Trop J Nat Prod Res, April 2020; 4(4):153-164 ISSN 2616-0684 (Print)
ISSN 2616-0692 (Electronic)

Tropical Journal of Natural Product Research

Available online at https://www.tjnpr.org

Original Research Article

Documentation of Medicinal Plants Used For Managing Cancer in Three Selected Local Government Areas of Ekiti State, Southwestern Nigeria

Tayo I. Famojuro and Taiwo O. Elufioye*

Department of Pharmacognosy, Faculty of Pharmacy, University of Ibadan, Ibadan, Nigeria

ARTICLE INFO

Article history:
Received 22 March 2020
Revised 04 April 2020
Accepted 23 April 2020
Published online 30 April 2020

ABSTRACT

Available chemotherapy for managing cancer is prone to various side effects and in Africa, majority use herbs for their health challenges. This study was undertaken to document medicinal plants used by both traditional healers and the people of Gbonyin, Moba and Efon local government areas of Ekiti State, Nigeria for managing cancer and cancer related diseases.
Information were obtained using semi-structured questionnaire and open interview from respondents made up of herbalist (39.4%), herb seller (15.8%), traditional medicine practitioners (21.1%), birth attendants (7.9%) and others (15.8%). Sixty-eight percent were males while 32% were females with their age ranging from 21 to 70 years.
A total of 57 plant species belonging to 53 genera and 38 families were identified. Ninety percent (90%) of the respondents interviewed claimed that their clients reported no side effect. Tree accounted for 38% of the life form mostly collected by the traditional healers and leaves were the most frequently used (33%) plant parts in herbal formulations. The commonest plant species among the recipes given by the respondents according to their Use Mention Index (UMI) were *Annona muricata* (0.154); *Xylopia aethiopica*, (0.154), *Nauclea lactifolia*, (0.115); *Plukeneta conophora*, (0.115) and *Plumbago zeylanica* (0.115).
The study concludes that medicinal plant in the study areas indicated high potential for cancer drug discovery.

Keywords: Ethnobotany, Traditional medicine, Medicinal plants, Cancer.

Introduction

Cancer is a disease characterized by abnormal and uncontrolled cell division which usually results from the prolonged unrepaired DNA damage by electrophilic species.[1] The cells are capable of forming mass or lump, which can diffusely invade the surrounding tissues. Cancer disease (CD) has become a global burden with its epidemiology, showing an alarming high incidence rate, hence, countries all over the world are facing increase in the number of cancer cases.[2] Worldwide, cancer is the main cause of death, with about 9.6 million cancer deaths and 18.1 million new cancer cases in 2018.[3] The cases of new cancer are likely to increase within the next twenty years to 22 million.[4] In 2018, Lung cancer (2.094 million, 11.6%), Breast cancer (2.089 million, 11.6%), Colorectal cancer (1.8 million, 10.2%), prostate cancer (1.3 million, 7.1%), Skin cancer (1.04 million, 5.7%) and Stomach cancer (1.0 million, 5.7%) accounts for the most commonly diagnosed cancers worldwide, while the commonest mortality due to cancer worldwide were the cancers of the trachea and lung (1.8 million deaths, 18.4%), Colorectal and colon (881,000 deaths, 9.2%), Stomach (783,000 deaths, 8.2%), Liver (782,000 deaths, 8.2%) and Breast (627, 000 deaths, 6.6%).[1] External environmental factors such as physical carcinogens, chemical carcinogens, and biological carcinogens are the major causes of cancer disease.[1] Tobacco, an example of environmental factors, contributes to about 25-30% deaths from cancer, while obesity and diet account for about 30-35%, infections account for 15-20%.[5] Of great concern are the various severe side effects associated with available drugs used in cancer chemotherapy, which is one of the main ways of treating CD. The inability of these chemotherapeutic agents to differentiate (poor selectivity) between the normal cells and cancerous cells and the high cost of purchasing the drugs, which make them not sufficiently available within the reach of the common man and the expensive cost of managing cancer through radiotherapy and surgery makes the search for alternative therapy attractive.
Medicinal plants have been reported to be useful source of several drugs including those in use for the management of cancer.[6] The use of complementary/herbal medicines such as plant or plant extract in cancer therapy however varies from one culture to another.[7] Worldwide, about 80% of the population depend on the use of medicinal plants to meet their health care challenges, however, this rate is much higher in developing countries such Nigeria.[8] Nigeria has great biodiversity and medicinal plants which are used in the treatment of various diseases including cancer. However, most of the medicinal plants are fast becoming threatened and they are yet to be identified and documented.[9] Some types of cancers have been successfully managed by traditional medical practitioners in many localities in Nigeria using plant-based preparations.[10] Many medicinal plants used in the management of cancer have been documented by previous workers in different parts of the country.[11-15] This study was however undertaken to document indigenous knowledge on medicinal plants in the management of cancer by the traditional healers of three selected local government areas (LGA) of Ekiti State, Southwestern Nigeria with a view to validate their potential use as anticancer agents.

*Corresponding author. E mail: toonitaiwo@yahoo.com
Tel: +2348033850773

Citation: Famojuro TI and Elufioye TO. Documentation of Medicinal Plants Used For Managing Cancer in Three Selected Local Government Areas of Ekiti State, Southwestern Nigeria. Trop J Nat Prod Res. 2020; 4(4):153-164. doi.org/10.26538/tjnpr/v4i4.7

Official Journal of Natural Product Research Group, Faculty of Pharmacy, University of Benin, Benin City, Nigeria.

Materials and Methods

Study area

The study area comprises of three local government areas (LGA) of Ekiti State, Southwestern Nigeria (Figure 1). Ekiti State lies in the south of Kwara and Kogi States, east of Osun State and bounded by

ISSN 2616-0684 (Print)
ISSN 2616-0692 (Electronic)

Ondo State in the east and in the south. It is divided into three geo-political zones and each of the three LGAs selected for this study represent each of the three geo-political zones; Gbonyin (Ekiti South), Moba (Ekiti North) and Efon (Ekiti Central). The study area lies between longitudes 40°51′ and 50°451′ east and 70°151′ and 80°51′ north of the geographical limits and covers an area of 2168 km² with a population of 381,436 in the 2006 national census.[16] Yoruba language which is one of the three major languages in Nigeria is the predominant language of the people of this region. Religions of the people in this region are Christianity and Traditional African religion, while a small percentage of the people are Islam. Greater population of this study area relies wholly on traditional practitioners for solutions to their health problems as they do not have access to modern health care facilities. Two distinct seasons of tropical climate, rainy season (April-October) and dry season (November-March), were found in the study area. A temperature range of between 21^{o}C and 28^{o}C, with high humidity is found in this region. The vegetation of the study area is in two forms; tropical forest which occurs in the south and central, and guinea savanna which is predominant in the northern periphery.

Study design

The ethnobotanical survey was conducted in three selected LGAs of Ekiti State with each representing one of the three geo-political zones, so as to gather information on the indigenous knowledge of treatment of cancer by the local populations of this state. It was carried out between April 2015 and October 2015. Open interviews as well as semi-structured questionnaires were used to obtain ethnomedicinal data from different categories of respondents which included traditional medical practitioners, herbalist, herb sellers and primary health care givers on indigenous plants used locally for the management of cancer in the selected LGAs of the State.

Informed Consent

Before the interview, a brief consultation was held with the village heads, elders and the head of the herbalist in the study communities in order to compile the names of the TMPs, herbalist and other relevant people before contacting them for interview. While in contact with the respondents, the purpose of the interview was made known to them and their permission to publish the findings of this research were obtained orally from all the participants.

Administration of Questionnaire

Although, English language was used to prepare the questionnaire, discussion was communicated to the respondents in Yoruba language and in cases where respondents did not fully understand, it was further communicated to them in Ekiti dialect. Three major sections were captured in the questionnaire; (1) covered demographic data like gender, ethnic group, age, religion, educational background, source of knowledge of herbal practice as well as duration of practice of the respondents. (2) Included respondent's folk classification of cancer disease and other questions assessing their knowledge of the disease, including factors responsible for cancer, cancer diagnosis methods, symptoms of cancer and cancer types which have been treated before by respondents. While (3) Involved information on medicinal plants used for cancer management, mode of administration, treatment duration, likely side effects of the recipes, availability of the plants used in the treatment as well as how they preserve their recipes.

