Original Research Article

Medicinal Plants Used for management of Asthma in FCT, Abuja and Its Environs

ABSTRACT

Aim: Asthma is a condition that affects the airways in human lungs. It causes its inflammation and hyper-responsiveness. The use of herbal remedies in treating the disease is widespread especially in local communities with little or no access to primary health care. Conventional therapies which are expensive and comes with undesirable side effects. This indigenous knowledge on the cure of asthma is gradually being lost among the populace. This study is aimed at documenting local remedies used in the management of asthma.
Methodology: Ethnobotanical survey was carried out in Federal Capital Territory (FCT) and surrounding communities among Traditional Medicine Practitioners (TMPs), Herb's sellers and elderly in the community using a semi-structured questionnaire and interview. Data were analysed using descriptive statistics and ethnobotany index.
Results: 80 respondents were interviewed, 58 of them laid claims to knowledge about medicinal plants used in its management. Majority respondents are Traditional Medicine Practitioners (48%). 59 plants species belonging to 38 plant families was documented with most belonging to the Moraceae plant family (10%). The recipes mentioned were mostly prepared as decoctions which are taken orally with a case of two being by smoking and inhalation.
Conclusion: This study has shown that the Federal Capital Territory and settlements within its environ is blessed with medicinal plants used in the management of asthma which serve as a cheap and alternative source of remedy for the local populace and as well, being a repository for scientific inquest that may lead to yet another drug discovery from plant origin used in the management of asthma.

Key words: Asthma, Ethnobotanical survey, Medicinal plants, Federal Capital Territory

INTRODUCTION

Asthma is a chronic inflammatory non-communicable disease affecting adults and children. It affects the airways in the lungs making the airways inflamed and consequently causing obstruction of airways and hyper-responsiveness. Symptoms include; shortness of breath, cough and wheezing [1]. Asthma is a heterogeneous medical condition caused by genetic predisposition, allergic conditions, disease conditions e.g. obesity among other factors [2]. Symptoms of asthma can be exacerbated by certain triggers such as; cold/dry air, chemical fumes/gases or dust, airborne substances such as pollen, mold spores etc. which implicates it with urbanization exploits, hence, these various triggers are to be avoided [3]. Asthma can be attributed to atopy [4] and as well could be non- atopic [5]. Atopic asthma affects children and adolescent and are often associated with family history of allergic diseases [6]. Non- atopic asthma affects adult often as a result of viral infections, and are independent of the antibodies that promotes inflammatory response [7].
According to Ozoh, Aderibigbe, Ayuk, Desalu, Oridota, Olufemi, Egbagbe, Babashani, Shopeyin and Ukwaja [8], there are about 13 million persons with clinical asthma and allergic rhinitis in

Nigeria with a prevalence that has variabilities across regions and age groups. The WHO estimate of people affected by asthma is about 262 million individuals and caused 461,000 deaths in the year 2019 alone (WHO, 2020). The Global burden of asthma witnessed a 12% upsurge between the year 2005 and 2015 mostly in developing countries and this has been linked to the urbanization and the economic exploits of these countries / region [9-11].With all the successes achieved with the current therapies in the management of asthma, they come with undesirable side effects ranging from oral candidiasis (thrush), decreased bone density in adults, anxiety, tremors, weight gain, glaucoma, nervousness amongst others [12-14].

Plant natural products/drugs developed from plants have played a vital role in the development of therapies and in the management of asthma. For example, cromoglycate and theophylline are derived plant products that have been widely used in the therapy of asthma [15]. Many others have been documented for the management of asthma [16]-[17]. Ephedrine which is a plant product is as well the earliest known antiasthmatic agent [15]. Some of the plant asthmatics have been documented to elicit different pharmacological activities which makes them better suited as an asthmatic as was posited by Greenberger [18] that medicinal plants used in the treatment of asthma should have anti-inflammatory, immunomodulatory, antihistaminic, smooth-muscle relaxants and allergic activities.

The FCT is endowed with flora utilized by the locals in the treatment and management of various conditions and illnesses [19-22]. It was however observed in the works of Fatokun, Wojuola, Esievo and Kunle [23] and Ozoh and Bandele [24] that plants used in the management of asthma seem to be well documented in the southern part of Nigeria compared to the scarce report in the northern region. Literature report of antiasthmatic plants is in fact non-existent in FCT, hence this study is an inaugural documentation of plants used in the FCT and environs for management of asthma. Also, in light of the different undesirable side effects that come with current therapies, lack of documentation of antiasthmatic plants in the study area and the past exploits/development of antiasthma remedies from plant origin, this study aims to document and preserve the indigenous knowledge of the people on the antiasthmatic medicinal plant remedies used around FCT - Abuja and environs, as well as creating a repository for scientific inquest into some herbal remedies that can serve as template for drug discovery and development.

2. MATERIALS AND METHODS

2.1. *Location and Study Area*

FCT - Abuja is located in 8°50′N 7°10′E north of the Niger River and Benue River. It is bordered by Niger, Kaduna, Nasarawa and Kogi states. The FCT has a land mass of approximately 7,315 km^2 situated within the savannah region with moderate climatic conditions. Hausa is the widely spoken language even though there are natives speaking their languages too. Majority of the locals are of Gbagyi, Gwandara and Koro ethnic origins and are predominantly Muslims. The study area also included nearby settlements in Niger (Madala, Suleja, Sabon-wuse, Diko) and Nasarawa (Keffi) states with cultural and geographical similarities.

