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The Use of Medicinal Plants in the Treatment of Diarrhoea in Ibibio Land: A Survey

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Authors' contributions

This work was carried out in collaboration between all authors. Author CEU designed the study, wrote the protocol and wrote the first draft of the manuscript. Author JSI managed the analyses of the study. Author EGA managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Diarrhoea is the passing of loose or watery stools at least three times per day or more frequently than normal for an individual. It is closely associated with poor hygiene and under nutrition. Medicinal plants have been known to provide alternatives to orthodox medicine in the treatment of diarrhoea in most parts of Africa. This survey was carried out to document the various medicinal plants and their use in the treatment of diarrhoea in Ibibio land, Akwa Ibom state of Nigeria. The outcome showed a total of 14 plants species of 9 families, with the family Anacardiaceae being the most commonly used, while *Ocimum gratissimum* was the most used plant. The leaves remained the part of the plant commonly used, and the most commonly used method of administration was by a decoction of the plant part. An ethnobotanical survey of the plants used in other locations for the same purpose, which is also present in Ibibio land gave a total of 53 plant species of 41 families mostly Euphorbiaceae, Anacardiaceae, Asteraceae, Malvaceae, Combretaceae and Lamiaceae. A comprehensive list of medicinal plants which will provide an array of options for the treatment of diarrhoea especially in areas where there are no healthcare facilities is therefore provided. Future investigations should aim to isolate, purify, and identify their bioactive components.

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1. INTRODUCTION

Diarrhoea is a leading cause of child death in the world and remains high on the international public health agenda [1]. Worldwide, an estimated 9 million children, most of them younger than 5 years of age die annually as a result of diarrhoea [2]. In Nigeria, diarrhoea kills about 194,000 children below five years annually [3]; the majority of deaths occur in rural communities where healthcare facilities are inadequate, and the majority of the people lack access to clean and safe water, a primary vehicle for transmission of diarrhoeal diseases [4].

Diarrhoea is defined as the passing of loose or watery stools at least three times per day or more frequently than normal for an individual [5]. It can be either chronic or acute. Chronic diarrhoea can last four weeks or more (whether continuous or intermittent), while acute diarrhoea lasts one or two days and goes away on its own. In most cases, symptoms resolve on their own within a couple of days without the need for medical treatment. The disease is caused by a wide range of pathogens which include bacteria, viruses and protozoa. The major pathogens include *Escherichia coli,* Shigella, Campylobacter, *Entamoeba histolytica*, Cytomegalovirus, *Giardia lamblia*, Cryptosporidium, non-typhoidal salmonella, Yersinia and Vibrio cholerae [6,7]. Rotavirus is one of the significant causes of diarrhoea, causing 40% of hospital admissions among children under the age of five worldwide [1]. The main symptom of diarrhoea is loose, watery bowel movement. The accompanying signs and symptoms include urgent need to go to the toilet, abdominal pain and cramping, change in colour of the stools, mucous, pus, blood or fat in stools, vomiting, general body weakness and tiredness [8]. Excretion of bloody, pus and mucous stools which is sometimes a life-threatening form of diarrhoea is categorised as acute dysentery [7].

There are two major healthcare systems used in the treatment of diarrhoea in the developing world; orthodox and indigenous systems [9]. While the orthodox system is well structured and highly developed, the indigenous systems are poorly organised and unregulated [10]. More than 80% of people in rural African communities still rely on indigenous medicine as a primary source of care, which is due to the fact that the majority of the people are not able to meet the high cost associated with the western health care system and also the benevolence attached to culture and tradition [11]. Apart from the fact that the use of traditional medicine in the treatment of diseases is cheap, the side effects are relatively harmless. Their resistance by microorganisms is also quite reduced. The use of these plants in the treatment of diseases will help to explore underutilised plants for ethno medicinal and other research purposes, as well as ensuring their conservation [12].

Numerous studies have validated the use of different plants in the treatment of diarrhoea [12,13,14,15,16,17]. The antidiarrhoeal effects of this plants has been shown to be due to the biological activity of the extracts of such plants which have antispasmodic effects, delay intestinal transit, are able to suppress gut motility, stimulate water adsorption or reduce electrolyte secretion [18].

