MEDICINAL PLANTS USED IN TREATING DISEASES IN BENUE STATE. NORTH- CENTRAL ZONE-NIGERIA

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ABSTRACT

Background: The study focused on the investigation of traditional uses of various medicinal plant species of the study area. **Objective(s) of study**: This study attempts to document information on the traditional medicinal plants used by the local communities and Traditional Medicine Practitioners (TMPs) in Benue state to treat human diseases/ailments. **Methodology**: Ethno-botanical data were collected using semi-structured questionnaires, group discussions, guided field walks and observations with participants. **Results:** A total of 105 medicinal plants distributed in 47 families were collected and identified. Plant family with the highest medicinal plants in the study area used for treatment of various diseases were Fabaceae (19 species), Euphorbiaceae (11 species), Moraceae (8 species), Bignoniaceae (8 species), Lamiaceae (6 species), Zingiberaceae (6 species), Myrtaceae (5 species); Meliaceae and Combretaceae had 4 species each. Other families had between 1-3 species. The result of the growth form analyses showed that shrubs constituted the highest proportion of medicinal plants. Leaves were the most frequently utilized plant part for preparation of herbal medicines. Crushing has a widely used mode of preparation of traditional remedies while oral administration was the dominant

route. The male gender forms the majority of herbal medicinal Practioners, Eleven (14.67%) were females and 63 (60.33%) were males and most of them were above the age of 50 years. Twenty-six of the people who took part in the study were above the age range of 50 years, fifteen were in the age range of 40-50, eleven in the range of 30-40 and one in the range of 20-30. **Discussion:** This shows that the younger generation had little or no interest in Traditional herbal practice. The traditional medicinal practitioners in the study area possess traditional knowledge of medicinal plants to treat various human diseases however, agricultural expansion and disinterest of younger generations became the major threat to medicinal plants practice. **Conclusions:** It is therefore, to preserve this indigenous knowledge on traditional medicine by proper documentation of plant species used in herbal preparations is the aim of this study. This will save medicinal plants from further loss by involving local communities in cultivation of the most utilized medicinal plants is recommended. Disease states like Cough, breathlessness/asthma and bronchitis which are symptoms of COVID-19 were some of the diseases being treated by the TMPs in the survey. Such plants can be analyzed and used in preparation of drugs for COVID-19.

Keywords: Herbal medicine, TMPs, COVID-19, Nigeria

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INTRODUCTION

Benue State lies within the lower river Benue trough in the middle belt region of Nigeria. Its geographic coordinates are longitude 7° 47' and 10° 0' East and Latitude 6° 25' and 8° 8' North; and shares boundaries with five other states namely: Nasarawa to the north, Taraba to the east, Cross-River to the south, Enugu to the south-west and Kogi to the west (Fig. 1 & 2). Benue occupies a landmass of 34,059 square kilometers and with a population of about 5,181,642 in 2016.

Benue State was first created on 3rd February 1976. It was one of the seven states created by the military administration headed by General Murtala Mohammed; the new Benue State of today has twenty-three (23) local government areas, which are administered by local government councils. In Benue Tiv, Idoma, and Igede are spoken predominantly. There are other ethnic groups as well. These include Etulo and Abakwa. Benue State is named after the Benue River and was formed from the former Benue-Plateau State in 1976, along with Igala, and some part of Kwara State. The people of the state are famous for their cheerful and hospitable disposition as well as rich cultural heritage. The Local Government Areas (LGA) include: Ado, Agatu, Apa, Buruku, Gboko, Guma, Gwer East, Gwer West, Katsina-Ala, Konshisha, Kwande, Logo, Makurdi, Obi, Ogbadibo, Ohimini, Oju, Okpokwu, Oturkpo, Tarka, Ukum, Ushongo and Vandeikya.

Plant resources have remained an integral part of human society throughout history. After fulfilling the primary needs like food and shelter, man has sought for a suitable remedy among plants for curing various diseases [WHO, 2002]. Traditional medicine is defined as indigenous medicine that is used to maintain health and to prevent, diagnose, and treat physical and mental illnesses differently from allopathic medicine based on theories, beliefs, and experiences [WHO, 2012]. Traditional medicine has been used for thousands of years with great contributions made by practitioners to human health, particularly as primary health care providers at the community level and has maintained its popularity worldwide [WHO, 2008]. According to Sofowora, 1982, about 60-85% of the population in every country of the developing world has to rely on traditional medicine. The use of plants in the tropical and