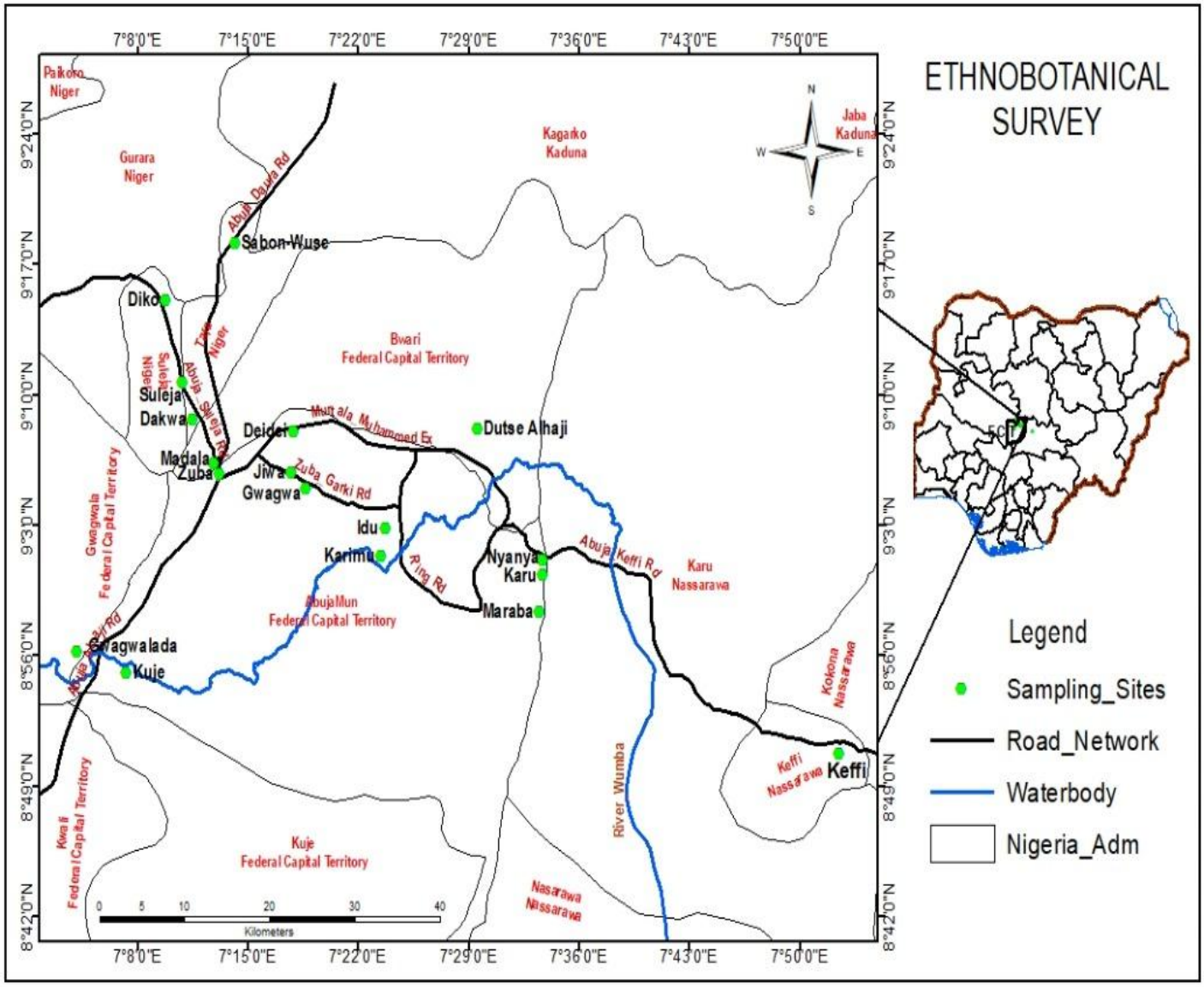

Figure 1.0: Map showing the Study areas (sampling site) within FCT and Neighbouring towns

2.2. *Informed Consent*

This inquest aimed towards documenting the local remedies used in the management of asthma started with a survey that was carried out between **March – June 2021** around FCT- Abuja and neighbouring settlements of Madalla, Diko, Sabon-Wuse, Suleija in Niger State and Keffi in Nasarawa State, Nigeria. The purpose of the work was clearly explained to the respondents and informed consent was obtained before questionnaire was administered.

2.3. *Data collection*

Ethnobotanical survey was carried out to obtain information about medicinal plants used for the treatment / management of asthma. The information gathered was based on a semi-structured questionnaire and oral interview as described by [25] and [26]. Plant information like local/vernacular names, part used, method of preparation, the most used amongst the plant species in recipe mentioned, other uses in ethnomedicine, methods of administration, dosage, additive in recipe and side effects. Consent of respondents was taken and were made to append their signature before the commencement of interview. Respondents were interviewed in their local languages (Yoruba, Hausa, Igbo, Pidgin English) and English language for clarity and better understanding of information needed from them. The demographic information of respondents such as sex, age, duration of practice and educational level etc. were gathered. Questions regarding their knowledge about asthma was also asked before they gave the local remedies/ recipes they use in the management/ treatment of asthma through the local names of the different plants mentioned and some animal materials.

2.4. *Plant identification*

The plants mentioned were identified and their names were translated to scientific names by the taxonomists at the NIPRD herbarium, National Institute for Pharmaceutical Research and Development, Idu, Abuja using the type specimens available at the herbarium and using the plant list online resource (www.theplantlist.org) and the world flora online (www.worldfloraonline.org)

2.5. *Data analysis*

Statistical tools were employed in the presentation of data gathered; descriptive statistics as well as quantitative ethnobotanical indices were used in the analysis of data. Use value index (UVI) was the ethnobotanical index used in the calculation and determination of validity and extent of use of plant species mentioned.

2.5.1. *Use Value Index*

The Use Value Index (UVI) is defined as the ratio of mention of a plant species **(n)** to the number **(N)** of respondents that took part in the survey, **UVI = n / N** as described by [27].

3. RESULTS

3.1. *Ethnopharmacological Data*

Data gathered includes list of plants used, the plant families, habits of the plants and part used, mode of preparation and administration, as well as the UVIs of the various plants mentioned after the data was analyzed.

Fifty-nine (59) plants species belonging to thirty-eight (38) families were mentioned in the survey. **Table 1.0** below shows the list of the different plants as mentioned by respondents with their local names, families, habit and UVIs. The pharmacological activities and chemical compounds previously isolated from these plants is also documented as seen in **Table 1.0.** Also, *Newbouldia laevis* and *Anogeisus leiocarpus* had the highest UVI of 0.10, followed by *Ficus thonningii* (0.08), *Allium sativum* and *Khaya senegalensis* with 0.06. Others are *Euphorbia hirta, F. platyphylla* and *F. sycomorus* with 0.05 UVIs as highlighted in **Table. 1.0.** above.

The Moraceae plant family had the highest mention of 10% followed by Fabaceae, Bignoniaceae and Amaryllidaceae with 9%, 8% and 8% respectively. Combretaceae and Meliaceae families each have a 6% representation **(Figure 2)**. Also, Anacardiaceae and Zingiberaceae plant families each have a 4% representation and other plant families represents 45% of the total plant mentioned.

As represented in **figure 4.0,** majority of the plants mentioned were trees with a few others being shrubs, herbs and climbers respectively. Leaves were the most used of the various plant parts used in the formulation of recipes, this is followed by the stem bark, root, whole plant respectively with the root sap being the least used as represented in **figure 3.0**.

Plants recipe were prepared as decoction, powder, maceration, juice, infusion and paste forms, with decoction and infusion forms having the most representation as seen in **figure 5.0**. Herbal preparations were majorly taken orally with a case of one being smoked.

The plant recipes, method of preparation, mode of administration and dosage of the recipes as described by the respondents, most used plant of the different recipes mentioned and their other ethnomedicinal uses is as well documented as seen in **Table 2.0**

3.2. *Socio-demographic characteristics of respondents*

The survey afforded a number of plants belonging to different plant families which shows that the study areas are blessed with flora used in the management of asthma. Eighty (80) respondents (59 males – 21 females) were engaged with only 58 laying claims to knowledge of medicinal plant and / willing to share some of their knowledge about antiasthmatic medicinal plants.

Table 3.0 below shows the demography of the respondents. Most of the respondents are male, TMPs, and majority of them had Primary education (36.25%) followed by secondary (32.50%) and other forms (Islamic) of education (31.25%) respectively with a few of them having tertiary education (6.25%). Majority of them are aged between 41-59 years.

Table 1.0: List of Plants Used in Treatment and Management Asthma in FCT and its Environs

S/N	Family	Scientific Name	Local Name	Habit	UVI	Ethnomedicinal use/ Pharmacological uses	Some chemical constituent/isolated compound(s)	References
1	Amaryllidaceae	*Crinum glaucum* A.Chev	Isumeri (Y), Albasar Kwa'adi (H)	Herb	0.02	Used in treatment of infectious diseases including cough and sexually transmitted infections /Antimicrobial	Lycorine, *β*-sitosterol, ambelline	[68]
2	Amaryllidaceae	*Crinum jagus* (J. Thomps.) Dandy	Ogede odo (Y), Albasa (H)	Herb	0.03	Used in treatment of tuberculosis /Anti-tuberculosis	Gigantellinine, gigancrine	[69, 70]
3	Amaryllidaceae	*Allium ascalonicum* L.	Alubosa elewe (Y), Ramuza (H)	Herb	0.03	Used in treatment of gastroduodenal disorder/Antimicrobial	Ascalonisoide A and B	[71], [72, 73]
4	Amaryllidaceae	*Allium cepa* L.	Alubosa funfun (Y), Albasa (H)	Herb	0.02	Used to relieve stomach upset, congestion /Anti-inflammatory	Cysteine, Methionine	[74, 75]
5	Amaryllidaceae	*Allium sativum* L.	Alubosa ayuu (Y), Tafarnuwa (H)	Herb	0.06	Used to cure systemic fungal infections/Antimicrobial	alliin, allicin, ajoenes, vinyldithiins	[76], [77, 78]
6	Anacardiaceae	*Mangifera indica* L.	Mangoro (H, Y)	Tree	0.02	Used in treatment of dysentery, ophthalmia, constipation /Antidiabetic, Antidiarrheal	Galic acid, Mangiferin, Kampferol, Quercetin, Ascorbic acid	[79, 80]
7	Anarcardiaceae	*Sclerocarya birrea* (A.Rich.)Hochst.	Daniya (H)	Tree	0.02	Used in treatment of diarrhea /Antidiarrheal, Antihypertensive, anti-inflammatory	Auronol,Davidigenin, naringenin, hesperetin	[81-83]
8	Annonaceae	*Annona senegalensis* Pers.	Abo (Y), Gwadan daaji (H)	Shrub	0.02	Used in treatment of epilepsy/ Anticonvulsant, anti-inflammatory	*N*-cerotoyltryptamine, lacceroic acid, stigmasterol glycoside	[84, 85]
9	Asphodelaceae	*Aloe vera* (L.) Burm.F.	Eti erin (Y), Kathala (H)	Shrub	0.02	Used in treatment of constipation, skin diseases, worm infection/ Antimicrobial	Veracylglucan A, aloenin aglycone, 7-hydroxy-5-(hydroxymethyl)-2-methylchromone	[86, 87]
10	Asteraceae	*Acanthospermum*	Danguro gogoro	Herb	0.03	Used in treatment of jaundice, malaria,	Flavanone, Stigmasterol,	[88, 89]

