
	Mukhuwa	<i>Tamarindus Indica</i>	Breast,General	Not specified	
	Apachi	<i>Warburgia Ugandensis</i>	Stomach,testicular,cervical,troat	Bark,	
	Chakula ya nyoka	<i>Cymbopogon citratus</i>	Throat	Not specified	

(mt. Elgon)	Mokoyweti		General	Not specified
	Taboswet	<i>Croton macrostachyus</i>	General	Not specified
	Chakula ya nyoka	<i>Cymbopogon citratus</i>	Throat	Not specified
	Chaptengande	<i>Croton dichogamus</i>	General	Not specified
	Einendet	<i>Periploca Linearfolia</i>	General	Not specified
	Mkuyu	<i>Ficus sycomorus</i>	General	Not specified
	Honey	<i>Apis mellifera</i>	General	Not specified
	Kwarasyet		General	Not specified
	Chemeeontet	<i>Houttugnia cordata</i>	General	Not specified
	Mowoobwarwa		General	Not specified
	Bitonyontet		General	Not specified
	Kabokoit	<i>Balanites aegyptiaca</i>	General	Not specified
Uasin Gishu	Ketemwo	<i>Toddalia asiatic</i>	General	Not specified
	Cheptiyeet	<i>Diaspyros abyssinica</i>	General	Not specified
	Sayineet	<i>Periploca Linearfolia</i>	General	Not specified
	Somborweet	<i>Ambrosia artemisiifolia</i>	General	Not specified
	Armoitit	<i>Dracaena ellenbeckiana</i>	Throat,General	Not specified
	Pumutet	<i>Terminalia brownii</i>	General	Not specified
	Mororwet	<i>Ehretia cymosa Thonn</i>	General	Bark
Nandi	Chilkotwet	<i>Platyclusus orientalis</i>	General	Not specified
	Tamuryekiat	<i>Carissa edulis</i>	General	Roots
	Chepkilas	Sacamore punctulate	General	Roots
	Momoniati	<i>Verbascum thapsus</i>	Prostate, skin, stomach,throat	Roots, leaves, flowers
	Mbogiat	<i>Amaranthus graecizans L</i>	Breast, Lung	Seeds, bud
	Chepkotiwot	<i>Bidens pilosa L</i>	Skin, throat	Leaf,root,bark
	Kaloswet	<i>Terminalia brownii</i>	General	Bark
	kibabustanyiet	<i>Maesa lanceolata</i>	Breast,colon,lung,liver	Not specified
	Ketemwet	<i>Toddalia asiatica</i>	Throat	Roots

Part Used

Roots were the most used plant parts 20.6%, in cancer management. Barks 17.7%, were the second most used part, while fresh buds were the least used as presented in Table 4.

Table 4

Plant Parts Used to Manage Cancer

Part used	Proportion
Bark	<u>17.65%</u>
Bud	<u>5.88%</u>
Flower	<u>8.82%</u>
Fruit	<u>14.71%</u>
Leaves	<u>14.71%</u>
Not specified	<u>17.65%</u>
Roots	20.59%

4.1.1 Practice of TMPs

Part used

Roots were the most used plant parts 20.6%, in cancer management. Barks 17.7%, were the second most used part, while fresh buds were the least used as presented in Table 5.

Table 5
Plant Parts Used to Manage Cancer

Part used	Proportion
Bark	17.65%
Bud	5.88%
Flower	8.82%
Fruit	14.71%
Leaves	14.71%
Not specified	17.65%
Roots	20.59%

4.1.2 Method of Preparation

Decoctions was the most used method of preparation for the medicinal plants used in cancer management. Poultices 14.7% were the least prepared, while for a further 11.8% of the medicinal plants, the method of preparation was not specified. Figure 2 shows the results.