subtropical regions is diversified and most of the uses are for medicine, source of food, clothing and shelter. But the medicinal uses of plants are rapidly declining among the present generation of local people as a consequence of modernization and civilization (Cox, 2005). The younger generation is showing little interest in learning this valuable science of healing. Usage of medicinal plants to cure diseases has also been much influenced by religious practices (Trease and Evans, 1989; Wambebe, 1999). All over the world, several ethno-botanical studies focusing on medicinal plants have been documented (Ekpendu *et al.,* 1998; Balansard and Timon, 2000; Singh and Singh, 2001; Wang *et al.*, 2002; Cox, 2005; Kumar *et al.*, 2005; Pei, 2005). But in Nigeria, very little information about ethnobotanical studies has been documented (Gill, 1992; Sofowora, 1993; Igoli *et al*., 1999; MacDonald *et al*., 2014; Shomkegh, *et al.*, 2016). Therefore the need for proper documentation of traditional medicinal practices among the people in Nigeria where there has been a dearth of published information is immediately called for and this accounts for the rationale to undertake the present study.

This study represents an attempt to document information on the traditional medicinal plants used in Benue state, Nigeria. A compiled check list of these plants including their Latin names, families, part used, uses, and names in different languages in Benue state and a cure for COVID 19 is the main purpose of this study. The documentation of medicinal uses of African plants is becoming increasingly urgent because of the rapid loss of the natural habitat for some of these plants due to anthropogenic activities.

Thus, this study was initiated to document and identify the traditional medicinal plants knowledge accumulated by local communities of Benue state. Plants used for disease states like Cough, breathlessness/asthma and bronchitis which are symptoms of COVID-19 were some of the diseases being treated by the TMPs in the survey. These could be useful for the identification of plants with medicinal potential for scientific investigation, validation and manufacture of drugs to treat COVID 19 symptoms.

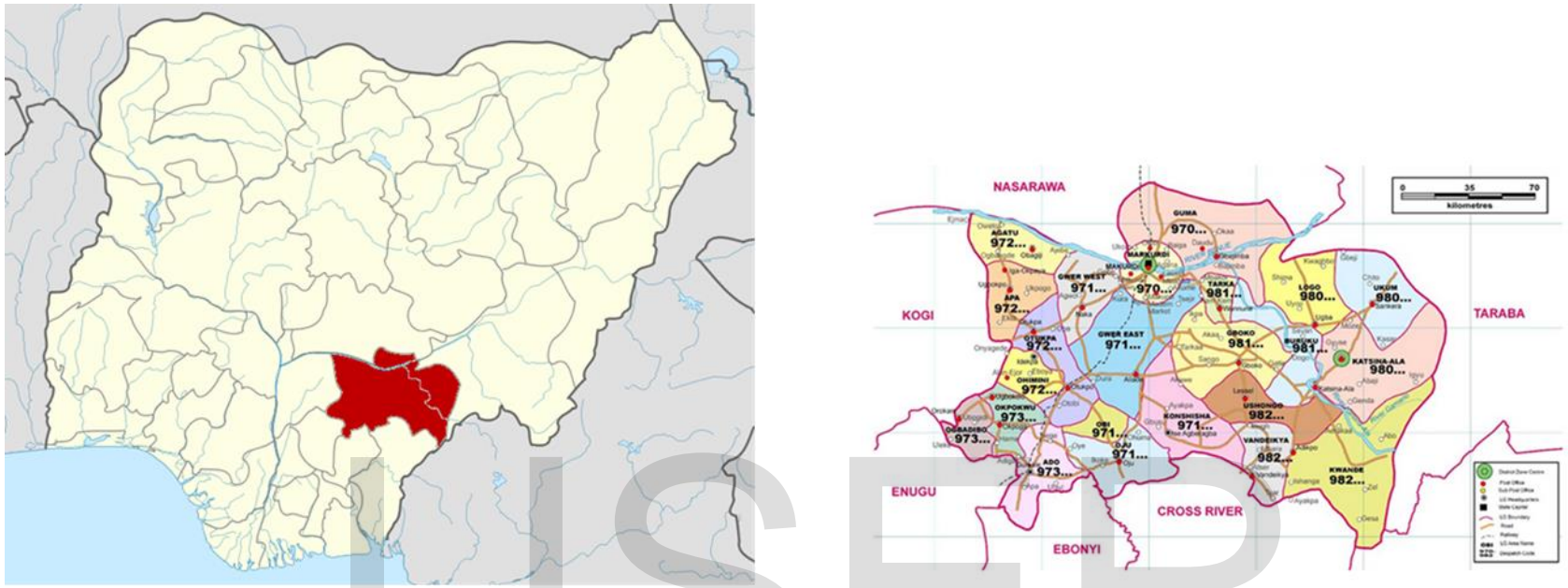


Figure 1a. General map of Nigeria showing its states (Benue in red). 1b. Local Government Areas and neighboring States

