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Ethnobotanical survey of medicinal plants used in the treatment of gastrointestinal tract infections in Ebiraland Kogi state, Nigeria

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Abstract
An ethnobotanical survey of medicinal plants used in the treatment of gastrointestinal tract infection in Ebira land Kogi State, Nigeria was carried out to obtain relevant information on their uses and potentials. Informed consent was obtained orally from traditional heads of the communities and all the participants before inception of the interview. Ethnobotanical data were collected by oral interview with the aid of a semi-structured questionnaire administered to the respondents which were mainly Herbalists/Traditional medical practioners (TMPs), Herb sellers, Elders and others (Housewives and Mothers). A total of 87 medicinal plant species representing 80 genera and 41 families were documented. The Common names, Local names, Habit, Habitat, Plant parts used, Indications and mode of preparation were also recorded. The Family Fabaceae was the most represented plant family with 8 species. The trees were the dominant plant habit (35.63%). Leaves were the most used plant part (50.27%), the plants obtained from the wild represented 38% while those cultivated made up 62%. Medicinal plants play a substantial role in the management of gastrointestinal tract infection in the study Area. However efforts should be made to conserve medicinal plant genetic resources and reduce pressures on the remaining germplasm to ensure continued access to these plant materials.

Keywords: Medicinal plants, gastrointestinal, ebiraland, ethnobotany

1. Introduction
Ethnomedicinal plants have been used since ancient time for human healthcare and still remains the most widely used medication system in developing and least developed nations [1]. Medicinal plants are considered a repository of numerous types of bioactive compounds possessing varied therapeutic properties. The therapeutic potential of plants has been well explored over a very long time period. The vast array of therapeutic effects associated with medicinal plants includes antiinflammatory, antiviral, antitumor, antimalarial, and analgesic [2]. Ethnobotanical study has been the method often used to search for locally important plant species with low side effects especially for the discovery of crude drugs [3]. Ethnobotany and ethno-medical studies are today, recognised as the most viable methods of identifying new medicinal plants or refocusing on those earlier reported for bioactive constituents [4-5]. Scientific investigations of ethnomedicinal plants have been initiated in many countries because of their contributions to health care. Gastrointestinal tract infections are characterized by inflammation of the gastrointestinal tract that involves the stomach and the small intestine resulting in some combination of diarrhea, vomiting, and abdominal pain and cramping. Although unrelated to influenza, it has also been called stomach flu or gastric flu [6]. Gastrointestinal infections are widespread in regions with low levels of hygiene and sanitation. Infections of the gastrointestinal tract can be caused by viruses, bacteria, protozoa, helminths and occasionally fungi [7]. The abundant information on medicinal plants is in danger of disappearing since it is often kept secret until the last minutes of the death of the traditional healer when they eventually call on somebody to inherit the information [8]. In Ebira land the traditional knowledge is verbally passed from generation to generation and valuable information are usually lost whenever a traditional medical practitioner or herbalist passes away without conveying his traditional medicinal plant knowledge to another.

This knowledge continues to decline over time as there are only few indigenous people with the traditional knowledge. In addition, the loss of valuable medicinal plants due to population pressure, agricultural expansion and deforestation is widely reported by different workers [5, 9]. The documentation of the traditional medicinal plants used by the Ebira people is scanty in literature, this trend might affect the medicinal plants conserved and administered by the local people in future, therefore the assessment and documentation of the knowledge of these indigenous people on the use and management of medicinal plants would fill the gap of indigenous knowledge on medicinal plants. Moreover, the presence of natural and anthropogenic factors affecting the losses of valuable medicinal plants calls for the need to document the eroding medicinal plants and the associated knowledge. This research aims to identify the species of these medicinal plants, determine which plant parts are used for medicinal purposes and mode of administration of these plants