		hispidum DC.	(Y), Kashi yawo (H)			convulsion/ Antiviral, Antimicrobial	Quercetin	
11	Bignoniaceae	*Newbouldia laevis* (P. Beauv.) Seem. ex Bureau	Akoko (Y), Aduruku (H)	Tree	0.10	Used in treatment of diabetes mellitus/ Antihyperglycemic	Apigenin, Ursolic acid, Stigmasterol, Canthic acid	[90-92]
12	Burseraceae	*Boswellia dalzielii* Hutch.	Ewe epa (Y), Hano / Harrabi (H)	Tree	0.02	Used in treatment of convulsion/ Anticonvulsant	Incensole, incensole acetate	[93, 94]
13	Caricaceae	*Carica papaya* L.	Ibepe (Y), Gwanda (H)	Tree	0.03	Used in treatment of urogenital disorders/ Antimicrobial, Antifungal	Ferulic acid, Choline, Quercetin, p – coumaric acid, papain	[95, 96]
14	Chrysobalanaceae	*Parinari spp.* Aubl.	Abere (Y), Gwandan gida (H)	Tree	0.02	Used in treatment of oral diseases/ Antimicrobial	Betulinic acid, Oleanolic acid	[97, 98]
15	Combretaceae	*Anogeissus leocarpus* DC.	Ayin (Y), Marke (H)	Tree	0.10	Used as an antifungal/ Antifungal	Chebulic acid, gallic acid, elaagic acid, castalagin	[99, 100]
16	Combretaceae	*Terminalia avicennioides* Guill. & Perr.	Idi (Y), Baushe (H)	Tree	0.03	Used in treatment of tuberculosis/ Anti-tuberculosis	Arjunolic acid, α-amyrin, olean-12-ene	[101, 102]
17	Combretaceae	*Combretum micranthum* G.Don	Ogan bule (Y), Geeza (H)	Shrub	0.02	Used in management of hypertension/ Anti -hypertension	β-sitosterol, picatechin	[103, 104]
18	Combretaceae	*Guiera senegalensis* J.F.Gmel	Olofun (Y), Sabara (H)	Shrub	0.02	Used as an Antifungal/ Antifungal	Quercetin, myricetin – 3- 0 – rhamnoside	[105, 106]
19	Combretaceae	*Terminalia catappa* L.	Ebelebo (Y), Dalziel (H)	Tree	0.02	Used in treatment of diabetes mellitus/ Antihyperglycemic	arjunoglucoside II, 3-betulinic acid, arjunolic acid	[107, 108]
20	Cucurbitaceae	*Momordica charantia* L.	Ejirin wewe (Y), Garahuni (H)	Climber	0.02	Used in treatment of peptic ulcer, use in diabetes/ antidiabetic, antimalarial	Charantal, charantoside XI	[109, 110]
21	Cyperaceae	*Cyperus tonkinensis* C.B.Clarke	Kajiji (H)	Herb	0.02	Used to cure Headache/ Antimicrobial	-	[111, 112]
22	Euphorbiaceae	*Euphorbia hirta* L.	Emi-ile (Y), Nonon Karciya (H)	Herb	0.05	Used to treats respiratory ailments, dysentery, digestive problem/ Antibacterial, Antimalarial, Anti-inflammatory	Myricitrin, quercetin, sitosterol, cycloartenol	[113, 114]

23	Fabaceae	*Cassia singueana* Delile	Runfu (H)	Shrub	0.02	Used in pain management /Antioxidant, Antimicrobial	Lupeol, Eugenol, octadecadienoic acid methyl ester,	[115], [116]
24	Fabaceae	*Abrus precatorius* L.	Ojuologbo (Y), Idar zakara (H)	Herb	0.03	Used to treat tetanus, prevent rabies, treat jaundice/Antioxidant, Anti-conversant	abruquinones	[117, 118]
25	Fabaceae	*Isoberlinia doka* Craib & Stapf	Takalmin zoombo (H)	Tree	0.02	Used in treatment of tuberculosis/Anti-tuberculosis	Alkaloids, Saponins, Flavonoids, Tanins & Phenols	[119, 120]
26	Fabaceae	*Prosopis africana* (Guill & Perr.) *Taub*.	Ayan (Y), Kirya (H)	Tree	0.03	Used in wound healing /Anti-tyrosine	hexacosano, quercetin, β-sitosterol 3-O-β-D-glucopyranoside	[121-123]
27	Fabaceae	*Piliostigma reticulatum* (DC.) Hochst.	Abafe (Y) Kargo (H)	Tree	0.02	Used for the treatment of diarrhea/ Antidiarrheal	Piliostigmol, 3,7,3' – trimethyl ether, 6,8 – Di – C-methylkaempferol	[124], [125, 126]
28	Fabaceae	*Bauhinia rufescens* Lam	Tsatsagi (H)	Shrub	0.02	Used in treatment of diarrhea, dysentery/Antidiabetic, Antioxidant	7-, 4′ dihydroxyl-5-methoxyl -5′ acetyl, menisdaurin	[127], [128-130]
29	Fabaceae	*Abrus canescens* Welw. ex Baker.	Omisinmisin (Y), Bambami (H)	Climber	0.02	Used in treatment of inflammation, ulcers, wounds, throat sore/Anti-inflammatory, Antifungal, Antidiabetic	Anthocyanidin 3-galactosides	[131, 132]
30	Hypericaceae	*Harungana madagascariensis* Lam. ex Poir.	Epo amuje (Y), Alillibarraafii (H)	Tree	0.02	Used in treatment of bacterial and fungal infection/Anti-inflammatory, Antioxidant, Antimicrobial	Chrysophanol, madagascin, harunganin, β-sitostero	[133, 134], [134]
31	Leguminosae	*Tetrapleura tetraptera* (Schumach. And Thonn)	Aidan (Y) Uhio (I), Dawo (H)	Tree	0.03	Used in wound healing, diabetes, epilepsy, inflammation, leprosy/Antioxidant	7-Hydroxy-6-methoxy coumarin, echinocystic acid-3-O sodium sulphate, Stigmasterol glycoside	[135], [136, 137]
32	Lecythidaceae	*Waltheria indica* L.	Kafafi (H)	Herb	0.02	Used against pain, inflammation, dysentery, diarrhea, convulsions/Anti-inflammation, Antimalarial	Waltherione, Vitexicarpin,Betulinic acid, Flindulatin	[138, 139]
33.	Loranthaceae	*Tapinanthus globiferus* (A Rich.) Van Tiegh	Afomo (Y), Kauchi (H)	Shrub	0.02	Used in treatment of epilepsy, hypertension, ulcer, diabetic/ Anti-inflammation	Lupeol acetate	[140], [141, 142]