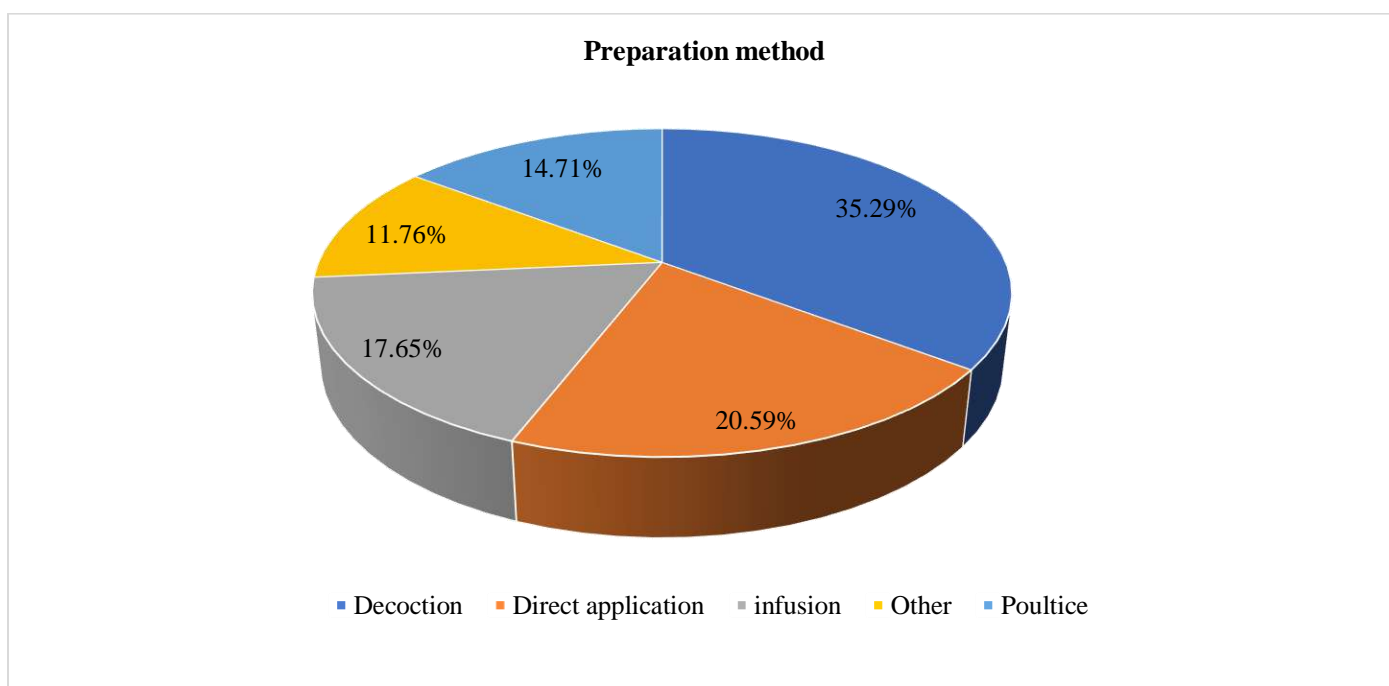


Figure 2
Preparation Method of Medicinal Plants

4.1.3 Method of Packaging

The majority of TMPs used bottles to package the medicines, accounting for over half of the packaging methods n=31(57.7%), about a quarter of the medicines were packaged using old newspapers and branded containers each, 26.9%. 3.8% of the medicines were not packaged, as shown in Table 6.

Table 6
Packaging Method of Traditional Medicine

Factor	Frequency	Percent
Methods of packaging		
Bottles	31	57.7
Plastic bags	19	34.6
Old newspapers	15	26.9
Branded containers	15	26.9
No packaging	3	3.8

4.1.4 Method of Administration

The most used method of administration was oral 35%, followed by direct topical application on the skin and under skin cuts, with 46.2% and 15.4% respectively, as illustrated in Figure 3.