The Ibibio people live in Akwa Ibom state of Nigeria and are considered the fourth largest ethnic group in the country, constituting 3.5% of the population of Nigeria. As one of the earliest settlers in the area, traditional medicine was the only source of health care [19]. Ibibio land is one of the places in the world where medicinal plants are used in treating diarrhoea and they have proven to be quite effective in this regard. This survey will try to identify some of the medicinal plants that are used in Ibibio land for the treatment of diarrhoea.

2. METHODOLOGY

2.1 Research Design

The study was carried out in Uyo Senatorial District of Akwa Ibom State, Nigeria where the Ibibio speaking people of the state live mainly. It involved interviewing traditional medicine practitioners and other individuals in Uyo Senatorial District who have either been treated for diarrhoea using medicinal plants or have very close relatives who have been so treated.

2.2 Instrument of Data Collection and its Administration

Data used was from primary and secondary sources. The primary source of data was interviewed. These interviews were conducted using structured questionnaires. They consisted

of five parts namely: the demographic data, characterisation of household, knowledge of diarrhoea, assessment of medicinal plants of diarrhoea treatment, assessment of traditional therapy.

The secondary source of data was published texts, journals, research projects and the library. Through these, it was possible to get a comprehensive list of medicinal plants that are already in use in the treatment of diarrhoea.

2.3 Population and Sampling Techniques

There are numerous traditional medicine users in Uyo Senatorial District of Akwa Ibom State. There is, however, no fixed data as to how many they are. The target population could not involve all the traditional medicine practitioners and traditional medicine users in Uyo senatorial district. Therefore, a sample population had to be selected and used as a basis on which conclusions can be drawn. The sample size chosen was sixty medicine practitioners and traditional medicine users which represent the required sample size.

2.4 Sample Size Determination and Sampling Techniques

Since the required sample size of sixty traditional practitioners were selected, it was necessary to determine the corresponding accessible sample population. This was determined statistically using Tar Yamene's formula [20], n =70.59 (approximately 71 traditional medicine practitioners and traditional medicine users). For a more flexible sampling, therefore, 71 questionaires were administered.

2.5 Description of Study Area

This study was carried out in Ibibio land of Akwa Ibom State, South-South Nigeria. Ibibio nation is the fourth largest ethnic group in Nigeria and the largest ethnic group in Akwa Ibom state. The Ibibio speaking people of Akwa Ibom state currently occupies eighteen Local Government Areas and are in three senatorial districts of Akwa Ibom state. This study was streamlined to some localities within Akwa Ibom North East (Uyo) Senatorial District (Fig. 1). The population

Fig. 1. Map of Akwa Ibom showing Uyo Senatorial District

of the area according to the 2006 population census is one million, three hundred and fifty-four thousand, two hundred and fifteen. This area was chosen for study because of the culture of the people which upholds traditional medical practice. The Ibibio speaking areas in the other two senatorial districts were not visited.

2.6 Other Sources of Data

The list of medicinal plants used in Ibibio land for the treatment of diarrhoea that was retrieved from the answers given by respondents to the interview was compiled. However, since the medicinal plants were given in Ibibio language, the common names, botanical names and family of these plants were then researched using the internet and the taxonomy unit of the department of Botany, University of Uyo.

A review was done on the studies carried out by others in different locations, a list of plants from these studies were compiled. This list of flora from other authors were cross checked to see if those plants are available in Ibibio land of Akwa Ibom state. The medicinal plants that are available in Ibibio land were then documented.

3. RESULTS

Seventy-one questionnaires were administered, sixty-five were retrieved, five contained errors that rendered them unfit for the purpose of this research. Sixty questionnaires were therefore used for the analysis.

3.1 Determinants of the Use of Medical Plants in Ibibio Land

The responses by various respondents gave a clue into the age brackets, educational background and income levels of those that use medicinal plants for the treatment of diarrhoea. Vital information that was provided include the frequency at which various categories of the people use these medicinal plants in treatment of diarrhoea as shown in Tables 1-3.

