



Survey of Plants Used by the Indigenous People of Ogbomoso Land for Ethno-botanical and Ethno-medicinal Purposes in South-Western Nigeria

Ajagun Ebele Joan^{1*}, Abdulsalam Taoheed Adedeji², Oyedele Julius Olusegun¹, Jayeoba Lukman Akanni¹, Afolayan Mayowa¹, Abdul Lucky Ajige¹, Awe Adebimpe Ajiteru¹, Abdulfatah Rukayah Kailani², Mustapha Abdullahi³

1 Bioresources Development Centre, Ogbomoso, P.M.B 3524, Ogbomoso, Oyo State, Nigeria

2 Department of Biological Sciences, Abubakar Tafawa Balewa University, P.M.B. 0248, Bauchi, Bauchi State, Nigeria.

3 National Biotechnology Development Agency, Umaru Musa Y'adua Way, Lugbe, P.M.B. 5118, Wuse Abuja

Corresponding Author: ajagunebelejoan@gmail.com

Abstract

The majority of people in Sub-Saharan Africa utilize folkloric medicine for their primary health care needs. Despite this wide acceptance and use of herbal medicine a lot of traditional medicine knowledge is being lost till date. Thus, this survey aims at identifying and documenting the ethno-botanical and ethno-medicinal uses of plants as applied by the indigenous people of Ogbomoso land, South-Western Nigeria. The survey was carried out within Ogbomoso land in Oyo State, South-Western Nigeria comprising of 5 local government areas. Ethno-botanical and ethno-medicinal information was obtained from respondents through the use of in-depth semi-structured interviews, group discussions and field observations from November 2019 to December 2020. Appropriate statistical packages were used to analyze collected data. A total of 166 plant species distributed within 72 families and 158 genera were identified. Fabaceae (9.5%) was the most frequently used; whilst plants from the Amaranthaceae (3.0%) family were the least used. The reported plant species were used for the treatment/management of non-communicable (52.6%), communicable (4.2%) and both disease conditions (4.1%). Leaves (40.4%) most used plant part; decoctions (70.2%) most preferred method of preparation and orally the most favoured route of administration (88.7%). The study identified a variety of plant species used in the treatment/management of both communicable and non-communicable diseases conditions; and complements the ongoing activities of the Bioresources Development Centre, Ogbomoso towards identifying and documenting the region's indigenous bioresources in terms of herbal medicine. Information provided in this study will contribute to local, national and international efforts intended at documenting indigenous flora with medicinal benefits; and the possible production of a local pharmacopeia.

Keywords: medicinal plants, Ogbomoso land, Fabaceae, traditional medicine, ethno-botanical and ethno-medicinal uses

Introduction

Traditional medicine (TM) also known as traditional therapy, complementary and alternative medicine (CAM), herbal medicine, folkloric medicine or indigenous medicine; encompasses in totality the knowledge, skills, and practices (whether understandable or not) used in the prevention, diagnosis, treatment and or management of physical and mental illness; and remains relevant in African, Asian and the Pacific Islands till date (Park and Canaway, 2019; WHO, 2019; Falemara et al., 2021). It is believed to play a vital role in the health care needs of countries where there is a disconnect between the health service and the people (WHO and UNICEF, 2018); however the wide acceptance of traditional medicinal preparations both in developing and developed countries is contrary to this fact (Bell et al., 2006; Elechi-Amadi et al., 2021).

Traditional medicine practice makes use of products derived from nature with medicinal values such as plants, animal parts, micro-organisms, and marine organisms; to either prevent, alleviate and or treat disease conditions

(Djagoun et al., 2011; Ajagun et al., 2017). In Africa, TM is not only a form of healthcare service but also a part of the tradition and culture of the people; hence deeply embedded in every society (Kim et. al., 2020). The preference for herbal preparations varies by country; and is at most times the only health care service available particularly in rural and isolated areas (WHO and UNICEF, 2018; Park and Canaway, 2019).

The world Health Organization has reported an estimated 88% of the global population to have adopted herbal preparations as the primary solution to their health care needs (WHO, 2019). Similarly, in Nigeria, 94% of urban, rural and semi-urban populations rely on traditional medicine for the management of different disease conditions (James et. al., 2018). These have ultimately resulted in the emerging global trend of the use of herbal medicine for the treatment and management of various chronic disease conditions; with a documented overall increase (30%-57%) in prevalence of medicinal plant use (Bell et. al., 2006; Peltzer and Pengpid, 2019; Kifle et. al., 2021). Also, available documented data have shown that

patients with chronic disease conditions are 1.6 times more likely to use herbal preparations with the sole aim of managing the disease condition and improving their quality of life (Garrow et al., 2006; Ranasinghe et al., 2012; Yuan et al., 2016; Alagathama et al., 2020).

Medicinal plants have been known to play a significant part in health care and its use continues till date (Chang et al., 2013); and have always served as the backbone for the identification, isolation and synthesis of new drug molecules based on existing documented indigenous uses (Ngueguim et al., 2013; Bamisaye et al., 2014; Ndukwe et al., 2017).

The dearth of interest of the younger generation, level of literacy of traditional practitioners, lack of documented evidences of efficacy and use; as well as the fact that a majority of indigenous medicinal knowledge are family heirlooms have resulted in a great loss of indigenous medicinal knowledge of a great proportion of the plant flora found within Sub-Saharan Africa, Nigeria not excluded (Gakuya et al., 2020; Petros and Nokwanda, 2021; thom et al., 2021; Ihekwoaba et al., 2022).

Over the years, the WHO has raised awareness on the drastic increase in global incidence of non-communicable diseases such as diabetes, hypertension, cancers (of various types); morbidity and mortality associated with these diseases as well as their early onset (mean age of onset) (WHO, 2017). These documented drastic increase in incidence of non-communicable diseases; population explosion; increased interest of WHO in alternative medicine (most especially herbal medicine); as well as the

government's appreciation of the importance of herbal medicine in the health care delivery system has made it imperative to identify, document and validate all indigenous medicinal plants with the hope of identifying that miracle plant that would produce complete cure with minimal associated adverse drug effect. Also for several years the WHO in collaboration with the Federal Ministry of Health, Nigeria has been working tirelessly to produce a local herbal pharmacopeia of the South-Western Nigeria (WHO, 2005).

Despite documented global acceptance and increased use of medicinal plants either as finished products (in form of tablets, capsules etc.), tinctures or crude extracts one cannot help but draw attention to the increasing loss of indigenous knowledge on the uses of some of these medicinal plants as seen in sub-Saharan Africa; Nigeria especially. Hence this survey was conducted with the sole aim of tapping into the culture and tradition of the people in an effort to preserve the indigenous knowledge of the people of Ogbomoso land, South-Western Nigeria in the area of medicinal plants and their indigenous medicinal uses.