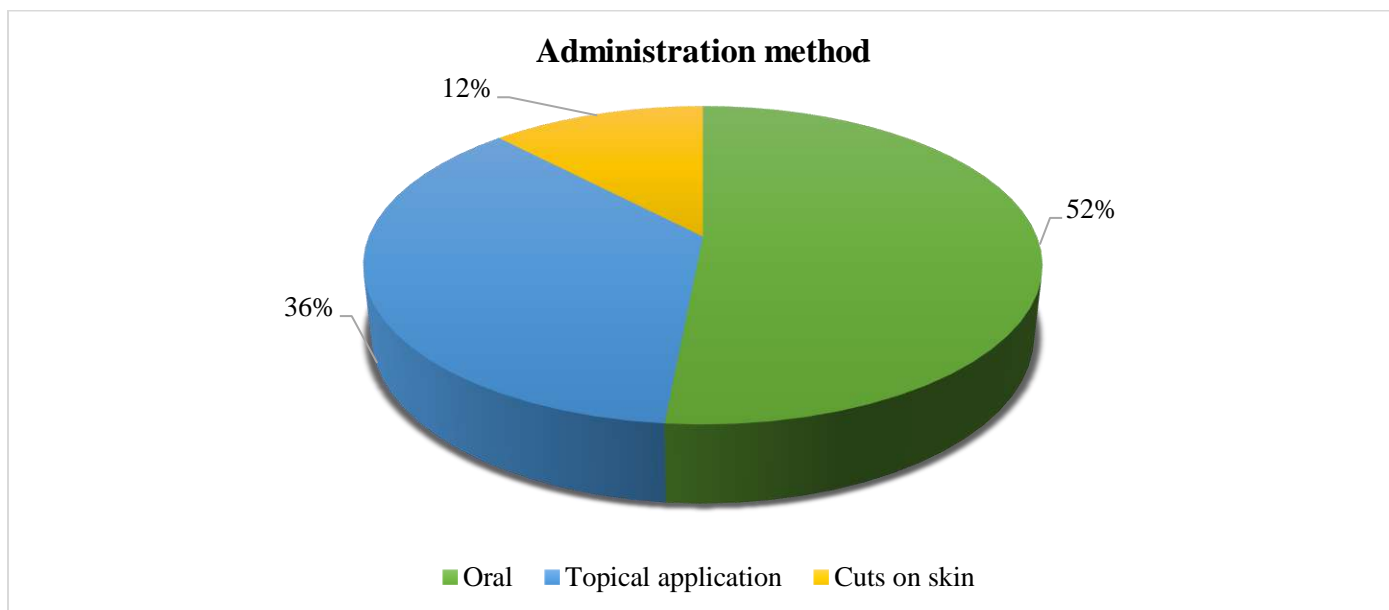


Figure 3
Administration Method of Cancer Medicines

4.1.5 Cancer Clients Managed by TMPs

Among the practitioners, referrals by their previous clients (76.9%) were the most used method of access to new patients, while radio was the least used. Women sought TMP services more than men, representing 42.3%. Other than cancer, bacterial infections, swelling and wounds, and bleeding were the conditions treated by the majority of the practitioners, as shown in Table 7.

Table 7
Client profile

Factor	Frequency	Percent
Access to clients		
Referrals	41	76.9
Radio	7	11.5
Advertise	13	23.1
Gender difference in Seeking TM		
Male	13	23.1
Female	23	42.3
Equal	19	34.6
Other Conditions treated		
Bacterial infections	41	76.9
Swelling and wounds	41	76.9
Bleeding	41	76.9
Childhood diseases	29	53.8
Infertility	37	69.2
Allergies	23	42.3
Diabetes	9	15.4

Presented in Table 8, prostate and throat cancers, representing two fifths of the cancer types treated cumulatively were the most treated types of cancer, seconded by breast cancer 17.2%, whereas testicular cancer was the least treated type of cancer.