2. Materials and methods

2.1 Study area

Ebiraland, the home of Ebira Tao is located in the central senatorial district of Kogi state. It has a landmass of 3,426km^2. The Ebira People occupy four Local Government Areas (LGA) namely Okene (latitude 7º 33' N and longitude 6º 14' E), Okehi (latitude 7º 40' N and longitude 6º 17' E), Adavi (latitude 7º 36' N and longitude 6º 12' E) and Ajaokuta (latitude 6º 40' N and longitude 8º 48' E) in Kogi central district with Okene the headquarter of this ethnic group (Figure 1). They occupy the hilly stretch of land with metaphoric rocks and undulating plains which rises to a peak of about 2000 feet, located southwest of the Niger- Benue confluence area and share boundaries to the South with the Bassa-nge, Bassa Kwomo and Igala to the North, to the West are various Nupe speaking groups of Kakanda, Eggan, Kupa and Nupe of Bida Emirate and to the South-West are the yoruba-speaking People of Akoko, Owe and Ijumu [10, 11].

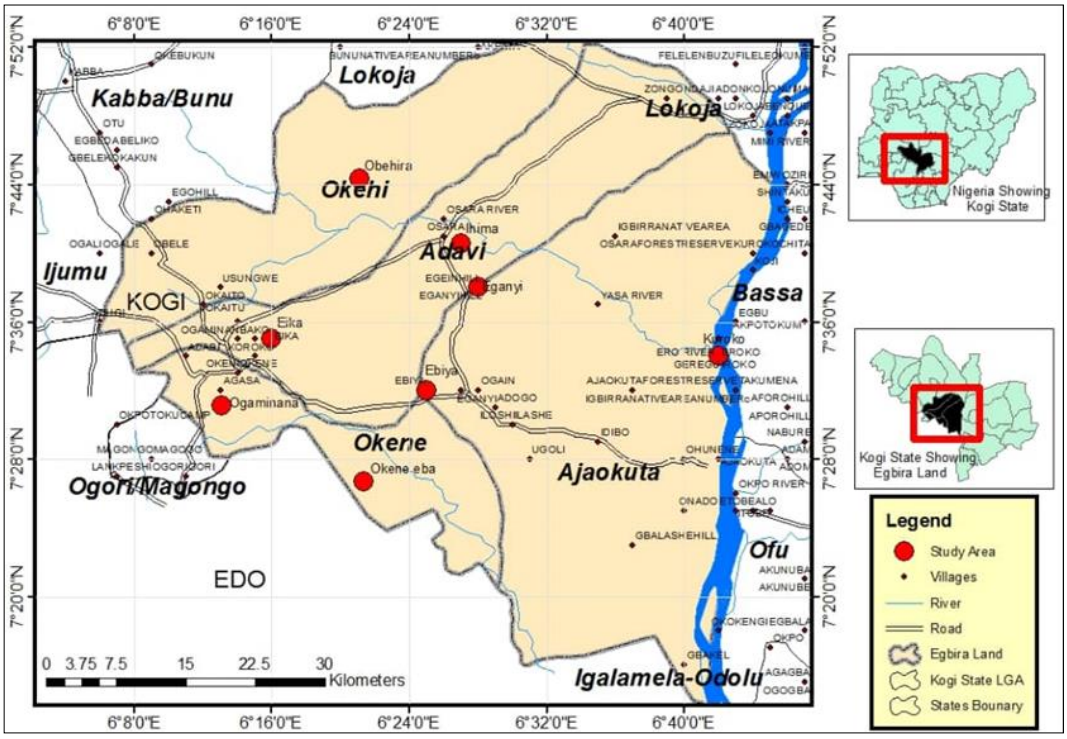

Fig 1: Map of Ebira land showing the study sites

2.2 Data collection procedure

An ethnobotanical survey was carried out between November 2016 and April 2017 to obtain relevant information about medicinal plants used in the treatment of gastrointestinal tract infection in Ebira land Kogi State. Informed consent was obtained orally from traditional heads of the communities and all the participants before inception of the interview. Data acquisition was successively collected using the communicable dialect (Ebira) within the area in line with standard enquiry procedure based on an oral interview with the aid of semi-structured questionnaire and a tape recorder from respondents. The study was conducted in eight locations namely; Eganyi, Ebiya, Obehira, Okene eba, Eika, Ihima, Ogaminana and Kuroko (Figure 1). The selection was made systematically based on the information gathered on the relative status of forest coverage, population settlement and availability of traditional practitioners in the area. In this study informants regardless of gender, age and social status were randomly selected based on their knowledge of traditional medicine. The sample population constituted traditional medicine practitioners (TMPs), Herbalist (also known as traditional healers), Elders with claims of medicinal plant knowledge, Herb sellers, Housewives and Mothers using purposive sampling method.