Material and Methods

The survey was carried out within Ogbomoso land in Oyo State, South-Western Nigeria. The investigated study area comprises of 5 of the 33 LGA's in Oyo state, Nigeria; and includes Ogo-oluwa, Surulere, Oriire, Ogbomoso North and Ogbomoso South local government areas (LGA) (Figure 1). Towns within these LGAs were randomly selected to make-up the study area as shown in the table below:

Table 1: Randomly selected towns within the LGAs and their coordinates that make-up the study area

LGA	Location(s)	Coordinates
<i>Ogo-oluwa</i> <i>Surulere</i>	Odoje-Orile	8.068N, 4.201E
	Aganyan village	8.099N, 4.391E
	Iresa-adu town	8.084N, 4.399E
	Ilodo	8.301N, 4.192E
<i>Oriire</i>	Ikoyi	8.300N, 4.191E
	Bolorunduro village	8.284-8.286N, 4.018-4.019E
	Alfa-Tedo	8.119N, 4.272E
<i>Ogbomoso</i> North	Ikose	8.121N, 4.215E
	Iluju	8.121N, 4.215E
<i>Ogbomoso</i> South	Esanu-Aje	8.11182N, 4.25306E
	Oke-Alapata	8.12689N, 4.23403E

Several field trips were conducted to the randomly selected towns within the twelve calendar months (November 2019 - December 2020).

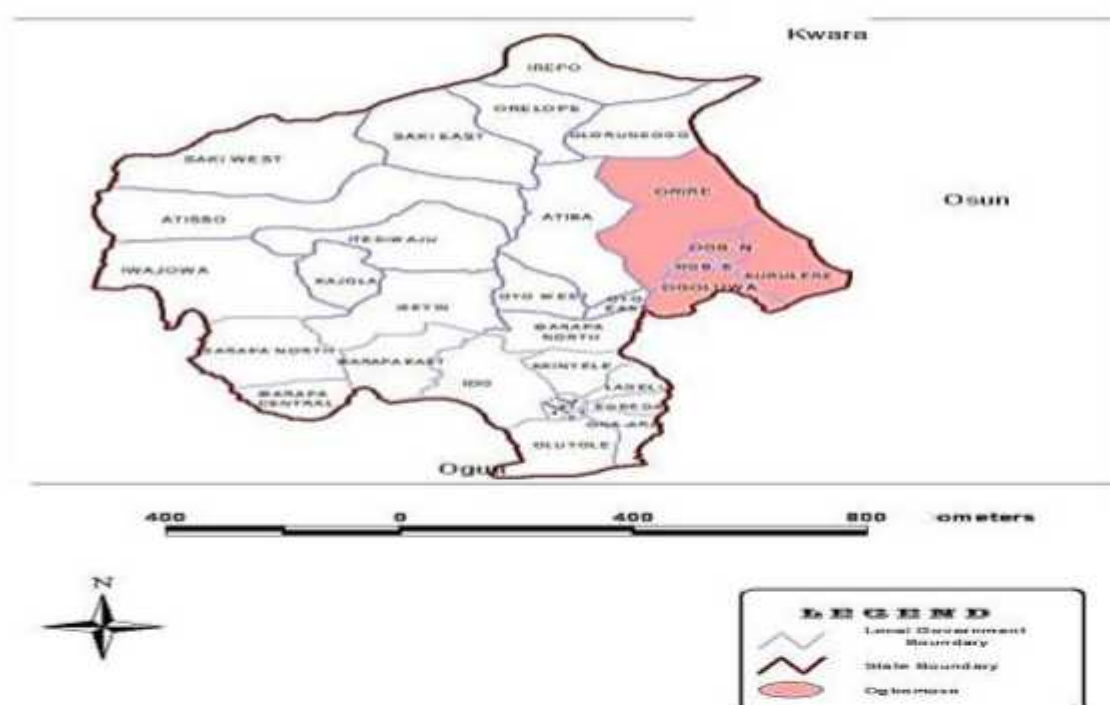


Figure 1: Map of Oyo State South-Western Nigeria with a shaded part showing the five (5) local government areas that make-up Ogbomosho Land (Ogunkan and Jelili, 2010)

Respondents were selected to include both the key informants (i.e. the traditional medicinal practitioners) and general informants (residents with detailed knowledge of medicinal plants, parts used as well as indication for their use). Prior to each interview, the aim of the survey was explained after which a verbal consent was obtained. All respondents with in-depth knowledge of the plant, indication for use, method of preparation and route of administration were included in the study; whilst those with no in-depth knowledge on the plant, indication for use, method of preparation and administration were excluded from the study. Respondents within these randomly selected towns who fulfilled inclusion criteria and gave verbal consent formed the study population. Ethno-botanical and ethno-medicinal information was obtained from respondents through the use of in-depth semi-structured interviews, group discussions and field observations during the study duration. Data collected include plants and parts used; indigenous names; indications for use; methods of preparation and application as well as pictures. Plant samples were also collected from the open fields, labeled with local names and properly packaged for the preparation of a local herbarium and possible establishment of a medicinal farm. Taxonomic identification was carried out at site of plant

collection using PlantNet@ app and confirmed using an online database "Integrated Taxonomic Information System" (<http://www.itis.gov>). Data collected were then analyzed using frequency distribution (SPSS version 20); and results were presented as table or graphs were appropriate.

Results and Discussion

Medicinal plants have been known to play a vital role in the health care needs of the global populace since time immemorial; and still serve as the bedrock for the identification and synthesis of novel drug moieties based on existing documented folkloric uses (Thomford et al., 2018). This survey identified a hundred and sixty-six (166) medicinal plants randomly distributed within 72 families as being used in the management of different disease conditions by the indigenous people of Ogbomosho land; and also describes the diversity of medicinal plant floral within the land (Table 1). The use of traditional medicine for the management and treatment of a wide variety of disease conditions by the indigenous people of Ogbomosho land can be related to its long pre-documented historical use and wide acceptability; such that it is now believed to be a family occupation where the medicinal uses of both plants and animal parts are passed down from generation to generation (Ajagun et al., 2017).

Plants belonging to the Fabaceae (9.5%), Asteraceae

(7.7%), Malvaceae (7.1%), Apocynaceae (4.7%), and Amaranthaceae (3.0%) families were the most frequently mentioned during the course of the survey; with approximately 71% of the plant families' recording 1–2 species for medicinal purposes. Also, 52.6%, 4.2% and 4.1% of the reported plant species were used for the treatment/management of non-communicable, communicable and both disease conditions respectively (Table 2).

Medicinal plants within the Fabaceae family represented the most used plant species for the treatment and management of both communicable and non-communicable disease conditions. This observed preference for the use of plants of this family was also reported

in studies conducted within several different countries (El-Ghani, 2016; Boadu and Asase, 2017; Magwede et al., 2019; Chukwuma et al., 2019; Lawal et al., 2020). The popularity and high preference of plants from this family in African traditional medicine might be linked to their availability, accessibility and abundance, as well as their adaptability to varying environmental/climatic conditions.