Table 8*Types of Cancer Managed by TMPs*

Cancer type	Percentage
Prostate	20.70%
Throat	20.70%
Breast	17.20%
Cervical	10.30%
Skin	10.30%
Lung	7.30%
Stomach	8.50%
Testicular	4.90%

As presented in Table 9, MPs in Kakamega county treated the majority of prostate cancer cases (36.4%), Cervical (60%), and breast (33.3%), in which it was similar to Bungoma.

Table 9*Cancer Types Managed Per County*

Cancer type	Kakamega	Bungoma	Nandi	Uasin Gishu	Baringo	Chi (p value)
Prostate	4(36.4)	2(18.2)	2(18.2)	1(9.1)	2(18.2)	1.60(0.81)
Throat	2(18.2)	3(27.3)	2(18.2)	2(18.2)	2(18.2)	1.91(0.75)
Breast	3(33.3)	3(33.3)	1(11.1)	0	2(22.2)	3.36(0.50)
Cervical	3(60)	0	0	1(20.0)	1(20.2)	3.58(0.47)
Skin	1(20)	2(40)	1(20)	0	1(20)	2.35(0.67)
Lung	1(25)	1(25)	0	2(50)	0	3.79(0.44)
Stomach	1(25)	1(25)	1(25)	0	1(25)	2.01(0.73)
Testicular	2(50)	0	2(50)	0	0	7.05(0.13)

4.1.6 Restrictions to Practice

As presented in Table 10, 38.5% of the respondents indicated no cultural restrictions to the practice of traditional medicine, while among those who had restrictions, gender was the major restriction 34.6%. Almost all 92.4% of the practitioners intended to pass their knowledge to their children and grandchildren. Half of the practitioners observed the restriction to the times of harvest of the herbs, which was reported to be either early in the morning or late in the evening.

Table 10*Restrictions to Practice*

Factor	Frequency	Percent
Knowledge inheritance		
(Grand)Children	49	92.4
Not specified	4	7.6
Restrictions to practice		
Gender	19	34.6
Marital status	11	19.2
Age	5	7.7
None	21	38.5
Restrictions to Harvest		
Time (Morning/Evening)	27	50
Not raining	7	11.5
Not whole plant	3	3.8
Not after funeral	3	3.8
Not a woman on periods	3	3.8
None	15	27.1

Adherence to W.H.O. Guidelines

As presented in Table 11 Overall, the level of compliance to the WHO guidelines was low, at 27%. When analysed per item, the most adhered to guideline was that which requires that dispensing of the medicine be authorized

by persons trained in the processing and quality control of herbal materials, in which 94.3% were found compliant. Almost half (47%) disposed waste water from production unit regularly, 43% thoroughly cleaned the equipment after use, and 42% had well organised storage areas. On the other hand, only 3.8% of the TMPs had clearly marked waste bins in the production area, 5.7% had written procedures on basic hygiene, and similarly, 5.7% maintained records of batch preparations.

Table 11
Compliance to WHO Guidelines

Item	YES N (%)	NO N (%)
Treated water used for manufacturing the medicines	20(37.7)	33(62.3)
Waste water from production unit regularly disposed of	25(47.2)	28(52.8)
Clearly marked waste-bins available at the production unit	2(3.8)	51(96.2)
Drug production processes are defined	6(11.3)	47(88.7)
Records are maintained such as the date, name and description of the product, receipts, storage, and expiry dates	3(5.7)	50(94.3)
Product defects or deterioration recorded in detail and the causes thoroughly investigated.	7(13.2)	46(86.8)
Reports of any adverse reaction/event are entered in a separate register	11(20.8)	42(79.2)
The dispensing of herbal medicines is authorized by persons trained in the processing and quality control of herbal materials	50(94.3)	3(5.7)
Records of training are maintained, with periodic assessments of the effectiveness of training programs	6(11.3)	47(88.7)
Personnel are protected from contact with toxic irritants and potentially allergenic plant materials using PPEs when manufacturing.	13(24.5)	40(75.5)
Written procedures listing the basic hygiene requirements are made available.	3(5.7)	50(94.3)
Practitioners observe hand washing before handling the formulations and contact with the patients.	12(22.6)	41(77.4)
The equipment used is thoroughly cleaned after use	23(43.4)	30(56.6)
Storage areas are well organized and tidy	22(41.5)	31(58.5)
Storage areas are well labelled and materials stored in a such a way as to avoid cross - contamination	5(9.4)	48(90.6)
A standard is set for the maximum amount of foreign matter, e. g insects, soil, animal excreta, allowable in the collected herbs	21(39.6)	32(60.4)
AGGREGATE	27%	73%