Table 1. The frequency of medicinal plant use in relation to age

Frequency of usage	Age (years)				Total
	20-39	40-59	60-79	80 and above	
Very often	6(10%)	9(15%)	6(10%)	0	21(35%)
Often	12(20%)	6(10%)	6(10%)	3(5%)	27(45%)
Not often	3(5%)	6(10%)	3(5%)	0	12(20%)
Total	**21(35%)**	**21(35%)**	**15(25%)**	**3(5%)**	60(100%)

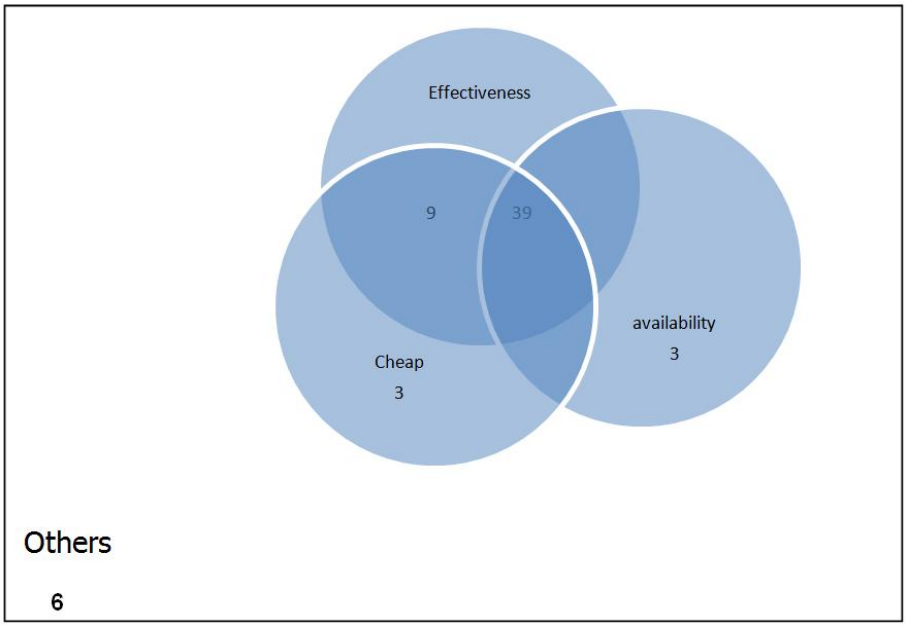

Fig. 2. A Venn diagram showing the reasons people use medicinal plants

Table 2. The frequency of medicinal plant use in relation to education

Frequency of usage	Level of education			Total
	Primary	Secondary	tertiary	
Very often	9(15%)	6(10%)	6(10%)	21(35%)
Often	9(15%)	12(20%)	3(5%)	24(:40%)
Not often	6(10%)	3(5%)	6(10%)	15(25%)
Total	**24(40%)**	**21(35%)**	**15(25%)**	60(100%)

Table 3. The frequency of medicinal plant use in relation to income level

Frequency of usage	Level of income per month(N)				Total
	<20,000	21000-39000	40000-50000	>50000	
Very often	6(10%)	3(5%)	6(10%)	3(5%)	18(30%)
Often	9(15%)	6(10%)	6(10%)	9(15%)	30(50%)
Not often	3(5%)	3(5%)	3(5%)	3(5%)	12(20%)
Total	**18(30%)**	**12(20%)**	**15(25%)**	**15(25%)**	60(100%)

4. MEDICINAL PLANTS FOR THE TREATMENT OF DIARRHOEA

The medicinal plants that are commonly used for treating diarrhoea from the responses to the questionaires were just fourteen. Three of the fourteen plants were common among a vast majority of the respondents with over sixty-seven percent (67%) of the respondents using them. Four other plants recorded over fifty percent (50%) of usage. The other seven plants had a low occurrence (below 50%) of data collected.

Together, about fifty-three plants that occur in Ibibio land were discovered to have antidiarrhoeal potential. Table 4 shows the plants that were mentioned in the responses to the interview carried out using the questionnaire. Table 5 shows a comprehensive list of plants in Ibibio land that can be used in the treatment of diarrhoea. The list in Table 5 is derived from interviews using questionnaire, as well as review of literature.

