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Use of medicinal plants for the treatment of gastric ulcer in some parts of Southwestern Nigeria

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Ulcer is erosion in the lining of the stomach or duodenum. It is caused by disruption of the gastric mucosal defense and repair systems. There has been much interest in natural medicines derived from traditional knowledge of pharmacological properties of plants recently. The major aim of this study was to conduct an ethnobotanical survey of plants used in the treatment of Gastric ulcers in some local government areas of Ibadan, South-West, Nigeria. Five local government areas which have prominent traditional medical practitioners and herbal markets were visited. Ninety-two plants belonging to forty-five different families were recorded. The prominent plants' families recorded include; Apocynaceae, Loranthaceae, and Lamiaceae. Some of the most frequently used medicinal plants mentioned by the respondents are: *Sphenocentrum jollyanum* Pierre, *Euadenia trifoliolata* (Sch. &Thon.) Oliv., *Khaya ivorensis* A. Chev., *Lonchocarpus cyanescens* Benth, and *Kigelia africana* (Lam.) Benth. Most of the herbs were prescribed together with other plants and recipes. Modes of administration were mostly concoctions and decoctions. Cultivation and proper documentation of some of the plants which may become endangered over time is therefore encouraged. Most of the identified plants have been used regularly by the traditional medical practitioners and the efficacies have been proven.

Key words: Gastric ulcer, ethnobotanical survey, medicinal plants, traditional medicine, South-west Nigeria.

INTRODUCTION

Traditional medicines entail the frequent use of medicinal plants in the management of gastric disorders (Schmeda-Hirschman and Yesilada, 2005). Several experimental studies have revealed the beneficial effects of herbal and plant extracts in the prevention of gastric injury. These studies have shown the three main functions of medicinal plants such as cytoprotective, antisecretory and antioxidant activities either alone or combined; they are responsible for protection against gastric mucosa (Al-Mofleh, 2010; Salami et al., 2014). Plant materials have been a main source of natural therapeutic remedies and are used in the treatment of various infectious diseases in many developing countries (Beverly and Sudarsanam, 2011; Dike et al., 2012). Medicinal plants have confirmed

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their contribution to the treatment of diseases, such as malaria, diabetes, HIV/AIDS, mental disorders, sickle-cell anaemia (Elujoba et al., 2005) and microbial infections (Okigbo and Mbajuka-Nyoku, 2005).

Ulcer can be defined as erosion in the lining of the stomach or duodenum and is caused by the disruptions of the gastric mucosal defense and repair systems (Al-Mofleh, 2010). Gastric ulcer is formed in the stomach. The drugs used in the treatment of ulcer include proton pump inhibitors, receptor blockers, and drugs affecting the mucosal barrier and acting on the central nervous system. The modern approach used to control gastric ulceration is to inhibit gastric acid secretion, promote gastro protection, block apoptosis and stimulate epithelial cell proliferation for effective healing (Bandyopadhyay et al., 2000). Hence, conventional medicine treats ulcer by proton pump inhibitors (PPI), H_2 receptor antagonist, antacids and antibiotics for *Helicobacter pylori*. However, there are reports of adverse effects and relapse in the long run. This makes people to find alternative medications. Furthermore, many of these drugs do not achieve all the valuable necessities (Dharmani and Palit, 2006). The clinical evaluation of these drugs showed development of tolerance and incidence of relapse and side effects thus making their efficacy debatable. This has been the rationale for the development of new, safe anti-ulcer drugs. Herbal drugs can lead to the development of such anti-ulcer drugs because these drugs are considered safe due to their natural ingredients. Recently, focus on plant research has increased all over the world and a large body of evidence has been collected to show huge potential of medicinal floras used in several traditional systems of medicine. There has been much attention given to natural medicines derived from the traditional knowledge of the pharmacological properties of plants recently. Herbal medicine is fast emerging as a substitute treatment to available synthetic drugs for ulcer management possibly due to lower costs, fewer adverse effects, availability and perceived effectiveness. Many tropical herbs have been scientifically reported to possess effective anti-ulcer activity (Goulart and Sela, 2005; Singh et al., 2008). Medicinal plants and dietary nutrients have been shown to possess gastro-protective activity (Kath and Gupta, 2006; Malairajan et al., 2007; Siti et al., 2009).

Kumar et al. (2011) reported some plants used for the treatment of peptic ulcer disease (PUD) in India. Some of these plants include *Amomum subulatum*, *Scoparia dulcis*, *Jasminum grandiflorum*, *Davilla rugosa*, *Kielmeyera coriacea*, *Larrea divaricata*, *Qualer grandiflora*, *Mammea americana*, *Anacardium occidentale*, *Ocimum sanctum*, and *Azadirachta indica*. Previous works have been conducted on the anti-ulcer activities of medicinal plants including Bhajoni et al. (2016) on *A. indica*; Bello et al. (2016) on *Cassia sieberiana;* Balogun et al. (2013) on *Nauclea latifolia* among others. However, there is little or no documentation of medicinal plants used for the treatment of gastric ulcer in Southwestern Nigeria. This documentation will serve as reference to researchers and traditional medical practitioners alike. Nigeria is known to be one of the most important countries in West Africa and is richly blessed with great diversity of medicinal plants. However, some of these medicinal plants are becoming threatened and endangered (Sonibare and Abegunde, 2012). The present study therefore aims to document the various medicinal plants used in treating gastric ulcer in Southwestern Nigeria.