Several studies have also reported increased likelihood of people with diabetes and hypertension to use herbal preparations in an attempt to achieve goal of therapy; which has also been reported by this survey where diabetes and hypertension were the most common non-communicable chronic diseases managed with the use of herbs (Garrow et

Table 2: Documentation of medicinal plants within Ogbomoso Land, South-Western Nigeria

S/N	Plant species	Family	Common Name	Indigenous Name	Part used	Diseases at Target	Methods of Preparation/ Route of Administration
1.	<i>Abelmoschus esculentus</i>	Malvaceae	Okra	Ila	Leaves and fruits	Gonorrhea	Decoction/oral
2.	<i>Abelmoschus maschatus</i>	Malvaceae	Musk mallow	Ila	Seeds, stem/leaves	Gonorrhea	Decoction/oral
3.	<i>Abrus precatorius</i>	Fabaceae	Rosary pea	Ojuologbo	Leaves, stem & seed oil	Diabetes	Infusion/ Oral
4.	<i>Abutilon mauritanium</i>	Malvaceae	African mallow	Furu / kawo	Leaves	Piles	Decoction/oral
5.	<i>Acacia ataxacantha</i>	Fabaceae	Flame thorn / Benin Rope Acacia	Ihun / Ewon adele	Leaves, bark and stem	Pneumonia	Decoction/oral
6.	<i>Acacia nilotica</i>	Mimosaceae	Gum Arabic / Egyptian mimosa	Booni	Stem, bark and leaves	Diabetes	Decoction/oral
7.	<i>Acalypha fimbriata</i>	Euphorbiaceae	Indian Acalypha	Jinwinnini	Leaves	Skin /microbial infection	Decoction/Topical
8.	<i>Acanthospermum hispidum</i>	Asteraceae	Bristly Star bur	Dagunro	Stem, leaves and Root	Microbial infection	Decoction/Oral
9.	<i>Acanthus montanus</i>	Acanthaceae	Mountain thistle	Ahon ekun	Leaves, roots/leaf sap	Syphilis, cough/ urethral discharge	Maceration/Oral
10.	<i>Acorus calamus</i>	Acoraceae	Sweet flag	Etiponla	Rhizome	Hypertension/epilepsy	Maceration/Oral
11.	<i>Adonsonia digitata</i>	Malvaceae	Baobab	Iuru	Seeds	Diabetes	Infusion/oral
12.	<i>Aerva lanata</i>	Amaranthaceae	Mountain knotgrass	Efun- ile	Whole plant	Asthma, cough & headache	Infusion/Oral
13.	<i>Aframomum melegueta</i>	Zingiberaceae	Alligator pepper	Atare	Seed	Anaemia, small pox & Chicken pox	Maceration/Oral

14.	<i>Ageratum conyzoides</i>	Asteraceae	Billygoat weed	Imi esu	Leaves	Ulcer	Maceration/Oral
15.	<i>Allanblackia floribunda</i>	Clusiaceae	Tallow tee	Eso roro	Fruits and leaves	Hypertension	Decoction/oral
16.	<i>Allium ascalonium</i>	Alliaceae	Spring onion	Alubosa elewe	Bulb	Convulsion, Dysentery	Infusion/Oral
17.	<i>Aloe barbadensis miller</i>	Asphodelaceae	Aloe vera	Ahon erin	Gel from leaves	Gastric ulcer/diabetes	Decoction/Oral
18.	<i>Alstonia congensis</i>	Apocynaceae	Cheese weed	Ahun	Bark	Microbial infection	Decoction/Oral
19.	<i>Alternanthera sessilis</i>	Amaranthaceae	Sessilis joyweed	Rekureku	Whole plants	Snake bite antidote, boil	Infusion/Oral
20.	<i>Anacardium Occidentals</i>	Anacardiaceae	Cashew leaf	Kasa	Fruit	Diabetes	Infusion/oral
21.	<i>Angraecum eichlerianus</i>	Orchidaceae		Ewe ela	Leaves	Degenerative diseases	Decoction/Oral
22.	<i>Annona comosus</i>	Bromeliaceae	Pineapple	Open oyinbo	Fruit	Hypertension	Decoction/Oral
23.	<i>Annona senegalensis</i>	Annonaceae	African custard apple	Arere	Root	Malarial infection	Infusion/Oral
24.	<i>Anogeissus leiocarpus</i>	Combretaceae	Chew stick tree, Axle wood, Giant fern	Igi pakp / Orin- odan	Stem and bark	Diabetes	Decoction/oral
25.	<i>Anogeissus schimperi</i>	Combretaceae	Chewing stick	Ayin	Leaves and bark	Malarial infection	Decoction/oral
26.	<i>Anthocleista djalonensis</i>	Loganiaceae	Cabbage tree	S Shapiro	Whole plants	Ulcer	Maceration/Oral
27.	<i>Argemone Mexicana</i>	Papaveraceae	Mexican prickly poppy	Ekan ekun	Root	Inflammation & cancer	Decoction/Oral
28.	<i>Argyria nervosa</i>	Convolvulaceae	Elephant creeper	Rerikomi	Leaves	Ulcer	Maceration/Oral
29.	<i>Aspilia Africana</i>	Asteraceae	Wild Sunflower	Yunyun	Leaves	Rheumatism, Scorpion stings	Infusion/Oral

30.	<i>Azadirachta indica</i>	Meliaceae	Neem	Dogon-yaru	Leaves, stem & bark	Lowers Blood Pressure / Diabetes	Decoction/Oral
31.	<i>Bacopa floribunda</i>	Sacrophyllaceae	Water hyssop	Oniyemiye	Leaves	Degenerative diseases	Decoction, maceration and Oral
32.	<i>Balanites aegyptiaca</i>	Balanitaceae	Desert date tree	Teji / Ewe-epa	Stem, bark and leaves	Diabetes	Maceration/oral
33.	<i>Basella alba</i>	Basellaceae	Malabar spinach	Aminututu	Leaves	Ulcer	Infusion/Oral
34.	<i>Bauhinia monandara</i>	Fabaceae	Pink orchid	Ahafa	Leaves, root & bark	Diabetes	Decoction/Oral
35.	<i>Blighia sapida</i>	Sapindaceae	Akee apple	Ishin	Stem, root, leaves & bark	Hypertension & Diabetes	Decoction/Oral
36.	<i>Boerhaavia verticillata</i>	Nyctaginaceae	Spreading hog weed, spiderlings	Inawo-ile	Leaves, root, whole plants	Skin disease, dysentery	Maceration/Topical/Oral
37.	<i>Boswellia serrata</i>	Burseraceae	Indian frankincense	Tahki, H - Samu	Leaves		Decoction/oral
38.	<i>Bridelia exaltata</i>	Phyllanthaceae	Scrub iron bark	Im	Bark	Malarial infection	Decoction/Oral
39.	<i>Bryophyllum pinnatum</i>	Crassulaceae	Life plant, resurrection plant	Ewe abamoda	Leaves	Cancer	Decoction/Oral
40.	<i>Butyrospermum paradoxum</i>	Sapotaceae	Shea tree	Ori	Leaves and stem	Trypanosomiasis	Decoction/oral
41.	<i>Byrsocarpus coccineus</i>	Connaraceae	Crimson thyme	Amaje wewe	Leaves	Urogenital diseases	Decoction/oral
42.	<i>Caesalpinia pulcherrima</i>	Fabaceae	Barbados pride	Eko omode	Whole plant	Kidney disease	Decoction/Oral
43.	<i>Calendula officinalis</i>	Asteraceae	Put marigold	Ododo maria	Leaves and Root	Cancer	Decoction/oral
44.	<i>Calotropis procera</i>	Apocynaceae	Sodom apple	Bemubomu	Leaves and fruit	Diabetes, Malarial infection	Decoction/Oral