Medicinal plants authentication

Majority of the plants were collected fresh with the help of the traditional healer(s) and authenticated at the Forest Herbarium Ibadan (FHI) of the Forestry Research Institute of Nigeria (FRIN) where their voucher specimens were deposited. Others were authenticated by comparing with the appropriate voucher specimens at the herbarium.

Analysis of medicinal plants data

Data obtained from the field survey were examined according to the use-mention index (UMI), which is defined as the number of mentions for one plant for a defined category, divided by the total number of respondents interviewed for the use category (n_u).[17] $UM_i = UM/ n_u$.

Results and Discussions

The documentation of medicinal knowledge about the use of indigenous plant for the treatment of different diseases by the local people of a particular region/culture being referred to as ethnobotany can serve as one of the major ways by which public health can be improved.[18] Often times, due to fear of losing customers as well as the risk of exposure of source of income/means of livelihood, the people endowed with the medical knowledge about the use of indigenous plant for the treatment of disease considered the knowledge as a family secrets that should not be revealed, but must be protected and passed on to a member of the family, sometimes, it could be by words of mouth without proper documentation. However, ethnobotanical survey has helped to avoid extinction of indigenous knowledge. This study documents medicinal plants used in the management of cancer disease and the existing knowledge among the traditional healers in Southwestern region (Ekiti state) of Nigeria.

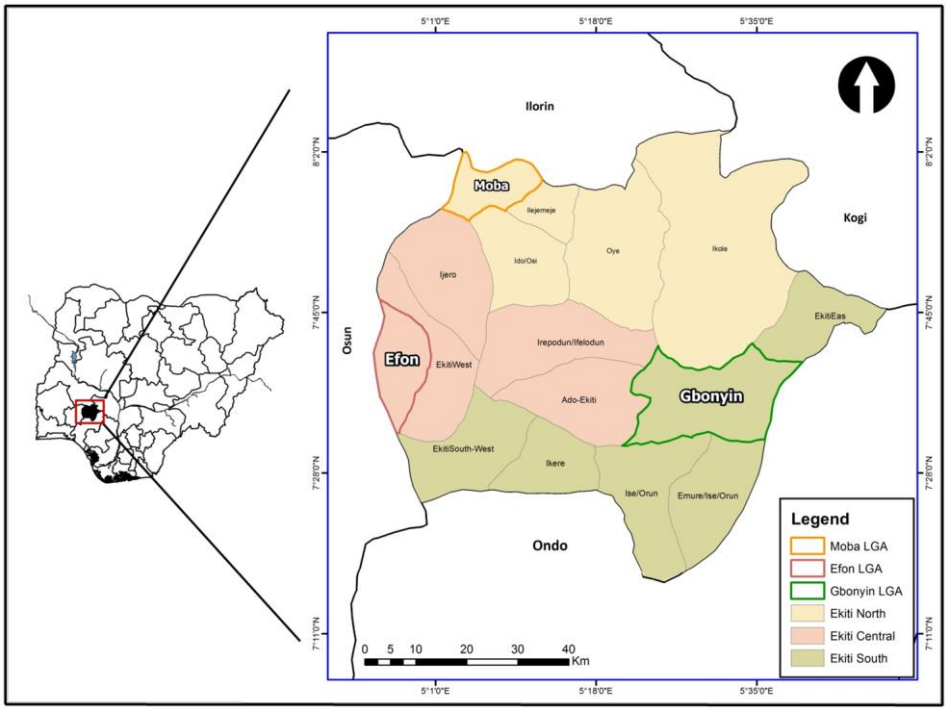

Figure 1: Location of the study areas (Ekiti State, Nigeria)

ISSN 2616-0684 (Print)
ISSN 2616-0692 (Electronic)

Respondents' demographic data

A total number of 38 respondents which includes; Herbalist (39.4%), traditional medicine practitioner (21.1%), herb seller (15.8%), traditional birth attendant (7.9%), peasant farmer (5.3%), hunter (7.9%) and nurse (2.6%), age ranges from 21-70 years were interviewed within the three selected LGAs of Ekiti State. The majority of the respondents were male (68.4%) while 31.6% were female and most of them had attained primary level of education (47.4%) and secondary level (31.6%) while 7.8% had no formal education (Table 1). The main religions of the respondents are Christianity (57.9%) and Traditional African religion (31.6%), while a small percentage of the people are Islam (10.5%). Majority of the respondents were married (76.3%) while 13.2% are widows and 10.5% are widowers (Table1).

The demographic result indicated 38 respondents made up of herbalists (39.4%), herb sellers (15.8%), traditional medicine practitioners (21.1%), traditional birth attendants (7.9%) and others (15.8%). Sixty-eight percent (68%) of the respondents were males, this may be because of the cultural opinion of the people, that males are the successors of the family inheritance, hence, in traditional medicine practice; the knowledge of plant use is transferred from generation to generation to the male child. In addition, the rigors in collection and preparation of medicinal plants in traditional medicine have restricted the trainee to be majorly males. More so, various forms of dangers associated with the collection of plants from the wild have made the practice less attractive to the female counterpart.[19] Christianity (58%) and Traditional African religion (32%) were the predominant religions of the respondents, while only a very small percentage of the people were Islamic worshipers. Sixty-one percent of the respondents were above 50 years of age; this clearly shows that the elderly are the main repository of indigenous knowledge about the local use of plant than any other age population. The educational status of the respondents was very low. However, the percentage that had basic education (primary) (47%) is incomparable with just 8% that had no formal education. Larger percentage (40%) of the respondents claimed to have been practicing for more than 40 years; with majority (47%) inheriting the practice from their grandparents and parents but few of them acquired the knowledge via dream and training. Such traditional practitioner's demographic data like educational level, age and their traditional knowledge sources have been reported in a similar finding.[20] Majority (63%) of the respondents interviewed were operating from their homes while 21% had offices/clinics and another 18% were consulting at the market place.

Respondents' traditional knowledge and year of practice

Most of the respondents (47.4%) interviewed admitted inheriting the practice of traditional medicine and associated medical knowledge from their family members, while some indicated that their source of knowledge was through training (15.8%). Specifically, 29.0% submitted that their source of traditional knowledge was through inheritance as well as training while 7.8% claimed that their source of inspiration was through dream or God (Figure 2). Most of the respondents (39.5%) had more than 40 years of practice, 26.3% for between 31-40 years, 21.1% for 21-30 years, 7.8% for 11-20 years while only few (5.3%) had practiced for less than 10 years (Table 2). Only nine (9) of the respondents had their practice registered with corporate affairs commission while some were affiliated to National association of traditional medicine practitioner in Ekiti State.