MATERIALS AND METHODS

Study area

The local government areas visited for the survey include: Ibadan South/West LGA, Akinyele LGA, Oluyole LGA, Ibadan North East LGA, and Egbeda LGA. The locality map is as shown in Figure 1. Ibadan South/West includes Molete and Bode market, Akinyele LGA includes Ojoo, Idi-ose, Moniya, and Ajibode, Oluyole LGA includes Idi Ayunre and Cocoa Research Institute of Nigeria (CRIN), Ibadan North-East LGA includes Oje market while Egbeda LGA includes Gbagi market, Alakia market. The five LGAs are part of the 11 LGAs of Ibadan, Oyo State with latitude 7°22′N and longitude 3°55′E. The region, being South West has tropical climate with two distinct seasons: dry and wet. The dry season is usually between November and February. Rainfall occurs throughout the year with an average annual rainfall of 250 cm^3 while dry season is usually between November and February. The areas still have villages with little or no access to modern health care and thereby rely on traditionalists and TMPs for solutions to their health challenges. Most of the natives interviewed are Yoruba and their occupations include herb selling and trading. Some of the places are rural areas which are not well developed, while some of the areas are moderately urbanized as shown in Figure 1.

Informed consent

The people visited include traditional medicine practitioners (TMP), herb sellers, and the elderly who have knowledge of medicinal plants used in the treatment of various ailments including gastric ulcer. Informed consent was obtained orally from all participants including TMPs, herb sellers and the elderly before inception of the interview.

Questionnaire administration and data collection

The survey was conducted between August 2015 and February 2016 where focused group discussion method was used at Traditional Medical Practitioners' meeting which usually take place fortnightly. The association of TMPs at Oluyole Local Government of Ibadan comprises both males and females; twelve members were present on the day of the interview. Herbs markets were mostly visited in the local governments and the herb sellers who were all women were interviewed. There were brief interruptions during the interview as customers visit them to buy herbs.

Semi-structured questionnaire and oral interview were used to obtain the relevant information and, in few cases, incentives were

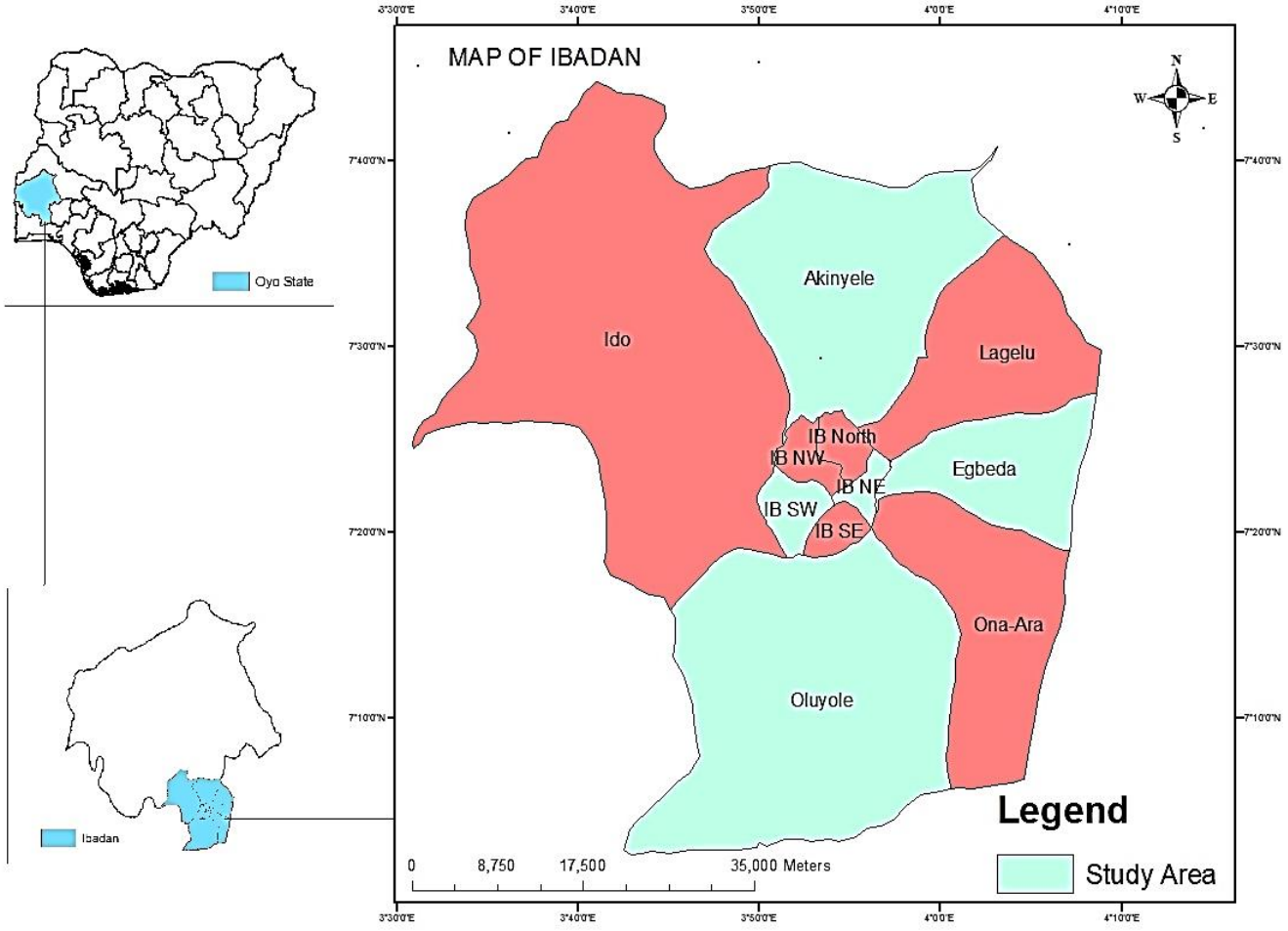


Figure 1. Map of Ibadan showing the local government areas visited for the survey.