Considering the low level of compliance to a number of the WHO guidelines, TMPs who scored at least 40% average compliance were considered to have high level of compliance. 18.9% of the TMPs showed a high level of compliance as shown in Table 12.

Table 12
Level of Compliance with WHO Guidelines

Compliance level		
Level	Frequency	Percent
Low	43	81.1
High	10	18.9

A significant association was found between the level of education and compliance, $\chi^2(3,53 = 19.48, p=0.000)$, primary income source $\chi^2(3,53 = 9.95, p=0.02)$ and duration of practice $\chi^2(4,53 = 28.84, p=0.000)$, as presented in Table 13.

Table 13*Association between Demographic Factors and Compliance*

Factor	Chi-Square	p value
Gender	3.20	0.07
County	2.35	0.67
Education level	19.48	0.00
Primary income source	9.95	0.02
Duration of practice	28.84	0.00

TMPs who had a tertiary level of education were found to be 3.12 times more likely to be compliant to WHO guidelines compared to those who had no formal education (OR= 3.12, 95% ci =0.64-15.21). Furthermore, TMPs whose primary income source was traditional medicine were found to be 3.56 times more likely to be compliant than those in formal employment, while those whose main income was farming were 1.8 times as likely as the reference to be compliant (OR= 1.8, 95% ci= 1.21-2.39). Compared to those who had practiced for over 40 years, TMPs with 21-30 years of experience were more than three times as likely to be compliant (OR= 3.24, 95% ci= 1.5-4.98), as presented in table 14.

Table 14*Demographic Predictors of Compliance*

Factor	Category	OR (95% ci)	p value
Gender	Male	0.21(0.03-1.16)	0.07
	Female	Ref	
County	Kakamega	5.85(0.26-11.44)	0.27
	Bungoma	7.73(0.29-15.17)	0.22
	Nandi	2.56(0.03-5.09)	0.68
	Uasin Gishu	12.02(0.27-23.77)	0.20
	Baringo	Ref	
Education	Tertiary	3.12(0.64-15.21)	0.001
	Primary	0.29(0.03-2.75)	0.28
	Secondary	0.43(0.02-7.73)	0.56
	None	Ref	
Income source	Traditional medicine	3.56(0.4-6.72)	0.004
	Farming	1.8(1.21-2.39)	0.04
	Business	0.84(0.23-1.45)	0.02
	Formal Employment	Ref	
Years of practice	1-10 years	0.49(0.02-0.96)	0.65
	11-20 years	0.57(0.22-0.92)	0.29
	21-30 years	3.24(1.5-4.98)	0.01
	31-40 years	0.66(0.037-1.28)	0.78
	Above 40 years	Ref	

