

CAPTURING INDIGENOUS KNOWLEDGE ON MEDICINAL PLANTS USE: CASE STUDY OF  
SELECTED COMMUNITIES IN OLD OYO NATIONAL PARK, NIGERIA

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**Abstract**

**Background:** Understanding the intricate link between humans and the plants use is needed to address some of to-day's socio-economic and health challenges.

**Materials and Methods:** The study focused on plants that have high cultural and medicinal values for the host communities of Old Oyo National Park, Nigeria. Local Knowledge was captured through focus group discussions with herbal vendors, interviews with herbalists as key informants and through field observations. Snowball sampling technique was used in selecting the key informants. Participants selected for the Focus Group Discussion varies with the number of herbal vendors encountered in each commercial market.

**Results:** In total, 78 medicinal plant species belonging to 39 families including 47 trees, 8 shrubs and 23 herbaceous plants were documented. Forty ailments categorized into thirty one treatments and prevention methods were discovered. *Kigellia africana*, *Cassia spp* and *Alstonia boonei* were used for treating common ailments like malaria, dysentery and gonorrhoea. Sources of collecting the medicinal plant species and their mode of administration were different.

**Conclusion:** The research outcome will contribute to advancement of traditional medicine, resource efficiency and development of new enterprise among the locals. Comprehensive quantitative study of social- economic importance of the medicinal plants is recommended.

**Keywords:** Intricate link, cultural values, host communities, traditional medicine, resource efficiency.

**Introduction**

There is a close cultural link between people and plants particularly in terms of treatment for ailments and nutrition. There is also an interesting similarity between the socio-economic and cultural values of the two subjects. Many of the planet's areas of highest biological diversity are inhabited by indigenous people with strong traditional ties (Owuor and Kisangau, 2006) providing what the Declaration of Belem called an "inextricable link" between biological and cultural diversity (Posey 1999). To describe the concept denoting this link, the term biocultural diversity was introduced (Posey 1988). Indigenous knowledge of medicinal plant use is context specific as it is related to, and contained within, a group of people who live in a defined geographic region (Kassam *et al.* 2010). Knowledge in this context is derived from a web of interactions among humans, plants, animals, natural forces, and land forms.

The use of traditional medicine and medicinal plants in most developing countries has been widely observed (UNESCO 1996). It was estimated that nearly three fourth of the plant –derived prescription drugs used worldwide were discovered following leads from local medicine (Wakdikar 2004). Development of modern biotechnological techniques therefore depends on the information obtained from the traditional healers; since they are found in most local communities deeply entrenched in their culture, tradition and belief. Hence, integration of traditional healers into primary health care has been emphasized in the literatures (Owuor *et al* 2005; Owuor and Kisangu 2006) as an approach to achieve improvement in health care system.

Traditional and folklore medicine handed down from generation to generation is rich in household remedies and community practice (Subramanyam *et al.* 2008). Traditional healers are found at household levels and they possess in-depth understanding of the medicinal plants used for treating various forms of ailments. Medicinal plants are used at the household level and over 80% of the populations of developing countries rely on traditional medicine, mostly plant drug, for their primary health care needs (WHO 1980). Traditional healers are often the first and last line of defense against most diseases such as headaches, coughs, diarrhea, wound healing and skin diseases (Matsheta and Mulaudzi 2008).

Since the beginning of this century, there has been an increasing interest in the study of medicinal plants and their traditional use in different parts of the world (Upriety *et al.* 2010). Recent interest in this area of research is partly driven by society's interest in healthy lifestyles, which supports a rapidly growing \$230 billion dollar market force in USA alone (Pesek *et al.* 2006). About 25% of modern medicines are descended from plants first used traditionally. Many others are synthetic analogues built on prototype compounds isolated from plants. About 70% modern medicines in India for example, are derived from natural products (Choudhary 2002). It is estimated that there are over 7800 medicinal drug manufacturing units in India, which consume about 2000 tonnes of herbs annually (Ramakrishnappa 2002).

The increasing global demand for herbal medicine has aroused global interest in ethno-botanical studies in recent times (Srivasta 2000). Medicinal plant uses contribute to the establishment of industries, employment generation and increased income (Baishya and Begum 2013). For instance in Costa- Rica substantial amount of money is being generated from the sales of medicinal plants and derived products (Ceballos-Lascurain 2001).

Despite the long standing history and culture of the host communities of Old Oyo National Park as recorded in some of the literatures (Akinjogbin 1996; Agbaje-Williams 1983 and Alarape 2002), the knowledge of the local people in medicinal plant use has not been properly documented. The site of Oyo-Ile in the north east corner of the Park was used as capital of Oyo-Empire between the 17<sup>th</sup> and 18<sup>th</sup> centuries (Akinjogbin 1966). The researcher emphasized that this was the hub of the ancient Oyo empire, a historic city and one of the first states to emerge in the forest and the coastal region of West Africa. The empire was flourished in the 18<sup>th</sup> -19<sup>th</sup> centuries as an important urban center both economically and politically; the present Oyo might be the seventh or eighth capitals (Agbaje-Williams 1983). This was among the key factors for the initiation of this research work hinged on the need to provide useful and detail information on the medicinal values of the flora resources based on the local knowledge of the host communities of Old Oyo National Park.

The study captured indigenous knowledge of medicinal plants used in selected communities adjoining the Park. Methods of use and preparation, ailments being treated, plant use frequency, distribution and extraction methods were documented. The research findings will contribute to advancement of contemporary medicine through the development of new enterprise and increase natural resource use. This will facilitate development of benefit sharing scheme targeting the alleviation of poverty and improving the livelihood of the local communities.