given to unwilling respondents. Some of the questions asked included: the local name and scientific name of the medicinal plants used in the treatment of gastric ulcer, mode of administration of the plant, side effects of the mentioned plant, other method(s) of treatment apart from herbs, etc. Demographic information such as name, age, sex, religion, marital status, education, and occupation of the respondents was obtained. The vernacular names of the plants were given in most cases because most of the respondents are not learned; textbooks and journals were consulted to confirm the botanical names (Gbile, 1984; Burkill, 1995). Fidelity level was employed using the method of Friedman et al. (1986) which shows the percentage of respondents claiming the use of each plant species for the same major purpose. This was calculated as:

$$FL\ (\%) = (Np / N) \times 100$$

where Np = Number of respondents claiming a specific use for each of the plants mentioned; N = Total number of respondents using the species for any purpose.

The top mentioned plants were collected, identified, and authenticated. Voucher specimens of the plants were deposited at Forest Herbarium Ibadan (FHI) with their respective FHI numbers. Isolated compounds from the plants were reported.

RESULTS

Demographic data

Seventy-two respondents participated in the survey and were not secretive about their knowledge of the medicinal properties of the plant species. The responses were encouraging throughout the survey. The population of the respondents is made up of herb sellers (72.3%), TMPs (16.6%), and the elderly (11.1%). Their ages were between 25 and 70 years. All the respondents were Nigerians from the Yoruba ethnic group with 23.7% practicing Christianity, 34.7% practicing traditional religion and 41.6% practicing Islamic religion. The age group 41-60 had the highest percentage (50%) while the majority of the respondents were females (69.4%). Most of the respondents practice Islam (41.6%), followed by traditional religion (34.7%), then Christianity (23.7%) (Figures 2 to 5).

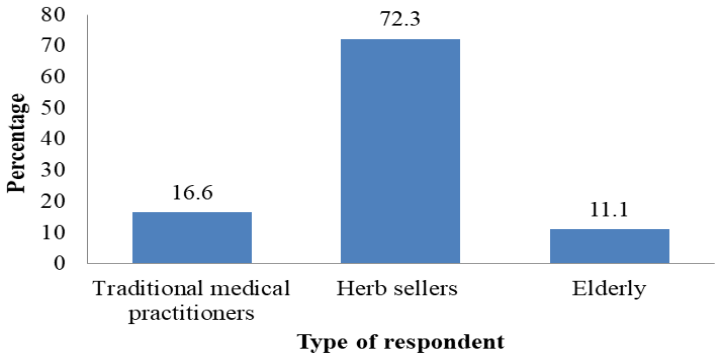


Figure 2. Type of respondent (%).

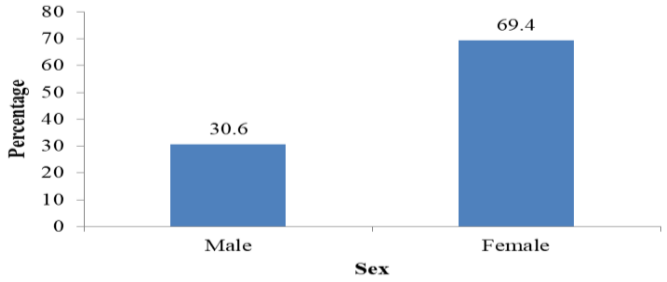


Figure 3. Sex of respondent (%).

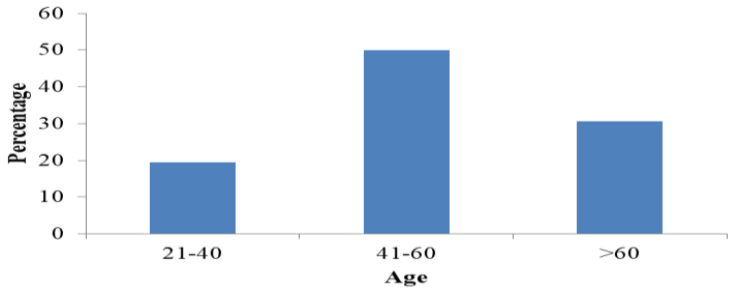


Figure 4. Age of respondents (%).

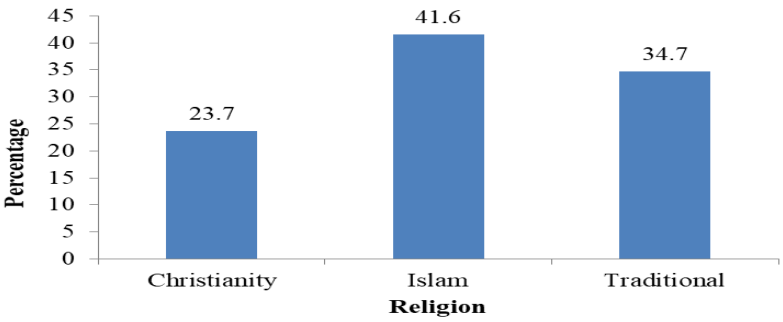


Figure 5. Religion of respondents (%).