2.3 Plant collection and identification

Plants specimens indicated in the recipes were collected, pressed, mounted, identified and authenticated using their local names and standard text [12]. Photographs of the collected plant species were also made to facilitate their identification process. Voucher specimens were deposited at the herbarium unit of the Department of Biological Sciences, Ahmadu Bello University, Zaria and the Department of Plant Biology, Bayero University, Kano. The Voucher number, habit and habitat of the plants were recorded for each of the plant species collected.

2.4 Data analyses
The Statistical analyses were carried out using statistical package for social sciences (SPSS 21.0 - computer package). Frequencies, percentages and chi-square were employed to analyze and summarize the data obtained from the ethnobotanical survey.

3. Results
3.1 Demography/personal information on respondents
A total of Eighty (80) respondents were interviewed. The respondents were mainly Herbalists/Traditional medical practioners (TMPs) 37 (46%), Herb sellers 9 (11%), Elders 14 (18%) and others (Housewives and Mothers) 20 (25%). The demographic survey of respondents is presented in Table 1. The result showed that the chi square analysis of the respondents within each of the parameters were not significantly different (p>0.05).

Table 1: Demographic survey of respondents on the Medicinal Plants used in the treatment of gastrointestinal tract infections in Ebiraland, Kogi state, Nigeria.

Parameter	Specification	N (%)
Practice specification	Herbalists/Traditional medical practioners (TMPs)	37 (46)
	Herb sellers	9 (11)
	Elders	14 (18)
	Others	20 (25)
		χ^2 = 22.30
Sex	Male	30 (37.5)
	Female	50 (62.5)
		χ^2 = 5.00
Age (years)	1 - 20	0
	21 - 40	22 (27)
	41 - 60	43 (54)
	>60	15 (19)
		χ^2 = 15.93
Religion	Islam	69 (86)
	Christianity	11 (14)
		χ^2 = 42.05

N = number of respondents; % = percentage of respondents

3.2 Medicinal Plants used in the treatment of gastrointestinal tract infections in Ebiraland, Kogi state, Nigeria.
A total of 87 medicinal plant species representing 80 genera and 41 families were documented. Table 2 gives a concise analysis on medicinal plant species, their families, Common names, Local names, Habit, Habitat, Plant parts used, Indications and mode of preparation. The family, Fabaceae 8 (9.2%) had the highest number of species, followed by Euphorbiaceae 7 (8.05%) and Asteraceae 6 (6.90%) respectively. The result showed that the highest Plant forms were Trees represented by 35.63% followed by Shrubs 22.45% (Fig 2). The most frequently used plant parts were the leaves (50.27%) (Figure 3). Analysis of the table also showed that the plants obtained from the wild represented 38% while those cultivated made up 62%.

Table 2: Medicinal plants used in the treatment of gastrointestinal tract infection in Ebiraland, Kogi State, Nigeria.