45.	<i>Camellia sinensis</i>	Theaceae	Tea shrub	Werepe	Leaves	Malarial infection	Decoction/oral
46.	<i>Canavalia ensiformis</i>	Fabaceae	Jack bean	Sese-ila	Leaves	Asthma	Decoction/oral
47.	<i>Capsicum annum</i>	Solanaceae	Bell pepper	Ata wewe	Fruit	Heart diseases	Decoction/Oral
48.	<i>Cardiospermum halicacabum</i>	Sapindaceae	Balloon plant	Shaworo	Leaves	Diuretic	Decoction/oral
49.	<i>Carica papaya</i>	Caricaceae	Pawpaw	Ibocpe	Fruit	Boil purgative	Decoction/Oral
50.	<i>Carpobrotus edulis</i>	Portulacaceae	Candlestick	Egbo-Omansun	Leaves/ bark	Rheumatism	Decoction/Topical
51.	<i>Cassia fistula</i>	Fabaceae	Indian laburnum	Aidan toro	Pod	Diabetes/Skin diseases	Decoction/Topical
52.	<i>Cassytha filiformis</i>	Lauraceae	Devil's gut	Omoniginigini	Stem, twigs	Helminthic and fungi	Decoction/Topical
53.	<i>Celastrus pentandra</i>	Malvaceae	Kapok tree	Iroko	Leaves	Malarial infection	Decoction/Oral
54.	<i>Celastrus indica</i>	Celastraceae	Bitter sweet	Ponju-owini	Leaves	Leprasy	Decoction/oral
55.	<i>Celosia argentea</i>	Amaranthaceae	Cockscomb	Sokoyokoto	Leaves	Rashes	Decoction/oral
56.	<i>Celosia laxa</i>	Amaranthaceae	Celosia	Ajefowo	Leaves	Antiscorbutic, purgative	Decoction/Oral
57.	<i>Chromolaena odorata</i>	Asteraceae	Siam weed	Akintola	Leaves	Malarial infection	Infusion/Oral
58.	<i>Chrysophyllum albidum</i>	Sapotaceae	African star apple	Aghalumu	Fruit	Delicacy/ anti-nausea	Maceration/Oral
59.	<i>Cinnamomum zeylanicum</i>	Lauraceae	True cinnamon tree	Oloorun	Seeds, bark	Arthritis	Decoction/oral
60.	<i>Citrullus lanatus</i>	Cucurbitaceae	Water melon	Egusi bara	Seed	Hypertension	Decoction/Oral/Topical
61.	<i>Citrus aurantifolia</i>	Rutaceae	Key lime	Osin wewe	Peel	Ulcer	Maceration/Oral
62.	<i>Citrus aurantium</i>	Rutaceae	Sour orange	Osin ganingama	Fruit	Diabetes	Maceration/Oral
63.	<i>Citrus sinensis</i>	Rutaceae	Sweet orange	Osin mimu	Fruit	Digestion	Decoction/Oral
64.	<i>Cnestis ferruginea</i>	Connaraceae	Short pod	Esimin	Leaves	Rashes	Decoction/oral
65.	<i>Cocos nucifera</i>	Arecaceae	Coconut	Aghon	Nut	Anti-poisons	Infusion/Oral
66.	<i>Cola acuminata</i>	Malvaceae	Kola nut	Obi agada	Nut	Migraine, headache	Decoction/Oral

67.	<i>Colocasia esculenta</i>	Araceae	Cocoyam	Koko	Tubers, leaves	Anaemia, rheumatism	Decoction/Oral
68.	<i>Corchorus olitorius</i>	Malvaceae	Indian jute	Ewedu	Leaves	Antioxidant	Decoction/Oral
69.	<i>Crassocephalum crepidioides</i>	Asteraceae	Red flower ring leaf	Efofobolo	Leaves	Ulcer	Decoction/oral
70.	<i>Croton jagus</i>	Amaryllidaceae	St. Christopher's lily	Ogededo	Leaves	Ulcer	Decoction/Oral
71.	<i>Crotalaria retusa</i>	Fabaceae	Rattle weed	Koropo	Root, seed, leaves & juice of pods	Cancer	Decoction/Oral
72.	<i>Croton labatus</i>	Euphorbiaceae	Lobed croton	Eru Alamo	Seed	Diabetes	Decoction/Topical
73.	<i>Cucurbita maxima</i>	Cucurbitaceae	Squash, Pumpkin	Elegede	Seeds, fruits	Tapeworm, diuretic	Decoction/Oral
74.	<i>Curcuma longa</i>	Zingiberaceae	Turmeric	Atale pupu	Fruit	Diabetes	Decoction/oral
75.	<i>Cymbopogon citratus</i>	Poaceae	Lemon grass	Koriko oba	Leaves	Hypertension	Maceration/Oral
76.	<i>Cyperus esculentum</i>	Sedges	Tiger nut	Ofo omu	Fruit	Prevent heart disease	Decoction/Oral
77.	<i>Daniella oliveri</i>	Fabaceae	African cupaiba balsam	Iya	Leaves, roots stem& bark	Gastric ulcer/Diabetes	Decoction/Oral
78.	<i>Datura stramonium</i>	Solanaceae	Green thorn apple	Apikan	Leaves, seeds	Sores and stings	Maceration/Oral
79.	<i>Defarium microcarpum</i>	Laguminosae	Sweet datrock/ Tallow tree	Ogbogbo	Bark and seeds	Diabetes	Decoction/oral
80.	<i>Dioclea reflexa</i>	Fabaceae	Sea purse	Aghaarin	Nut	Diabetes	Maceration/Oral
81.	<i>Dioscorea dumetorum</i>	Dioscoreaceae	Cluster yam	Esuru	Leaves and tubers	Diabetes	Decoction/oral
82.	<i>Dioscorea cayenensis</i>	Dioscoreaceae	Guinea yam	Ako isu	Tubers	Diarrhoea	Decoction/Oral