Respondents' knowledge about Symptoms, causes, diagnosis and treatment of cancer

The respondents had a fair understanding of the disease called cancer on the basis of acceptable clinical symptoms such as lumps or thickening on breast (9), unusual bleeding or discharge (5) and severe pain of the affected region (6), hence they identified it as 'aisan jejere' meaning cancer disease in Yoruba language. They also understood cancer spread from its original location to other parts of the body (12) and sometimes difficult to treat (5). Breast, prostate, skin and blood were types of cancer mostly mentioned by the respondents. A large number of the respondents (50.0%) believed that CD is caused by spiritual attack while others admitted that consumption of canned foods (31.6%), committing of abominable act (10.5%) and heredity (7.9%) are various factors which can be responsible for CD (Table 3). Respondents believed that cancer can be diagnosed on the basis of the state of illness (42.1%), 'ifa' oracle (23.7%), presence of swollen and hard growth on the skin (13.2%) and hospital confirmation (21.0%) (Table 3). Some respondents also said that cancer wound (breast)

Table 1: Demographic characteristics of the respondents

Parameter	Number	Percentage (%)
Primary occupation		
TMPs	8	21.1
Herbalist	15	39.4
Herb-sellers	6	15.8
Traditional birth attendants	3	7.9
Peasant farmer	2	5.3
Hunter	3	7.9
Nurse	1	2.6
Age (Years)		
< 20	0	0.0
21-30	2	5.3
31-40	4	10.5
41-50	9	23.7
> 50	23	60.5
Sex		
Male	26	68.4
Female	12	31.6
Educational level		
Primary	18	47.4
Secondary	12	31.6
Tertiary	5	13.2
None	3	7.8
Religion		
Christianity	22	57.9
Islam	4	10.5
Traditionalist	12	31.6
Marital status		
Single	0	0.0
Married	29	76.3
Divorced	0	0.0
Widow	5	13.2
Widower	4	10.5

TMPs: Traditional medical practitioners

Table 2: Duration of practice of respondents (n=38)

Parameter	Number	Percentage
Duration of practice (year)		
< 10	2	5.3
11-20	3	7.8
21-30	8	21.1
31-40	10	26.3
> 40	15	39.5

ISSN 2616-0684 (Print)
ISSN 2616-0692 (Electronic)

smells and has discharge which could be in form of pulse initially, then blood and later watery as it responds to treatment towards healing. Herbal preparation (47.3%) was the major way indicated by the respondents for the treatment of CD, however, the use of divination (21.1%), incantation (10.5%), and other things are also common among the traditional medicine practitioners in the study area (Table 3).

Respondents were found to have knowledge about cancer disease and its treatment as they are able to recognize cancer as '*aisan jejere*' in Ekiti dialect. They understand that cancer has the ability to spread from its original location and migrate to other parts of the body. They indicated that cancer can affect all parts of the body and cancers of the breast, skin, and prostate were the specific types mentioned. The respondents recognized some of the symptoms of cancer such as general weakness of the body, weight lost and severe pain of the affected region, their ability to identify the disease is very important otherwise, information provided on the treatment can be misleading. Fifty percent (50%) of the respondents specified that spiritual attack is the main cause of cancer, while other superstitious beliefs such as committing abominable act in the family accounted for (11%). Meanwhile, thirty percent (30%) of the respondents indicated environmental factor like consumption of canned food as the cause of cancer and seven percent (7%) associated heredity with cancer development. The respondents diagnose cancer by the manifestation of lumps or thickening on breast (42%), swollen and hard growth on the skin (solid tumours) (24%), and spiritual divinations like consultation of the ifa oracle in some cases (24%). The respondents also said many of the cancer patients may have been confirmed with the disease in the hospital first (21%) but, because of insufficient fund, decide to undergo a traditional healer treatment, as it is more affordable. A similar case of this nature was previously reported [21]

Medicinal plants used for cancer disease management

Fifty-seven (57) plants from fifty-three (53) genera and thirty-nine (39) families were reportedly been used by the respondents in their herbal formulation for cancer treatment. The botanical names, common names, local names, the parts used and their use mention index (UMI) are shown in Table 4. Euphorbiaceae with eight (8) species, Annonaceae and Fabaceae with three (3) species each, were the most reported families. Others are Menispermaceae and Moraceae with two species each, the rest have one species each (Table 4).

Table 3: Causes, Diagnosis and Treatment of cancer by the respondents (n=38)

Parameter	Number	Percentage
Causes		
Spiritual attack	19	50.0
Committing abominable act	4	10.5
Consumption of can foods	12	31.6
Heredity	3	7.9
Diagnosis		
Lump or thickening on breast	16	42.1
Ifa oracle	9	23.7
Presence of swollen and hard growth on the skin	5	13.2
Hospital confirmation	8	21.0
Treatment		
Herbal preparation only	18	47.3
Divination only	8	21.1
Incantation only	4	10.5
Herbal preparation + incantation	6	15.8
Herbal preparation + other things	2	5.3

Frequently cited plants were *Annona muricata* (0.184) and *Nauclea lactifolia* (0.137) with frequency of 7 and 5, respectively, followed by *Calliandra portoricensis* (0.10), *Combretum racemosum* (0.10) and *Xylopia aethiopica* (0.10) with frequency of 3 each (Table 4). The respondents said they use plants purchased from the herb markets or plants collected fresh from the forest (where available) to treat cancer. Respondents confirmed that freshly collected samples are preferred in some cases, but however admitted that both forms of plant materials are effective in herbal preparation. Fifteen percent (15%) of respondents said incantation was necessary during plant collection, while majority (85%) were against incantation during herb collection.

On the whole, the survey revealed fifty-seven (57) different plants species used by the traditional healers in cancer disease management. Some of the plants mentioned in this study have also been cited in a similar work,[13] which supported the use of nineteen (19) plant species out of the fifty-seven (57) used traditionally to treat cancer in Nigeria as implicated in this study. These species includes; *Aframomum melegueta*, *Allium cepa*, *Antiaris africana*, *Chenopodium ambrosioides*, *Citrus aurantifolia*, *Elaeis guineensis*, *Khaya grandifolia*, *Nauclea lactifolia*, *Nymphaea lotus*, *Olax subscorpioidea*, *Parquetina nigrescens*, *Petiveria alliacea*, *Piper guineese*, *Pistia stratiotes*, *Plumbago zeylanica*, *Pycnanthus angolensis*, *Securidaca longipedunculata*, *Tetrapluera tetraptera* and in other culture; In India and South America folklore medicine, *Boerhavia diffusa* is used in the management of cancer,[22] *Bridelia micrantha* in Kenya,[23] *Paullinia pinnata* in Cameroon,[24] *Carica papaya* in India,[25] *Aristolochia ringens* in Algeria[26] and *Anacadium occidentale* in India.[27] Hence, the use of the same plants species in different culture in the management of cancer strongly suggests that these species may be effective.

Reviews on the plants mentioned indicated *Annonas muricata*,[28-30] *Xylopia aethiopica*[13,31,32] and *Plukeneta conophora*[33] as anticancer species. Other plants species mentioned in this study which have been scientifically investigated include: *Boerhavia diffusa*,[22] *Bridelia micrantha*,[23] *Carica papaya*,[25] *Chenopodium ambrosioides*,[34] *Euphorbia poissoni*,[35] *Allium cepa*,[36] *Jatropha curcus*,[37] *Jatropha gossypifolia*,[38] *Pistia stratiotes*,[39] *Rouwolfia vomitoria*,[40] *Securidaca longipedunculata*,[41] *Plumbago zeylanica*,[42,43] *Piper guineese*,[13] *Psidium guajava*,[44] *Anacadium occidentale*,[27] *Paullinia pinnata*,[24] *Petiveria alliacea*,[45,46] *Aristolochia ringens*,[26] *Calliandra portoricensis*,[47,48] *Combretum racemosum*[49] and *Citrus aurantifolia*[15] have been investigated by previous workers and reported to have anticancer properties. These accounts for 60% of the total plants implicated in this study and the active principles have also been obtained from some of the plants cited in this study. *β*-hydroxylup-20(29)-ene-27,28-dioic acid from *Plumbago zeylanica*,[43] *β*-caryophyllene, linalool from *Calliandra portoricensis*[47] acridone alkaloids from *Citrus aurantifolia*[15] are some of the phytochemicals obtained that have demonstrated anticancer activity. The efficacies of the remaining twenty-three plants species (40%) need to be scientifically investigated to ascertain their potency in the management of cancer.

. The family, Euphorbiaceae has been mentioned as the predominantly used in cancer management in a related study[14] carried out in North-Eastern Nigeria which revealed 65 anticancer plants. The occurrence of medicinal plants in these families suggests their importance as repository of useful plants which may be explored scientifically for anticancer drug development. Plants collected for herbal preparations by the respondents were found to be majorly trees (38%) followed by herbs (20%), shrub (10%) and climbers (14%) while others were undershrub, grass, clumping and straggling shrub with less than 5% each (Figure 3).