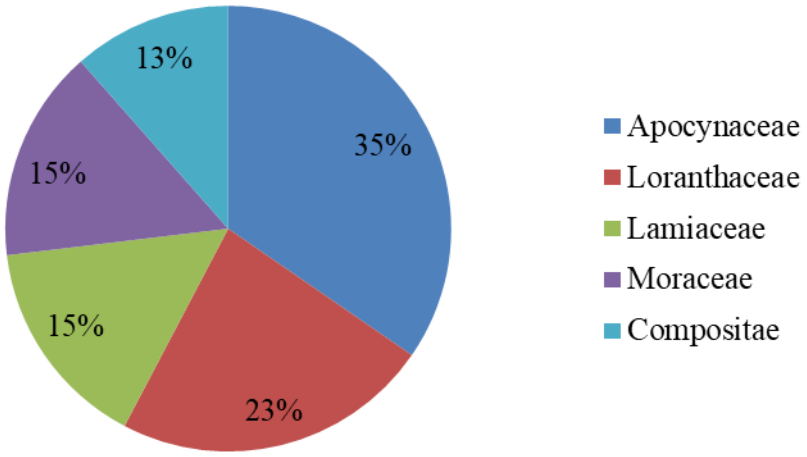


Figure 6. Distribution of plant species according to family (%).

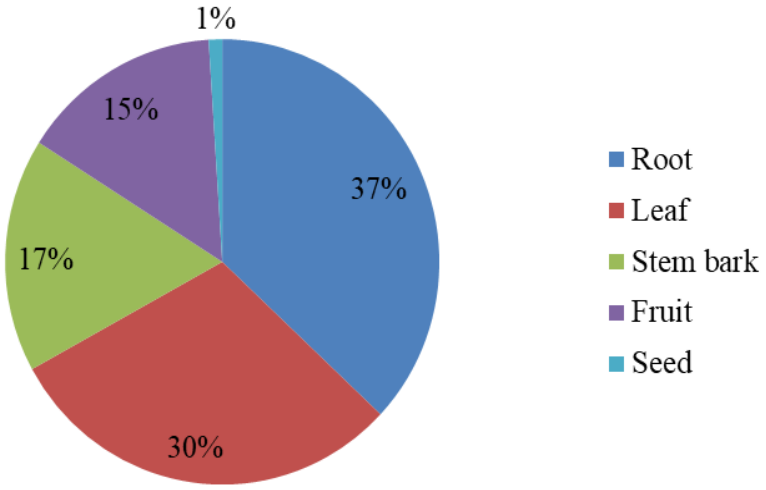


Figure 7. Plant parts used in the treatment of gastric ulcer (%).

Plant information and their families

A total of 92 plant species belonging to 45 different families were identified (Table 1). The table shows the list of identified plant species, families, local names, plant parts used, frequency of occurrence, and fidelity level. The most prominent among these plant families are the Apocynaceae, Loranthaceae and Lamiaceae with nine, six, and five species, respectively. Other plant families include Compositae and Moraceae with four species each (Figure 6). The plants' roots and leaves are mostly used for herb preparation while the seeds are least used (Figure 7). Many of these plant species are also used for treating wounds and diabetes. Most of the respondents confirmed regular supply of their plant remedies from the forest. Knowledge of herbal treatment was mainly inherited; few of the informants went for the training. Some of the mentioned plants include *Ageratum conyzoides* L., *Aloe barbadensis* L., *Alstonia scholaris* (L.) R. Br., *Artocarpus altilis* (Parkinson) Fosberg, *Artocarpus integrifolia* Auct, *Aspilia africana* (Persoon) C.D. Adams, *Bacopa monniera* L., *Benincasa hispida* Thunb., *Bryophyllum pinnatum* (Lam.) Oken, *Carica papaya* L., *Ceiba pentandra* (L.) Gaertn., *Centella asiatica* L., *Citandra cymulosa* Benth, *Citrus aurantium* L. among others (Table 1).

Many of these plants are obtained from the forest, while a few are collected from the garden around the house.