83.	<i>Dracaena arborea</i>	Dracaenaceae	Dragon tree	Peregum	Leaves, Root & bark	Diabetes	Maceration/Oral
84.	<i>Elaeis guineensis</i>	Arecaceae	African Palm tree	Imo ope	Flower	Ulcer	Decoction/Oral
85.	<i>Enantia chlorantha</i>	Annonaceae	African yellow wood	Dokita igbo	Bark	Microbial infection	Decoction/Oral
86.	<i>Eugenia caryophyllata</i>	Myrtaceae	Clove	Kanufaru	Seeds	Diabetes	Decoction/oral
87.	<i>Euphorbia affinis</i>	Euphorbiaceae	Eye bright	Ewe oja	Leaves	Eye diseases	Decoction/oral
88.	<i>Ficus capensis</i>	Moraceae	Cape fig plant	Opoto	Root, fruit/bark & leaf	Infertility	Decoction/Oral
89.	<i>Ficus exasperata</i>	Moraceae	White fig tree, Sandpaper leaf	Ecpin	Leaves, root & bark	Diabetes	Decoction/Oral
90.	<i>Garcinia kola</i>	Clusiaceae	Bitter kola	Orogbo	Seed	Antiviral & purgative	Decoction/Oral
91.	<i>Gossypium arboreum</i>	Malvaceae	Cotton plant	Owu	Leaves	Malarial infection	Decoction/Oral
92.	<i>Gossypium hirsutum</i>	Malvaceae	Upland cotton	Owu	Leaves and root	Diabetes	Decoction maceration/oral
93.	<i>Helianthus annuus</i>	Asteraceae	Common sunflower	Fufulele	Leaves	Malarial infection	Decoction/Oral
94.	<i>Heliotropium indicum</i>	Boraginaceae	Indian turnsole	Ogbe akuko, Agogo igun	Leaves, bark & root, Whole plant	Malarial/Convulsions/cancer	Infusion/ Maceration /Oral
95.	<i>Hunteria umbellata</i>	Apocynaceae	Polydora	Abeere	Seeds, bark and root	Diabetes	Decoction infusion/oral
96.	<i>Hybanthus enneaspermus</i>	Violaceae	Blue spade flower	Abiwere	Leaves	Induction of Labour	Decoction/Topical
97.	<i>Hymenocardia acida</i>	Hymenocardiaceae	Male flower	Aboopa/orupa	Leaves and bark	Malarial infection	Decoction maceration /oral
98.	<i>Ipomoea batatas</i>	Convolvulaceae	Sweet potato	Anamo	Whole plant,	Diabetes	Maceration/oral

99.	<i>Ipomoea mauritiana</i>	Convolvulaceae	Morning glory	Atewogha	leaves and bark Whole plant	Asthma/ rheumatism	Decoction/Oral
100.	<i>Irvingia gabonensis</i>	Irvingiaceae	Native mango	Oro mopa	Seed	Condiment	Decoction/Oral
101.	<i>Jatropha curcas</i>	Euphorbiaceae	Barbados nut	Lapalapa	Leaves	Hypertension	Decoction/Oral
102.	<i>Justicia flava</i>	Acanthaceae	Water-willow	-	Leaves	Skin diseases	Decoction/oral
103.	<i>Khaya grandifolia</i>	Meliaceae	African mahogany	Oganwo	Bark	Blood supplement	Decoction/Oral
104.	<i>Kigelia africana</i>	Bignoniaceae	Sausage tree	Pondoro	Fruit	Ulcer	Decoction/Oral
105.	<i>Lactuca capensis</i>	Asteraceae	Wild lettuce	Yaurin	Whole plant	Hypertension	Maceration/Oral
106.	<i>Landolphia ulcus</i>	Apocynaceae	-	Ibobo	Leaves	Malarial infection	Decoction/oral
107.	<i>Lawsonia inermis</i>	Lythraceae	Henna plant	Lali	Leaves, flowers & Bark	Ulcer	Decoction/Oral
108.	<i>Lecaniodiscus cupanioides</i>	Sapindaceae	Fruiting branches / stink ant forest	Akika	Leaves	Malarial infection	Decoction/Oral
109.	<i>Lippia multiflora</i>	Verbenaceae	Bush tea	Efinrin gogoro	Whole plant	Hypertension	Infusion/Oral
110.	<i>Magnifera indica</i>	Anacardiaceae	Mango	Mangoro	Leaves, stem & bark	Diabetes	Decoction/Oral
111.	<i>Mimosa pudica</i>	Fabaceae	Sensitive plant	Patamno	Leaves	Guinea worm/piles	Decoction/Oral
112.	<i>Momordica charantia</i>	Cucurbitaceae	African bitter cucumber	Ejirin	Leaves	Gastric ulcer	Infusion/Oral
113.	<i>Monodora myrsinica</i>	Anonaceae	African nutmeg	Ariwo	Seeds	Guinea worms	Decoction/oral
114.	<i>Morinda lucida</i>	Rubiaceae	Brimstone tree	Otuwo	Leaves	Fever	Infusion/Oral
115.	<i>Moringa oleifera</i>	Moringaceae	Moringa	Ewe ile	Leaves	Erectile dysfunction	Decoction/Oral
116.	<i>Mucuna pruriens</i>	Fabaceae	Cowitch plant	Esis	Hairs on the pod	Intestinal worms	Decoction/Oral
117.	<i>Mucuna sloanei</i>	Fabaceae	Stinging bean	Ewe ina	Seeds/riots	Hemorrhoids/skin diseases	Maceration/ Topical/Oral
118.	<i>Musa paradisiaca</i>	Musaceae	Plantain	Ogede aghagha	Leaves/ fruit	Diabetes/ulcer	Decoction/Oral
119.	<i>Nauclea latifolia</i>	Rubiaceae	African / Guinea peach	Egbesi	Root	Ulcer	Decoction/Oral
120.	<i>Newbouldia laevis</i>	Bignoniaceae	Tree of life	Akoko	Leaves	Asthma	Infusion/Oral
121.	<i>Nicotiana glauca</i>	Solanaceae	Common Tobacco	Ewe taba	Leaves	Hemorrhoids, rheumatism & stomach problems	Decoction/Oral
122.	<i>Ocimum gratissimum</i>	Lamiaceae	Scent leaf	Efinrin nla	Leaves	Stomach ache	Infusion/Oral
123.	<i>Parkia biglobosa</i>	Fabaceae	African locust bean	Igi itu	Leaves and bark	Malarial infection	Maceration/ Decoction
124.	<i>Parquetina nigrescens</i>	Apocynaceae	Bullock	Igi ogbo	Leaves	Malarial infection	Decoction/Oral
125.	<i>Pennisetum purpureum</i>	Poaceae	Elephant grass	Fesun funfun	Leaves	Malarial infection	Decoction
126.	<i>Peperomia pellucida</i>	Piperaceae	Shiny bush, pepper elder	Rurin	Leaves	Ulcer	Infusion/Oral
127.	<i>Persea americana</i>	Lauraceae	Avocado pear	Igha/epoka	Fruit	Hypertension/ ulcer	Maceration/Oral
128.	<i>Phytolacca imbricata</i>	Marantaceae	-	-	Leaves	Arthritis	Maceration/oral
129.	<i>Phyllanthus amarus</i>	Phyllanthaceae	Gale of the wind	Eyin olobe	Leaves	Malarial infection	Decoction/Oral
130.	<i>Piper guineense</i>	Piperaceae	Benin pepper	Iyere	Seed	Ulcer	Extraction/Oral
131.	<i>Plukenetia conophora</i>	Euphorbiaceae	African /Nigerian walnut	Awusa	Root	Ulcer	Decoction/Oral
132.	<i>Plumbago zeylanica</i>	Plumbaginaceae	Ceylon leadwort	Inabiri	Root	Ulcer	Decoction/Oral
133.	<i>Polygonum viviparum</i>	Polygonaceae	Alpine bistort	-	Root	Arthritis	Decoction/oral