Family/ Botanical Names	Common Names	Vernacular names	Parts used	Habit/ Habitat	Indication	Mode of preparation	Voucher number
1. Aizoaceae							
Trianthema portulacastrum L.	Giant Pigweed	Omuavuta	L	Cr/W	Diarrhoea	Infusion	1397
2. Anacardiaceae							
Anacardium occidentale L.	Cashew	Ikashu	SB, L	T/ C	Diarrhoea, Typhoid	Decoction	184
Mangifera indica L.	Mango	Umangoro	SB, L	T/ C	Diarrhoea, Typhoid	Decoction	1944
3. Annonaceae							
Annona senegalensis Pers.	African custard apple.	Ochiku	SB, L	Sh/ W	Dysentry, Stomach disorder	Decoction	382
4. Asclepiadaceae							
Calotropis procera (Ait.) Ait.F	Sodom Apple	Avi-aniwara	L, R	Sh/C	Stomach disorder	Decoction	900219
5. Asteraceae							
Acanthospermum hispidum. Schrank	Star bur	Ovareyikoza	WP	H/W	Stomach disorder	Decoction	900051
Ageratum conyzoides L.	Goat weed	Avi hupa-hupa	WP	H/C	Diarrhoea, Stomach disorder	Decoction	232
Aspilia africana (Pers) C. D. Adams	Wild sunflower	Owozunava	WP	H/W	Typhoid, Stomach disorder	Decoction	1146
Chromolaena odorata (L.) R.M. King & Robinson	Siam weed	Awo	L	T/W	Typhoid	Decoction	1128
Spilanthes filicaulis Schum & Thonn	Brazil cress	Osete	L	Sh/W	Diarrhoea, Dysentry	Infusion	534
Vernonia amygdalina Del.	Bitter leaf	Avi-uzi	L	Sh/C	Typhoid	Maceration	675
6. Bignoniaceae							
Newbouldia laevis (P. Beauv.) Seamen ex Bureau	Fertility Tree	Ogisi	L, RB	T/C	Stomach disorder	Decoction	2881
7. Bombacaceae							