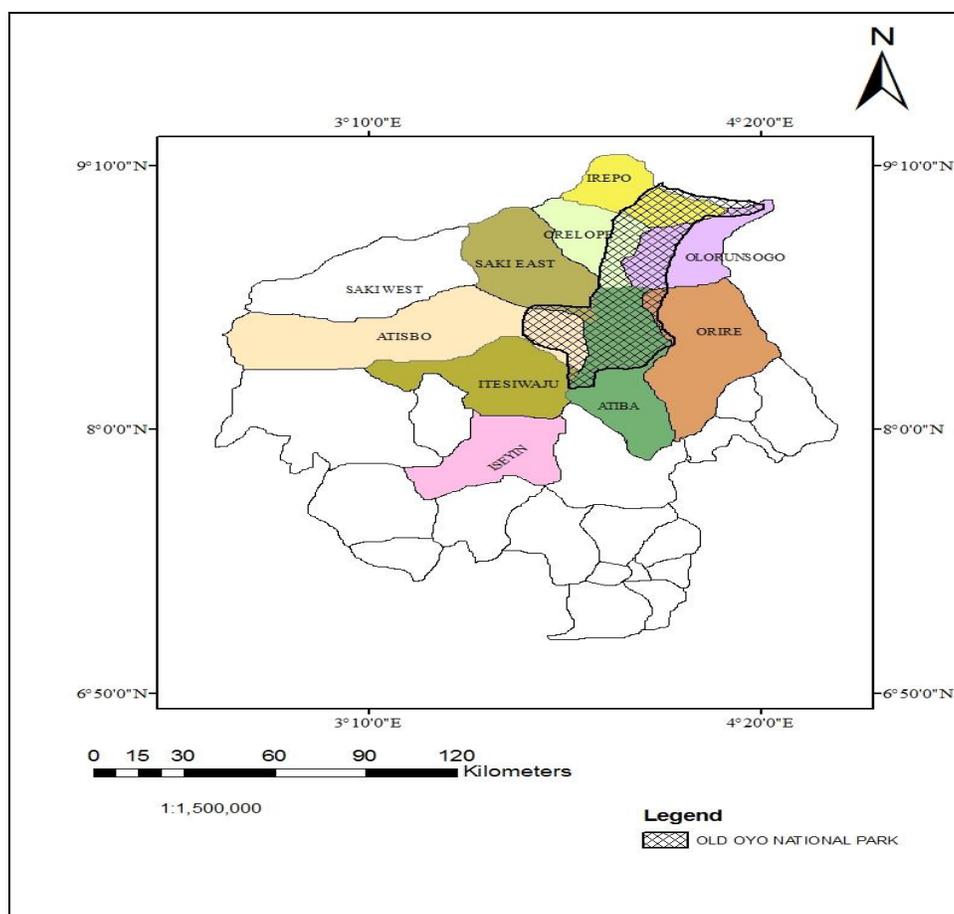
## Methods and Materials

### Study area

This study was conducted in Old Oyo National Park, Oyo-State, Nigeria. Politically, the park lies in Oyo State in the Southwest of Nigeria and borders with Kwara State in the Northeast. The Park is located between 8°10" and 9° 05" North latitudes, and 3° 35" and 4° 21" East longitudes (Figure 1). It covers a land area of approximately 2,512 square kilometers making it the fourth largest national park in Nigeria. The park spans through eleven Local Government Areas of Oyo state Atisbo (Tede/Ago-Are) 3.4220°E,8.5420°N), Atiba (Oyo)(3.9260°E, 7.8400°N), Irepo (Kisi) (3.8510°E,9.079°N), Oorelope (Igboho) (3.7550°E, 8.8340°N ), Saki East (Ago-Amodu) (3.6100°E, 8.6090°N), Iseyin (Iseyin) (3.5760°E,7.9590°N), Orire (Ikoyi) (4.1690°E, 8.2700°N) Itesiwaju (Otu) (3.3970°E,8.2110°N), Oyo West (Ojongbodu/Oyo), Olorunsogo (Igbeti)(4.1350°E,8.7450°N), Saki West (Saki) (3.3860°E,8.6620°N) and Kaima Local Government Area in Kwara State. The host communities adjoining the Park are selected for this study based on the long standing history of their existence and cultural antecedent as reported in some literatures (Akinjogbin, I.A 1996.; Agbaje-Williams, B 1983 and Alarape, A., 2002). The natural vegetation of the area is classified as Southern Guinea Savanna (Key, 1959). However more intense studies by Charter (1970) classified the Southern portion of the vegetation as Forest savanna Mosaic with wooded savanna containing relic of Moist Semi deciduous forest, grading northwards into drier Mixed Leguminous Wooded Savanna with a continuous lower stratum of perennial grasses. Geerling (1973) analyzed and classified the vegetation into four broad groups; including dense woodland and forest outlier in the Southern portion and the North West corner dominated by *Burkea africana*, *Azelia africana*, *Detarium microcarpum*, *Daniellia oliveri*, *Pterocarpus erinaceus*, *Piliostigma thonningii*, *Vitex doniana*, *Nauclea latifolia*. Mixed open savanna in the middle and north east portions dominated by *Terminalia aviceniodes*, *Prosopis africana*, *Terminalia laxiflora* and *Khaya senegalensis*. Outcrop vegetation in the hilly and rocky areas throughout, dominated by *Adasonia digitata*, *Anogeisus leocarpus*, *Parkia biglobosa* and *Acacia species*; Riparian grassland and fringing woodland and forest vary along major rivers and streams. The research work carried out by Afolayan, *et al.* (1996 & 1997) gave a classification of the Vegetation of the Park to four broad ecozones. Zone A is designated as forest and dense savanna mosaic woodland of the park around Sepeteri axis with predominant species include *Burkea africana*, *Azelia africana*, *Detarium microcarpum*, *Piliostigma thonningii*, *Daniellia*

*oliveri*, *Vitex doniana*, *Nauclea latifolia*, *Terminalia glaucescens*, *Kigelia africana*, *Anogeissus leiocarpus* and *Diosporous soubrena*; Zone B as dense and open savanna woodland mosaic in the central portion of the park, Igbeti-Ighoho axis, dominated by species such as *Terminalia aviceniodes*, *Prosopis africana*, *Terminalia laxiflora* and *Khaya senegalensis*; Zone C as dense savanna woodland, north of Igbeti-Kishi axis and the dominant species include *Burkea africana*, *Detarium microcarpum*, *Gardenia tenuifolia*, *Crossopteryx febrifuga*, *Ficus ingene*, *Ammania auriculata*; and Zone D as open savanna woodland, North-east of the park (Oyo-Ile sector) with major tree species including *Urena lobata*, *Pittosporum viridiflorum*, *Terminalia laxiflora*, *Ammania auriculata*, *Panicum repens*, *Parkia biglobosa*, *Cassia rotundifolia*, *Cleome ciliata*. Findings from these studies have indicated changes in vegetation vis –a–vis species composition of the park. Over the years, the family Caesalpinioideae constituted the highest in species composition followed by the family Combretaceae. Predominant floral resources in the Park include *Burkea africana*, *Azelia africana*, *Detarium microcarpum*, *Piliostigma thonningii*, *Daniellia oliveri*, *Vitex doniana*, *Nauclea latifolia*, *Terminalia glaucescens*, *Kigelia africana*, *Anogeissus leiocarpus* and *Diosporous soubrena*. However, species of plants such as *Vitex doniana*, *Diosporous soubrena*, *Nauclea latifolia*, *Terminalia species* have shown decrease tendency.

The flora resources experienced a decrease as a result of human activities such as collection for charcoal production, one of the major occupations of the inhabitants and collection for medicinal purposes (Yakubu and Idumah 2002). The park for a very long period in the past evidently suffered from mismanagement through destructive activities such as hunting, cattle grazing, logging and uncontrolled burning. The flora and fauna resources of the park have been largely depleted leading to local extermination of some species (Alarape 2002; Oladeji and Agbelusi 2014).



**Figure 1:** Location of Old Oyo National Park relative to its position in Oyo-State and its Local Government Areas. The study focused on four Local Government Areas: Iseyin, Atiba, Saki East and Atisbo.

### Method of data collection

Focus Group Discussion, Key Informant Interview and field observations were employed for this study (Anwana and Obot 2003; Betti., 2004 and Kayode., 2006 ). For this study, four Local Government Areas (LGAs) were specifically selected from the ten LGAs adjacent to the Park, based on their proximities. The selected LGAs were Iseyin, Atiba, Saki East and Atisbo. Prior to the commencement of the research work, brief group discussions were held with the herbal

vendors, traditional healers and the herbalists in all the selected communities for the purpose of obtaining their consent. The need to provide accurate, up to date, detailed and first-hand information as a way to achieve proper documentation of the indigenous medicinal plants of value to their health and sustenance was also emphasised. The discussions and interviews conducted were structured according to the standardized enquiry list of the PROTEA (Plant resources of Tropical Africa) DATABANK online database sheet (PROTABASE LINK). PROTA is an initiative of Wageningen University, the Netherlands working in cooperation with a variety of institutes in Africa and Europe. PROTA synthesizes all the information available for approximately 8,000 plants used in tropical Africa and makes it widely accessible in various media. Researchers asked the questions about prescriptions techniques; i.e, which species of plant is used for the treatment of particular ailments. Answers to these questions afford researchers the opportunity to generate detailed information on the ailments and plant parts used. Other questions that were asked include sources/places of collection of the plants or parts used, methods of application/administration, unit of measurement of the dosage and price, prevailing ailment in these communities, and accessibility to health care facilities. Method of knowledge transfer from the herbal vendors and herbalists to the young ones was established by engaging their biological children as apprentice. All the interviews and discussions were conducted in local Yoruba language. There was no problem of communication since the researchers are from the Yoruba speaking part of the country. No plant sample was collected as all the identifications were carried out on site based on the experience of the researchers (Oladeji and Adeyemo 2012). This was complemented with knowledgeable source (the researchers being accompanied by the assigned botanist from the research unit of Old Oyo National Park who incidentally is an indigene that has been practicing traditional healing over the years). Relevant literatures were also consulted as field guide books (Arbonnier 2004; Keay1959; Keay *et al.*, 1964 and Odugbemi 2008). Some of these books contain coloured pictures of flora species (trees, shrubs and herbaceous plants) notable to these areas. These books were taken along and shown to the respondents in order to facilitate identification, especially when the key parts such as flowers, fruits and seeds that facilitate identification have been detached.