Method of preparation

The herbal remedies can be prepared either from dry

Table 1. Medicinal plants used for the treatment of gastric ulcer

S/N	Botanical name	Family	Local names	Part(s) used	Frequency of occurrence	Fidelity Level (%)
1	*Ageratum conyzoides* L.	Compositae	Imi-esu	Leaf	4	5.6
2	*Aloe barbadensis* L.	Liliaceae	Eti-erin	Root	5	6.9
3	*Aloe barteri* L.	Liliaceae	Eti-erin	Leaf	5	6.9
4	*Alstonia boonei* (L.)R.	Apocynaceae	Ahun	Whole plant	6	8.3
5	*Ananas comosus* (L.) Merr.	Bromeliaceae	Penapu ibile	Fruit	1	1.4
6	*Artocarpus altilis* (Parkinson)	Moraceae	Berefuutu	Leaf	2	2.8
7	*Artocarpus integrifolia* auct.	Moraceae	Tapoun	Root	2	2.8
8	*Asparagus racemosus* Willd.	Liliaceae	Aluki	Root	4	5.6
9	*Aspilia africana* (Persoon) C.D. Adams	Compositae	Yonyon-agbute	Leaf	1	1.4
10	*Bacopa monniera* L.	Scrophulariaceae	Awenu	Fruit	1	1.4
11	*Benincasa hispida* Thunb	Cucurbitaceae	Abua	Fruit	1	1.4
12	*Bryophyllum pinnatum* (Lam.) Oken	Crassulaceae	Abamoda	Leaf	1	1.4
13	*Byrsocarpus coccineus Schumach & Thonn.*	Connaraceae	Amuje	Stem bark	3	4.2
14	*Carica papaya* L.	*Carica papaya* L.	Ibepe	Seed, fruit	5	6.9
15	*Ceiba pentandra* (L.) Gaertn.	Malvaceae	Araba	Leaf	5	6.9
16	*Centella asiatica* L.	Apiaceae	Tutugbo	Fruit	1	1.4
17	*Citandra cymulosa* Benth	Mimosaceae	Aagba	Root	1	1.4
18	*Citrus aurantium* L.	Rutaceae	Jaganyin	Leaf	4	5.6
19	*Citrus medica* L.	Rutaceae	Osan wewe	Leaf, Root	6	8.3
20	*Citrus sinensis* L.	Rutaceae	Jaganyin	Leaf, Root	6	8.3
21	*Clitandra orientals Hall.*	Apocynaceae	Aagba	Root	4	5.6
22	*Clitandra togolana Hall.*	Apocynaceae	Aagba	Root	3	4.2
23	*Cocos nucifera L.*	Arecaceae		Fruit	2	2.8
24	*Cruda klainei Pierre ex De Wild.*	Caesalpinaceae	Afomo	Leaf	6	8.3
25	*Curculigo pilosa*	Hypoxidaceae	Epakun	Seed	25	34.7
26	*Dalbergia lactea Vatke.*	Papilionaceae	Ojiji	Root	8	11.1
27	*Desmodium gangeticum (L.) DC.*	Papilionaceae	Emo	Root	12	16.7
28	*Detarium microcarpum Guill. & Perr.*	Caesalpinaceae	Arira	Stem bark	12	16.7
29	*Emblica officinalis Gaertn*	Euphorbiaceae	Ojiji	Leaf	8	11.1
30	*Englerina goborensis (Engl.) Balle*	Loranthaceae	Afomo	Leaf	12	16.7
31	*Englerina lecardii (Engl.) Balle*	Loranthaceae	Afomo	Leaf	9	12.5
32	*Entada gigas L.*	Mimosaceae	Aagba	Root	28	38.9
33	*Euadenia trifoliolata (Sch. &Thon.) Oliv.*	Capparaceae	Logbokiya	Leaf	26	36.1
34	*Ficus arnottiana Miq.*	Moraceae	Obata	Fruit	7	9.7
35	*Ficus exasperata Vahl.*	Moraceae	Ipin	Root	7	9.7

Table 1. Contd.

36	*Floscopa africana (P. Beauv) C.B. Clarke*	Commelinaceae	Toronini	Root	11	15.3
37	*Fluerya aestuans L.*	Urticaceae	Iranje	Leaf	12	16.7
38	*Garcinia cambogia L.*	Clusiaceae	Okuta	Fruit	10	13.9
39	*Globimetula braunii (Engl.) Danser*	Loranthaceae	Afomo	Leaf	12	16.7
40	*Hedranthera barteri (Hook. F.) Pichon*	Apocynaceae	Oko aja	Root	6	8.3
41	*Hemidesmus indicus (L.) R. Br.*	Apocynaceae	Ogbe akuko	Root, leaf	7	9.7
42	*Hoslundia opposite Vahl*	Lamiaceae	Efinrin odan	Leaf	9	12.5
43	*Hunteria umbellate K. Schum*	Apocynaceae	Erin	Root	12	16.7
44	*Khaya ivorensis A. Chev.*	Meliaceae	Ogano	Stem bark	28	38.9
45	*Kielmeyera coriaceae Mart. & Zucc.*	Caricaceae	Emo	Stem bark	9	12.5
46	*Kigelia africana (Lam.) Benth.*	Bignoniaceae	Pandoro	Root, stem bark, fruit	26	36.1
47	*Lagenaria siceraria (Mol.) Standl*	Cucurbitaceae	Igba	Stem bark	3	4.2
48	*Lonchocarpus cyanescens benth*	Papilionaceae	Elu	Leaf	22	30.6
49	*Macaranga barteri Mull. Arg*	Euphorbiaceae	Agbaasa	Root	10	13.9
50	*Markhamia tomentosa (Benth.) K. schum*	Bignoniaceae	Oruru	Root, Bark	9	12.5
51	*Microdesmis puberula Hook. F. ex Planch.*	Pandaceae	Aringo	Leaf	12	6.7
52	*Morinda citrifolia L.*	Rubiaceae	Oruwo	Fruit, Root	18	25.0
53	*Motandra guineensis (Thonn.) A.D.C.*	Apocynaceae	Aagba	Root	21	29.2
54	*Musa paradisiaca L.*	Musaceae	Ogede agbagba	Fruit	23	31.9
55	*Musa sapientum L.*	Musaceae	Omini	Fruit	21	29.2
56	*Ocimum basilicum L.*	Lamiaceae	Efinrin aja	Leaf	18	25
57	*Ocimum sanctum L.*	Lamiaceae	Efinrin aja	All parts	16	22.2
58	*Oxytenanthera abyssinica (A. Rich.) Munro*	Poaceae	Aparun	Root	13	18.1
59	*Parkia biglobosa Jacque Benth.*	Mimosaceae	Igba	Stem bark	22	30.6
60	*Parquetina nigrescens Afzel*	Asclepiadaceae	Ogbo	Root, Leaf	18	25
61	*Peperomia pellucida (L.) Kunth*	Piperaceae	Erin	Root	12	16.7
62	*Persea Americana Mill.*	Lauraceae	Oguro	Leaf	12	16.7
63	*Phragmanthera capitate (Sprengel) S.Balle*	Loranthaceae	Afomo	Leaf	5	6.9
64	*Phragmanthera kamerunensis (Engl.) Balle*	Loranthaceae	Afomo	Leaf	7	9.7
65	*Picralima nitida Thellung*	Apocynaceae	Erin	Root	9	12.5
66	*Piper guineense Schumach. & Thonn.*	Piperaceae	Iyere	Root	11	15.3
67	*Piper nigrum L.*	Piperaceae	Iyere	Fruit	12	16.7
68	*Plectranthus amboinicus (Lour.) Spreng*	Lamiaceae	Aringo	Whole plant	6	8.3
69	*Plumbago zeylanica L.*	Plumbaginaceae	Inabiri	Root	7	9.7
70	*Pseudocedrella kotschyi (Schweinf.) Harms*	Meliaceae	Emigbegiri	Stem bark	29	40.3
71	*Pycnanthus cingolensis (Welw.) Warb.*	Myristicaceae	Akomu	Stem bark	12	16.7