(*Source: Field Survey November 2019 - December 2020)

134.	<i>Psidium guajava</i>	Myrtaceae	Apple guava	Girofa	Leaves & bark	Hypertension Diabetes	Decoction/Oral
135.	<i>Pupalia lappacea</i>	Amaranthaceae	Forest burr	Eino agbo	Whole plant	Diabetes	Infusion/oral
136.	<i>Pyrus communis</i>	Rosaceae	European pear	Pia	Leave/ fruits	Ulcer	Maceration/Oral
137.	<i>Securidaca longepedunculata</i>	Polygalaceae	Violet tree	Ipete	Root, stem-bark, seeds and leaves	Arthritis and cough	Decoction infusion/oral
138.	<i>Senna podocarpa</i>	Fabaceae	Candle tree	Asumwon ibile	Bark	Ulcer	Decoction/Oral
139.	<i>Sida acuta</i>	Malvaceae	Wire weed	Ose potu	Whole plant	Ulcer, intestinal worms	Decoction/Oral
140.	<i>Sida cordifolia</i>	Malvaceae	Flannel weed	Iso obo	Leaves/Root	Asthma	Decoction/Oral
141.	<i>Sida rhombifolia</i>	Malvaceae	Arrowleaf sida	Isekun pupa	Stem and leaves	Rheumatism	Decoction/oral
142.	<i>Solanum incanum</i>	Solanaceae	Bitter apple	-	Fruits	Diabetes	Decoction/oral
143.	<i>Solanum lycopersicum</i>	Solanaceae	Tomatoes	Tomati	Fruit	Vegetable, vitamin C	Decoction/Oral
144.	<i>Sphenocentrum jollyanum</i>	Menispermaceae	Aduro kokou	Akerejupon	Root	Malarial infection	Decoction/ maceration/Oral
145.	<i>Spindias mombin</i>	Anacardiaceae	Hog plum	Iseye	Leaves, stem & bark	Gastric ulcer/hypertension	Decoction/Oral
146.	<i>Strophanthus hispidus</i>	Apocynaceae	Poison arrow vine	Sagere	Stem, root and leaves	Inflammation and STDs	Decoction/oral
147.	<i>Strychnos potatorum</i>	Loganiaceae	Clearing-nut	-	Seeds	Gonorrhea	Decoction/oral
148.	<i>Swietenia mahagoni</i>	Meliaceae	Mahogany	Igi apa	Bark	Malaria infection	Decoction/ Maceration/Oral
149.	<i>Syzygium guineense</i>	Myrtaceae	Berry water pear	Ori	Seeds, stem and leaves	Hypertension and Cancer	Decoction/oral
150.	<i>Talinum triangulare</i>	Portulacaceae	Water leaf	Gbare	Leaves	Ulcer	Decoction/Oral
151.	<i>Telfaira occidentalis</i>	Cucurbitaceae	Fluted pumpkin	Agroko	Leaves, fruit and seeds	Convulsion	Decoction/Oral
152.	<i>Tetrapleura tetraptera</i>	Fabaceae	Aidan tree	Aidan	Pod	Ulcer	Decoction/Oral
153.	<i>Thaumatococcus daniellii</i>	Maranthaceae	Miracle berry / sweet prayer plant	Ewe moi-moi	Leaves	Laxative	Decoction/oral
154.	<i>Tridax procumbens</i>	Asteraceae	Coatbuttons	Ighalode	Leaves	Malarial and Fungal infections	Decoction/Oral
155.	<i>Uraria picta</i>	Fabaceae	Dabra / pithwan	Alupayida	Root & whole plant	Inflammation, Diuretic properties	Decoction/Oral
156.	<i>Urtica dioica</i>	Urticaceae	Singing nettle	-	Leaves	Diabetes	Maceration/Oral
157.	<i>Uvaria afzeli</i>	Annonaceae	Finger root / bush banana	Gbonghose	Leaves	Cancer	Decoction/oral
158.	<i>Uvaria chamae</i>	Annonaceae	Finger root/bush banana	Eruju	Leaves and stem	Diabetes	Decoction/oral
159.	<i>Vernonia amygdalina</i>	Asteraceae	Bitter leaf	Ewuro	Leaves	Ulcer/Diabetes	Decoction/Oral
160.	<i>Vernonia colorata</i>	Asteraceae	Star-flowered bitter-tea	Eino-ijebu	Leaves and bark	Diuresis, Gastritis	Decoction/oral
161.	<i>Viscum album</i>	Loranthaceae	Mistletoe	Afomo	Leaves and Root	Hypertension	Decoction/oral
162.	<i>Vitex doniana</i>	Lamiaceae	Black plum	Omi-nla	Leaves	Pneumonia	Decoction/oral
163.	<i>Vocanga africana</i>	Apocynaceae	Small-fruited vocanga	Ako dodo	Leaves	Gonorrhea	Decoction/oral
164.	<i>Zea mays</i>	Poaceae	Corn Maize	Aghado	Seeds silk	Hypertension	Decoction/oral
165.	<i>Zingiba officinale</i>	Zingiberaceae	Ginger	Atale	Fruit	Diabetes	Decoction/Oral
166.	<i>Ziziphus mucronata</i>	Rhamnaceae	Buffalo thorn	-	Leaves	Diabetes	Decoction/oral

(*Source: Field Survey November 2019 - December 2020)

Table 3: Frequency Distribution of Medicinal Plants against Disease Classification