5. DISCUSSION

Diarrhoea is a common disease that affects the Ibibio people of Akwa Ibom state, Nigeria. All but one of the respondents to the questionnaires attested to diarrhoea infection either personally or to someone close to them. This phenomenon points to the high prevalence of diarrhoea in Ibibio land in particular and Akwa Ibom state in general. The cause of this high prevalence of diarrhoea is most likely due to lack of clean drinking water, poor hygiene and sanitation [8].

For most people in developing societies like the Ibibio land, especially those in the rural communities, it is near impossible to access quality healthcare. However, the desire to be in health means that the people will seek alternative healthcare. Alternative healthcare comes mostly in the form of traditional medicine which uses medicinal plants to treat various diseases. It is easier to access traditional medical practitioners who will administer medicinal plants at a very low cost than to consult an orthodox doctor when one is ill. The results of this survey clearly show that the Ibibio people depend on medicinal plants in the treatment of diarrhoea.

The high frequency of use of medicinal plants by the respondents, as shown in table 1-3 (35% using medicinal plants very often and 45% using medicinal plants often) indicates that many people rely mainly on medicinal plants for the treatment of numerous ailments. This is in tandem with what many researchers have observed to be the case in low-income communities [22]. Over three-quarters of the world's population rely on plants and plant extract for healthcare [23]. These medicinal plants used in traditional medicine play a vital role in developing countries because they are cheap, effective and have natural origins [23].

There are certain factors (Fig. 2) that are responsible for this perceived preference or bias towards traditional medicine in most developing areas. Among these factors are age, level of education attained, and income level. From the results, people between age 20 and 59 years tend to use medicinal plants in the treatment of diarrhoea more than people who are 60 years and above (Table 1). This is likely due to the fact that they are in their active/reproductive years and can easily access these plants.

Table 4. List of medicinal plants from responses to questionnaires

S/N	Family	Botanical names	Common names	Preparation	Ibibio names	Freq
1	Amaranthaceae	*Achyranthese aspera Acyranthes*	Devils horse ship	Decoction of leaves	Udok mbiet	26
2	Anacardiaceae	*Magnifera indica Linn*	Mango	Decoction of the bark	Mankoro or manko	24
3	Anacardiaceae	*Spondia mombin Linn*	Yellow monbin, hog plum	Infusion of the leaves	Nsukakara or udok edeme	25
4	Annonaceae	*Uvaria chamae p. beauv.*	Finger root	Roots are crushed and boiled in water or palm wine as decoction or macerated in soda water as infusion	Nkarika ikot	23
5	Asteraceae	*Vemonia amygdalina Del. Cent*	Bitterleaf	Root	Etidot	42
6	Caricaceae	*Carica papaya*	Pawpaw	Decoction of seeds	Udua edi	33
7	Clusiaceae	*Garcinia cola Heckle*	Bitter kola, African wonder nut	Seed and leaves	Efiat	37
8	Combretaceae	*Terminalia catappa*	Tropical almond, sea almond	Leaves	Mmansang mbakara	29
9	Compositae	*Croton zambesicus Mull. Arg.*	Rush foil	Decoction of Leaves	Eto obuma	29
10	Gnetaceae	*Gnetum africanum welw*	African jointfir	Leaves	Afang	38
11	Lamiaceae	*Ocimum gratissimum L.*	Lime harry, hoary basil	Leaves	Ntong	52
12	Myrataceae	*Psidium guajava L.*	Guava	Infusion of the leaves	Woba	31
13	Rubiaceae	*Heinsia crinata (afzel) g. tayl*	Bush apple	Decoction of root and bark	Atama	42