Table 1: The various ethnic groups in Benue State and their Local Government Areas

S/No	Ethinic group	LGA
1.	Idoma, Igede, Igbo, Akweya and Nyifon	Ado, Agatu, Apa, Obi, Ogbadibo, Ohimini, Oju, Okpokwu, and Oturkpo.
2.	Tiv, Etulo and Jukun	Buruku, Gboko, Guma, Gwer East, Gwer West, Katsina-Ala, Konshisha, Kwande, Logo, Makurdi, Tarka, Ukum, Ushongo and Vandeikya.

METHODOLOGY

Selection of Study Sites

A reconnaissance survey of the study area was conducted. The study sites were selected depending on recommendation from the TMPs, local authorities, and altitudinal range. Thus, the study was carried out in gatherings in four locations in Benue state (Adi-Etulo, Agboda, Gboko and Otukpo) where the TMPs converged to be interviewed.

Figure 2. A- D. Group of TMPs in Adi-Etulo for interview for the survey

Figure 3. A- D. Group of TMPs in Adi-Etulo for interview for the survey

Figure 4. A- D. Group of TMPs in Adi-Etulo for interview for the survay

Figure 5. A- D. Drying and packaging of herbal products in Adi-Etulo

Figure 6. A. The survey team being treated with pounded yam and bush meat after the survey

Figure 7. A- D. Group of TMPs in Amgboda-Ohimini for the interview for the survey

Figure 8. A- D. Group of TMPs in Otukpo for the interview for the survey

Figure 9. A- C. TMP in Otukpo Administering herbs to clients
D. Drying of leaves

Selection of Participants

A total of 75 participants (64 men and 11 women) were selected randomly from the representative LGAs. Representative common participants and knowledgeable traditional medicine practitioners of Benue state were selected using random and purposive sampling approaches, respectively, following Martin, 1995. Key participants were selected purposively and systematically based on the recommendations of knowledgeable elders, local authorities, and development agents. Local healers automatically qualified as key participants being traditional experts who are guardians of indigenous knowledge on medicinal plants.

Ethno-botanical Data Collection

The standard data collection methods [Martins, 1995; Alexiades, 1996; Cotton, 1996] have been followed to document indigenous knowledge of the local community on health, use, conservation, and threats of medicinal plants. The techniques employed for data collection were semi structured questionnaires, group discussion, guided field walks, and observations with participants. Semi structured questionnaires were undertaken based on checklist of questions prepared in English and translated to Tiv and Idoma the language of local people. Information was carefully recorded during an interview with a participant. The interview was guided to cover the key topics on the checklist. Field observations were performed on the morphological features and habitats of each medicinal plant species in the field. Brief group discussions were made with participants regarding the medicinal plants in the study area. The discussions were conducted on threats to medicinal plants, conservation of the medicinal plants, and transferability of knowledge in the community. Verbal consents were also obtained from the participants by performed group discussions about the objectives of the study prior to the interviews, and all data were collected through their oral consents. Honorariums in cash were given to all the participants.

Voucher Specimen Collection

The voucher specimens were collected on site during guided field walk, numbered, pressed, dried for identification. Identification was carried out using Flora of Nigeria comparing with already identified specimens. A confirmation trip (FRIN-Ibadan) was carried out for some of the collected plants. Finally, the identified specimens were stored at the National Institute for Pharmaceutical Research and Development Herbarium, Abuja-Nigeria.

Data Analysis

The collected ethno-botanical data were summarized using descriptive statistical methods such as frequency, percentage, tables, and graphs.

RESULTS AND DISCUSSION

Medicinal Plants of the Study Area

A total of 105 medicinal plant species belonging to 47 families were used by the local communities to treat 47 human ailments (Table 2). Fabaceae had the leading family with 19 species. Of the ethno medicinally important plant species that are used to treat human ailments recorded in 14 local LGAs, 15 (14.3%) were from home gardens and 91 (86.7%) species were from the wild. Various studies conducted in Benue state reported that most of medicinal plants are being harvested from non-cultivated areas (MacDonald *et al*., 2014; Shomkegh *et al.*, 2016; Monier and El-Ghani, 2016). The study conducted by Monier and El-Ghani, indicated that the highest number (90.43%) of medicinal plants was collected from wild. Similarly, in this report about 86.7% of medicinal plants were harvested from wild. This observation is a good indication of the fact that the local people have not yet started cultivating most of the plant species they are using as remedies for diseases.