Adansonia digitata L.	Baobab Tree	Ovovo	L	T/C	Stomach disorder	Decoction	1350
Ceiba pentandra Linn.	Silk cotton Tree	Ucheba	L, SB	T/W	Stomach disorder	Decoction	7059
8. Boraginaceae							
Heliotropium indicum L	Cock's comb	Orukonkono	WP	Sh/W	Dysentery, diarrhoea, stomach disorder	Infusion	1654
9. Bromeliaceae							
Ananas comosus (L) Merr	Pineapple	Epoyivo	UF peel	H/C	Stomach disorder	Decoction	032310
10. Caricaceae							
Carica papaya Linn.	Pawpaw	Irenwa	L	T/ C	Dysentry, Typhoid	Decoction	230510
11. Cochlospermaceae							
Cochlospermum planchonii Hook.	False Cotton	Evaze	L,R	Sh/W	Typhoid, Stomach disorder	Decoction	2759
12. Combretaceae							
Terminalia catappa L.	Indian almond	Furutu	L	T/W	Typhoid, Stomach disorder	Decoction	BUKHAN0389
13. Convolulaceae							
Ipomea asarifolia Linn	Morning glory	Etana	WP	H/C	Stomach disorder	Decoction	062408
14. Crassulaceae							
Bryophyllum pinnatum (Lam.) Oken	Resurrection Plant	Iraje Ozi	L	H/C	Stomach disorder	Decoction	3278
15. Cucurbitaceae							
Citrullus colocynthis (L) Schrad	Bitter gourd	Ipapara	F	Cl/ C	Stomach disorder	Decoction	1266
Lageneria siceraria (Mol.)	Long Melon	Ohurere	L	Cl/C	Stomach disorder	Decoction	2934
Luffa aegyptiaca Mill.	Sponge gourd	Awe	L	Cl/C	Diarrhoea, Typhoid	Decoction	1597
Momordica balsamina Linn.	Balsam Pear	Avi-ehe	L	Cl/W	Diarrhoea, Typhoid	Decoction	1857
Telfairea occidentalis Hook.F.	Fluted Pumpkin	Ugu	L	Cr/C	Typhoid, Stomach disorder	Infusion	363
16. Euphorbiaceae							
Euphorbia deightonii Croizat	NA	Okumaba	S	Sh/C	Stomach disorder	Decoction	685
Bridelia ferrugineae Benth	Sweetberry	Awuya	SB/L	T/W	Diarrhoea, Dysentry	Maceration	937
Euphorbia hirta L.	Asthma herb	Ireva uku	WP	H/C	Diarrhoea, Dysentry, Stomach disorder.	Decoction	583
Jatropha curcas Linn.	Physic nut	Avi ochiga	L,R	Sh/C	Typhoid, Stomach disorder	Decoction	1911
Jatropha gossypifolia L.	Wild cassava	Avi ochiga onyivo	L	Sh/C	Typhoid, Stomach disorder	Decoction	1768
Phyllanthus amarus Schum.&Thonn	Hurricane weed	Ogerema	WP	H/C	Typhoid	Decoction	BUKHAN0278
Ricinus communis L.	Castor Plant	Avi-castor	L	Sh/C	Stomach disorder	Decoction	923
17. Fabaceae							
Abrus precatorius L	Crab's eye	Ohinehine-owei	L,S	Cl/W	Typhoid	Decoction	932
Daniellia oliveri (Rolfe) Hutch. & Dalz.	Ilorin balsam	Usechi	SB,L	T/ W	Diarrhoea, Dysentry, Typhoid	Decoction	BUKHAN0268
Desmodium velutinum (P.Beauv.) DC	Hitch hikers	Ema obanyi	L	Sh/W	Stomach disorder	Decoction	166
Mucuna pruriens Linn	Velvet bean	Idaku	L	Cl/W	Typhoid	Decoction	1588
Parkia biglobosa (Jacq)	Locust bean	Unenchi	L,SB	T/C	Diarrhoea, Dysentry, Typhoid	Decoction	7064
Piliostigma thonningii (Schum.) Milne –Redh.	Wild bauhinia	Omuorupa	L	Sh/W	Diarrhoea, Dysentry, Typhoid	Decoction	171
Senna alata (L.) Roxb.	Candle Bush	Idedenguhi obanyi	L	Sh/W	Stomach disorder	Ground into powder and taken with pap	1389
Senna occidentalis L.	Negro Coffee	Idedenguhi owei	L	Sh/ C	Stomach disorder	Ground into powder and taken with pap	1611
18. Guttiferae							
Garcinia kola Heckel	Bitter Kola	Oro	F, RB	T/W	Typhoid	Chewing of nut/Decoction	0625
19. Lamiaceae							
Hyptis suaveolens Poit	Tea bush	Avi opari	L	Sh/C	Diarrhoea, Stomach disorder	Decoction	012310
Ocimum gratissimum L	Scent Leaf	Ireru	L	Sh/ C	Diarrhoea, Stomach disorder	Decoction	1285
Tectona grandis L.F.	Teak	Ochi-ira	L, SB	T/C	Dysentry, Stomach disorder	Decoction	796
20. Lauraceae							
Casssytha filiformis (Linn)	Parasitic vine	Irimanyahu	WP	Cl/W	Typhoid	Ground into powder and taken with pap	2841
21. Liliaceae							
Allium sativum L.	Garlic	Galiki	Bulb	H/C	Typhoid	Decoction	1804
22. Lythraceae							