4.2 Discussions

4.2.1 Medicinal Plants Used in Cancer Treatment

In this study, 58 plants from 14 plant families and 20 species were identified that were used to treat cancer. By comparison, in Pakistan, (Khan et al., 2021) found 159 plants, from 69 families, with *Lamiaceae* and *Asteraceae* being the majority. Their study, however, covered a larger area with more respondents. The study in Mexico by (Alonso-Castro et al., 2011) identified more plant families, finding 90 families, however, they used a different methodology, utilizing a Bibliographic investigation of databases, with a time span of five decades prior. In Morocco, 33 botanical families were identified using a similar methodology, however, the target population was the general public, with the *Lamiaceae* being the most used family (Mohamed et al., 2022). A finding close to this study was that by Omara et al. (2020) in Uganda, who found 24 botanical families with 29 species, even though they utilized a systematic review approach. As in this study, the *Asteraceae* family was among the most used anti-cancer families as was identified by (Ochwang'i et al., 2014) in Kakamega. The pattern of utilization of these medicinal plants shows a variation in the families used depending on the abundance of the species. A small overlap is found in the anti-cancer medicinal plants

used in the study area and the neighboring countries with similar climatic conditions. Furthermore, the study in Kenya by Omara et al. (2022) documented ethnobotanical plants from 125 genera, spread across 55 families used for their anti-cancer properties, wherein the most used family of medicinal plants were, in order, from the family: *Fabaceae* with nineteen species, *Asteraceae* with eleven species, *Euphorbiaceae* with eight species, and *Rutaceae* with seven species. In Western Kenya, the *meliaceae* family, with twenty-two species cited, was found to be the dominant family in the medicinal markets followed by *Apocynaceae*, citing nineteen species, *Fabaceae*, with 17 species, and *Rutaceae* and *Euphorbiaceae* both with ten species, being the most common families, carrying over half of all medicinal plants used in the region for cancer management (Paul, 2020). Against leukemia, (Ochwang'i et al., 2018) identified the viability of *Prunus Africana* extracts while *Clerodendrum Myricoides* is deployed against a wide range of cancerlike symptoms. In the Tana river region, 9.7% of the herbal remedies deployed by TMPs are used in the treatment of breast cancer. (Kaingu et al., 2013). In addition, Among the Embu community that is in Central part of Kenya, the most cited anti-cancer plants, all of which are used to treat breast and prostate cancer, are *Fagaropsis angolensis*, known as Mukuria Hungu by the local community, *Prunus Africana*, Mwiria to the local community and *H. solmsiana*, Ndonga to the local community (Misonge et al., 2019)

4.2.2 Compliance to WHO Guidelines

The WHO requires that treated water used for manufacturing the medicines. A 38% compliance rate was found in this study. Albeit slightly higher, this is comparable to the compliance rate in Malawi, which was determined to be 41% (Mponda et al., 2024), and significantly higher than the 18% recorded in Nigeria (Adigwe et al. 2022). Secondly, it is recommended that the equipment used in the manufacture of the herbal medicine are regularly cleaned. In this study, the compliance rate to this guideline was 43.4%, a rate which despite being less than half, is higher than the 31% found by (Mponda et al., 2024) Further, the WHO recommends that the dispensing of the medicines be approved by a person trained in the processing and quality control of herbal materials. A high level of compliance to this guideline was found, 94.3%. As Chege et. al 2018 pointed out, the TMPs maintain a high level of secrecy around their work thus they keenly oversee the dispensation of their medicines, hence the high adherence. At 47% the compliance to disposing of waste water from the production unit regularly was low, in line with the findings of Adigwe et al.(2022), whose study found challenges around water sourcing by the practitioners.

The WHO further recommends, with regards to handling and storage of the medicines, that adequate, clean, well-labelled storage is provided, as to minimize the risk of cross contamination. Even though the compliance to tidiness of storage areas was high, 42%, by comparison, only 9.4% were compliant of the labelling requirement. Furthermore, a low 5.7% compliance rate was recorded for written procedures listing the basic hygiene requirements. By comparison, Mponda et al. (2024) found a 27.6% compliance rate to the adequacy of clean storage, and a 6.9% rate for adherence to the provision of written SOPs. Similarly, the compliance to the requirement of standard operating procedures for dispensing and recall of the medicines was 13%, comparable to that in Malawi and Nigeria Mponda e al. (2024), even though there was found a higher rate of compliance, 21%, to record keeping in this study.