34	Malvaceae	*Cola nitida* Schott & Endl.	Orogbo (Y), Goro (H)	Tree	0.02	Used in management of type-2-diabetes /Antibacterial	Caffeine, hexadecanoic acid	[143], [144, 145]
35	Malvaceae	*Adansonia digitata* L.	Bishiyan kuka (H)	Tree	0.02	Used in treatment of diarrhea, fever, inflammation /Antiviral, Anti-inflammation, Antioxidant	ß-sitosterol, stigmasterol, tocopherol, isopropyl myristate	[146, 147]
36	Meliaceae	*Azadirachta indica* A.Juss.	Dogoyaro (Y), Dogon yaro (H)	Tree	0.02	Used for skin and blood purifying/Antiviral, Antifungal, Antibacterial	Salannin, 3-deacetylsalannin, Azadirachtin	[148, 149]
37	Meliaceae	*Khaya senegalensis* (Desr.) A.Juss.	Oganho (Y), Madachi (H)	Tree	0.06	Used in treatment of microbial infections/Antimicrobial, Anticancer	Khayandirobilide, rutin, catechin, quercetin rhamnoside	[150-152]
38	Menispermaceae	*Chasmanthera dependens* Hochst.	Atoo (Y), Damar zaya (H)	Climber	0.02	Used in treatment of fractures/Antifungal, Antibacterial, Antiviral, Anti-inflammatory	Pallidine, govanine, coreximine	[153], [154]
39	Moraceae	*Ficus platyphylla* Delile	Epo obo (Y), Gamji (H)	Tree	0.05	Used in treatment or management tuberculosis/Anti-tuberculosis	Charantagenins D (1) and E	[119, 155]
40	Moraceae	*Ficus sycomorus* L.	Baure (H)	Tree	0.05	Used in treatment of diarrheal/ anticancer	Lupeol acetate, quercetin, gallic acid, β-Sitosterol-3-O- β-D-glucopyranoside.	[156-159]
41	Moraceae	*Ficus thonningii* Blune	Odan (Y), Chediya (H)	Tree	0.08	Used in treatment of diabetes/anti-fungal	Naringenin, p-hydroxybenzoic acid, luteolin, thonningiiflavanonol A and B, methylparaben, shuterin	[160, 161]
42	Moringaceae	*Moringa oleifera* Lam.	Ewe igbale (Y), Zogale (H)	Tree	0.02	Used in treatment of ear infections/anti-inflammatory activities	Phenylmethanoid, Moringa A. adenosine, glucomoringin, 4-hydroxybenzaldehyde rhamnoside	[162], [163, 164]
43	Myristicaceae	*Pycnanthus angolensis* (Welw.) Warb.	Egbo akomu (Y), Damarzaya / Idon zakara (H)	Tree	0.02	Used for management of diabetes/anti inflammatory	Palmitic acid, Myristoleic acid, pycnantolol, pycnanthulignene A – D, 2′ -hydroxyformononetin	[165, 166]
44	Myrtaceae	*Psidium guajava* L.	Goroba (Y), Goobaa (H)	Tree	0.02	Used for treatment of diarrheal/anti bacteria	Gallocatechin, caryophyllene oxide, beta-carotene, 2α-hydroxyursolic acid,	[167, 168]

							betulinic acid, Lupeol	
45	Ochnaceae	*Lophira lanceolata* Tiegh. ex Keay	Namijin kande (H)	Tree	0.02	Used in treatment of abdominal pain/treating arterial blood pressure	α′-chlorolophirone E, 5′-chlorolophirone D, Lophirone E,	[169, 170]
46	Olacaceae	*Ximenia americana* L.	Tsada (H)	Tree	0.03	Used for treating constipation/ anti-microbial activity	Sambunigrin, β-glucogalline, quercetin, avicularin, gallic acid	[171], [169, 172]
47	Oleaceae	*Olea europaea* L.	Zaitun (H)	Tree	0.02	Used in treatment of diarrhea/anti-viral activities	Tyrosol, Linoleic acid, Oleic acid, Oleocanthal,Oleuropein	[173, 174]
48	Poaceae	*Urelytrum giganteum* Pilg.	Jema (H)	Herb	0.02	Used in treatment of headache/ -		[175]
49	Poaceae	*Eleusine indica* (L.) Gaertn.	Ese kannakanna (Y), Tuji (H)	Shrub	0.02	Used in treatment of dysentery/ anti-inflammatory activities	Schaftoside, Vitexine, Heptacosane, Isoschaftoside	[176, 177]
50	Rhamnaceae	*Ziziphus mauritiana* Lam.	Magarya (H)	Shrub	0.03	Used to stop nausea and vomiting/anticancer activity	Sativanine, Sanjoinine, Lotusine, Paliurine, Xylopyrine, Nummularine, Abyssenine	[178, 179]
51	Rubiaceae	*Pavetta crassipes* k. Schum.	Idagbon (Y), Gadu (H)	Shrub	0.02	Used as cough remedy/	Ixoside,5- o-caffeoylquinic acid methyl ester, rutin	[180-182]
52	Rubiaceae	*Crossopteryx febrifuga* (Afzel.ex G.Don) Benth	Ayeye (Y), Kashir awaki / Kasfiyako (H)	Tree	0.02	Used to treat stomach disorders/	palmitic acid, β-sitosterol, 3*β*-D-glucopyranosylurs-12,20(30)-diene-27,28-dioic acid	[183, 184]
53	Rutaceae	*Citrus limon* (L.) Osbeck	Lemon (Y), Lemu tsaye (H)	Tree	0.02	Used as toothpowder/anti-oxidant	Sabinene, myrcene, limonene, β – cymene, terpinien – 4- ol	[185, 186]
54	Sapotaceae	*Butyrospermum paradoxa* C.F.Gaertn.	Ori (Y), Kadai (H)	Tree	0.02	Used in Wound healing, treatment of small pox, measles and hair loss / anti-bacterial, anti-diabetic, anti-inflammatory	tieghemelin A, arginine, sotachioside, gallic acid, para-doxoside A	[187-189]
55	Solanaceae	*Datura metel* L.	Gegemu (Y), Zakami (H)	Shrub	0.02	Used for treatment of epilepsy/ used for anesthetic	pregnane A, daturafoliside X, daturafoliside Y	[190, 191]
56	Solanaceae	*Nicotiana tabacum* L.	Ewe taba (Y), Taba (H)	Herb	0.03	Used to treat ringworm/antimicrobial activity	Gramisterol, Campesterol, Ketorolac,	[192, 193]

57	Verbenaceae	*Vitex doniana* L.	Oori nla (Y), Ucha koro (I), Dinya (H)	Tree	0.02	Used to treat gonorrhea/anti-bacteria, anti- HIV	Stigmastero Alkaloids, Saponins, Tannins, Anthraquinones, Terpenoids, Flavonoids	[194-196]
58	Zingiberaceae	*Aframomum melegueta* K.Schum.	Ataare (Y), Chitta (H)	Herb	0.03	Used to treat diarrhea/ anticancer	6-shogaol, 6-Gingerol, oleanolic acid, 6-paradol	[197, 198]
59	Zingiberaceae	*Zingiber officinale* Roscoe	Atale (Y), Chitta mai Yatsa (H)	Herb	0.02	Used for treating indigestion/ antibacterial	methyl 6- gingerol, 6-shogaol, 6-poradol, isovanillin, p-hydroxybenzaldehyde	[199-201]