Table 5. Antidiarrhoeal medicinal plants in Ibibio land

S/N	Family	Botanical names	Common names	Preparation	Ibibio names	Source
1	Amaranthaceae	*Achyranthese aspera Acyranthes*	Devils horseship	Decoction of leaves	Udok mbiet	1,2
2	Amaryllidaceae	*Allium satillum L.*	Garlic	Bulb	Etebe owo inua	3
3	Anacardiaceae	*Anacrdium occidentale L*	Cashew	Decoction of leaves	Kasiu	3
4	Anacardiaceae	*Magnifera indica Linn*	Mango		Mankoro or manko	1,3
5	Anacardiaceae	*Spondia mombin Linn*	Yellow monbin, hog plum	Infusion of the leaves	Nsukakara or udok edeme	1,2,3
6	Annonaceae	*Uvaria chamae P. Beauv.*	Finger root	Roots are crushed and boiled in water or palm wine as decoction or macerated in soda water as infusion	Nkarika ikot	1,2
7	Apiaceae	*Daucus carota Schubl and G. Martens*	Carrot	Tap root	karọt	3
8	Apocynaceae	*Holarrlena floribuda (G.Don) Dur. And Schinz*	Conessi.	Seed	Ọkpọ ikọt	3
9	Asteraceae	*Ageratum conyzoides L.*	Billy goat weed, goatweed	Infusion of leaves	Ayanno	3
10	Asteraceae	*Conyza floribunda kunth*	Fleabane	Decoction of leaves	Ntang- ebek mboṅ	1,3
11	Asteraceae	*Vernonia amygdalina Del. Cent*	Bitterleaf	Root	Etidot	1,3
12	Bignoniaceae	*Crescentila cujete Linn*	Calabash tree	Leaves	Ikim eto	3
13	Caesalpiniaceae	*Anthonetha macrophyla P. Beauv*	African rose wood	Leaves	Nya	3
14	Caricaceae	*Carica papaya*	Pawpaw	Decoction of seeds	Udua edi	1,4
15	Clusiaceae	*Garcinia cola Heckle*	Bitter kola, African wonder nut	Seed and leaves	Efiat	1,3
16	Combretaceae	*Terminalia catappa*	Tropical almond, sea almond	Leaves	Mmansang mbakara	1,3

S/N	Family	Botanical names	Common names	Preparation	Ibibio names	Source
17	Combretaceae	*Combretodendrum macrocarpum P. Beauv.*		Decoction of root	Usin eto	2
18	Compositae	*Croton zambesicus mull. Arg.*	Rush foil	Decoction of Leaves	Eto obuma	1,2,4
19	Crussulaceae	*Bryphyllum pinnatum (Lam) Oken*	African never die, resurrection plant	Leaf	Ndodop	3
20	Curcubitaceae	*Mormodia charautia*	Bitter melon, bitter gourd	Decoction of leaves	Mbiadoṅ, edoṅ	4
21	Ebenaceae	*Diosphyyros mespitformis L.*	African ebony	Infusion of the leaves	Obubit neto	3
22	Euphorbiaceae	*Acalypha arvenisis poepp. And endl*	Field copper leaf	Leaves	Okokho nuyin	3
23	Euphorbiaceae	*Alchromia cordefollia (schum and thonn) muell Arg.*	Christmas bush	Infusion of the leaves	mbom	3
24	Euphorbiaceae	*Euphorbia hirta*	Asthma weed	Macerate of the leaves	Atinkene ekpo	4
25	Euphorbiaceae	*Riccinus communis Linn*	Castor oil plant	Seed oil	Eto adan ukebe	3
26	Euphorbiaceae	*Securinega virosa*	Common bush weed	Decoction of the leaves, root and stem bark	Okut uko odoṅ ofoṅ	3,4
27	Fabaceae	*Pterocarpus erinacevis Poir*	Bar wood, munings	Bark	Ukpa	3
28	Gnetaceae	*Gnetum africanum welw*	African jointfir	Leaves	Afang	1,2,4
29	Hippocrateaceae	*Hippocratea africana*	African paddle-pod	Decoction of the root	Eba enang- enang	4
30	Lauraceae	*Cassytha filiformis Linn*	Love vine	Stem	wuọ nduṅ	3
31	Lamiaceae	*Ocimum gratissimum L.*	Lime harry, hoary basil	Leaf	Ntong	1,3
32	Lamiaceae	*Ocimum basillium L.*	Sweet basil, basil	Seeds	ikọ	3
33	Lecythidaceae	*Napoleona vogeli Hook and Planch*	Napoleonaea	Leaves	Eto nduduoho	3
34	Liliaceae	*Aloe barteri Miller*	Aloe vera	Leaves	Akokafid	3
35	Loganiaceae	*Antodeista djalonesis A. Chev*	Cabbage tree	Infusion of the leaves	Ibu	3
36	Malvaceae	*Gossypium herbacium L.*	Levant cotton	Aerial part	Eto-ofom	3