S/ N	Family	Plant specie	Disease classification		
			Communicable	Non-communicable	Both
1	Acanthaceae	<i>Acanthus montanus</i> , <i>Justicia flava</i>	02	00	00
2	Acoraceae	<i>Acorus calamus</i>	00	01	
3	Alliaceae	<i>Allium ascalonium</i>	00	00	01
4	Amaranthaceae	<i>Celosia argentea</i> , <i>Purpurea lappacea</i> , <i>Aerva lanata</i> , <i>Celosia laxa</i> , <i>Alternanthera sessilis</i>	01	03	01
5	Amrillidaceae	<i>Crinum jagus</i>	00	01	00
6	Anacardiaceae	<i>Magnifera indica</i> , <i>Spindias mombin</i> , <i>Anacardium occidentale</i>	00	03	00
7	Annonaceae	<i>Monodora myristica</i> , <i>Annona senegalensis</i> , <i>Enantia chorantha</i> , <i>Uvaria chamae</i> , <i>Uvaria afzelii</i>	03	01	0
8	Apocynaceae	<i>Calotropis procera</i> , <i>Landolphia dulcis</i> , <i>Parquetina nigrescens</i> , <i>Hunteria umbellata</i> , <i>Strophanthus hispidus</i> , <i>Vocanga Africana</i> , <i>Alstonia congensis</i>	05	02	01
9	Araceae	<i>Colocasia esculentum</i>	00	01	00
10	Arecaceae	<i>Elaeis guineensis</i> , <i>Cocos nucifera</i>	00	02	00
11	Asphodelaceae	<i>Aloe vera</i>			01
12	Asteraceae	<i>Vernonia amygdalina</i> , <i>Crassocephalum crepidioides</i> , <i>Ageratum conyzoides</i> , <i>Acanthospermum hispidum</i> , <i>Chromolaena odorata</i> , <i>Lactuca capensis</i> , <i>Aspilia africana</i> , <i>Heliathus annuus</i> , <i>Tridax procumbens</i> , <i>Cola acuminata</i> , <i>Vernonia colorata</i> , <i>Calendula officinalis</i>	05	08	00
13	Balanaceae	<i>Balanites aegyptiaca</i>	00	01	00
14	Basellaceae	<i>Basella alba</i> , <i>Solanum lycopersicum</i>	00	02	00
15	Bignoaceae	<i>Balanites aegyptiaca</i> , <i>Newbouldia laevis</i>	00	02	00
16	Boraginaceae	<i>Heliotropium indicum</i>	00	01	00
17	Bromeliaceae	<i>Ana's comosus</i>	00	01	00
18	Bursaceae	<i>Boswellia serrate</i>	00	00	01
19	Caricaceae	<i>Carica papaya</i>	00	01	00
20	Castraceae	<i>Celastrus indica</i>	01	00	00
21	Clusiaceae	<i>Garcinia kola</i> , <i>Allanblackia floribunda</i>	01	00	01
22	Combretaceae	<i>Anogeissus leiocarpus</i> , <i>Anogeissus schimperi</i>	01	01	00
23	Connaraceae	<i>Cnestis spp.</i> , <i>Byrsocarpus coccineus</i>	02	00	00
24	Convolvulaceae	<i>Ipomoea batata</i> , <i>Ipomoea mauritiana</i> , <i>Argyria nervosa</i>	00	02	01
25	Crassulaceae	<i>Bryophyllum pinnatum</i>	00	01	00
26	Cucurbitaceae	<i>Citrullus lanatus</i> , <i>Telfairia</i>	00	04	0

		<i>occidentalis</i> , <i>Mordica charantia</i> , <i>Cucurbita maxima</i>			
27	Dioscoreaceae	<i>Dioscorea dumetorum</i> , <i>Dioscorea cayennensis</i>	01	01	00
28	Draceanaceae	<i>Dracaena arborea</i>	00	01	00
29	Euphorbiaceae	<i>Acalypha frimbriata</i> , <i>Plukenetia conophora</i> , <i>Jatropha curca</i> , <i>Croton lobatus</i>	01	03	0
30	Fabaceae	<i>Abrus precatorius</i> , <i>Bauhinia monandara</i> , <i>Cassia fistula</i> , <i>Daniell oliveri</i> , <i>Tetrapleura tetraptera</i> , <i>Crotolaria retusa</i> , <i>Dioclea reflexa</i> , <i>Mucuna sloanei</i> , <i>Mimosa pudica</i> , <i>Senna podocarpa</i> , <i>Caesalpinia pulcherrima</i> , <i>Mucuna pruriens</i> , <i>Urania picta</i> , <i>Parkia biglobosa</i> , <i>Canavalia ensiformis</i> , <i>Acacia ataxacantha</i>	01	13	02
31	Hymenocardiaceae	<i>Hymenocardia acids</i>	00	01	00
32	Irvingiaceae	<i>Irvingia gabonensis</i>	00	01	00
33	Lamiaceae	<i>Ocimum gratissimum</i> , <i>Vitex doniana</i>	00	02	00
34	Lauraceae	<i>Cassythadiffens</i> , <i>Persea Americana</i> , <i>Cinnamomum zeylanicum</i>	01	02	00
35	Leguminaceae	<i>Urania picta</i> , <i>Detarium microcarpum</i>	00	02	00
36	Loganiaceae	<i>Anthocleista djalensis</i> , <i>Strychnos potatorum</i>	01	01	00
37	Loranthaceae	<i>Viscum album</i>	00	01	00
38	Lythraceae	<i>Lawsonia inermis</i>	00	00	01
39	Malvaceae	<i>Gossypium hirsutum</i> , <i>Adonsonia digitata</i> , <i>Gossypium arboreum</i> , <i>Ceiba pentandara</i> , <i>Sida cordifolia</i> , <i>Sida acuta</i> , <i>Corchorus olitorius</i> , <i>Cola acuminata</i> , <i>Abelmoschus moschatu</i> , <i>Sida rhombiofolia</i> , <i>Abelmoschus esculentus</i> , <i>Abutilon mauritanum</i>	05	07	00
40	Maranthaceae	<i>Phrynium imbricatum</i> , <i>Thaumatococcus daniell</i>	00	02	00
41	Meliaceae	<i>Syzygium guineense</i> , <i>Eugenia caryophyllus</i> , <i>Psidium guajava</i>	01	02	00
42	Menispermaceae	<i>Sphenocentrum jollyanum</i>	00	01	00
43	Mimosaceae	<i>Acacia nictica</i>	00	01	00
44	Moraceae	<i>Ficus exasperate</i> , <i>Ficus capensis</i>	00	02	00
45	Moringaceae	<i>Moringa oleifera</i>	00	01	00
46	Musaceae	<i>Musa paradisiacal</i>	00	01	00
47	Myrtaceae	<i>Eugenia caryophyllus</i> , <i>Psidium guajava</i> , <i>Syzygium guineense</i>	00	03	00
48	Nyctaginaceae	<i>Boerhavia verticillata</i>	01	00	00
49	Orchindaceae	<i>Angraecum eichlerianus</i>	00	01	00
0	Orobanchiaceae	<i>Euohrasia officinalis</i>	00	01	00

51	Papaveraceae	<i>Argemone Mexicana</i>	00	00	01
52	Phyllanthaceae	<i>Bridelia exaltata</i> , <i>Phyllanthus amarus</i>	02	00	00
53	Piperaceae	<i>Peperomia pellucid</i> , <i>Piper guineense</i>	00	02	00
54	Plumbaginaceae	<i>Plumbago zeylanica</i>	00	01	00
55	Poaceae	<i>Zea mays</i> , <i>Pennisetum purpureum</i> <i>Cymbopogon citratus</i>	01	02	00
56	Polygalaceae	<i>Carpolobia lutea</i> , <i>Securidaca</i> <i>longipedunculata</i> , <i>Polygonum</i> <i>viviparum</i>	01	02	00
57	Portulacaceae	<i>Talinum triangulare</i>	00	01	00
58	Rhamnaceae	<i>Ziziphus mucronata</i>	00	01	00
59	Rosaceae	<i>Pyrus communis</i>	00	01	00
60	Rubiaceae	<i>Nauclea latifolia</i> , <i>Morinda lucida</i>	00	02	00
61	Rutaceae	<i>Citrus aurantifolia</i> , <i>Citrus</i> <i>aurantium</i> , <i>Citrus sinensis</i>	00 3	03 1.8	00
62	Sacrophileacea	<i>Bacopa floribunda</i>	00	01	00
63	Sapataceae	<i>Butryospermum paradoxum</i>	01	00	00
64	Sapindaceae	<i>Blighia sapida</i> , <i>Lecaniodiscus</i> <i>cupanioides</i> , <i>Cardiospermum</i> <i>halicacabum</i>	01	02	00
65	Sapotaceae	<i>Chrysophyllum albidum</i>	00	01	00
66	Sedges	<i>Cyperus esculentum</i>	00	01	00
67	Solanaceae	<i>Capsicum annum</i> , <i>Nicotonia</i> <i>tabacum</i> , <i>Datura stramonium</i> , <i>Solanum incanum</i>	00	04	0
68	Theacea	<i>Camellia sinensis</i>	01	00	00
69	Urticeae	<i>Urtica dioica</i>	00	00	00
70	Verbenaceae	<i>Lippia multiflora</i>	00	01	00
71	Violaceae	<i>Hybanthus enneaspermus</i>	00	01	00
72	Zingiberaceae	<i>Curcuma longa</i> , <i>Zingiba officinale</i> , <i>Aframomum melegueta</i>	00	02	01