Key: H = Hausa, I = Igbo, Y = Yoruba, UVI = Use Value Index

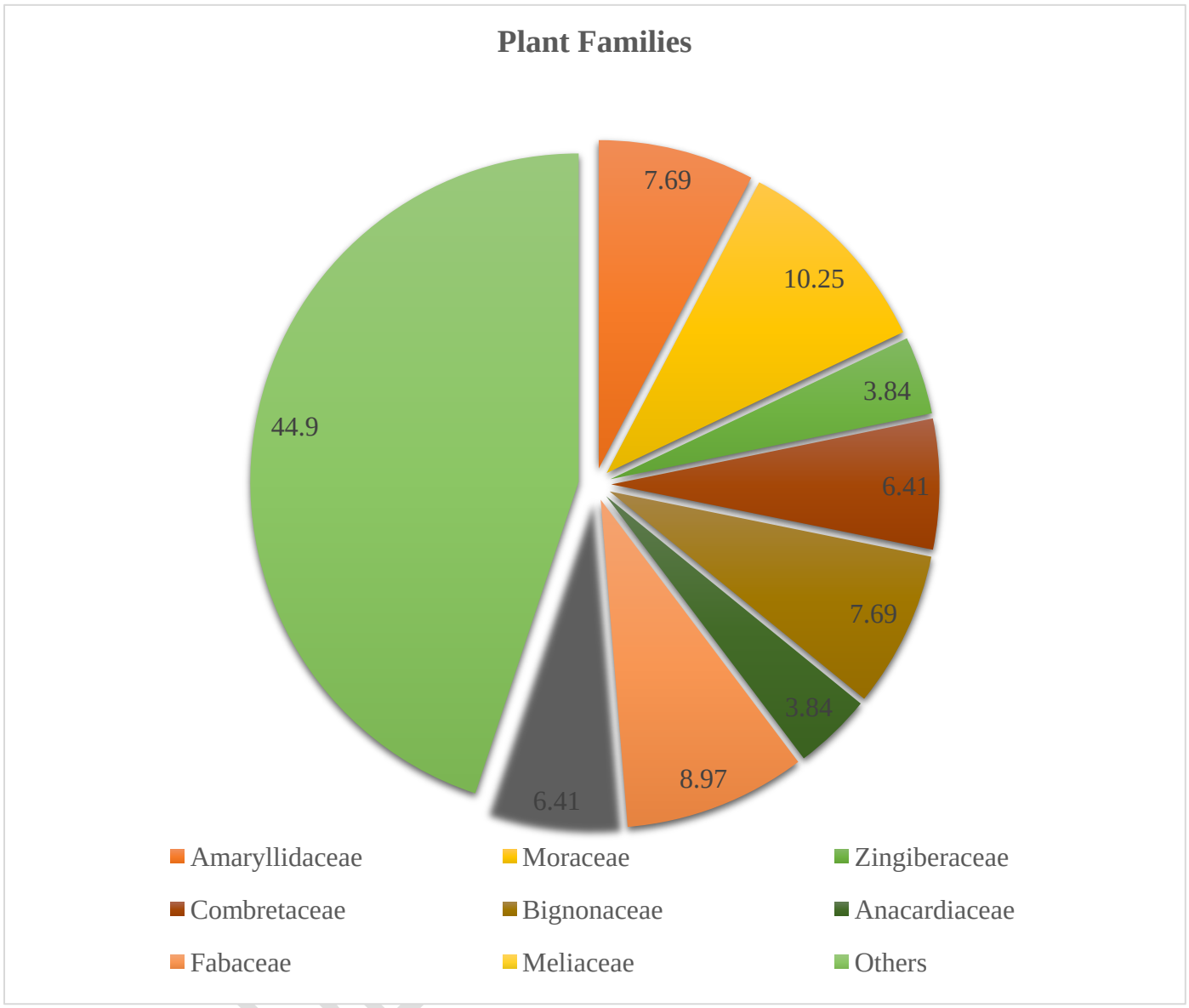

Figure 2.0: Showing Plant Families of the different plants mentioned in the Ethnobotanical Survey

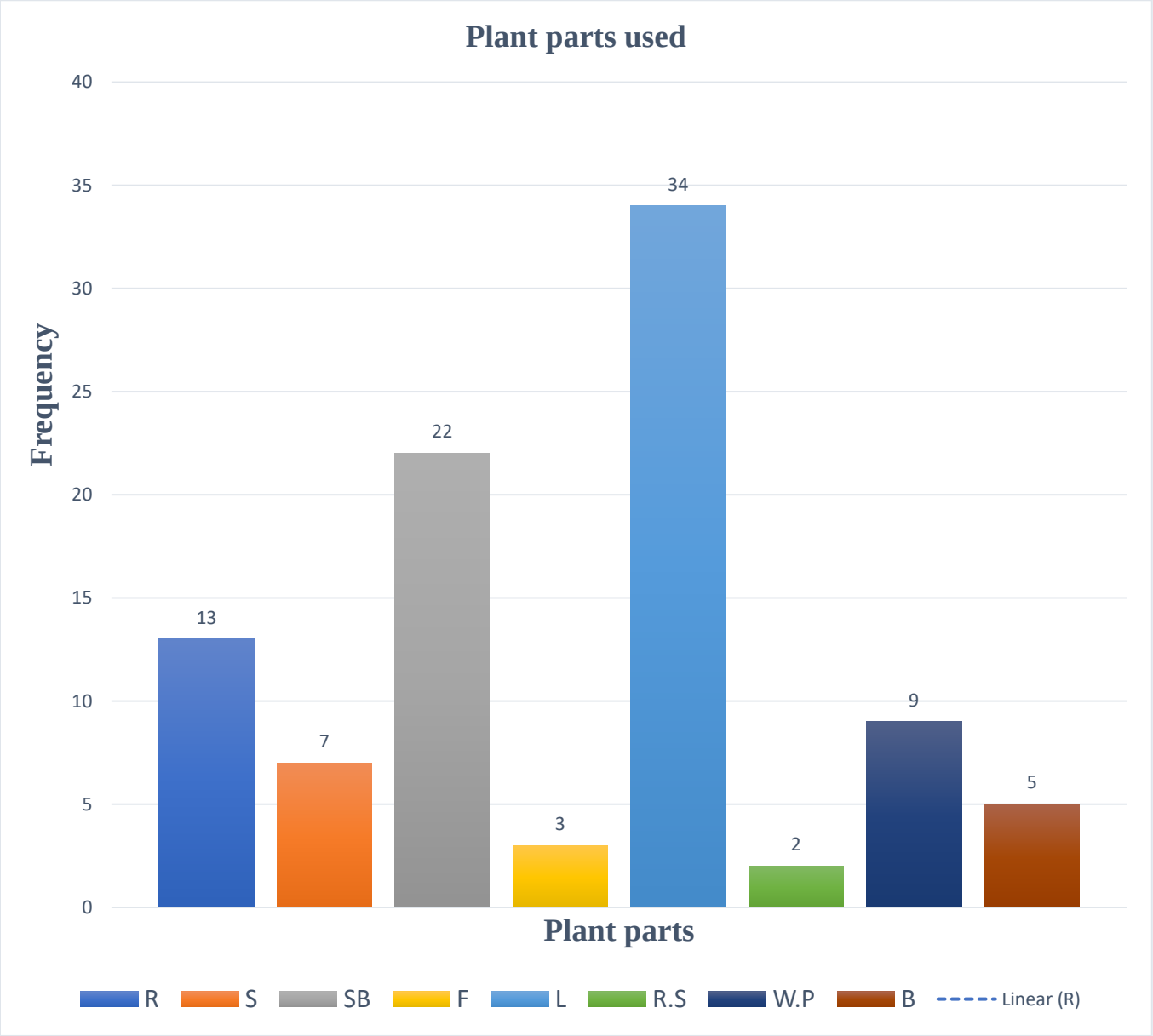

Figure 3.0: Showing the frequency of the various Plants Part Used in the recipe formulation mentioned in the survey