Ahmad and co-worker reported that herbs among all other life forms of plant, were the mostly use by the traditional healers all over the world due to their high abundance and easy collection.[50] Interestingly, in this study, trees (38%) were the life form mostly used by the traditional healers in the study area (Figure 3), this could be attributed to their availability and easy access throughout the year and their proven effectiveness when made into herbal formulation for cancer treatment.[51,52]

ISSN 2616-0684 (Print)
ISSN 2616-0692 (Electronic)

Plants parts used

Although different morphological parts were usually used in medicine preparation, the predominantly used plant parts was the leaves accounting for 33%, followed by the stem bark (26%), root (13%), latex and fruit with 8% each while the root bark, whole plant, stem, bulb and seed accounted for less than 5% each (Figure 4).

Documented plant parts used by the traditional healers in their herbal formulations for cancer treatment, as observed in this study consist of majorly leaves (33%), followed by the stem bark (26%) and root (13%) (Figure 4). Similar studies in Nigeria[9,11,15,53], have also reported this observation. This was supported by Bhat *et al*,[54] who reported that in traditional medicines for cancer therapy in some culture such as India and Kenya, the plant part mostly exploited are the leaves. This may not be unconnected with their easy process of harvesting as well as their less effect on plant conservation. In addition, traditional healers indicated their preference for leaves in ethnomedicinal formulations due to its collection having the least threat on plant species life cycle and its all-round the year relative availability.[55] Leaves and barks appeared as medicinally active agents/compounds accumulator, thus they are given more preference in herbal recipes formulation. Roots on the other hand are the part of the plants that is mostly rich in secondary metabolites, and are commonly used by traditional healer.[56] Because, root anchors the plant to the soil, excessive harvesting may result in the death of the plant, therefore caution must be taken when harvesting.[57]

Herbal formulations, preparations and administration

Thirty-one herbal recipe formulations were indicated by the respondents for the management of CD in the selected LGAs of Ekiti State (Table 5). The main method of the preparations was by decoction (38.2%) while other preparations such as tincture (19.4%), powder (12.9%), concoction (6.5%), sharing (6.5%), paste (6.5%) soap (3.2%), infusion (3.2%) and ointment (3.2%) were also used (Table 5). The time required for boiling usually varies depending on the plant material or plant parts being processed. Sometimes, the medicines can be made from mixtures of two or more different plant species such as *Nauclea lactifolia* plus *Annona muricata* or *Piper guineese*, *Pistia stratiotes*, *Nymphaea lotus* plus *Xylopia aethiopica* while sometimes, a single plant can be prepared to cure the disease as claimed by some respondents during the interview. Examples of such plants include; *Alchornea laxiflora*, *Chasmathera dependens* (Table 5). Some of the respondents admitted the use of other materials such as 'obu otoyo' (local salt substitute), 'adin eyan' (palm kernel oil), 'ako okuta' (male stone) and 'ose dudu' (black soap) in their recipes for the treatment of CD (Table 5). In most cases, the herbal preparations are usually administered orally while in some cases, it can be applied topically. Teacup full (250 mL) two or three times daily, short cup full (60 mL) twice daily, table spoon full (15 mL) twice daily and teaspoon full (5 mL) twice or once daily (Table 5) were the mentioned quantities for administration. The need for treatment for up to 6 months and above, between 3-6 months, between 1-3 months and below 1 month as the case may be was recommended by some of the traditional practitioners.

Reported anticancer used in Ethno-medicine

Medicinal plants obtained from the survey were subjected to literature review to confirm their traditional use in other cultures for treating cancer. Some of the medicinal plants implicated have also been used in other communities as well. These includes; *Boerharia diffusa*, *Bridelia micrantha*, *Carica papaya*, *Aristolochia ringens* and *Anacadium occidentale*. Some of the plant species mentioned by the respondents have been investigated experimentally by previous workers and reported to have anticancer properties. These plants include: *Annona muricata*, *Xylopia aethiopica*, *Plukeneta conophora* and *Plumbago zeylanica*. Other plants species mentioned in this study which have been scientifically investigated include: *Chenopodium ambrosioides*, *Euphorbia poissoni*, *Allium cepa*, *Jatropha curcus*, *Jatropha gossypifolia*, *Pistia stratiotes*, *Rouwolfia vomitoria*, *Securidaca longipedunculata*, *Paullinia pinnata*, *Plumbago zeylanica*, *Petiveria alliacea*, *Calliandra portoricensis*, *Psidium guajava* and *Citrus aurantifolia.*

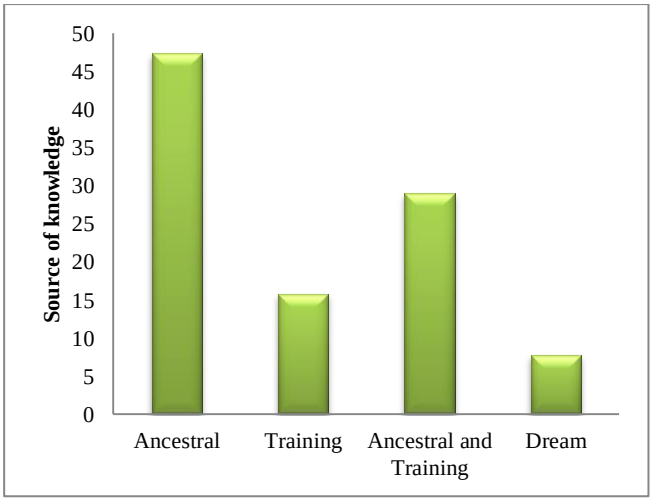

Figure 2: Proportion of source of knowledge of the respondents

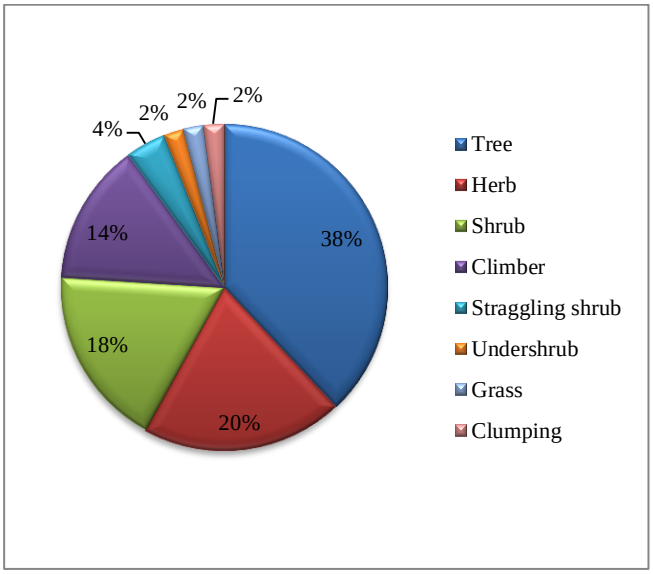

Figure 3: Proportion of habit of plants reported to be used in anticancer preparations

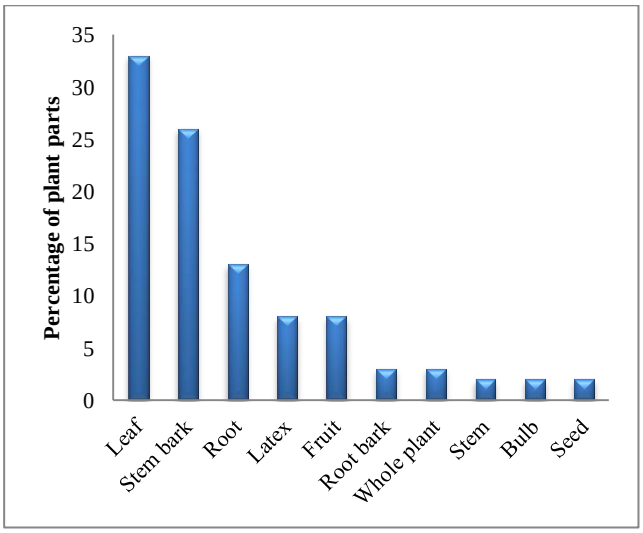

Figure 4: Proportion of plant part reported to be used in preparation of cancer disease

ISSN 2616-0684 (Print)
ISSN 2616-0692 (Electronic)