The health act no. 21 of 2017 which empowered the department of Health to provide policies and regulatory institutions that guide the practice of traditional and alternative medicine. The regulatory bodies created therein were required to provide guidance on registration, licensing and standards, and ensure compliance. The act further provided mechanisms for Traditional Health Practitioners to refer patients to health care facilities. In 2019, Kenya passed the Health Laws Act No. 5 of 2019, which recognizes traditional medicine as a health product. The act provided for training, registration and licensing of traditional and alternative health practitioners and spelt out regulatory and disciplinary guidelines. It also made provisions for the development of the Traditional and Alternative Health Practitioners Council (TAHPC) with two registered traditional health practitioners with over 10 years of experience as members of the council, in this study the compliance to WHO guidelines was 27%, which is low.

V. CONCLUSIONS & RECOMMENDATIONS

5.1 Conclusions

This study finds 58 plants from 14 plant families and 20 species were identified that were used to treat cancer in the five counties studied. The family of *Rutaceae* was the most presented as followed by *Asteraceae* family of plants Herbs and shrubs are the most common life form, with roots, barks and leaves being the most used plant parts in cancer management.

Most of TMPs could not identify the plants scientific names and a few could also not identify the traditional names, this is a challenge. Throat, prostate, and breast cancers are the three leading types treated using medicinal plants, accounting cumulatively for almost two thirds of the cancer types treated by traditional medicine practitioners in the study area and testicular cancer was the least type of cancer managed by the TMPs.

Decoction was the most used method of herbal preparation and empty bottles and plastic bags were the most method of packaging of herbal medicines as Oral administration method of drug was the most preferred. Most TMPs did not have labelling of their herbal medicines in terms of the date of manufacture, the names of the plants used in preparing herbal, expiry date and cancer they treat, this may be a challenge in practice maybe because of trainings. The longer the period in practice the more the compliance to the WHO guidelines and more cancers being managed. Kakamega and Bungoma counties seems to manage more cancers as compared to the other counties.

Females were the most gender that seeks for help in cancer management using herbal medicines, this is due to many types of cancers found in female gender while male were few. There are restrictions of practice in terms of Gender and harvesting of herbal medicines. Most TMPs prefer to pass their knowledge and practice to their grandchildren. The level of compliance to the WHO guidelines on traditional medicines harvesting, preparation and dispensing was low, at 27%. There is a significance association between the level of education, source of income and duration of practice and compliance in the practice.

5.2 Recommendations

Documentation of the Herbal Medicines or traditional medicinal plants for cancer management need to be put down clearly and made aware to the TMPs and even to the entire society. Ministry of Environment and wild life needs to partner with the Education sector in the institutions such as higher learning education to provide programs such as Herbal Medicine in management of diseases just like the other health workers are being trained such as pharmacologist, therefore this will promote the use of herbal medicines in cancer management and more skills gaining.

The health act policy no. 21 of 2017 which empowered the department of Health to provide policies and regulatory institutions that guide the practice of traditional and alternative medicine needs to be implemented by Government The regulatory bodies in Ministry of Health under surveillance therein should provide guidance on registration, licensing and standards, and ensure compliance of TMPs. TMPs also needs to be trained on the important of safety of the clients as they use herbal medicines. There is need for provision of processing of machines for herbs, in addition, the TMPs should be trained more on the methods of packaging, storage, premises sanitations and even the toxicity of the herbal medicine or the processed drug and administration of drugs and diagnosis to prevent cross infection in the middle of practice.

There is need to implement integration frameworks between traditional Medicine and modern Medicine in Kenya. World Health Organization in partnership with ministry of health should provide training to the TMPs in order to promote health to the locals so that practitioners to have modern skills in terms of processing of medicines, packaging, storage, administration and even know the efficacy of the herbs that they are administering. When this is done it will sustain the practice and therefore even the clients go to herbal medicines their safety is guaranteed.

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