Lawsonia inermis (L) Keay	Henna	Lali	L	Sh/C	Typhoid	Decoction	0342
23. Malvaceae							
Gossypium hirsutum L.	Cotton Plant	Owu	L, R	H/C	Diarrhoea, Dysentry	Decoction	453
Sida acuta Burm. F.	Wire weed	Irare uno	L	H/C	Typhoid	Decoction	653
Hibiscus sabdariffa L.	Roselle	Ichakoro	L	Sh/C	Dysentry	Decoction	1384
Abelmoschus esculentus (L.) Moench	Okro	Epehu	F	H/C	Dysentry	Made as soup	398
24. Meliaceae							
Azadirachta indica A. Juss	Neem	Dongoyaro	SB,L	T/C	Diarrhoea, Typhoid	Decoction	0900151
Khaya senegalensis (Desr.) A. Juss	Mahogany	Ago	SB,L	T/ C	Diarrhoea, Typhoid	Decoction	1886
25. Moringaceae							
Moringa oleifera Lam.	Moringa	Anahu	L, S	Sh/C	Stomach disorder	Infusion	1136
26. Moraceae							
Ficus capensis Thunb	Cape fig	Ebankoro	L, SB	T/C	Dysentry	Decoction	1019
Ficus exasperata Vahl.	Sand paper Tree	Hariha	L,SB	T/W	Diarrhoea, Dysentry, Typhoid,	Decoction	BUKHAN0499
Ficus platyphylla Del.	Flake Rubber Tree	Okatakiti	L,SB	T/ W	Diarrhoea, Typhoid	Decoction	7230
27. Musaceae							
Musa sapientum L.	Plantain	Ogede-abor	L	H/C	Diarrhoea, dysentry	Decoction	549
Musa paradisiaca Linn.	Banana	Ogede	L	H/C	Diarrhoea, dysentry	Decoction	428
28. Myrtaceae							
Eucalyptus camaldulensis Dehnh	River red gum	Avi fever	L	T/C	Typhoid	Decoction	2510
Psidium guajava Linn.	Guava	Igova	SB,L	T/C	Diarrhoea, Typhoid	Decoction	3253
29. Onchanaceae							
Lophira lanceolata Van Tiegh. ex. Keay	Red oak	Okovi	SB,L	T/W	Diarrhoea, Dysentry, Typhoid	Decoction	BUKHAN0300
30. Palmae							
Cocos nucifera Linn.	Coconot	Atahuneva	FB	T/C	Typhoid	Decoction	1708
31. Papaveraceae							
Argemone Mexicana L.	African poppy	Irarezu	L	H/W	Stomach disorder	Decoction	2439
32. Poaceae							
Bambusa vulgaris Schrad.ex Wendl.	Bamboo	Oparu	L	G/C	Stomach disorder	Decoction	1007
Cymbopogon citratus (DC.) Stapf.	Lemon grass	Avi tea	L	G/C	Typhoid	Decoction	1882
Eleucine indica (L) Gaertn	Goose grass	kirikiri	R	G/C	Typhoid, Stomach disorder	Made as soup	2476
Sorghum bicolor (L.) Moench	Guinea Corn	Aku	S	G/C	Typhoid	Decoction	2319
Zea mays L.	Maize	Apapa	S	G/C	Typhoid	Decoction	1066
33. Rubiaceae							
Borreria stachydea (DC)	NA	Andoji	L	H/W	Stomach disorder	Decoction	2810
Morinda lucida Benth.	Brimstone Tree	Oguro	SB,L	T/ W	Diarrhoea, Dysentry, Typhoid	Decoction	BUKHAN0498
Nauclea latifolia J. E. Smith.	African Peach	Obedu	SB,L	T/ W	Diarrhoea, Dysentry, Typhoid	Decoction	1268
34. Rutaceae							
Citrus aurantifolia (Christm) Swingle	Lime	Oromi owei	F	T/ C	Typhoid	Decoction	1432
Citrus paradisi Macf	Grape	Gerepu	F	T/ C	Typhoid	Decoction	1440
35. Sapotaceae							
Chrysophyllum albidum G. Don.	African Star apple	eha	L, SB	T/C	Diarrhoea, Dysentry, Typhoid	Decoction	2151
Vitellaria paradoxa C. F. Gaertn	Shea butter tree	Okume	L, SB	T/C	Diarrhoea, Dysentry, Typhoid	Decoction	BUKHAN0489
36. Scrophulariaceae							
Scoparia dulcis L.	Sweet broom	Ohinehine sesere	WP	H/W	Stomach disorder	Decoction	555
37. Solanaceae							
Capsicum frutescens L.	Chile pepper	Akoko	F	H/C	Dysentry	Decoction	2845
Datura metel Linn	Devil's trumpet	Avi onuvu	L	H/W	Stomach disorder	Decoction	
Physalis angulata L.	Ballon cherry	Otube	WP	H/C	Diarrhoea	Decoction	6877
38. Sterculiaceae							
Sterculia setigera Del.	NA	Avi-atachi	L,SB	T/W	Diarrhoea, Dysentry, Typhoid	Decoction	900252
39. Talinaceae							
Talinum triangulare (Jacq.) Wild	Water Leaf	Agure	WP	H/C	Stomach disorder	Decoction	2961
40. Verbanaceae							
Gmelina arborea Roxb.	White Teak	Ochi-ichana	F, RB	T/C	Stomach disorder	Decoction	1134
Vitex doniana Sweet	Black plum	Ozunchi	SB,L	T/ W	Diarrhoea, Dysentry, Typhoid	Decoction	1162