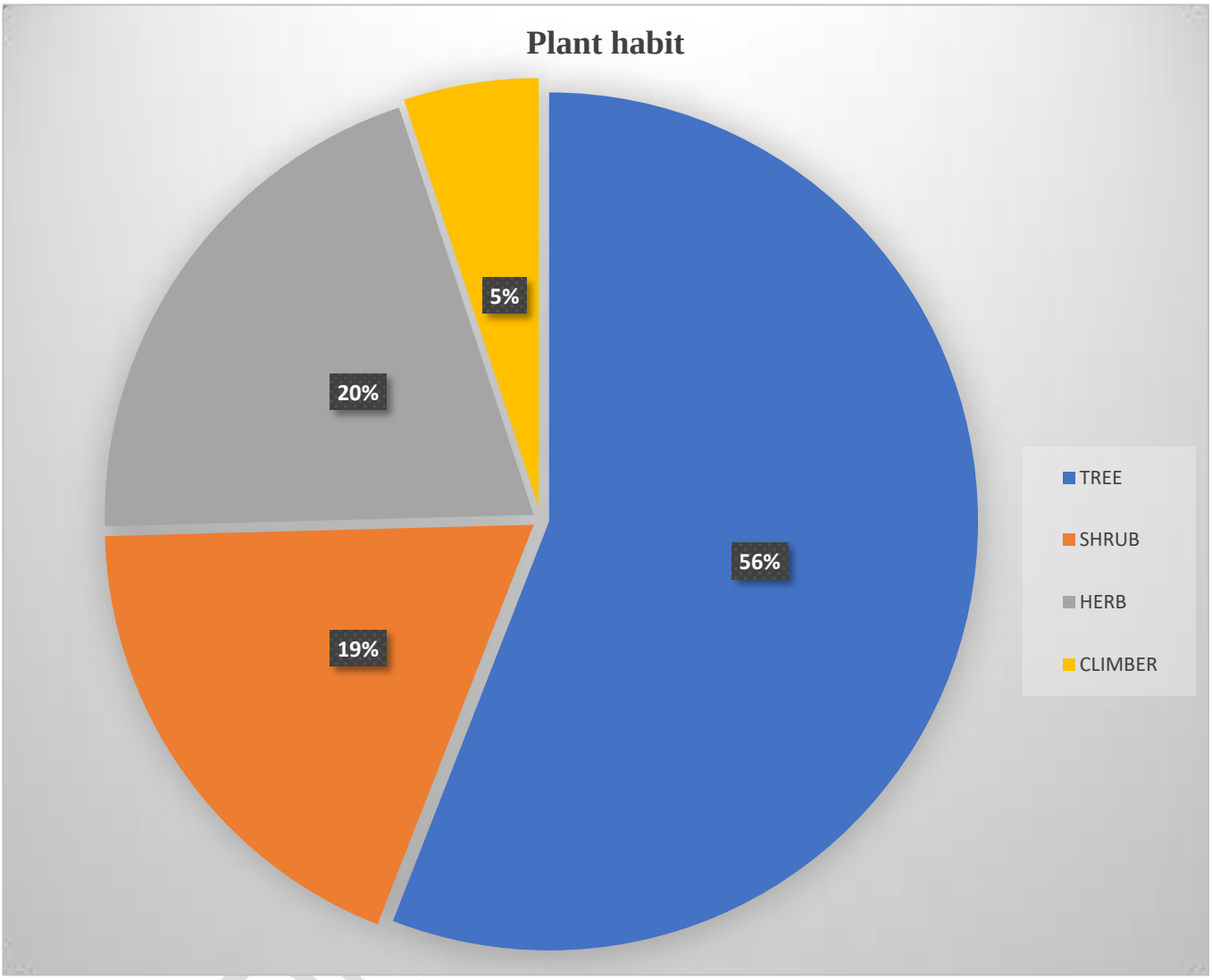

Figure 4.0: Showing the frequency of the Habits of the plants mentioned in the ethnobotanical survey

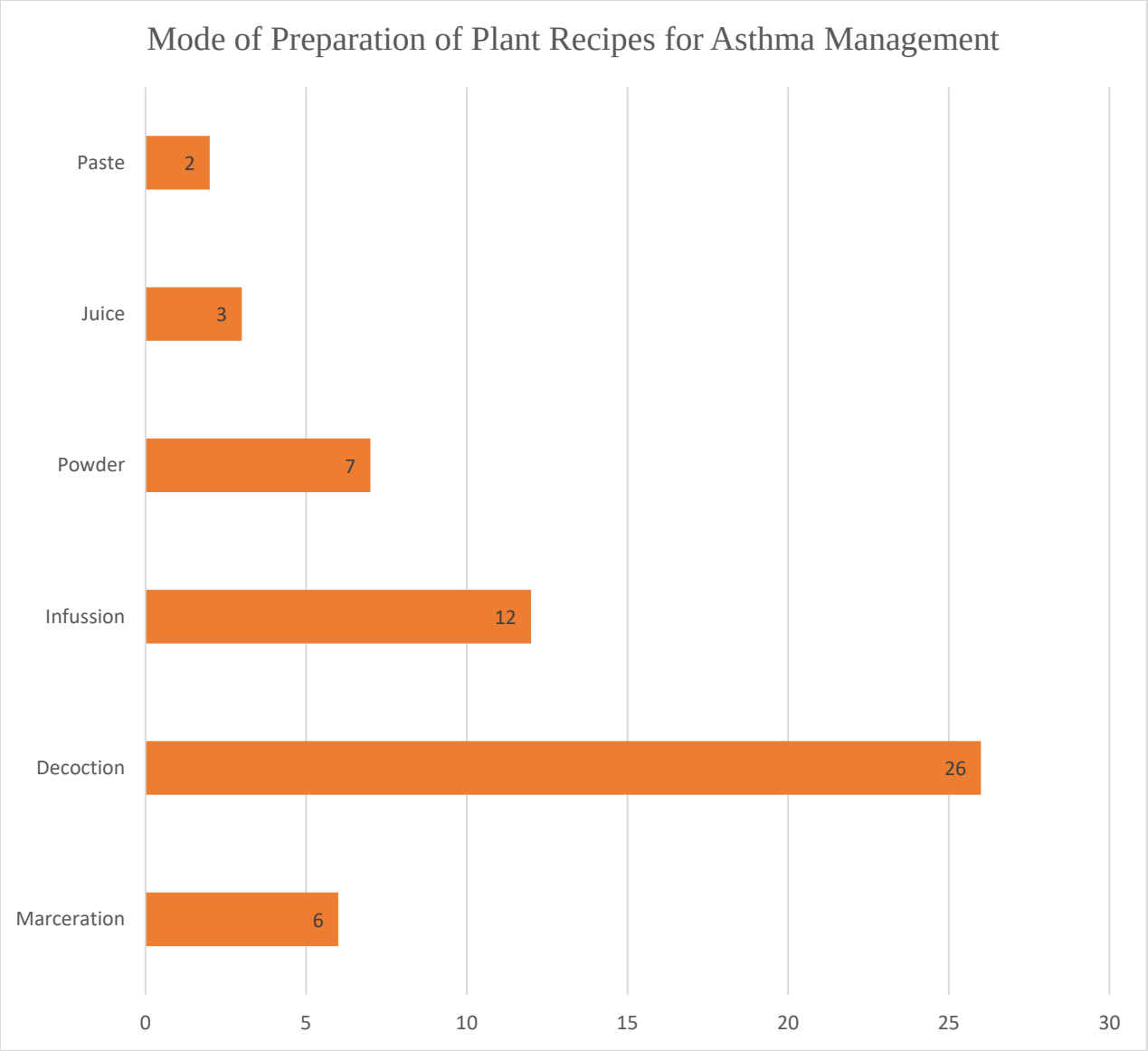

Figure 5.0: Showing frequency of the different Modes of preparation of plant recipes mentioned in the ethnobotanical survey

Table 2.0: Method of Preparation and Administration of Plant recipe for management of Asthma in FCT and Its Environs