S/N	Family	Botanical names	Common names	Preparation	Ibibio names	Source
37	Malvaceae	*Hibiscus sabdariffa Linn*	Zobo	Infusion of calys of the flower	Ifot ebot, afut iban	3
38	Malvaceae	*Sida acuta Burm*	Broom weed	Aerial part	Odod anwan	3
39	Melastomaceae	*Dissotis rotundifolia triania*	Spanish shawl	Decoction of leaves	Nyin ndaṅ	4
40	Mimosaceae	*Cyclicodiscus gabunensis*	African greenheart	Decoction of the stem bark	Nnyaan	4
41	Musaceae	*Musa sapientum Ivan A. Ross*	Banana	Fruit	Mboro	3
42	Myrataceae	*Psidium guajava L.*	Guava	Infusion of the leaves	Woba	1,3,4
43	Myristicaceae	*Myristica fragrans* (HOUTT)	African nutmeg	Seed	Inwum mbakara	3
44	Phyllanthaceae	*Bridella ferruginea*	Costal golden-leaf	Decoction of stem bark	Udia ufua	4
45	Plantaginaceae	*Plantago major Linn*	Plantain weed	Infusion of the plant	Mbid ukom	3
46	Plumbaginaceae	*Plumbago zeylnica L*	Ceylon leadwork	Root	Afege ntok	3
47	Rubiaceae	*Heinsia crinata (afzel) g. Tayl*	Bush apple	Decoction of root and bark	Atama	1
48	Rubiaceae	*Ixora coccinea L*	Ixora	Decoction of whole plant	Ixora	2
49	Rutaceae	*Murraya koenigai (L)*	Curry leaf tree	Leaf	Eto Iko	3
50	Santalaceae	*Viscum album L.*	Mistletoe	Leaves	Ndoro onyong	3
51	Solanaceae	*Solanum erianthum tuberosum D. Donl*	Potato tree	Infusion of root	Ediam mbakara	3
52	Sterculiaceae	*Cola nitida (Vent) Schott and Endl*	Kola nut tree	Stem bark	Ibong asanu	3
53	Zingiberaceae	*Zingiber officinale Roscoe*	Ginger	Stem	Ginja	3

Sources: 1. Interview. 2. Ajibesin et al. [21]. 3. Nduche and Omosum, [12]. 4. Njume and Goduka, [4]

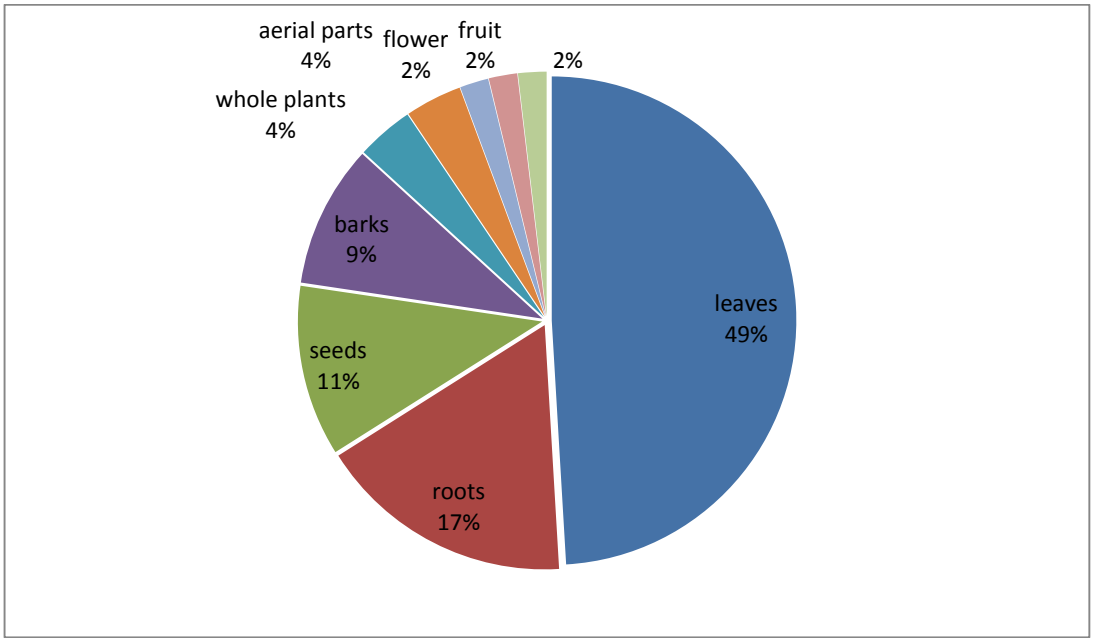

Fig. 3. Percentage distribution of medicinal plant parts in the treatment of diarrhoea