Table 1. Contd.

72	*Pyrus communis L.*	Rosaceae	-	Leaf	5	6.9
73	*Rauvolfia vomitoria Afzel.*	Apocynaceae	Asofeyeje	Root, leaf	4	5.6
74	*Ricinodendron heudelotii (Hutch. & E.A. Bruce)*	Euphorbiaceae	Erinmodo	Stem bark	7	9.7
75	*Ritchiea capparoides (Andrews) Britten*	Capparaceae	Capparaceae	Leaf	6	8.3
76	*Sarcocephalus latifolius Smith Bruce*	Rubiaceae	Egbesi	Stem bark, root	5	6.9
77	*Securidaca longepedunculata Fres.*	Polygalaceae	Ipeta	Root	14	19.4
78	*Spathodea campanulata Beauv.*	Bignoniaceae	Ruuru	Root, stem bark	3	4.2
79	*Spondias mombin L.*	Anacardiaceae	Iyeye	Stem bark	14	9.4
80	*Sphenocentrum jollyanum Pierre*	Menispermaceae	Akerejupon	Root, fruit	30	41.7
81	*Staudtia stipitata Warb.*	Myristicaceae	Amuje	Stem bark	4	5.6
82	*Talinum triangulare (Jacq.) Willd*	Portulacaceae	Gbure	Leaf	8	11.1
83	*Tapinanthus buntingii (Sprague) Danser*	Loranthaceae	Afomo	Leaf	7	9.7
84	*Terminalia pallida Brandis*	Combretaceae	Idi	Whole plant	14	19.4
85	*Terminalia superba Engl. & Diels.*	Combretaceae	Afara	Stem bark	12	16.7
86	*Urena lobata Linn.*	Malvaceae	Efore loka	Leaf	15	20.8
87	*Uvaria afzelii Sc. Elliot*	Annonaceae	Gbogbonise	Root	30	41.7
88	*Uvaria chamae P. Beauv*	Annonaceae	Eruju	Root	30	41.7
89	*Vernonia amygdalina Delile*	Compositae	Ewuro jije	Root	18	25
90	*Vernonia odoensis Delile*	Compositae	Ewuro oko	Root	12	16.7
91	*Vitellaria paradoxa C.F Gaertn.*	Sapotaceae	Emiyemi	Stem bark	16	22.2
92	*Zingiber officinale Rosc.*	Zingerberaceae	Atale	Leaf	14	19.4

plants from markets or freshly collected samples from the forest, around homes or home gardens. However, the respondents confirmed that both forms of plant materials are efficient in the preparation of the herbal remedies except in some cases where freshly collected samples are preferred. The main method of preparation given is decoction (boiling in water). Others are infusion and concoction. Preference was given to the method of decoction. The time required for boiling varies and is dependent on plant parts or nature of plant. The preparation is to be taken orally in all cases.

Enumeration of species

The herb sellers mentioned some plants which should be prepared as concoction; *Citrus medica* L. leaves and roots, *Citrus sinensis* L. leaves and roots, *Citrus medica* var. *acida* leaves and roots. Some herb sellers also mentioned that the fruit and root of *Sphenocentrum jollyanum* Pierre should be ground into powder and drunk with pap or water. Root of *Vernonia amygdalina* Delile should be cooked with water (decoction) and allowed to cool before drinking. Other recipes such as honey and raw egg are usually used with *Ananas comosus* (L.) Merr. fruit. Root of *Uvaria afzelii* Sc. Elliot and stem bark of *Parkia biglobosa* Jacque Benth. are boiled together with water and taken orally on a daily basis. Some medicinal plant species are used in combination when boiled with water; these include stem barks of *Vitellaria paradoxa* C. F. Gaertn., *Khaya ivorensis* A. Chev., and *Pseudocederela kotshyi* (Schweinf). Harms. fruits and roots of *Morinda citrifolia* L., roots and fruits of *S. jollyanum* Pierre, stem barks of *Detarium microcarpum* Guill. & Perr., *Staudtia stipitata* Warb., *Kigelia africana* (Lam.) Benth. and *Sarcocephalus latifolius* Smith Bruce. A particular

Table 2. Authentication of selected plants.