Table 2: List of Medicinal Plants used by TMPs for Treatment of Diseases in Benue State

S/N	Scientific Names	Family	Local Names	Plant part used	Ethno-medical Uses	Preparation, Administration & dosage
1.	*Syzygium guineense* *Acalypha wikesiana*	Myrtaceae Euphobiaceae	Uvi (Etulo)	Leaves, twig,	Skin infection Constipation	Drink Decoction and used in a bathe
2.	*Vitellaria paradoxa* *Alchornia laxiflora*	Sapotaceae Euphorbiaceae	Chamegh (Tiv)	Stem, roots, leaves	Infection/venereal diseases	Drink decoction and as a bathe
3.	*Syzygium guineense* *Antidesma venosum*	Myrtaceae Euphorbiaceae	Daanyam (Tiv)	Stem bark	Anthelmintic	Drink decoction
4.	*Allium sativa*	Amaryllidaceae	Garic (Tiv)	Bulb	Asthma, cough, fever	Crush and add to honey and lick
5.	*Vernonia amygdalina* *Bridelia ferrufuginea*	Asteraceae Euphorbiaceae	Ituna (Tiv)	Stem bark leaves	Diabetes Mouth wash/Oral trash, gonorrhea	Recipe Administration not specified

6.	*Ficus polita,*	Moraceae	Akinde-Nor	Leaves, fruit, bark	Malaria	Recipe Administration not specified
	F. thonningii	,,				
	Blighia sapida	Sapindaceae				Not specified
	Vernonia amygdalina		Ituna (Tiv)	Leaves	Diabetes	
7.	*Citrus limon*	Rutaceae		Leaves, fruit, bark	Cold, cough	
	Piper umbellatum	Piperaceae		Leaves, root, fruits,	Rheumatism, inflammation	
8.	Piper nigrum	Piperaceae	Hookula (Tiv)	Fruits	Rheumatic pains, pile	Add to soups.
9.	*Ocimum gratissimum,*	Labiatea	Kungureku , Jiargba	Leaves and	Ring worm,	Topical application
	Periscopsis laxiflora	Fabaceae	(Tiv)	fruits	scabies	
	Cola milleni	Sterculiaceae				
10.	*Khaya senegalensis*	Meliaceae	Haa , Asange chi	Stembark,		Recipe Administration not specified
	Cola nitida	Sterculiaceae	(Tiv)	seeds, kernel	Diarrhea	Recipe Administration not specified
11.	*Streospermum kunthianum,*	Bignoniaceae,	Kpantembe,			Recipe Administration not specified
	Urena lobata	Maliaceae	Ishoho (Tiv)	Seeds	Nasal congestion	
	Butyrospermum paradoxum	Sapotaceae				
12.	Chryophyllum albidum	Sapotaceae	Ayaka yaka (Tiv)	Bark, leaves	Fever/malaria	Recipe Administration not specified
13.	Baccopa monnifera	Scrophulariaceae	Agbenge alum (Tiv)	Whole plant	Cough, catarrh, bronchitis	Recipe Administration not specified
14.	*Khaya senegalensis*	Meliaceae	Haar (Tiv)			Recipe Administration not specified
	Ceiltis					
15.	*Combretum Molle*	Combretaceae	Azulugh (Tiv)	Root	Arthritis	Recipe Administration not specified
	Ceiltis midbreadii	Ulmaceae				