### **Focus Group Discussion (FGD)**

FGD was held with a group of herbal vendors selected in each of the major commercial markets in the four LGAs (Iseyin, Atiba, Saki East and Atisbo) making a total of four group discussions held in the course of the study. The relationship between herbal vendors and herbalist is like that of pharmacists and the doctor in contemporary medicine. While the doctors diagnose and prescribe, the pharmacists are regarded as the chemists who interpret the composition of the prescription and the physical properties. After the patient has been diagnosed for the ailments by the herbalist, herbal vendors would be consulted to provide information on the chemistry (composition and physical properties) of the medicinal plants that are prescribed by the herbalists. This information led to the application or administration of the medicinal plants in form of concoction, decoction and body lotion or powdered as the case may be. The number of participants selected for the Focus Group Discussion varies from 10 to 13, depending on the total number of herbal vendors encountered in each commercial market and the number of years of selling herbal medicine, i.e 13 in Iseyin,, 12 in Atiba ; 10 in Saki East and in Atisbo. The participants were in the age range of 39-45 with females constituting the greater percentage. Apprentices were also included in the survey. The apprentices were said to be learning the usage and marketing of herbal plants or parts of it for an agreed period of time.

### **Key Informants Interviewed**

Traditional healers and herbalists served as key informants, and Snowball sampling technique was used for selecting key informants for the interview. This technique involved locating the heads of the herbalists in the communities in order to collect the list of registered members and their contact addresses. Contact addresses of 16 members who were known to have spent up to twenty years or more in the practice of traditional medicine were taken from a list of fifty two registered members as the key informants. Considering length of time they spend in the practice of traditional medicine. Key informants are expected to have a profound knowledge of useful medicinal plants including familiarity with the culture, tradition, belief and norms of these communities. The informants were asked to mention different ailments in the selected communities along with plants or parts being used for the treatment of these ailments. Other information gathered from the key informants included source of collection and process of traditional knowledge transfer from one generation to the other. Male and female apprentices were encountered at the herbalists' home which is an indication of how traditional knowledge is passed from one generation to the other. Meanwhile, male practitioners constituted greater percentage (87.5%) of the key informants. This also shows that two of the sixteen selected informants are female.

### **Field observation**

Field observation was carried out in home gardens established at the back yards of the traditionalists/herbalists/diviners where some identified medicinal plant species were grown to ensure that their immediate needs were met. Cultivated farmlands and the forest area adjoining the communities were also visited. Diversity of species of medicinal

plants in the forest area is documented by Oladeji and Adeyemo (2012). Lists of species of medicinal plants observed in the cultivated farm lands and home gardens were also documented in the present study.

### **Data Analysis**

Uses of plants as discussed during small group and individual interviews were arranged according to plant usage categories developed by Moerman (1998) and modified by Kassam *et al.* (2010). Kassam *et al.*, (2010) developed a grouping based on the use of medicinal plants among indigenous Pamir Mountains of Afghanistan and Tajikistan. In cases where a particular use of a plant could be assigned to more than one category, the most specific category was used; i.e, no description of use was assigned to more than one category. The researchers carried out modifications and additions to the categories of Kassam *et al.* (2010) in order to reflect the context specificity of medicinal uses described by the host communities of Old Oyo National Park. Three categories were modified and ten new medicinal plant uses were added for treatment and prevention based on the context of the host communities of Old Oyo National Park. Medicinal plants per function were categorised rather than medicinal plants per species based on the application of plant usage categories and in some instances at the discretion of the researchers. This method offers two opportunities to examine medicinal plants per function rather than per species, to allow for comparison with current trends in the institutional health care system to evaluate the potential for medicinal plants to improve human health. The data obtained were analysed relative to the demographic characteristics of the respondents.

**Table1.** Names of plants used for economic and medicinal purposes, parts being used, method of use and ailments being treated with

S/N	Scientific Name	Family	Local name	Parts being utilized	Method of application	of	Ailments being treated	Conservation status IUCN/Catalogue of life
1	<i>Abrus precatorius</i> L. (climbing herb)	LEGUMINOSA E	Ojuologbo	Leave	Decoction		Cough	++
2	<i>Acacia ataxacantha</i> DC. (scrambling shrub)	MIMOSOIDEA E	Cassia	Root	Decoction		Dysentery	++
3	<i>Acacia nilotica</i> (L.) Wild. ex Del (Tree)	MIMOISOIDE AE	Booni	Bark	Fumigation		Fungal fumigant	++
4	<i>Adasonia digitata</i> L. (Tree)	BOMBACACE AE	Ose	Bark	Concoction with aethiopia	cook	For baby to quickly gain weight or to treat caries in children	++
5	<i>Aframomum elegueta</i> Rosc (Herb)	ZINGIBERACE AE	Atare	Leave	Decoction		Diarrhea, skin diseases. Malaria, dietary aid	++
6	<i>Ageratum conyzoides</i> L. (Herb)	ASTERACEAE	Imi-esu	Fruit and seed	Decoction		dysentery malaria, stimulant	**
7	<i>Allium ascalonicum</i> L. (Herb)	LILIACEAE	Alubosa-elewe	Leaves	Decoction		Malaria, cough,	**
8	<i>Allium sativum</i> L.(Herb)	LILIACEAE	Alubosa-ayu	Bulb	Decoction, ingredient	soup	Malaria, cough, preservative	**
9	<i>Alternanthera repens</i> L. (Herb)	AMARANTHACEAE	Dagunro	Leave	Decoction, Dysentery		Deworming, Malaria fever.	++
10	<i>Anarcadium occidentale</i> L. (Tree)	ANACARDIACEAE	Kaju	Leave, Bark	Concoction		Malaria	++
11	<i>Annona senegalensis</i> Pers. (Tree)	ANNONACEAE	Abo	Bark, leave	Concoction		Diabetics, venereal disease, gonorrhoea, watery sperm	**
12	<i>Anogeissus leiocarpus</i> (DC.) Guill. &Perr.	COMBRETACEAE	Ayin	Root, bark	Chewing concoction	stick,	Mouth disease,	++