(*Source: Field Survey November 2019 - December 2020) (f = frequency)

The survey also revealed the various parts of plant used; method of preparation and route of administration of the herbal medicines. The leaves (40.4%) were the preferred plant part used for the preparation of herbal medicine as shown in the results of this study; followed by the bark (12.8%) and root (10.4%) whilst the fruits and seeds (9.2%) were the least used plant part (Figure 2). The trend of mainly using leaves of medicinal plants as observed in this study and the wide variety of plants listed from various families and genera is similar to results of other works/surveys (Lawal et al., 2020; Falemara et al., 2021).

The preference for the use of leaves can be related to the ease of collection, processing, and presence of high amounts of secondary metabolites and biologically active compounds which are responsible for observed pharmacological activity (Tugume et al., 2016; Boadu and Asase, 2017; Faruque et al., 2018). Also, the frequent use of the leaves as herbal medicine causes less damage on the regeneration of a plant than the use of roots and bark where plants need to be completely destroyed for such parts to be obtained; resulting in the conservation and sustainability of the plants.

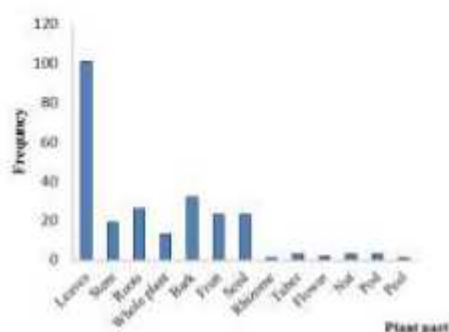


Figure 2: Frequency distribution of plant parts used as herbal medicine

This study also revealed the various methods used in the preparation of herbal medicines from the indigenous medicinal plants; and include decoction, maceration, and infusion. However in some cases a combination of several methods are used. Decoction was reported as the most

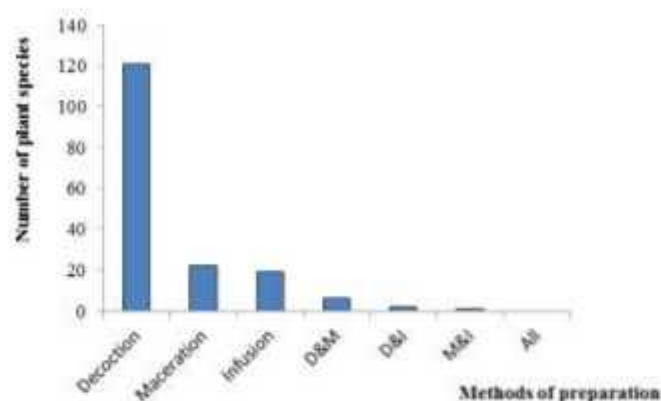


Figure 3: Method of preparation of Ogbomoso indigenous medicinal plants

The use of herbal medicine within the study area has shown the preference of the indigenous populace for the use of leaves (part of choice), decoction (method of preparation), and oral administration in traditional medicinal practices. These results obtained were in line with similar works conducted both within and outside the country (Rokaya et al., 2010; Tugume et al., 2016; Umair et al., 2017; Keo et al., 2018). However other authors have reported crushing and paste preparation as the most popular mode of herbal medicine preparation (Tumoro and Maryo, 2016; Habtamu et al., 2014; Faruque et al., 2018). Further, Ogbomoso land is blessed with a wide range of flora based on its location and its diverse geo-climatic condition; and a culture deeply rooted in traditional herb use hence its high rate of acceptability and use of herbal preparations in the treatment and management of both communicable and non-communicable disease conditions (Ajagun et al., 2017); which has been shown by the results obtained by this work.

The survey exposed the loss of both herbal medicine knowledge (in terms of plant used, uses and administration) as well as the lack of manpower needed to carry forward this knowledge/ information as most of these knowledge are yet to be documented in written form and are still passed on within generations verbally.

Conclusion and Recommendation

This survey was conducted in an effort to preserve the indigenous knowledge of the people of Ogbomoso land, South-Western Nigeria; and complements the ongoing activities and efforts of the Bioresources Development

preferred method of preparation of herbal medicine within the study areas followed by maceration and infusion (Figure 3); with the oral route of administration as the most common route of administration (88.2%) (Figure 4).

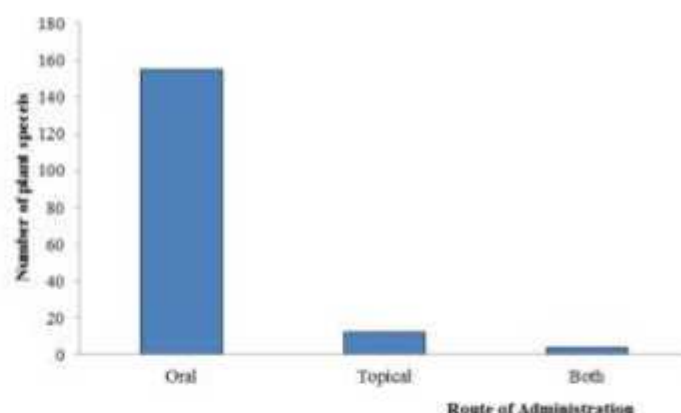


Figure 4: Preferred route of administration of Ogbomoso indigenous medicinal plants

Centre, Ogbomoso towards tapping into indigenous bioresources. The aim was to explore the different areas, document indigenous knowledge in the area of medicinal plants and their uses; and provide an updated inventory of available indigenous ethno-botanicals within Ogbomoso land. The survey has contributed to the existing knowledge in the area of ethno-medicine and ethno-botanicals; especially in the study location.

Information provided in this study will contribute to local, national and international efforts intended at documenting indigenous flora with medicinal benefit among local communities in Nigeria; allowing for further research aimed at validating pharmacological efficacy of the most important flora existing in the study areas. However, it is recommended that each individual plant is validated in terms of reported indications of use, standardized in the area of recommended dosage; and possible commercialization of effective herbs.

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CONFLICT OF INTEREST STATEMENT:

All the authors have seen, read and approved the final copy of the manuscript. We have no conflict of interest to disclose.

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