Thirty-one (31) different herbal recipes, majorly multicomponent in nature were indicated by the traditional healers of the selected local government areas of Ekiti State for the treatment of cancer. Decoction (38%) was the most dominant formulation method, which can be attributed to the fact that water is easily accessible for use in herbal formulation. In addition, the majority (90%) of the traditional healers admitted no side effect for recipes prepared with water. Majority of the recipes were found to be polyherbal, and the traditional healers prescribe the polyherbal to patients as they claimed and believed that it usually exhibited increased efficacy as against a single plant preparation. This can be explained by the buffering and synergy principle offered by the different herbs when combined to make herbal recipe.[58] This was also supported by the work of Chen and co-worker, who reported that in Chinese traditional medicine system, for ages, the use of polyherbal therapies is a common practice.[59] The traditional healers also claimed that the use of other materials such as 'iya ose', 'obu otoyo' (local salt substitute), 'adin eyan' (palm kernel oil), 'ako okuta' (male stone), 'ose dudu' (black soap) and honey in some herbal recipes made for the treatment of cancer, in some cases served as preservatives as well as additives. Respondents were aware of possible toxicity from phytomedicines. Majority (90%) of the respondents said their herbal preparations are safe for patients' use. However, some respondents said some patients may experience nausea, feel drowsy or even sleep for a prolonged period after taking the recipe. Some of them reported advising their patients against the use of their herbal medication with orthodox medicines to avoid drug interaction as well as complications.

Table 4: Medicinal plants used for the management of cancer

S/N	Botanical name	Family name	Local name	Habit	Part used	Use mention index (UMI)	Reported anticancer activity	FHI NO
1	*Acanthus montanus* (Nees) T. Anders.	Acanthaceae	Ahon ekun	Herb	Whole plant	0.026	No	FHI 112210
2	*Aframomum melegueta* K Schum.	Zingiberaceae	Atare	Herb	Fruit	0.078	No	FHI 109986
3	*Alchornea laxiflora* (Benth.) Pax and K. Hoffman.	Euphorbiaceae	Iya/Pepe	Shrub	Fresh leaf	0.026	No	FHI 112194
4	*Allium cepa* L.	Amaryllidaceae	Alubosa	Herb	Bulb	0.052	Yes	FHI 109858
5	*Anacadium occidentale* L.	Anacardiaceae	Kaju/Kasu	Tree	Stem bark	0.026	Yes	FHI 112207
6	*Annona muricata* L.	Annonaceae	Abo	Tree	Fruit	0.184	Yes	FHI 112193
7	*Antiaris africana* Engl. C.C Berg	Moraceae	Oriro	Tree	Stem bark	0.026	No	FHI 109519
8	*Aristolochia ringens* Vahl.	Aristolochiaceae	Akoigun/ Areogun	Herb	Whole Plant	0.052	Yes	FHI 112195
9	*Azadirachta indica* A. Juss.	Meliaceae	Dongoyaro	Tree	Stem bark	0.026	No	FHI 112206
10	*Boerhavia coccinea* Mill.	Nyctaginaceae	Etupalola	Herb	Leaf	0.052	No	FHI 004348
11	*Boerharia diffusa* L.	Nyctaginaceae	Etupalola	Herb	Leaf	0.026	Yes	FHI 109603
12	*Bridelia micrantha* (Hochst.) Baill.	Phyllanthaceae	Arasan	Tree	Leaves	0.026	Yes	FHI 109831
13	*Caesalpinia benthamianus* Baill.	Fabaceae	Amuranju	Straggling shrub	Leaf	0.078	No	FHI 110847
14	*Calliandra portoricensis* (Jacq.) Benth.	Fabaceae	Tude	Shrub	Root	0.10	Yes	FHI 109672
15	*Carica papaya* L.	Caricaceae	Ibepe	Shrub	Leaf	0.052	Yes	FHI 106998
16	*Ceiba pentandra* (L.) Gaertn.	Bombacaceae	Araba	Tree	Stem bark	0.052	No	FHI 112198
17	*Chasmathera dependens* Hochst.	Menispermaceae	Atoo	Climber	Root	0.052	No	FHI 110619
18	*Chenopodium ambrosioides* L.	Chenopodiaceae	Arupale	Herb	Leaf	0.026	Yes	FHI 112208
19	*Cissampelos owarensis* P.Beauv. ex DC.	Menispermaceae	Jenjoko/	Climber	Leaf & Root	0.052	No	FHI 106764

ISSN 2616-0684 (Print)
ISSN 2616-0692 (Electronic)

			Jokojee					
20	*Citrus aurantifolia* (Cristm.) Swingle	Rutaceae	Osan wewe	Shrub	Fruit	0.026	Yes	FHI 110009
21	*Combretum racemosum* P. Beauv	Combretaceae	Okan pupa	Climber	Root	0.10	Yes	FHI 109781
22	*Croton lobatus* L. Mull.Arg.	Euphorbiaceae	Aru	Herb	Leave	0.026	No	FHI 24957
23	*Cymbopogon citratus* (DC.)	Poaceae	Ewe tea	Grass	Leave	0.052	No	FHI 109052
24	*Elaeis guineensis* Jacq.	Arecaceae	Igi ope	Tree	Stem bark	0.052	No	FHI 107987
25	*Enantia chlorantha* (Oliv.)	Annonaceae	Dokita igbo	Tree	Stem bark	0.078	No	FHI 101821
26	*Euphorbia lateriflora* Schumach. & Thonn.	Euphorbiaceae	Oro enukokure	Shrub	Latex	0.026	No	FHI 109817
27	*Euphorbia opuntia* Mill.	Euphorbiaceae	Oro alagogo	Shrub	Latex	0.078	No	FHI 111088
28	*Euphorbia poissoni* Pax Tinya	Euphorbiaceae	Oro kirimi/ Oro adete	Shrub	Latex	0.052	Yes	FHI 104789
29	*Ficus mucuso* Welw. ex Ficalho	Moraceae	Obobo/Obo	Tree	Stem bark	0.026	No	FHI 112205
30	*Fimbristylis dichotoma* (L.) Vahl	Cyperaceae	Fidi	Clumping	Leaf	0.052	No	FHI 37323
31	*Hymenocardia acida* Tul	Phyllanthaceae	Orunpa	Tree	Stem bark	0.078	No	FHI 108220
32	*Jatropha curcus* L.	Euphorbiaceae	Dodoromi	Shrub	Latex	0.026	Yes	FHI 112200
33	*Jatropha gossypifolia* L.	Euphobiaceae	Botuje pupa	Shrub	Latex	0.052	Yes	FHI 112203
34	*Khaya grandifoliola* C. DC.	Meliaceae	Oganwo	Tree	Stem bark	0.026	No	FHI 112197
35	*Lgenaria breviflorus* Benth.	Cucurbitaceae	Tagiri	Climber	Fruit	0.052	No	FHI 110618
36	*Nauclea lactifolia* Smith.	Rubiaceae	Egbesi	Shrub	Root	0.131	No	FHI 112209
37	*Nymphaea lotus* L.	Nymphaeaceae	Osibata	Herb	Leaf	0.026	No	FHI 110617
38	*Olax subscorpioidea* Oliv.	Olacaceae	Ifon	Tree	Stem	0.078	No	FHI 110739
39	*Parquetina nigrescens* (Afel.) Bullock	Asclepiadaceae	Ogbo	Climber	Leaf	0.052	No	FHI 112192
40	*Paullinia pinnata* L.	Sapindaceae	Sweet gum span	Climber	Leaf	0.052	Yes	FHI 109830
41	*Petiveria alliacea* L	Phytolaccaceae	Awogba arun	Herb	Leaf	0.026	Yes	FHI 112189
42	*Piper guineese* Schumach.	Piperaceae	Iyere	Climber	Leaf	0.078	Yes	FHI 107249
43	*Pistia stratiotes* L.	Araceae	Ojuoro	Herb	Leaf	0.052	Yes	FHI 109643
44	*Plukenetia conophora* Mull. Arg	Euphorbiaceae	Ausa	Climber	Leaf & Stem bark	0.078	Yes	FHI 112199
45	*Plumbago zeylanica* L.	Plumbaginaceae	Inabiri	Straggling shrub	Root	0.078	Yes	FHI 112211
46	*Psidium guajava* L.	Myrtaceae	Goaba	Tree	Stem bark	0.026	No	FHI 112196
47	*Pterocarpus osun* Jacq.	Fabaceae	Arosu/Osun	Tree	Stem bark	0.026	No	FHI 112191
48	*Pycnanthus angolensis* (Welw.) Warb.	Myristicaceae	Akomu	Tree	Root bark	0.052	No	FHI 112190
49	*Ritchiea longipedicellata* Gilg	Capparaceae	Logbekiya	Undershrub	Leaf	0.052	No	FHI 110624