S/N	Scientific Name	Family	Local name	Parts being utilized	Method application	of	Ailments being treated	Conservation status IUCN/Catalogue of life
13	(Tree) <i>Anthocleista djalonesis</i> Chev. (Tree)	A. LOGANIACEAE	Sapo	Bark	Concoction		dysentery Skin disease, malaria	++
14	<i>Aristolochia ringens</i> Vahl (Twining herb)	ARISTOLOCHIA ACEAE	Akogun	Root	Decoction		Typhoid, malaria	**
15	<i>Azadirachta indica</i> A. (Tree)	Juss MELIACEAE	Dangoyaro	Leave, bark	Concoction		Malaria	++
16	<i>Basella alba</i> L. (Creeping herb)	BASELLACEAE	Amunututu	Leave	Decoction		Stomach disturbance	**
17	<i>Berlinia grandiflora</i> (Vahl) Hutch. & Dalz. (Tree)	CAESALPINIO IDEAE	Apado	Latex			To increase man's libido	++
18	<i>Blighia sapida</i> Koenig (Tree)	SAPINDACEAE	Isin	Fruit	Soup condiment		Dysentery, diabetes	**
19	<i>Bridelia ferruginea</i> Benth. (Tree)	EUPHORBIACEAE	Ira	Leave, stem	Decoction chewing stick		Dysentery, teeth disease, antibacterial, malaria.	**
20	<i>Bridelia micrantha</i> (Hochst.) Baill (Tree)	EUPHORBIACEAE	Isa	Leave, fruit	Concoction		Yellow fever, jaundice	**
21	<i>Cajanus cajan</i> Harms (Shrub)	CAESALPINIO IDEAE	Otili	Leave, seed	Concoction, Cook the seed		Malaria, protein constituent	++
22	<i>Capsicum frutescens</i> L. (Shrub)	SOLANACEAE	Ata were	Seed, fruit	Soup condiment, concoction		Stimulant, laryngitis	++
23	<i>Carica papaya</i> L. (Tree)	CAPPARACEAE	Ibepe	Leave, fruit	Decoction and concoction		Malaria, jaundice	**
24	<i>Cassia sieberiana</i> DC. (Tree)	CARICACEAE	Aidan tooro	Root	Concoction		Dysentery	++
25	<i>Celosia laxa</i> Auct. (Herb)	AMARANTHACEAE	Marugbo-sanyan	Leave	Concoction, soup condiment		Breast pain in women (abscesses of breast)	++
26	<i>Chasmanthera dependens</i> Hochst. (Creeping Herb)	MENISPERMA CEAE	Atoo	Leave, bark	Decoction, grind the leave and mix with body ointment		Fracture, swollen leg or wound, children	++

S/N	Scientific Name	Family	Local name	Parts being utilized	Method application	of	Ailments being treated	Conservation status IUCN/Catalogue of life
27	<i>Chenopodium ambrosioides</i> L.(Herb)	CHENOPODIA CEAE	Orugbon	Leave	Mix the with ointment	leave body	with weak bones Arthritis, wound	++
28	<i>Citrus aurantifolia</i> (Christm.) Swingle (Tree)	RUTACEAE	Osanoronbo	Fruit, leave, bark	Decoction concoction	or	Typhoid, malaria, dysentery	++
29	<i>Cocos nucifera</i> L. (Tree)	PALMAE	Agbon	Nuts, bark	Decoction, fruit is edible		Skin disease, uterine disease	**
30	<i>Combretum molle</i> R.Br. ex G. Don (Tree)	COMBRETAC EAE	Okuku	Bark	Concoction		Dysentery	++
31	<i>Crinum jagus</i> Thombs.(Herb)	AMARYLLID ACEAE	Ireke-odo	Root	Concoction		Convulsio n, cough	**
32	<i>Cucumis melo</i> L.(Creeping Herb)	CUCURBITAC EAE	Baara	Fruit	Decoction in a fermented corn water	in a maize	Gonorrhea, dysentery	**
33	<i>Cyathula prostrata</i> Bl. (Herb)	AMARANTHA CEAE	Soworepepe	Leave	Concoction		To boost trading or business	++
34	<i>Cymbopogon citratus</i> DC. Stapf. (Herb)	POACEAE	Ewe tea	Leave	Concoction		Malaria fever	++
35	<i>Diocleare flexa</i> Hook. (Climber)	LEGUNINOSA E	Agbaarin	Seed	Decoction		To improve Woman fertility	++
36	<i>Enantiac hlorantha</i> Oliv. (Tree)	ANNONACEA E	Awopa or bush doctor	Bark	Decoction		Malaria	++
37	<i>Entada Africana</i> Guilli. &Perr. (Tree)	LEGUMINOSA E	Igbanso	Bark, root, leave	Concoction		Diarrhea	**
38	<i>Erythrococca anomala</i> Juss.ex.Purr (Tree)	EUPHORBIAC EAE	Iyere	Fruit, seed	Decoction, spices soup		Dysentery, stimulant	++
39	<i>Eugenia aromatic</i> Kuntze (shrub)	MYRTACEAE	Kanafuru	Seed	Decoction, soup spices, preservative		Dysentery, diarrhea	**
40	<i>Euphorbia laterifolia</i> Schum&Thun (Herb)	EUPHORBIAC EAE	Enuopiye	Stem, leaves	Decoction, grind and mix with body ointment		Skin disease, hives	++
41	<i>Erythrophleum suaveolens</i>		Erun obo	Bark	Decoction, burn		Repellent	

S/N	Scientific Name	Family	Local name	Parts being utilized	Method application	of	Ailments being treated	Conservation status IUCN/Catalogue of life
	(Guill&Perr.) Brenan (Tree)	CAESALPINIO IDEAE			as incense		of evil spirit	++
42	<i>Ficus capensis</i> Thunb (Tree)	MORACEAE	Opoto	Stem, leaf, root	Concoction		Gonorrhea, dysentery	++
43	<i>Funtumia elastic</i> ( Preuss) Stapf. (Tree)	APOCYNACE AE	Ire	Bark	Soak in fermented water from grounded maize		Diarrhea, dysentery	**
44	<i>Garcinia kola</i> Heckel (Tree)	GUTTIFERAE	Orogbo	Seeds, root, bark	Chewing the seed, decoction		Cough, bronchitis, throat and respiratory disorder	V
45	<i>Hannoa undulate</i> (Guill. &Perr.) Planch.(Herb)	GUTTIFERAE	Ewe oriji	Leave, root	Decoction or concoction		To receive favour or forgiveness, restore broken love or relationship to boost sales	++
46	<i>Harunganamadaga scariensis</i> Lam. ex Poir (Tree)	GUTTIFERA	Amuje	Bark, leave	Concoction		antianaemia	++
47	<i>Kalanchoe crenata</i> (Andrews Haw) (Shrub)	CRASSULACE AE	Odundun	Leave	Concoction		Gonorrhea, small pox, to boost trading	**
48	<i>Khaya senegalensis</i> (Desr.) A.Juss. (Tree)	MELIACEAE	Oganwo	Bark	Decoction, concoction		Skin disease, malaria	V
49	<i>Kigelia africana</i> ( Lam.) Benth. (Tree)	BIGNONIACE AE	Pandoro	Bark, stem, root, fruit	Concoction		Malaria, dysentery, gonorrhoea, rheumatism	**
50	<i>Lagenaria breviflorus</i> (Benth) Roberty (Creeping Herb)	CUCURBITAC EAE	Tangiri	Fruit	Decoction, throw on the floor around the house to prevent spread of small pox		Small pox, purgative	++
51	<i>Lagenaria siceraria</i> (Molina)	CUCURBITAC	Ado	Fruit pup	Dried fruit pup as		Anthelmint	**