The educational level of an individual plays an important role in the kind of healthcare someone is likely to seek when ill. Table 2, shows that those with primary education make up about forty percent (40%) of the medicinal plant users. Respondents with a maximum of secondary education were thirty five percent (35%) that were in favour of traditional medicine. 25% of those with tertiary education admitted to the use of medicinal plants in the treatment of diarrhoea. This trend shows that the higher the level of education attained, the less likely the the tendency to seek traditional or alternative medicine.

The frequency of use of medicinal plant (Table 3), shows a relationship with the income level. The percentage of those who earn within the twenty thousand Naira to thirty-nine thousand naira range among the respondents was highest (30%) while only 25% of those who earn above fifty thousand naira use medicinal plants (Table 3). On the whole, seventy five percent (75%) of the respondents who agreed to the use medicinal plants for the treatment of diarrhoea were low-income earners. This confirms that low income earners most patronise traditional medicine practitioners because their products are expensive when compared to orthodox medicine [12,11].

This survey is beneficial in knowing the different medicinal plants used in Ibibio land for the treatment of diarrhoea. The table of result of medicinal plants from the respondents shows that the Ibibio people mainly use 14 plants for treating diarrhoea. It is worthy of note that these 14 plants do not provide the entire array of plants that are currently used in Ibibio land for treating diarrhoea, but were derived from those interviewed. There may be other plants that the people use which do not make the list because those who use them were not interviewed. Therefore, it could be said that table 4 provides a list of 14 common plants of 9 famillies that are used to treat diarrhoea in Ibibio land. The family Anacardiaceae is the most commonly used of the 14 plants. *Ocimum gratissimum* L. is the most frequently used plant, having been used by 52 respondents. This family was also common in a survey carried out by Nduche and Omosun [12] in Abia, a neighbouring state. The part of plant mostly used was said to be the leaves, though, the roots and seeds of some plant were also used (Fig. 3). The method of administration was mostly by decoction of the plant part. Some plants were infused while others were macerated.

An ethnobotanical survey of medicinal plants in other parts of the country carried out (Table 5) revealed other plants that are used in other parts of Nigeria for the treatment of diarrhoea, which

are found in Ibibio land. The plants from this survey are used to update what can be referred to as a comprehensive list of the medicinal plants used in Ibibio land for the treatment of diarrhoea. The list as contained in table 5 comprises of 53 plants from 41 families that are readily available in various parts of Ibibio land. Among these, six families appear to be more frequently used than others, and they include Euphorbiaceae, Anacardiaceae, Asteraceae and Malvaceae, Combretaceae and Lamiaceae.

Many more medicinal plants with antidiarrhoeal properties have been studied around the world. Majority of these plants have been studied concerning their phytochemical and pharmacological properties [18,24]. This justifies their use by traditional medical practitioners and individuals in the treatment of diarrhoea.

6. CONCLUSION

This study has shown that the Ibibio people, like many other ethnic groups in the developing economies, use medicinal plants for the treatment of diarrhoea. Income, age, educational level are among the factors that influence the choice of individuals who use medicinal plants. This survey has successfully provided a list of medicinal plants used for the treatment of diarrhoea in Ibibio land and a comprehensive list of medicinal plants used for the same purpose in other locations which are available in Ibibio land of Akwa Ibom state, Nigeria. The list, if made public, will provide an array of options for the treatment of diarrhoea especially in areas where there are no healthcare facilities. Future investigations should aim to isolate, purify, and identify the bioactive components. Such research can help to standardise the extracts and validate these plants as a secure and trustworthy alternative to pharmaceuticals used for the treatment of diarrhoeal infections and are known to have undesired side effects.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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