Plant sample	Voucher Specimen no.
Curculigo pilosa	FHI 109816
Entada gigas	FHI 110507
Euadenia trifoliolata	FHI 110522
Kigelia africana	FHI 110520
Sphenocentrum jollyanum	FHI 110510
Uvaria chamae	FHI 110508
Vitellaria paradoxa	FHI 109816

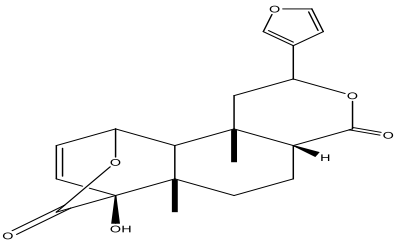
Identification and authentication of most mentioned plants

The voucher specimens of the most mentioned plants with their respective FHI numbers are presented in Table 2 with some of the reported isolated compounds (Figure 8). Moody et al. (2005) isolated columbin and isocolumbin from Sphenocentrum jollyanum seeds. Catechin and epicatechin were isolated from Vitellaria paradoxa stem bark (Emmanuel et al., 2016), while Valls et al. (2006) isolated pilosidine and Piloside A from Curculigo pilosa rhizomes. Uvaretin and isouvaretin were isolated from Uvaria chamae (Hufford and Lasswell, 1976), while Lazare et al. (2015) isolated lupeol and β sitosterol from Kigelia africana (Figure 8).

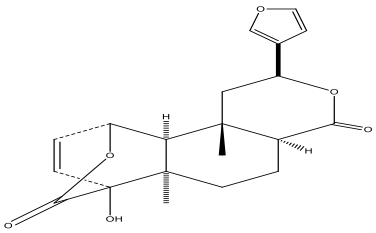
DISCUSSION

The ethnobotanical survey on medicinal plants with anti-ulcer activities was conducted to access information about the uses of plants in traditional medicine. A total of 72 respondents were accessed who were assisted to complete the questionnaire. Respondents were located in five different local governments in Ibadan, South West Nigeria: Ibadan South/West LGA, Akinyele LGA, Oluyole LGA, Ibadan North East LGA, and Egbeda LGA. Majority of the respondents were herb sellers (52 respondents), while 12 of the respondents were Traditional Medical Practitioners TMPs (12 respondents), and 8 of the respondents were elderly. All respondents belonged to the native Yoruba tribe and they speak Yoruba dialect fluently. The findings from this survey suggest that most of the plant families have prospects and thus can be explored for drug development scientifically. The family Apocynaceae has a comparatively high incidence in the list thus may contain useful species that can be further explored as sources of anti-ulcer drugs. The results also showed that majority of the respondents are familiar with the use of certain species such as *Entada gigas*, *K. africana*, *Curculigo pilosa*, *K. ivorensis*, *Lonchocarpus cyanescens*, *P. biglobosa*, *S. jollyanum*, *Musa sapientum*, *Uvaria chamae*, *U. afzelii*, *P. kotschyi*, and *Euadenia trifoliolata* in the treatment of gastric ulcer. This was inferred from the frequency of occurrence and fidelity level of the plant species. This result also revealed that various parts of the plants especially the leaves, stem bark, roots, and fruits but rarely the whole plants have been used in the treatment of the disease. Investigations on the plant parts used and the mode of preparation and administration revealed that water was the main medium for all the medicinal preparations irrespective of the plant part(s) or combinations used. The drug was administered along with honey or hot pap. Most of the respondents claimed there are usually no side effects in the use of the medicinal plants. Many scientific researchers have reported the anti-ulcer activities of some of the plants identified in this study. Chilaka et al. (2010) and Orole et. al. (2013) worked on *U. chamae* and *K. africana,* respectively. Ghangale et al. (2009) also evaluated the aqueous extract of *O.sanctum* for its anti-ulcer activity against methanol induced ulcer in Wistar rats. The investigation revealed that *O. sanctum* exhibited significant antiulcer activity by enhancing antioxidant potential of gastric mucosa thereby reducing mucosal damage. Chioma and Raymond (2013) also worked on the anti-ulcerogenic activity of the methanol extract of *C. pentandra* stem bark on indomethacin and ethanol-induced ulcers in rats. The results showed that *C. pentandra* possess ulcer protective properties against experimentally induced ulcers and validates its traditional use in the treatment of stomach pain and ulcer. Kayode et al. (2015) also evaluated the anti-ulcer activities of *Securidaca longepedunculata* and *Luffa cylindrica* in Wistar rats using ethanol-induced gastric ulcer. The study demonstrates that the leaf extracts of the two plants are possible potent gastro-protective and anti-ulcer agents, thus providing evidences that may justify their ethno-medicinal uses as anti-ulcer agents.