S/N	Scientific Name	Family	Local name	Parts being utilized	Method of application	of	Ailments being treated	Conservation status IUCN/Catalogue of life
	Standl. cv (Creeping Herb)	EAE			gourd to keep herbal medicine		ic properties	
52	<i>Launaea taraxacifolia</i> (Willd) Amin Ex. C. Jeffry (Herb)	ASTERACEAE	Yanrin	Leave	Decoction		Cataract	++
53	<i>Lippia multiflora</i> Moldenke (Herb)	VERBENACEAE	Efinrin-foronoba	Leave	Decoction		Dysentery	++
54	<i>Mangifera indica</i> L. (Tree)	ANACARDIACEAE	Mangoro	Leave, bark, fruit	Concoction		Malaria, juice production	D
55	<i>Melicia excelsa</i> (Welw.) Berg. (Tree)	MELIACEAE	Iroko	Root, fruit, seed, bark	Concoction		Neutralizer, spiritual deliverance from oppression	++
56	<i>Morinda lucida</i> Benth. (Tree)	RUBIACEAE	Oruwo	Leave	Concoction		Malaria	**
57	<i>Nauclea latifolia</i> (Smith) Bruce (Tree)	RUBIACEAE	Egbesi	Leave, root	Concoction or decoction (soak the root in water with <i>Eugenia aromatica</i> )		Malaria	**
58	<i>Ocinum basilicum</i> L. (Herb)	LABIATAE	Efinrin	Leave	Decoction		Dysentery, loss of appetite, sleeplessness	++
59	<i>Olex subscorpiodea</i> Oliv. (Tree)	OLACACEAE	Ifun	Root	Concoction		Malaria, yellow fever	++
60	<i>Parinari curatellifolia</i> Planch. ex Benth. (Tree)	ROSACEAE	Idofin	Root, bark	Powdered the bark (Agunmu) root can be chewed		Skin disease, cough, dysentery	++
61	<i>Parkia biglobosa</i> (Jacq.) R. Br. ex G. Don (Tree)	MIMOSOIDEAE	Igiigba	Bark, leave, seeds, fruit pup	Soup condiment (Iru), concoction		Tonic, malaria, intestinal and mental disorder	**
62	<i>Peperomia lucida</i> L.HBK (Herb)	PIPERACEAE	Rinrin	Leave	Mix the leave with ointment (Ori)		Small pox	**
63	<i>Phyllanthus amarus</i>	EUPHORBIACEAE	Eyinolobe	Leave	Grind the leave		Hives,	**

S/N	Scientific Name	Family	Local name	Parts being utilized	Method application	of	Ailments being treated	Conservation status IUCN/Catalogue of life
	Schum&Thonn (Herb)	EAE			and mix with ointment (Ori)		small pox	
64	<i>Piliostigma thonningii</i> (Schumach.) Milne-Redh. (Tree)	CAESALPINIA CEAE	Abafe	Root, bark, leave	Concoction		Malaria, diabetes	++
65	<i>Pseudocedrela kotschyi</i> (Schweinf.) Harms (Tree)	MELIACEAE	Emi gbegi	Bark, root	Chewing concoction	stick,	Skin disease, dysentery	++
66	<i>Securidaca longepedunculata</i> Fres. (Tree)	POLYGALACEAE	Ipeta	Root	Decoction		Venereal disease, children skin disease	++
67	<i>Securine gavirosa</i> (Roxb,exWilld.) Baill.(Tree)	EUPHORBIAC EAE	Iranje	Root	Decoction		Diarrhea, dysentery, jaundice	**
68	<i>Schebera arborea</i> A. Chev. (Tree)	OLEACEAE	Opele	Bark	Concoction		Fontanel	++
69	<i>Senna hirsuta</i> (L.) Irwin and Barneby (Herb)	CAESALPINIO IDEAE	Amunimuye	Leave, root	Decoction		Skin diseases, syphilis	++
70	<i>Senecio abyssinicus</i> Sch. Bip. ex-A Rich (Shrub)	LEGUMINOSA E	Rere	Leave	Decoction		Purgative	++
71	<i>Sorghum bicolor</i> (L.) Moench (herb)	POACEAE	Epolola	Leave	Concoction		Anemia (Serve as blood tonic)	**
72	<i>Sphenocentrum jollyanum</i> Pierre (shrub)	MENISPERMA CEAE	Akerejupon	Root (yellow)	Concoction		Malaria, yellow fever, jaundice	++
73	<i>Spigelia anthelmia</i> Linn (Tree)	LOGANIACEAE	Apaaran	Root	Concoction		Anthelmintic ,deworm	**
74	<i>Terminalia macroptera</i> Guill.&Perr. (Tree)	COMBRETACEAE	Idi	Root, leave, bark	Chewing stick,		Dysentery, diarrhea	++
75	<i>Tetrapleura tetraptera</i> (Schum.&Thonn.) (Tree)	MIMOSOIDEAE	Aidan	Bark, fruit	Grind and mix local soap (Osedudu) for bathing, concoction		Skin disease, malaria	++
76	<i>Theobroma cacao</i> L. (Tree)	STERCULIACEAE	Koko	Pod, fruit	Concoction, grind		Anemia	**

S/N	Scientific Name	Family	Local name	Parts being utilized	Method application	of	Ailments being treated	Conservation status IUCN/Catalogue of life
		<i>AE</i>			the seed	as	(blood tonic, vitamin)	
77	<i>Vitellaria paradoxa</i> Gaertn. f (Tree)	SAPOTACEAE	Igiemi	Pod without the seed Pod and the seed	Oil extract from the seed is edible, bark as concoction		Vitamin, ointment, malaria, hypertension	V
78	<i>Xylopia aethiopica</i> A.Rich (Tree)	Dunn. ANNONACEAE E	Erun Alamo pod without the seed erunisori (the pod and the seed)	Bark, seed	Mix with local soup Decoction or concoction		Skin disease, purgative, diabetes, dysentery	++

**Note : ++-** This taxon has not yet been assessed for the IUCN Red List, and also is not in the Catalogue of Life.  
**\*\* -** This taxon has not yet been assessed for the IUCN Red List, but is in the Catalogue of Life.  
**V-** Vulnerable under IUCN category of conservation status  
**D-**Data deficient and need updating

**Table 2:** Number and proportion of plants exclusively used for various categories of treatment and prevention.

Category of medicinal use	Number of plants	Percent of all uses
Cough medicine	2	2.6
Dysentery medicine <sup>a</sup>	6	7.6
Incense/Evil spirit repellent <sup>b</sup>	2	2.6
Pediatric <sup>c</sup>	3	3.9
Dietary aid	1	1.3
Stimulant	2	2.6
Preservative	1	1.3
Deworming/ Anthelmintic <sup>d</sup>	3	3.9
Malaria <sup>e</sup>	7	8.8
Veneral disease <sup>f</sup>	6	7.6
Mouth/tooth disease <sup>g</sup>	2	2.6
Dermatological aid <sup>h</sup>	6	7.6
Typhoid	2	2.6
Stomach disturbance <sup>i</sup>	1	1.3
Man's libido	1	1.3
Diabetics medicine	2	2.6
Yellow fever <sup>j</sup>	4	5.0
Protein constituent	1	1.3
Throat aid <sup>k</sup>	1	1.3
Abscesses in breast of women	1	1.3
Orthopedic <sup>l</sup>	3	3.9
Gynecological aid	2	2.6
Spiritual Intervention/deliverance <sup>m</sup>	4	5.0
Antidiarrhea <sup>n</sup>	4	5.0
Respiratory disorder	1	1.3
Antianaemia <sup>o</sup>	3	3.9
Small pox	2	2.6
Purgative	2	2.6
Eye medicine	1	1.3
Mental disorder	1	1.3
Vitamin	1	1.3
<b>Total</b>	<b>78</b>	<b>100</b>