ISSN 2616-0684 (Print)
ISSN 2616-0692 (Electronic)

50	*Rauwolfia vomitoria* Afzel.	Apocynaceae	Asofeyeje	Tree	Root & Stem bark	0.026	Yes	FHI 108987
51	*Securidaca longipedunculata* Fresen.	Polygalaceae	Ipeta	Small tree	Root	0.026	Yes	FHI 109974
52	*Solenostemon monostachyus* (P Beauv.) Briq.	Lamiaceae	Olojongbodu	Herb	Leaf	0.026	No	FHI 112212
53	*Spondias mombin* L.	Anacardiaceae	Okikan	Tree	Stem bark	0.052	No	FHI 107896
54	*Terminalia superba* Engl. & Diels.	Combretaceae	Afara	Tree	Stem bark	0.052	No	FHI 16678
55	*Tetrapleura tetraptera* (Schumach. and Thonn) Taub.	Mimosaceae	Aidan	Tree	Fruit	0.052	No	FHI 110141
56	*Trema orientalis* (L.) Blume	Canabaceae	Afefe	Tree	Stem bark	0.026	No	FHI 112204
57	*Xylopia aethiopica* (Dunal) A. Rich.	Annonaceae	Arunje/ Aruje	Tree	Root bark & Seed	0.10	Yes	FHI 108978

FHI: Forest Herbarium Ibadan

Table 5: Herbal Recipes for different types of cancer disease management

S/N	Recipe formulation	Solvent used	Types of preparation	Mode of administration	Dosage
1	The dried fruits of *Annona muricata* and *Nauclea lactifolia* are dried and grinded.	Pap	Powder	Oral	Tea spoon, once daily
2	Leaves of *Pistia stratiotes, Nymphaea lotus, Piper guineese* and fruits of *Xylopia aethiopica*, all in equal quantity are boiled with water in a local pod.	Water	Decoction	Oral and Topical (breast cancer patient cover herself with it).	Tea cup, twice daily
3	Roots of *Plumbago zeylanica, Calliandra portoricensis* and leaves of *Caesalpinia benthamianus* are macerated in alcohol 12 to 24 hrs,	Alcohol	Tincture	Oral	Short cup, twice daily for twenty days to one month.
4	The leaves of *Euphorbia poissoni*, stem of *Euphorbia opuntia* and *Euphorbia lateriflora* are pounded and mixed with 'obu otoyo' and 'adin'	Local oil	Paste	Topical	Apply with cotton wool on the breast as often as possible
5	Leaves of *Pistia stratiotes*, bulb of *Allium cepa* and fruits of Short *Tetrapluera tetraptera* are soaked in alcohol 12 to 24 hrs.	Alcohol	Tincture	Oral	Short cup, twice daily
6	Roots and leaves of *Rouwolfia vomitoria*, roots and leaves of *Cissampelos owarensis* are boiled with water in a local pot.	Water and oil	Concoction	Oral	Short cup, twice daily.
7	Leaves of *Piper guineese, Ritchea capparioides* and roots of *Plukeneta conophora* all in equal quantity are cooked with snail, salt, local pepper, locust beans, red oil and water in a local pot.	Red oil and water	Concoction	Oral	To be taken once daily

ISSN 2616-0684 (Print)
ISSN 2616-0692 (Electronic)

8	Leaves of *Jatropha gossypifolia*, leaves and roots of *Plukeneta conophora* are boiled with pap water in a local pot that contains 'ako okuta' underneath.	Pap water	Decoction	Oral	Tea cup, three times daily
9	Leaves of *Fimbristylis dichotoma* and seeds of *Adenopus breviflorus* all in equal quantity are boiled with water in a local pot,	Water	Decoction	Topical ('Iya ose' and decocted water is use to bath the patient's breast very early in the morning when she has not greet anyone).	As much as possible
10	The fresh leaves of *Alchornea laxiflora* are touch three times very early in the morning, incantations are recite, then leaves collected, dry andpowdered	Hot pap	Powder	Oral	Tea spoon, Once daily
11	Leaves of *Parquetina nigrescens, stembark* of *Lecaniodiscus cupanioides*, root of *Nauclea lactifolia* and stem bark of *Hymenocardia acida*, all in equal quantity are boiled with water.	Water	Decoction	Oral	Tea cup, three times daily
12	Fruits of *Tetrapluera tetraptera*, *Xylopia aethiopica*, and root of *Securidaca longipedunculata* and bulb of *Allium cepa* are soaked in alcohol 12 to 24 hrs	Alcohol	Tincture	Oral	Short cup, twice daily
13	Roots of *Plukeneta conophora* are pound, water extracted and latex of *Jatropha curcus* are mixed together with local soap (ose dudu)	Water and Latex	Soap	Topical	Birth the patient regularly especially breast cancer
14	Stem bark of *Antiaris africana* and *Ceiba pentandra* all in equal quantity are boiled with water in a local pot	Water	Decoction	Oral	Tea cup, twice daily
15	Stem barks of *Khaya grandifoliola*, *Enantia chlorantha,* and *Pycnanthus angolensis*, all in equal quantity are boiled with water in a local pot	Water	Decoction	Oral	Tea cup, twice daily
16	Leaves of *Chenopodium ambrosioides*, *Solenostemon monostachyus* and fruits of *Citrus aurantifolia*, the first two in equal quantity with little citrus are boiled with water in a local pot	Water	Decoction	Oral	Tea cup, three times daily
17	Fresh leaves of *Annona muricata*, *Boerharia diffusa* and *Petiveria alliacea* are boiled with water in a local pot	Water	Decoction	Oral	Tea cup, three times daily
18	Roots of *Combretum racemosum* and *Plumbago zeylanica* are soaked with alcohol for 12 to 24 hrs.	Alcohol	Tincture	Oral	Short cup, twice daily
19	Fruits of *Nauclea lactifolia* and *Xylopia aethiopica* are dried, burnt and grounded.	Hot pap	Sharing	Oral	Teaspoon, once daily
20	The leaves and fruits of *Annona muricata* and stem bark of *Pycnanthus angolensis* are boiled with water in a local.	Water	Decoction	Oral	Tea cup, two to three times daily

ISSN 2616-0684 (Print)
ISSN 2616-0692 (Electronic)