S/N	Recipe and Plant part used	Method of Preparation	Dosage/Mode of Administration	Most used plant and other uses
1.	*Vitax doniana* L. (SB) + *Tapinanthus bangwensis* (Engl. & K. Krause) Danser (L)	Decoction of powdered SB and Leaves of both plant	3TD for 2 weeks/ taken orally	*T. bangwensis* (Engl. & K. Krause), **Diabetes**
2.	*Euphorbia hirta* L. (L & S)	Powder leaves to make stew	3TD for 2 weeks/ taken orally	
3.	*Abrus canescens* Welw. ex Baker. (WP)	Powder leaves with Honey and allium	2TD / taken orally	*A. canescens* Welw., **cough**
4.	*Ficus thonningii* Blune (R)	Decoction of Powder roots + Potash and Shea butter	3TD for 2-3 weeks / taken orally	-
5.	*Chasmathera dependens* Hochst (R)	Decoction of root of plant + Honey	2 cups 2TD for 3-4 weeks / taken orally	-
6.	*Crinum jagus* (J. Thomps.) Dandy (Bulb) / *Crinum glaucum* A.Chev (Bulb) + *Tetrapleura tetraptera* (Schumach. And Thonn) (F)	Cut the plant recipe Macerate, pound and filter. Add Honey to be taken orally	2TD / taken orally	-
7.	*Allium ascalonicum* L. (Bulb) + Garlic	Powder the recipe and cook with shea butter	2TD / taken orally	*A. ascalonicum* L., **convulsion**
8.	*Crinum jagus* (J. Thomps.) (Bulb) + Allium *ascalonicum* L. (Bulb) + *Tetrapleura tetraptera* (Schumach. And Thonn) (F)	Maceration of powdered recipe and filter + Honey	2TD / taken orally	-
9.	*Pycnanthus angolensis* (Welw.) Warb. (R & B) + Harungana *madagascariensis* Lam. ex Poir. (B)	Infusion of the recipe in pap water	2TD for 3 days / taken orally	*P. angolensis* (Welw.), **high blood pressure**
10.	*Nicotiana tabacum* L. (L)	Juice of leaves + Honey	2TD / taken orally	*N. tabacum* L., **cough**
11.	*Aframomum melegueta* K.Schum. (Seed) + Frog	Burn to powder + Palm oil	2TD / taken orally	*A. melegueta* K.Schum., **Heart diseases, Relieve chest burn**
12.	*Parinari spp.* Aubl. (Seed) + Citrus *limon* (L.) Osbeck (F)	Juice of citrus and Powdered seed of P. *spp.* + palm wine	2TD / taken orally	*P. spp.* Aubl., **fever**
13.	*Allium cepa* L. (Bulb) + *Ficus platyphylla* Delile (WP)	Juice of onion + the juice of the other plant + Honey	2TD / taken orally	*A. cepa* L., **cough**
14.	*Anogeissus leocarpus* DC. (S) + *Prosopis africana* (Guill & Perr.) *Taub*. (B)	to be powdered and infused in water	2TD for 2 weeks / taken orally	-
15.	*Guiera senegalensis* J.F.Gmel (SB) + *Khaya senegaliensis* (Desr.) A.Juss. (SB)	Macerate in water + Potash	2TD / taken orally	-
16.	*Ficus sycomorus* L. (RS)	Juice	2TD / taken orally	-
17.	*Mangifera indica* L. (L)	Maceration + Potash	2TD for a week / taken orally	*M. indica* L., **fever, nose blockage**
18.	*Isoberlinia doka* Craib & Stapf (SB & R)	infuse in water	2TD for 2 to 3 weeks / taken orally	-
19.	*Ziziphus mauritania* Lam. (L) + *Newbouldia laevis* (P. Beauv.)	Decoction	2TD / taken orally	-

	Seem. ex Bureau (SB)			
20.	*Newbouldia laevis* (P. Beauv.) Seem. ex Bureau(L) + *Ficus thonningii* Blune (R)	Decoction + Potash	2TD / taken orally	-
21.	*Newbouldia laevis* (P. Beauv.) Seem. ex Bureau (L & S)	Decoction + Potash	2TD for 2 weeks / taken orally	-
22.	*Terminalia catapa* L. (L)	Decoction	2TD for a week or 2 / taken orally	*T. catapa* L., **anemia**
23.	*Carica papaya* L. (S) + *Waltheria indica* L. (R) all powdered	Decoction + Potash	2TD / taken orally	*W. indica* L., **Cough**
24.	*Anogeissus leocarpus* DC. (SB) + *Cola nitida* Schott & Endl. (F)	Powder recipe and Infusion + Potash	2TD / taken orally	*C. nitida* Schott & Endl., **Cough**
25.	*Lophira lanceolate* Tiegh. ex Keay (SB / L)	powdered recipe + pap water, Infuse	1D / taken orally	-
26.	Honey	Oral	1D / taken orally	-
27.	*Khaya senegaliensis* (Desr.) A.Juss. (SB) + *Mangifera indica* L. (L) (SB) + *Psidium guajava* L. (L)	Decoction	3TD / taken orally	
28.	*Newbouldia laevis* (P. Beauv.) Seem. ex Bureau (L) + *Ficus thonningii* Blune (R) + *Ziziphus mauritania* Lam.	Decoction + Potash	2TD / taken orally	-
29.	*Khaya senegaliensis* (Desr.) A.Juss. (SB)	Decoction + Potash	2TD / taken orally	-
30.	*Khaya senegaliensis* (Desr.) A.Juss. (SB) + *Carica papaya* L.	Decoction + Potash	2TD / taken orally	*C. papaya* L., **Cough**
31.	*Xymenia americana* L. (L & SB)	Powder and infuse in pap water	1D / taken orally	-
32.	*Boswellia dalzielii* Hutch. (SB)	powder + local sugar	Taken orally	-
33.	*Terminalia avicennioides* Guill. & Perr. (L) powdered + Tamarindus indica extaract	Infusion	3TD / taken orally	-
34.	*Sclerocarya birrea* (A.Rich.)Hochst.(SB)	Maceration	3/4 TD / taken orally	-
35.	*Datura metel* L. (R)	Decoction + Red Potash	2TD / taken orally	*D. metel* L., **treat mental illness**
36.	*Mormordica charantia* L. (WP)	Infusion of powdered plant	2TD for 1- 2 weeks / taken orally	-
37.	*Newboldia laevis* (P. Beauv.) Seem. ex Bureau (L & SB)	Decoction	2TD / taken orally	-
38.	*Euphorbia hirta* L. (WP)	Decoction	2TD / taken orally	-
39.	*Piliostigma reticulatum* (DC.) Hochst. (L) + *Butyrosperum paradoxa* C.F. Gaertn. (L) + Moringa *oleifera* Lam. (L)	Decoction + potash / Oral & Steam Inhalation	2TD / taken orally	*P. reticulatum* (DC.) Hochst. (L), **ulcer**
40.	*Acanthospermum hispidum DC.* (WP)	Decoction + Potash + Shea butter	3TD / taken orally	-
41.	*Anogeissus leocarpus* DC. (SB) + *Urelytrum giganteum* Pilg. (R) + *Annona senegalensis* Pers (R) + *Ficus sycomorus* L. (SB) + *Ficus platyphylla* Delile	Powder + Honey	1D / taken orally	*F. platyphylla* Delile, **cough, convulsion**
42.	*Anogeissus leocarpus* DC. (SB)	Infuse powder + potash in water	3 – 4TD / taken orally	*A. leocarpus* DC., **Cough, Heart complications, Relieves breathing**.