<sup>a</sup>Medicinal Plants that treat dysentery, <sup>b</sup>Medicinal plants that are burn to serve as incense to repel evil spirit from surrounding, <sup>c</sup>Modified from Kassam *et al.*, 2010. Pediatric aid to include medicinal plants used in treating disease associated with children such as wide Fontanel, loss of weight or low weight gain, <sup>d</sup>Medicinal plants used in deworming <sup>e</sup>Medicinal plant used in treating malaria, <sup>f</sup>Medicinal plants used in treating venereal disease such as gonorrhea, syphilis <sup>g</sup>Medicinal plants used for the treatment of mouth and teeth disease, <sup>h</sup>Modified from Kassam *et al.*, 2010 dermatological aid to include medicinal plant used in treating skin diseases in Adult and children, <sup>i</sup>Medicinal plant used in treating stomach disturbance, <sup>j</sup>Medicinal Plants used in the treatment of yellow fever and close to this jaundice, <sup>k</sup>Modified from Kassam *et al.*, 2010 to include medicinal plants used in treating laryngitis, <sup>l</sup>Medicinal plants used in treating bones and muscle, <sup>m</sup>Medicinal plants in this category require incantation, however, it is not advisable to practice it without proper consultation with the traditionalists. It is a psychic's warning as provided by the orthodox practitioners (traditionalists, diviners and herbalists among the informants). <sup>n</sup>Medicinal plants used for the treatment of diarrhea, <sup>o</sup>Medicinal plants used in treating shortage of red cells or haemoglobin in the blood.

## Results and Discussion

### Demographic characteristics of the Informants/participants in the group discussion.

This research study revealed that traditional healing in these communities is being practiced by both men and women. This was observed among herbal vendors (those who engage in the sales and trade of some types of medicinal plants in the market) and herbalists (those who diagnose and prescribe at home).

Females engaged more in the sales of herbal medicine than males, which contrasted to what was obtained from the herbalists. The proportion of male herbalist was higher (87.5%) than their female counterparts. This findings accord with the study of Shapi *et al.* (2009) that in some communities both men and women practice traditional medicine. The relationship between herbal vendors and herbalists is like that of pharmacists and the doctor in contemporary medicine. While the doctors diagnose the ailments and prescribe the treatment, the pharmacists are regarded as the chemists who interpret the composition of the prescription and the physical properties. After the patient has been diagnosed for an ailment by the herbalist, herbal vendors are consulted to provide information on the chemistry, composition and physical properties of medicinal plants as prescribed by the herbalist. This is a clear indication that there is a synergy in the operation of the two, based on indigenous knowledge both of them have acquired through training as apprentices in the sales of the medicinal plants or as it was handed down to them by their grandparents, especially, for the traditional practitioners. The age range of the herbalists varied between 35 -78 years while the vendors were between the age range of 28 -64 years. Children of the herbalists and the vendors constituted a greater percentage of the apprentices (60%) and were in the age range of 16 and 25 years. Apprentices who were 40 years of age and above were very few compared to those in the lower age group. Involvement of participants' children as apprentices in these areas is a way of transferring indigenous knowledge of medicinal plant use from one generation to the other.

### **Indigenous Knowledge of medicinal plants**

All key informants and herbal vendors expressed their opinions on how Indigenous knowledge of medicinal plants is being transferred and retained in these communities. This is being sustained through training of their children as apprentices in trading and practicing of traditional medicine. They equally reiterated their strong belief in orthodox medicine as a means of tackling ailments including those that defy human reasoning or are considered spiritual (i.e psychic's). In such cases, the herbalist can act as a diviner thereby consulting an oracle for direction. In the studied communities, 78 plant species were identified (Table 1). The family Leguminosae constitute the highest number (8), followed by the family Euphorbiaceae (6) and Meliaceae (4) while the family Amaranthaceae, Annonaceae, Combretaceae, Compositae and Rubiaceae have the same number (Table 1). Trees ranked highest (60%) followed by herbs (30%) while shrubs were the least common (10%). Some of these plant species also served other social and economic purposes such as source of food, vitamin, body ointment, purgative, blood tonic and other spiritual purposes.

Forty ailments that were categorized into thirty one ailments were identified to have been successfully treated by traditional medicinal plant at the study communities (Tables 1 and 2). Among the ailments that have been successfully treated through application of different parts of the plants include malaria and dysentery, malaria fever being the commonest. Others include hypertension, Anemia, yellow fever, typhoid, diabetics, jaundice and wide fontanel in children. For instance, 27 species of the total plant species identified in the markets were used in the treatment of malaria (Table 1). Therefore, for every three identified plant species, one can be used in the treatment of malaria. This was followed by the 22 plant species used for the treatment of dysentery. Next to this was the plant species used for treating skin diseases, diarrhea, cough, gonorrhea, yellow fever, diabetes etc.

The number of plant species exclusively used for treating one particular category of ailment appeared to be few (Table 2). The largest number of species identified ( seven) were solely used for treating malaria followed by those used for treating dysentery medicine, dermatological aid, venereal disease with six identified plant species. Three reasons can be deduced from these findings. First, the herbal vendors interviewed "choose" to trade herbal medicine used for the treatment of malaria, the commonest disease in the area, more than those used for other purposes. Second, the herbal vendors and the traditionalists might enjoy highest patronage from patients suffering from malaria as compared to those suffering from other ailments. Third, plant species used in the treatment of malaria are readily available in these communities. Other diseases that have lowest frequency of treatment are considered not common in these communities; they include convulsion, rheumatism, arthritis, fontanel, mental disorder, syphilis, laryngitis etc. This is because one or two plant species were identified to be used for their treatment (Tables 1 &2).

**Methods of use/preparation:** These medicinal plants were prepared in various forms for the various ailments depending on the uses.

### **Mixtures**

#### **Concoction and decoction**

Some of the identified plants are either prepared in form of concoction or decoction. Concoction here referred to herbal medicine that were cooked, it could be a mixture of two or more medicinal plants or it might be a species of plants while decoction referred to those that are not cooked but can be soaked in water or wine or local gin. In most cases plant such as *Allium sativum* served as preservatives. Supplement News (2005), reported that one of the several indigenous remedy plants employed by local traditional healers in South West Nigeria as immune booster in the palliative management of immune suppressive diseases is the cold decoction of the leaf and seed of *Phyllanthus amarus* .

In this study, *Phyllanthus amarus* is used in the treatment of hives and small pox when the leave is grinded and mix with ointment (Ori). The use of *Ocimum basilicum* leave in form of decoction in the treatment of dysentery, loss of appetite, sleeplessness is equally observed and documented in this study. This is in variance with the findings of Ilori *et al.*, (1996) as reported in South East Nigeria, the authors opined that *Ocimum spp* is commonly available as spice in local savoury dishes and have been used in the treatment of different diseases such as upper respiratory infections, diarrhea, headaches, fever, ophthalmic, skin diseases and pneumonia.

### **Mixtures of the plants' parts with ointment (Ori) or soap (Ose-dudu) as body lotion or bathing soap**

This includes plants that are grounded and mixed with ointments as body lotion or mixed with soap for bathing. Plants in this category includes the leaves of *Chasmanthera dependis* mixed with body ointment for the treatment of fracture, swollen leg or wound. The leave of *Chenopodium ambrasioides* mixed with body ointment in treating arthritis. Others include mixture of *Euphorbia laterifolia* with palm oil or body ointment; mixture of *Peperomia lucida* leave with body ointment for treating small pox; mixture of *Phyllanthus amarus* with ointment for treating hives; *Tetrapleura tetraptera* are grinded together and mix with local soap (*Osedudu*) for bathing in treating skin disease. In most cases the ointments referred to are locally produced oil extracts from *Vitellaria paradoxa* known as "Ori" and the bathing soap is locally produced from ash known as "Ose-dudu". Current findings are similar to Olowokudejo *et al.*, (1993) who reported that medicinal plants are prepared in the form of powder, decoction, bathing soap, soup and the majority of them are used in mixtures of or concoctions of materials while a few are used as single.