21	Leaves and seeds of *Piper guineese*, fruits of *Xylopia aethiopica* and roots of *Chasmathera dependens*, all in equal quantity are soaked in alcohol for 12 to 24 hrs	Alcohol	Tincture	Oral	Short cup, twice daily
22	Stem bark of *Ficus mucuso, Enantia chlorantha* and fruits of *Annona muricata* all in equal quantity are boiled with water in a local pot.	Water	Decoction	Oral	Tea cup, taken regularly by the patient
23	Leaves of *Piper guineese, Mezoneuron benthamianus, Ritchea capparioides* and roots of *Olax subscorpioidea* are boiled with water in a local pot.	Water	Decoction	Oral	Tea cup, two to three times daily
24	Roots of *Chasmathera dependens* are pound and soak in adin for a week.	Oil	Ointment	Oral and Topical	Tea spoon, twice daily
25	Roots of *Combretum racemosum,* fruits of *Piper guineese* and *Nauclea lactifolia* are dried, burnt and grounded	Hot pap	Sharing	Oral	Tea spoon, once daily
26	Leaves of *Lagenaria breviflorus, Cissampelos owarensis* and *Fimbristylis dichotoma* all in equal quantity are boiled with pap water in a local pot	Pap water	Decoction	Oral	Tea cup, once daily (very early in the morning).
27	Leaves of *Acanthus montanus, Anacadium occidentale* and whole plant of *Aristolochia ringens* are dried and grounded.	Hot pap	Powder	Oral	Tea spoon, once daily (very early in the morning).
28	Stem bark of *Elaeis guineensis and Hymenocardia acida*, as well as root of *perquentina nigrescens* are dried, powder and grounded.	Hot pap	Powder	Oral	Tea spoon, once daily
29	Seed of *Carica papaya, Terminalia superba* and *Pterocarpus osun* are soaked in alcohol with the leaves of *Paullinia pinnata* and *Trema orientalis* for 48 hrs	Alcohol	Tincture	Oral	Short cup, twice daily
30	Fresh leaves of *Boerhavia coccinea, Cissampelos owarensis cymbopogon citratus and Croton lobatus*, all in equal quantity are put inside a local pot, added hot water for 10 – 15 minutes.	Hot water	Infusion	Oral	Tea cup, three times daily
31	Roots of *Psidium guajava, Spondias mombin, Terminalia superba, Paullinia pinnata* and *Croton lobatus* are pounded, the water extracted is mixed with small local soap and potash.	Juice	Paste	Oral	Tea spoon, twice daily

Conclusion

In spite of the popularity of orthodox medicine, traditional medicine continues to be a major source of health care for most of the local population. This documentation has provided the basis for further studies towards developing new, effective, safe and affordable plant-derived anticancer drugs from the rich resources of indigenous plants. However, to avoid extinction of these medicinal plants, their conservation should be encouraged.

Conflict of interest

The authors declare no conflict of interest.

Authors' Declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them.

Acknowledgments

Thanks to all the informants who willingly shared their knowledge on the medicinal plants used for the management of cancer disease in their locality.

References

1. WHO. "Cancer Fact Sheet N°297". World Health Organization. February 2018. Retrieved 21 March 2018. https://www.who.int/news-room/fact-sheets/detail/cancer
2. IARC. International Agency for Research on Cancer (IARC). Latest global cancer data: Cancer burden rises to 18.1 million new cases and 9.6 million cancer deaths in 2018. CA: A Cancer J Clin. 2018; 68:317-386.
3. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global Cancer Statistics: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries: Global Cancer Statistics 2018. CA Cancer J Clin. 2018; 68:394–424.
4. Torre LA, Bray F, Siegel RL, Ferlay J, Lortet-Tieulent J, Jemal A. Global Cancer Statistics. CA: A Cancer J Clin. 2015; 65:87–108.
5. Islami F, Goding SA, Miller KD, Siegel RL, Fedewa SA, Jacobs EJ, McCullough ML, Patel AV, Ma J, Soerjomataram I, Flanders WD, Brawley OW, Gapstur SM, Jemal A. Proportion and number of cancer cases and deaths attributable to potentially modifiable risk factors in the United States. CA: A Cancer J Clin. 2018; 68:31–54.
6. Omosa LK, Midiwo JO, Masila VM, Gisacho BM, Munayi R, Chemutai KP, Efferth T. Cytotoxicity of 91 Kenyan indigenous medicinal plants towards human CCRF-CEM leukemia cells. J Ethnopharmacol. 2016; 179:177-196.
7. Fabio F and Luigi G. Herbal Medicine Today: eCAM. 2007; 4:1:37–40.
8. WHO. Cancer. World Health Organisation. Archived from the original on 29 December 2010. Retrieved 5 January 2011. https://www.who.int/health-topics/cancer#tab=tab_1
9. Sonibare MA and Abegunde RB. Ethnobotanical study of medicinal plants used by the Laniba village people in South Western Nigeria. Afr J Pharm Pharmacol. 2012; 6:1726-1732.
10. Nwodo J, Ibezim A, Simoben CV, Ntie-Kang F. Exploring cancer therapeutics with natural products from African medicinal plants, Part II: alkaloids, terpenoids and flavonoids. Anti-Cancer Agents Med Chem. 2016; 16:108-127.
11. Abubakar MS, Musa AM, Ahmed A, Hussaini IM. The perception and practice of traditional medicine in the treatment of cancer and inflammations by the Hausa and Fulani Tribes of Northern Nigeria. J Ethnopharmacol. 2007; 111:625-629.
12. Aiyelola A and Bello OA. Ethnobotanical potentials of common herbs in Nigeria: A case study of Enugu State. Educ Res Rev. 2006; 1:16-22.
13. Soladoye MO, Amusa NA, Raji-Esan SO, Chukwuma EC, Taiwo AA. Ethnobotanical survey of anti-cancer plants in Ogun State, Nigeria. Ann Bio Res. 2010; 1:261–273.
14. Ngule SI, Sandabe UK, Hassaini IM. Ethnobotanical survey of anti-cancer plants in Askira/Uba Local Government Area of Borno State, Nigeria. Afr J Pharm Pharmacol. 2015; 9:123-130.
15. Segun PA, Ismail FMD, Ogbole OO, Nahar L, Evans AR, Ajaiyeoba EO, Sarker SD. Acridone alkaloids from the stem bark of *Citrus aurantium* display selective cytotoxicity against breast, liver, lung and prostate human carcinoma cells. J Ethnopharmacol. 2018; 227:131-138.
16. National Population Commission (NPC). Federal Republic of Nigeria, 2006. Population and Housing Census, Priority Table Volume IV, Population Distribution by Age and Sex. Abuja: National Population Commission (NPC). 2010.
17. Andrade-Cetto A, Heinrich M. From the field into the lab: useful approaches to selecting species based on local knowledge. Front Pharmacol. 2011; 2:20.
18. Cheikhyoussef A, Mapaure I, Martin S. The use of some Indigenous Plants for Medicinal and other Purposes by Local Communities in Namibia with Emphasis on Oshikoto Region: A Review. J Med Plants Stud. 2011; 5:406-419.
19. Tesfaye H, Sebsebe D, Zemede A. An ethnobotanical study of medicinal plants used by local people in the lowlands of Konta Special Woreda, Southern nations, nationalities and peoples regional state, Ethiopia. J Ethnobiol Ethnomed. 2009; 5:26.
20. Adebo GM and Alfred SDY. Gender dimension of herbal medicine's knowledge and practice in Ekiti and Ondo States, Nigeria. J Med Plants Res. 2011; 5:1283-1290.
21. Ashidi JS, Houghton PJ, Hylands PJ, Efferth T. Ethnobotanical survey and cytotoxicity testing of plants of South-western Nigeria used to treat cancer, with isolation of cytotoxic constituents from *Cajanus cajan* Millsp. Leaves. J Ethnopharmacol. 2010; 128:501–512.
22. Mumtaz A, Shahjahan Q, Suresh S, Ramamurthy N. Important medicinal plants with Anti-cancer properties in Mahabubnagar district, Telangana State. Int J Phytother Ethnobot. 2015; 2:30–31.
23. Ochwangi DO, Kimwele CN, Oduma JA, Gathumbi PK, Mbaria JM, Kiam SG. Medicinal plants used in treatment and management of cancer in Kakamega County, Kenya. J Ethnopharmacol. 2014; 151:1040–1055.
24. Tamokou JdD, Chouna JR, Fischer-Fodor E, Chereches G, Barbos O, Damian G. Anticancer and Antimicrobial Activities of Some Antioxidant-Rich Cameroonian Medicinal Plants. PLoS ONE. 2013; 82:e55880.
25. Nguyen TT, Parat MO, Shaw PN, Hewavitharana AK, Hodson MP. Traditional Aboriginal Preparation Alters the Chemical Profile of *Carica papaya* Leaves and Impacts on Cytotoxicity towards Human Squamous Cell Carcinoma. PLoS ONE. 2016: 11(2):e0147956.
26. Benarba B and Meddah B. Ethnobotanical study, antifungal activity, phytochemical screening and total phenolic content of Algerian *Aristolochia longa*. J Intercult. Ethnopharmacol. 2014; 3:15–154.
27. Jain P and Sharma HP. A potential ethnomedicinal plant *Semecarpus anacardium* Linn. A review. Int. J Res. Pharm. Chem. 2013; 3:564–572.
28. Eka P, Nur R, Tuti SS. The breast of anticancer from leaf extract of *Annona muricata* against cell line in T47d. Int J Res Appl Sci. 2012; 2:1.