41. Zingiberaceae							
Aframomum melegueta K. Schum	Aligator Pepper	Ose	F, Se	H/C	Typhoid	Infusion	5753
Zingiber officinale Roscoe.	Ginger	Ginger	Rh	H/ C	Typhoid	Decoction	3021

Keys: Parts used represented as WP- Whole Plant; S- Stem; SB- Stembark; R- Root; RB- Rootbark; L- Leaves; UF- Unripe fruit; F- Fruit; Rh- Rhizome; Se- Seed. Habit denoted as H- Herb; T- Tree; S- Shrub; G- Grass; Cl- Climber; Cr- Creeper
Habitat denoted as C- Cultivated or W- Wild. NA- Not available

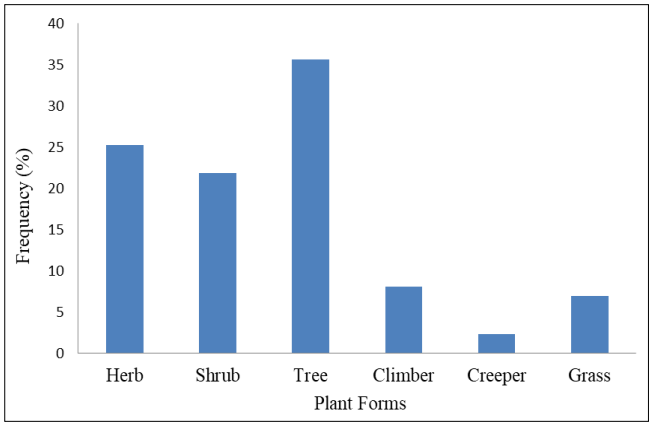

Fig 2: Frequency of plant forms used in the treatment of gastrointestinal tract infections

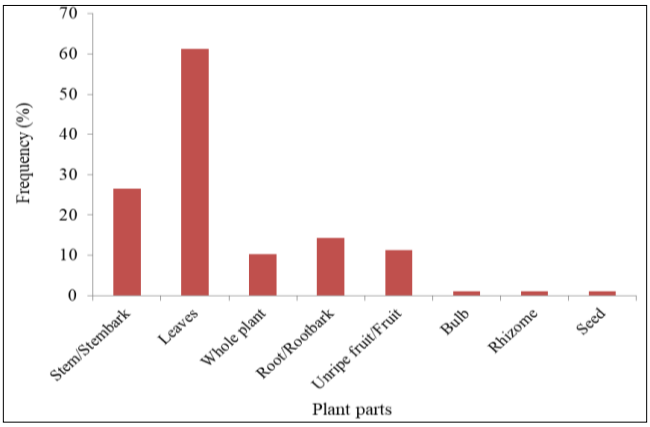

Fig 3: Frequency of plant parts used in the treatment of gastrointestinal tract infections