### **Mixtures of the plants' parts with other plant species**

Combination of some of the identified plant species such as *Khaya spp*, *Ageratum conyzoides* either in the form of concoction or decoction in the treatment of Malaria (a prevalent ailments in the study communities) was documented. This support the findings of Fabeku and Akinsulure, 2008 , that combination of the bark of *Khaya spp* (Epo Oganwo), bark of *Alstonia boonei* (Epo ahun), fruits of *Xylophia aethiopica* (Eleru-Alamo) soak with water are used in the treatment of malaria in Nigeria. The research finding also revealed that the root of *Nauclea latifolia* soak in water with *Eugenia aromatica* are used in the treatment of Malaria in these communities . The leave of *Morinda lucida* mix together with the bark of *Khaya spp* are used in the treatment of Malaria are equally reported. This is in tandem with Sofowora, (1993) and Odugbemi *et al.*, 2007 that *Morinda lucida* and *Khaya spp* were found to be in use for malaria therapy in Okeigbo area of Ondo-State, Nigeria. The mixtures of other plant species in treating ailments such as Anemia, dysentery and diabetics were also observed as presented in Table 1.

### **Other methods of use**

Other methods of use include chewing stick, soup condiment and grinding into powdery form. The fruits of *Lagenaria breviflorus* can be thrown on the floor around the houses while the bark of *Erythrophellum suaveolens* can be soaked in water to scare away evil spirit. There are also those reported to be used as gourd to keep medicine. This involves the use of various parts like bark, stems, leaves, seeds, pods, bulbs, nuts, roots and fruits. For instance, inflammation treatments can best be administered in the form of cream or pomade while teething problem or mouth disease can best be treated by chewing the stick or the stem of the plant and sometimes the patient might prefer herb preparation in the form of a concoction to a decoction. The barks of species of plant like *Acacia nilotica* (Booni) can be used in combination as a burnt incense to scare away or repel evil spirit or in the form of decoction to treat dysentery. The use of herbal decoction, extracts of medicinal plants and their various parts for treatment of ailments have been reported by several researchers (FAO 1983; Gbile *et.al* 1985; Anwana and Obot 2003).

### **Plants use by frequency of use and preparation methods**

All the species of plants used in the treatment of common ailments such as malaria, diarrhea, dysentery, yellow fever, jaundice, hypertension, diabetic e.t.c can be considered as the frequent. This includes 27 plant species used in the treatments of malaria, 21 species used for the treatment of dysentery e.t.c. 14 species of the identified plants are used in the treatment of up to three to four ailments either in the form of concoction or decoction. For instance, *Xylophia aethopia* can be used as concoction or decoction for the treatment of Skin disease, purgative, diabetes and dysentery, *Vitellaria paradoxa* can be used in the treatment of malaria, hypertension and also in the production of body ointment, and as a vitamin supplement; depending on the parts of plants used and their methods of production. *Parkia biglobosa* can be used for the treatment of malaria, intestinal incontinence and mental disorder; also as tonic. Also the root of *Aristolochia ringens* can be used in the form of decoction either soaked in water or local gin in the treatment of typhoid or malaria. Kubmarawa *et al.*, (2007) noted that *Aristolochia albidia* and *Nuclea diderichii* are reported to be used as antimalarial in Riji, Adamawa State, North eastern Nigeria.

*Chasmanthera dependeus* was found useful in the treatment of four ailments including fracture, swollen leg, wound and for children with weak bones; this is in the form of decoction. Among these multipurpose medicinal plants, trees constituted the highest percentage (about 65%) of the identified medicinal plants, followed by herbaceous plants (about 32%), and shrubs were the least (about 13%).

### **Patient patronage and Local Knowledge**

The vendors and the traditionalists gave various reasons for having different levels of clientele, the most important of which includes the affordable price of the herbal medicine. For instance, the cost of preparing, concoction or decoction for the treatment of malaria or dysentery (\$1 and \$2 per dosage) does not have a standard or precise measurement. Measurement is based on the discretion of the user and his/her level of response to treatment. Traditionalists and some herbal vendors also offer spiritual consultation (especially for ailments considered as psychic) to their patients on matters such as provision of repellent of evil spirit, causes of infertility, broken relationships, loss of patronage or businesses success and causes of delayed in marriages. In this case, the herbalists can decide to act as diviners when sacrifices are offered and oracles are consulted. They also treat ailments where the cost of contemporary medicine is considered too exorbitant. Another reason given for the increased level of patronage being enjoyed by the herbal vendors includes bottleneck and bureaucratic procedures; associated with contemporary medical consultant and nurses in public hospitals as compared to the easily accessible herbal vendors and traditionalists. All the reasons provided support the findings of Kassam *et al.* (2010) that heavy reliance on plant medicine or self-treatment may be the major option and local knowledge of medicinal plants might save lives due to their relative accessibility, low prices, general acceptance by local communities and the inadequacy of health centers especially in rural areas. The challenges occasionally faced by patients include long queues at the points of collection of patient cards and at the places that are set up for meeting the doctors. Poverty could be the underlining factor that many patients find it difficult to patronize privately owned hospitals due to high charges, although their services are relatively more efficient.

### **Therapeutic rationale behind formulation**

The rationale behind formulation of these herbal mixtures or single dose can be attributed to believe and trust in curative remedies of these plant species. There are indications that adherence to these traditional believes have been sustained through a formidable and organized indigenous knowledge system handed from one generation to the other as reported by the herbal vendors and the herbalist. Elujoba, (2005) emphasized that it is believed very strongly that if the herbs never worked for our predecessors, malaria would have devastated Africa and the missionaries that came to scramble for Africa would not have met a single person on the continent of Africa. World Health Organization International Agency for Research on Cancer (WHO-IARC, 2002), opined that due to the complexity of herbal and botanical preparations, information on the active principles of plant derived products is incomplete or unavailable this explains reason why the therapeutic rationale behind their formulation is lacking. The author therefore concluded that it is a function of the traditionally –held belief that the synergistic combination of several active principles in some herbal preparations is responsible for their beneficial effects.

Apart from believe there is no therapeutic rationale behind the usage and formulation of these herbal medicines in these communities hence a scientific study needed to be initiated. This forms part of the view of a group of experts invited by the World Health organization Regional Office for the Western Pacific that most herbal medicines still need to be studied scientifically, although the experience obtained from their traditional use over the years should not be ignored (WHO, 1993). The group went further to illuminate on the fact that since there is not enough evidence produced by common scientific approaches to answer questions of safety and efficacy about most of the herbal medicines now in use, the rational use and further development of herbal medicines will be supported by further appropriate scientific studies of these products, and thus the development of criteria for such studies.