29. Biba VS, Amily A, Sangeetha S, Remani P. Anticancer, antioxidant and antimicrobial activity of Annonaceae Family. WJPPS. 2014; 3:1595-1604.
30. Minari JB and Okeke U. Chemopreventive effect of *Annona muricata* on DMBA-induced cell proliferation in the breast tissues of female albino mice. Egypt J Med Hum Genet. 2015; 16:207-286.
31. Andrade-Cetto A. Ethnobotanical study of the medicinal plants from Tlanchinol, Hidalgo, Mexico. J Ethnopharmacol. 2009; 122:163–171.
32. Bakarnga-Via I, Jean BH, Patrick VTF, Lauve RYT, Gary-Bobo M, Audrey G, Marcel G, Lucain W, Youssouf S, Pierre MJD, Fabrice FB, Chantal M. Composition and cytotoxic activity of essential oils from *Xylopia aethiopica* (Dunal) A. Rich and *Monodora myristica* (Gaertn) growing in Chad and Cameroon. Compl Altern Med. 2014; 14:125.
33. Engel N, Oppermann C, Falodun A, Kragl U. Proliferative effects of five traditional Nigerian medicinal plant extracts on human breast and bone cancer cell lines. J. Ethnopharmacol. 2011; 137:1003-1010.
34. Wu Jia-liang, Ma Dan-wei, Wang Ya-nan, Zhang H, He B, Li Q, Zou Zhi-yan, Feng J. Cytotoxicity of essential oil of *Chenopodium ambrosioides* L. against human breast cancer MCF-7 cells. Trop J Pharm Res. 2013; 12:929- 933.
35. Sayed MD. Traditional medicine in health care**.** J Ethnopharmacol. 1980; 2:19-22.
36. Nath KVS, Rao KNV, David B, Sandhya S, Sudhakar K, Saikumar P, Sudha P, Chaitanya RK. A comprehensive review on *Allium cepa*. J Adv Pharm Res. 2010; 1:94-100.
37. Ehsan O, Norhani A, Wan ZS, Abdul RO, Syahida A, Wen BK, Nor AZ, Rudi H, Yin WH. Antioxidant, anti-inflammatory and anticancer activities of methanolic extracts from *Jatropha curcas* Linn. J Med Plants Res. 2011; 5:49-57.
38. Falodun A, Sheng-Xiang Q, Parkinson G, Gibbons S. Isolation and characterization of a new anticancer diterpenoid from *Jatropha gossypifolia*. Pharm Chem J. 2012; 45:636.
39. Jha M, Sharma V, Ganesh N. *In vitro* antioxidant and cytotoxicity assay of *Pistia Stratiotes* L. against B16f1 and B16f10 melanoma cell lines. Chem Phytopot: Health Ener Environ Perspec. 2012; 4:19-23.
40. Jun Y, Yan M, Jeanne D, Qi C. Antitumor activities of *Rauwolfia vomitoria* extract and potentiation of carboplatin effects against ovarian cancer. Curr Ther Res. 2013; 75:8–14.
41. Lawal RA, Ozaslan MD, Odesanmi OS, Karagoz ID, Kilic IH, Ebuehi OAT. Cytotoxic and antiproliferative activity of *Securidaca longepedunculata* aqueous extract on Ehrlich ascites carcinoma cells in Swiss albino mice. Int J Appl Res Nat Prod. 2012; 5:4.
42. Sachin H, Kishor D, Vijay K, Bibhilesh M. Evaluation of anticancer activity of *Plumbago zeylanica* Linn leaf extract. Int J Biomed Res. 2010; 1:2.
43. Sathya S, Sudhagar S, Vidhya PM, Bharathi RR, Muthusamy VS, Niranjali DS, Lakshmi BS. 3β-hydroxylup-20(29)-ene-27,28-dioic acid dimethyl ester, a novel natural product from *Plumbago zeylanica* inhibits the proliferation and migration of MDA-MB-231 cells. Chem Biol Interact. 2010; 188:412-420.
44. Sato R, Dang KM, McPherson BG, Brown AC. Anticancer Activity of Guava (*Psidium guajava*) Extracts. J Compl. Integr Med. 2010; 7:43.
45. Claudia U, Claudia C, Diana C, Amparo A, Punit K, Alexzander A, Susana F. *Petiveria alliacea* extracts uses multiple mechanisms to inhibit growth of human and mouse tumoral cells. BMC Compl Altern Med. 2008; 8:60.
46. John FH, Claudia PU, Maria CC, Tito AS, Luis MP, Diana C, Alexzander A, Susana F. A *Petiveria alliacea* standardized fraction induces breast adenocarcinoma cell death by modulating glycolytic metabolism. J Ethnopharmacol. 2014; 153:641–649.
47. Isiaka AO, Nudewhenu OA, Guido F, Alimot-Sadiat OH, AbdulRazaq OO, Akindele OO. Essential oils from the leaves of six medicinal plants of Nigeria. Nat Prod Comm. 2013; 8:243-248.
48. Adaramoye O, Erguen B, Oyebode O, Nitzsche B, Höpfner M, Jung K, Rabien. Antioxidant, antiangiogenic and antiproliferative activities of root methanol extract of *Calliandra portoricensis* in human prostate cancer cells. J Integr Med. 2015; 13:185–193.
49. Gossan DPA, Magid AA, Yao-Kouassi PA, Josse J, Gangloff SC, Morjani H, Voutquenne-Nazabadioko L. Antibacterial and cytotoxic triterpenoids from the roots of *Combretum racemosum*. Fitoter. 2016; 110:89–95.
50. Ahmad H, Khan SM, Ghafoor S, Ali N. Ethnobotanical study of upper Siran. J Herbs Spices Med Plants. 2009; 15:86–97.
51. Kolata G. Tree yields a cancer treatment, but ecological cost may be high. New York Times. 1991; A1: A13.
52. Khan SM, Page S, Ahmad H, Harper DM. Sustainable utilization and conservation of plant biodiversity in montane ecosystems: the western Himalayas as a case study. Ann Bot. 2013; 112:479–501.
53. Ogbole OO and Ajaiyeoba EO. Traditional Management of Tuberculosis in Ogun State of Nigeria: The Practice and Ethnobotanical Survey. Afr. J. Tradit. Complement. Altern. Med. 2010; 7:79-84.
54. Bhat JA, Kumar M, Bussmann RW. Ecological status and traditional knowledge of medicinal plants in Kedarnath Wildlife Sanctuary of Garhwal Himalaya, J Ethnobio Ethnomed. 2013; 9:1.
55. Moshi MJ, Otieno DF, Weisheit A. Ethnomedicine of the Kagera region, North western Tanzania. Part 3: plants used in traditional medicine in Kikuku village, Muleba district. J Ethnobiol Ethnomed. 2012; 8:14.
56. Adnan M, Ullah I, Tariq A. Ethnomedicine use in the war affected region of northwest Pakistan. J Ethnobiol Ethnomed. 2014; 10:16.
57. Verma AK, Kumar M, Bussmann RW. Medicinal plants in an urban environment: the medicinal flora of Banares Hindu University, Varanasi, Uttar Pradesh. J Ethnobiol Ethnomed. 2007; 3:35.
58. Pal SK and Shukla Y. Herbal medicine: Current status and future. Asian Pac. J. Cancer Prev. 2003; 4:281–288.
59. Chen S, Wang Z, Huang Y. Ginseng and anticancer drug combination to improve cancer chemotherapy: A critical review. Evid Based Compl Altern Med. 2014; 2014:1-13.