43.	*Combretum micranttum* G.Don (L) + *Cassia singueana* Delile (L)	Decoction of powdered sample + Honey	Until relief is felt / taken orally	*C. micranttum* G.Don, Anaemia + *C. singueana* Delile ,**Jaundice, Gonorrhea**
44.	*Adansonia digitate* L. (Seed) + *Allium sativum* L. (Bulb) + *Aframomum melegueta* K.Schum. (L)	Infusion + Honey	Taken orally	-
45.	*Eleusine indica* (L.) Gaertn. (WP)	Decoction + potash	2TD / taken orally	*E. indica*, **chest pain**
46.	*Terminalia avicennioides* Guill. & Perr. (L)	Chew fresh leaves	Taken orally	*T. avicennioides* Guill. & Perr., **Diabetes, fever, malaria**
47.	*Abrus precatorius* L. (WP)	Decoction	3TD for 3 weeks / taken orally	*A. precatorius* L., **treats cough in children**
48.	*Allium sativum* L. (Bulb)	Paste + Honey	3TD / taken orally	-
49.	*Olea europaea* L.	Oil + Honey	3TD / taken orally	*O. europaea* L., **Ulcer, hotness of the stomach(infection), cosmetics for hair**
50.	*Bauhinia rufescens* Lam (SB) + *Acanthospermum hispidum* DC. (WP)	Decoction + Potash	2TD for 2 – 4 weeks / taken orally	-
51.	*Azadirachta indica* A.Juss. (L & B) + *Moringa oleifera* Lam. (L) + *Allium sativum* L. (Bulb)	Maceration	3TD / taken orally	*M. oleifera* Lam. Ulcer + *A. indica* A.Juss., **pile, malaria**
52.	*Pavetta crasspes* k. Schum. (L)	Decoction + Shea butter	2TD / taken orally	-
53.	*Anogeissus leocarpus* DC. (SB) + *Xymenia americana* L. (R) + *Ficus sycomorus* L. (RS)	Infusion	2TD / taken orally	-
54.	*Nicotiana tabacum* L. (L)	Powder	2TD / Smoke	-
55.	*Ficus thonningii* Blune (R)	Decoction + potash	2TD / taken orally	*F. thonningii* Blune, **fever**
56.	*Anogeissus leocarpus* DC. (L) + *Cyperus tonkinensis* C.B.Clarke + *Allium sativum* L. (Bulb)	Decoction	8TD / taken orally	-
57.	*Crossopteryx febrifuga* (Afzel.ex G.Don) Benth (F & L)	Powder + Honey / Oral	3 – 4 TD / taken orally	-
58.	*Euphorbia hirta* L. (WP)	Infuse powdered recipe + potash	2TD / taken orally	-

Key: L = Leaves, **B** = Bark, **S** = Stem, **SB** = Stem Bark, **F** = Fruits, **R** = Roots, **RS** = Root Sap, **WP** = Whole Plant, **TD** = Times daily

Table 3.0: Demography of Respondents

Parameters	Specification	Number of respondents	%
Sex	Male	59	73.75
	Female	21	26.25
Age distribution	15- 20	0	0.00
	21- 30	3	3.75
	31- 40	24	30.00
	41- 59	44	55.00
	60 and above	9	11.25
Educational level	Primary	29	36.25
	Secondary	26	32.50
	Tertiary	5	6.25
	Others	25	31.25
Occupation / Practice	Herb Seller	23	28.75
	Traditional medical practitioner	38	47.50
	Herbalist	1	1.25
	Bone setter	3	3.75
	Traditional Birth attendant	8	10.00
	Farmer	7	8.75
Tribe	Hausa	40	50.00
	Igbo	7	8.75
	Yoruba	17	21.25
	Others	16	20.00
Association membership	Yes	50	62.5
	NO	30	37.5

4. DISCUSSION

The survey areas within the FCT and environs afforded us a rich and diverse plant species as we set an insight into the activities of the people as far as asthma and its management using medicinal plants is concerned. Medicinal plants are said to account for about 80% of the primary healthcare of the people living in the developing world [28], and this is evident due to their abundance and diversity in those regions of the world, Nigeria inclusive. Asthma remains one of the respiratory disorders with a high prevalence in Africa with no cure [29]. Different plant species have been used by the indigenous people of Nigeria in the management of asthma [23, 30-32]. Medicinal plants have been utilized in other parts of the world for management of asthma. Over 200 species medicinal plants were documented for use as asthmatics in Russia [33], several others were documented among various tribal communities in India as well as Cameroon, South Africa among many others [34-36].

In a study conducted among the Yoruba (southwestern) people of Nigeria, plants belonging to different families ranging from Moraceae, Zingiberaceae, Bignoniaceae, Meliaceae, Anacardiaceae, Combretaceae among others have been implicated and documented in the work of [17, 30] as therapy for asthma. The utilization of plants from the Moraceae plant family with the highest mention in this study was alluded to by the wide use in other parts of Africa [37]. Some of the medicinal plants mostly utilized in the study area; *Aframomum melegueta, Allium ascalonicum, Allium sativum, Zingiber officinale, Crinum glaucum, Euphorbia hirta, Anogeisus leiocarpus, Newbouldia laevis* among others have been documented as therapy for asthma treatment/management [30, 38, 39]. Plants like *Psidium guajava* have been reported as pharmacological treatment for bronchitis [40] which can be a potential bronchodilator in asthma management. *Abrus precatorius*, a plant mentioned in this survey have also been previously reported for treatment of asthma by [41]. Medicinal plants like *Zingiber officinale, Ageratum conyzoides, Aframomum melegueta* have been reported for their anti-asthmatic, anti-inflammatory, antispasmodic and immunomodulatory activities [17, 42, 43] which is consistent with the report of [15] that drugs used in the treatment/management of asthma possess anti-inflammatory and muscle relaxant abilities. [44] also reported that asthma management depends largely on therapeutic agents that can act as a bronchodilators and steroidal anti- inflammatory agents. *M. oleifera* and *A. conyzoides* as mentioned in this work were found to be previously reported as bronchodilators used in the management of asthma by [45] who also reported that plants used in the treatment of respiratory diseases/disorders are as well used in the treatment/management of asthma. *M. indica, Aloe vera, C. procera, G. kola* among others were some of the plants reported for use in the management of respiratory disorders and are used as asthmatics due to their therapeutic ability as an anti-inflammatory, anti-anaphylactic, anti-spasmodic and immunomodulatory agents giving credence to their mention as asthmatics in this work according to the reports of [18, 44]. A *Ficus* spp. belonging to the Moraceae plant family with the highest mention in this study have also been previously reported by [46, 47] as an antiasthmatic therapy, hence species from the plant family may be potential anti-asthmatics. Most the documented medicinal plants have been previously reported to contain different phytoconstituents and elicit bio-activities that have been pharmacologically validated and linked to amelioration of asthmatic condition which justifies their indigenous use as asthmatics[17, 24, 48-50].

The different recipes mentioned are polyherbal. This is typical of herbal remedies which are usually polyherbal formulations inform of decoction, powder, maceration etc.[51] this suggests that the different medicinal plant components of these formulations may be working in

synergism in a manner that helps to quickly alleviate disease conditions as also described by [52]. Generally, decoctions and infusions are the most popular methods of preparing herbal formulations [53-55] probably due to the simplicity of the process[56]. Leaves were found to be the most frequently used plant part owning to their importance being an integral part of herbal preparation ingredients for various ailments and as well containing more pharmacological bioactive constituents than other plant part as also reported by [57, 58]. Several other ethnobotanical studies have shown leaves to be the most utilized plant part in the treatment of different illnesses [54, 59-61]. The plant parts that are mostly used after leaves are the stem bark, roots and whole plants which do not regenerate easily unlike the leaves. This can be a problem as far as conservation and sustainable plant exploitation is concerned, a situation highlighted in the work of [62]. Majority of plants used for medicinal purposes are still being collected from the wild as reported by [63-65] and other researchers, a situation which do not help in the quest for plant sustainability and conservation. The plant habit of most of the medicinal plants mentioned are trees and this may be due to their all-year round availability [66]. It has also been shown in other studies on medicinal plants used in the management of asthma or medicinal plants used in the treatment of respiratory disorders that trees represent the major life forms of the plant species mentioned [56, 67].

The majority of respondents are male TMPs who are poorly educated and may not practice or know the importance of proper documentation. However, most of them are aged between 41-59 and can still get some form of enlightenment on proper documentation and standardization of their products and procedures. Some of the respondents have knowledge of medicinal plants but do not know about that of asthma, claiming it is an urban disease (Urbanization is a contributory factor to high prevalence of asthma) and it is not really known to them and perhaps just treat it as mere cough, while others refused to share their information with us because they feel some form of distrust due to past experience(s) (personal or related) of intellectual theft. Hence the need to partner more with them to build trust and relationship, else, important information that could be of great benefit will be lost.

CONCLUSION

This study has helped to identify and document medicinal plants used in the treatment/management of asthma in FCT and environs and will serve as a repository for researches that would be looking into drug development from alternative/ natural source.

CONSENT

In line with standard practice, the scope of the work was clearly explained to the respondents, consent forms were handed to willing participants which was duly signed and kept.

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