### **Dosage and Unit of measurement**

One of the challenges encountered in this study was on the question of unit of measurement used in the administration of these drugs. This is because no standard measurement for dosage was presented even upon request by the researchers. This is due to lack of standard of measurement for the dosage. The data obtained shows that there is observable difference in the quantity of dosage delivered by vendors. For instance, in a situation where a cup of the concoction was prescribed to be taken in the morning or afternoon or night by one vendor while the other vendor may prescribe larger/smaller volume of the same medicine for the same ailment. Therefore, the greater challenge that traditional medicine is facing is the lack of unified or standardized unit of measurement. For instance, cases of patients who mistakenly assumed a cup of dosage to be equivalent to 500ml-cup rather than 250ml have been recorded as severe. This is unlike contemporary medicine, where dosage is stipulated and in most cases unit of measurement is found attached to the prescribed drug. A cup of dosage as prescribed by the vendors or traditionalist could be assumed to mean either a tumbler of 50ml or a stainless or

mug cup of 300ml. The decision to use either a tumbler of 50ml or a stainless or mug cup of 300ml as unit of measurement as prescribed by the herbal vendors or herbalist is at the discretion of the patient. The patient therefore rely on the information obtained on the method of preparation and the concentration of the content. If the herb is prepared and soak in a local gin there is every tendency that the concentration will be very high hence a tumbler cup of 50ml represent the unit of measurement as a cup. On the other hand, if the herbal medicine is prepared with water, a stainless or mug cup of 300ml is preferably considered. Other units of measurement commonly used as identified in this study include a tablespoon. A tablespoon could vary between 5ml and 10ml depending on the size. Thus, confusion may arise in the use of this unit of measurement.

### **Other socio-economic uses of medicinal plants**

The study revealed that in addition to their medicinal values, some of the identified plants offer other socio-economic benefits. For instance, the oil extracts from the seed of *Vitellaria paradoxa*, apart from serving as ointment can also serve as vegetable oil and is used for cooking and in remote rural areas it could serve as biofuel for the locally produced lamp. The seeds of *Parkia biglobosa* can also be processed to serve as soup condiment locally called “iru”. Medicinal plants are grouped for many commercial purposes in the broader category “medicinal and aromatic plants” (MAPs), covering plants used not only medicinally (Sensu stricto), but also for neighbouring and overlapping purposes, for instance, as foods, condiments and cosmetics (Hamilton 2003). The research finding also revealed that fruit of *Mangifera indica* can be processed at a commercial scale for the production of juice, while the seeds of *Capsicum frutescens* can be used as a stimulant. All the key informants and participants in the group discussions were familiar with the use of these plant species for various purposes as indicated. This is largely because apart from their medicinal values these plant species constituted greater proportion of their food. Similar research studies have been undertaken on the social and economic values of some of these identified plant species as reported in literatures. For instance, the mango, *Mangifera indica* is well known for its excellent exotic flavor and commercial production has been reported in more than 87 countries (Sivakumar Jiang *et al.*, 2010). In addition to its use as a stimulant, medicinal values of *Capsicum frutescens* was observed among the locals in Weno, Romanum, and Pilis islands, Chuk Atoll, Federated States of Micronesia (Yamamoto., 2013). The researcher reported that when asked about medicinal uses of *Capsicum*, three people responded that the peppers are used to treat toothaches. In other regions of Oceania, the fruits, seeds, and leaves are used to treat various ailments such as painful joints, back pain etc.

### **Method of collection or source**

We found that it was the norm for traditionalists to maintain home botanical gardens to meet their immediate medicinal needs rather than visiting markets to purchase. All the herbaceous plants identified can be regarded as being successfully domesticated and they can be found grown at the back yard or on the cultivated farm unlike trees. Tree species such as *Kigellia africana*, *Annona senegalensis*, *Tetraptera teraptera* used for the treatment of ailments such as malaria, dysentery and rheumatism can only be obtained in the wild. It can therefore be deduced that the host communities have recorded success in domesticating and cultivating the herbaceous and shrub medicinal plant species compared to the trees. Domestication of indigenous plants have been emphasized as one of the ways of achieving ex-situ conservation of various species of plants and animals of threatened or endangered species (Nigeria First National Biodiversity Report 2001). *Aframomum melegueta*, *Allium ascalonicum*, *Allium sutivum*, *Erythrococca anomala*, *Eugenia aromatica*, *Garcinia kola* and *Xylophia aethiopica* were said to be non –native but were sought or bought from other places outside these communities.

### **Conclusion**

The selected communities adjoining Old Oyo National Park have an intricate link between indigenous knowledge and medicinal plant use. This study has established that the traditionalists (herbal vendors and herbalists) possessed local knowledge of medicinal plants use which they transfer or pass from one generation to the other by involving their biological children and other young ones (non-biological children ) in herbal sales and traditional healing. This is a clear demonstration of how indigenous knowledge of medicinal plant use is being retained and transferred from one generation to the other.

Various plant species were identified to treat different ailments, in addition to using the same species as sources of food and raw materials, among others. Seventy-eight plant species were identified to be used for the treatment of forty ailments in thirty-one categories across the communities. Trees ranked highest (60%) followed by herbs (30%) while shrubs were the least common (10%). Some of these plant species also served other social and economic purposes such as sources of food, vitamins, body ointment, purgative, blood tonic and other spiritual purposes.

Forty ailments that were categorized into thirty one were identified to have been successfully treated by traditional medicinal plant at the study communities. The names of some of the identified ailments that have been successfully treated through application of different parts of the plants include malaria and dysentery. Others include hypertension, Anemia, yellow fever, typhoid, diabetes, jaundice and wide fontanel among the children. These medicinal plants were prepared in various forms for the different ailments according to their uses. There are those used as concoction, decoction or as both. This involves the use of various parts as bark, stem, leaves, seed, pod, bulb, nut, root and fruits.

It can also be deduced that the host communities have recorded success in domesticating and cultivating the herbaceous and shrub medicinal plant species compared to the trees. This is because tree species such as *Kigellia africana*, *Annona senegalensis*, *Tetraptera teraptera* used for the treatment of ailments such as malaria, dysentery, rheumatism can only be obtained in the wild. Species of plants such as *Aframomum melegueta*, *Allium ascalonicum*, *Allium sativum*, *Erythrococca anomala*, *Eugenia aromatica*, *Garcinia kola* and *Xylophia aethiopica* were said to be non –native and they were sought or bought from other places outside these communities.

The vendors and the traditionalists gave various reasons for having different level of customer's patronage and the most important include the affordable price of the herbal medicine. One of the challenges faced in this study was the question of unit of measurement used in the administration of these drugs by the herbal vendors or sellers and the traditionalists or the herbalists. This is due to the lack of standard of a measurement for the dosage.

Capturing local knowledge on medicinal plant use is recognized today as the most viable method of identifying new medicinal plants or refocusing on those earlier reported for bioactive constituents. The study will contribute to the advancement of contemporary medicine, resource efficiency and development of new enterprise in the selected communities.

## Recommendations

Based on the findings of this study, there is need to create a data base of information on medicinal plant species used by the study communities including their methods of application for various ailments. Further research works also need to be carried out on the laboratory analysis of these species to identify the active ingredients as a way of synthesizing some of these plants for the production of drugs used in modern day medicine. The therapeutic or prophylactic indications of the identified herbal medicines can only be established through thorough and in-depth scientific research. Comprehensive quantitative study on the social and economic importance of the medicinal plants is recommended. Issues related to standardizing dosage also need to be addressed as a way of saving life, resource and time. Methods of domesticating the identified medicinal plant species, especially the trees mostly being collected from the wild need further research. Policy and development are also lacking and they need to be included in the research.

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**Conflict of Interest:** The authors whose names are listed below hereby declared that there is no conflict or affiliations or involvement in any organization or entity with any financial or non-financial interest on the submitted manuscript titled: Capturing Indigenous Knowledge on Medicinal Plants Use: Case study of selected communities in Old Oyo National Park, Nigeria.

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