4. Discussion

Herbal remedies from plants have been used by mankind to cure all types of ailments. The global clamour for more herbal ingredients encourages the local cultivation of medicinal and aromatic crops as well as the sustainable harvest of wild plants. Such endeavors could help raise rural employment in the developing countries, boost commerce around the world and perhaps contribute to the health of millions [13]. The percentage of females who participated in this study were more than men. Gender is a variable that is often, although not always, reported as influencing knowledge acquisition. Some researchers argue that since women are generally responsible for the health and well-being of their children, they tend to have more knowledge about medicinal Plants [14]. Many studies on medicinal Plant knowledge distribution used this model to explain greater medicinal plant knowledge among women than men [15]. This study revealed that medicinal plant knowledge accumulates with age. The knowledge of medicinal plants use is nearly disappearing among the young generation, because most of the knowledgeable persons did not properly pass on their knowledge to the next generation or the knowledge on medicinal plant use is kept secret until their death. Hence, the young generation may not have the opportunity to acquire the traditional knowledge. On the other hand, the positive relationship between age and knowledge may not be entirely due to knowledge accumulation, lifestyle changes of younger community members may have caused a decreased need to learn about medicinal plants. The entire survey of the respondents indicated that a total of 87 medicinal plant species from 41 families were in use by the different categories of practitioners. Plants are more easily recognized by their local names in every part of the world. These local names play a vital role in ethnobotanical study of a specific tribe or region [16, 17]. Respondents interviewed gave Ebira names of plants in recipes used for the treatment of gastrointestinal tract infections. The local names mentioned were authenticated with their respective botanical names using standard texts. Although local names are not recommended directly for scientific accounts of plants as they lack uniformity and consistency [16] (Singh, 2008), yet they may certainly be considered as a useful tool for obtaining useful information on plants. Local names provide means of reference by local people in a particular area. The survey revealed that Fabaceae 8(9.2%) was the most dominant medicinal plant family reported by the respondents of the study area followed by Euphorbiaceae 7(8.05%) then Asteraceae 6(6.90%). Abraha *et al.* [18] had also mentioned that Fabaceae had the largest proportion of medicinal plant spp in their Research. The medicinal plant species mentioned were represented by all plant forms. Trees (35.63%) were found to be the most used plant form followed by shrubs, herbs, grass, climbers and creepers in descending order. In contrast, Hossain and Rahman [19] mentioned in their study that herbs were the most dominant plant species used in herbal medicine (59%), followed by trees (26%), which indicated that the variation of traditional medicinal plants in abundance and diversity was based on agro ecological zone of the study area. It was observed that leaves (61.22%) formed the most frequently used plant parts, followed by stem bark (26.53%), roots (14.29%), fruits (11.22%), whole plants (10.20%), seeds (1.02%), bulbs (1.02%), rhizomes (1.02%). Leaves are the parts actively involved in photosynthesis, hence the numerous bioactive constituents seen in leaves could explain the efficacy in the treatment of diseases. The plant leaves are important ingredient in many herbal preparations. This finding concurred with other studies such as Shosan, *et al.*; Hossain and Rahman [10, 19]. The most common method of preparation of the herbs for the treatment of gastrointestinal tract infection was decoction which involves the boiling of plant materials in a pot and leaving them to cool before drinking. The frequent practice of this method of preparation by most traditional healers may be due to the fact that boiling the ingredients will definitely kill some unwanted microbes present in the content of the remedy. Also, heat may probably facilitate the extraction of the active ingredient in the plant part which is an important item in the remedy. This finding corroborates studies carried out by Ugulu *et al.* [20] and Gbekley *et al.*, [21]. In some cases herbal or steam baths were also prepared, here the plant material was boiled in water, and the patient was bathed in the medicine. Alternatively, the patients covered their heads over a bowl

containing the steaming herbal preparation and inhaled the steam. The least common method of preparation was chewing of the plant parts. Some recipes were prepared from a single plant source while others were in combinations with other plants. Some of the plants revealed in the survey have been cited in some ethnobotanical studies [11, 17, 22, 23].

5. Conclusion

The ethnobotanical survey of medicinal plants indicate that the study area is rich in its medicinal plant composition. A total of 87 medicinal plant species represented by 80 genera and 41 families were documented for the treatment of gastrointestinal tract infection in Ebiraland Kogi State, Nigeria and the most common method of preparation of the herbs was decoction. The future existence of medicinal plants resource and the associate knowledge is under threat because of the ongoing practice of deforestation, agricultural encroachments, over exploitation of plant resources. So, *in-situ* and *ex-situ* conservation strategies of medicinal plants should be adopted and implemented in the district by training (educating and awareness creating) the practitioners. The local government should organize medicinal practitioners association in such a way that their valuable knowledge can be used along with modern medicines.

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