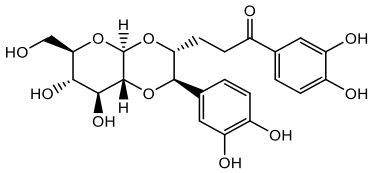
The survey showed that majority of the plant species used for the treatment of gastric ulcer is sourced from the wild. It has been reported that although, medicinal plants are necessary in deciding a programme of action for primary health care, most of the traditional medical practitioners have not cultivated the habit of conservation techniques. Most of these genetic resources are largely



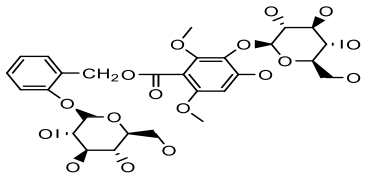
Columbin from *Sphenocentrum jollyanum* (Moody et al., 2005)



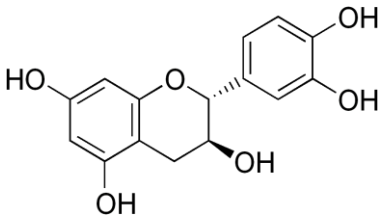
Isocolumbin from *Sphenocentrum jollyanum* (Moody et al., 2005)



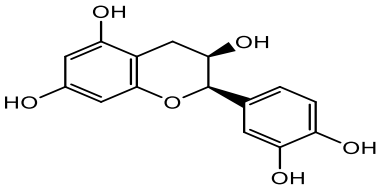
Pilosidine from *Curculigo pilosa* (Valls et al., 2006)



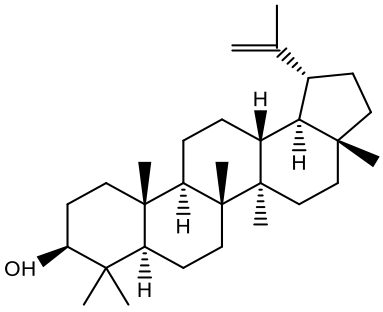
Piloside A from *Curculigo pilosa* (Valls et al., 2006)



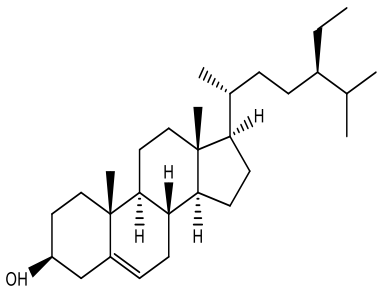
Catechin from *Vitellaria paradoxa* (Emmanuel et al., 2016)



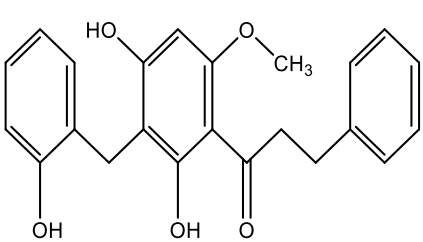
Epicatechin from *Vitellaria paradoxa* (Emmanuel et al., 2016)



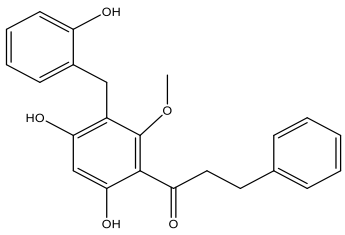
Lupeol from *Kigelia africana* (Lazare et al., 2015)



β-Sitosterol from *Kigelia africana* (Lazare et al., 2015)



Uvaretin from *Uvaria chamae* (Hufford and Lasswell, 1976)



Iso-uvaretin from *Uvaria chamae* (Hufford and Lasswell, 1976)

Figure 8. Isolated compounds from selected plants used in the treatment of gastric ulcer.

undocumented for now and the indigenous knowledge of their relevance is steadily being lost due to unsustain and continuous harvesting of plants from the wild. Reports of unsustainable harvesting of various medicinal plants in different communities in Africa and other continents of the world are quite enormous (Soladoye et al., 2005). The case was not different in the areas visited in Ibadan during the survey as some of the herb sellers and Traditional Medical Practitioners (TMPs) indicated the problem they encounter in finding some of the herbs at localities where they previously existed. This might be an indication of the fast disappearance of these plants which may eventually lead to extinction of these important species if urgent measures are not taken.

An estimate of 70 to 80% of people worldwide relies mostly on traditional, largely herbal medicine to meet their primary healthcare needs (Pei, 2001). Unfortunately, there are many cases of unsustainable harvesting of various medicinal plants in different communities in Africa and other continents of the world. The use of important medicinal plants in a sustainable way must be ensured in order to have a considerable long term effect on the environment, health care and economy (Wong et al., 2001). Therefore, encouraging cultivation and proper documentation of these plants is essential to prevent them from being endangered and going into extinction. Based on the information on the local uses of these medicinal plants, biological activities and subsequent isolation of the biologically active compounds from the plants can be carried out which will thus form the basis for future drug discovery from these indigenous medicinal plants. Bioactive compounds have been previously isolated from some of the mentioned plants. Moody et al. (2006) isolated columbin and isocolumbin from *S. jollyanum* seeds. Catechin and epicatechin were isolated from *V. paradoxa* stem bark (Emmanuel et al., 2016), while Valls et al. (2006) isolated pilosidine and Piloside A from *Curculigo pilosa* rhizomes. Conservation of the traditional knowledge of these medicinal plants is greatly advised for future reference. Research is ongoing in the laboratory on the gastroprotective activity of selected plants using indomethacin induced gastric ulcer in Wister rats. Bioactive compounds which could serve as lead compounds will be isolated, characterised, and elucidated in addition to the existing bioactive compounds from medicinal plants.

Conclusion

This study revealed ninety-two medicinal plants used in the treatment of gastric ulcer in five local government areas in Ibadan, Southwestern part of Nigeria. This report provides relevant information on indigenous knowledge on plants used for the treatment of gastric ulcer in the study area. The documentation apart from broadening the existing knowledge on the plants used could also serve as a guide for further work on the reported plants for the treatment of gastric ulcer. The study plays an important role in the documentation and conservation of traditional knowledge of plants for present and future use.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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