16.	*Kigelia africana* *Clerodendrum capitata*	Bignoniaceae Verbanaceae	Nonogye (Etulo)	Leaves, root	Wound and cuts	Recipe Administration not specified
17.	*Stereopermum kunthianum* *Lantana camara*	Bignoniaceae Verbenaceae	Kpantembe (Tiv)	Leaves	Fever, aniseptic	Recipe Administration not specified
18.	*Meytenus senegalensis*	Celastraceae	Alomade (Tiv)			Recipe Administration not specified
19.	*Khaya senegalensis* *Lippia multiflora*	Myrtaceae Verbenaceae	Haar (Tiv)	Whole plant	Hypertension	Recipe Administration not specified
20.	Afromorsia spp.	Zingiberaceae		Root	Anthelmintics	Recipe Administration not specified
21.	*Burkea africana* *Afromomum melegueta*	Fabaceae Zingiberaceae	Yitse (Etulo)	Leaves, seeds	Stimulant, smallpox	Recipe Administration not specified
22.	*Ficus spp.* *Kaempfera nigerica*	Moraceae Zingiberaceae	Akinde (Tiv)	Rhizome	Mental disorder	Recipe Administration not specified
23.	*Curcuma longa*	Zingiberaceae	Mngerem wenge (Tiv)	Rhizome	Jaundice, eye wash	Recipe Administration not specified
24.	*Cocos nucifera*	Arecaceae		Bark, root, nuts	Bronchitis, scabies	Recipe Administration not specified
25.	*Elaeis guineensis* *Lophira alata*	Palmaceae Ochnaceae	Wule (Tiv)	Roots, bark, seeds, leaves	Fever/jaundice	Recipe Administration not specified
26.	*Ludwigia suffruticosa*	Onacaceae	Nunun (Tiv)	Whole plant	Vomiting, anti-tumor	Recipe Administration not specified

27.	*Burkea africana* *Ficus exasperate*	Fabaceae Moraceae	Gbagbongom (Tiv) Dark brown powder	Stem bark Leaves, bark, root, seeds	Diabetes Stomach disorder	Recipe Administration not specified
28.	*Terminalia avicennioides* *Nymphaea lotus*	Combretaceae Nymphaeaceae	Kuegh (Tiv)	Whole plant	Vomiting, anti-tumor	Recipe Administration not specified
29.	*Vitex laxifolia*, *Khaya senegalensis* *Ficus capensis*	Verbenaceae , Myrtaceae Moraceae	Kpan huu, Haa (Tiv)	Leaves, root, fruits	Leprosy, dysentery, gonorrhea	Recipe Administration not specified
30.	*Arthocarpus altilis*	Moraceae	Shokoshoko (Tiv)	Roots, fruit, wood	Fever, sedative	Recipe Administration not specified
31.	*Protea madiensis* *Moringa oleifera*	Proteaceae Moringaceae	Ndough kpough (Tiv)	Whole plant	Veneral diseases, inflammatory diseases	Recipe Administration not specified
32.			Achikpokpo (Tiv)			
33.	*Stereospermum kunthianum*, *Azadirachta indica*	Bignoniaceae Meliaceae	Kpantembe, Abogoo (Tiv)	Root powder induce sneezing	Malaria, jaundice, syphilis	Recipe Administration not specified
34.	*Syzygium guineense* *Hibiscus sabderiffa*	Myrtaceae Malvaceae	Daanyam (Tiv)	Leaves, calyx, flower	Cough, blood tonic	Recipe Administration not specified
35.	*Raphia sudanica* *Allium cepa*	Palmaceae Liliaceae	Icor (Tiv)	Bulb, leaves	Cough, anthelmintics	Recipe Administration not specified
36.	*Aloe vera*	Liliaceae	Mbimbi (Tiv)	Leaves	Guinea worm, breast cancer	Recipe Administration not specified
37.	*Grewia venusta*, *Cassytha filiformis* *Lawsonia inermis*	Lauraceae Lythraceae	Hueza, GbarAndo (Tiv)	Leaves, flower, bark	Skin diseases, jaundice, malaria	Recipe Administration not specified
38.	*Napoleona vogelii*	Lecythidaceae		Leaves and	Diabetes,	Drink decoction

				stem	fever,	
39.	*Steculia setigera*	Sterculiaceae	Kumenduur (Tiv)			
	Napoleona imperialis	Lecthidaceae		Leaves and stem	Asthma, cough	Drink Decoction
40.	*Hibiscus spp.*	Malvaceae	Ashwe (Tiv)			Recipe Administration not specified
	Abrus precatoria	Fabaceae		Leaves, seeds, roots	Anti-dote for poison, conjunctivitis	
41.	*Khaya senegalensis, Afromorsia laxiflora*	Myrtaceae Fabaceae	Haa, Baver (Tiv)	roots	Body pain	Recipe Administration not specified
42.	*Afzelia Africana*	Fabaceae	MtseAgalen (Tiv)	Root, leaves, stembark	Gonorrhea	Recipe Administration not specified
43.	*Maytenus senegaleensis, Albizia lebbeck*	Celastraceae, Fabaceae	Alomade, Manyothea (Tiv)		River blindness/eye diseases	Recipe Administration not specified
44.	*Cajanus cajan*	Fabaceae	Charakem (Tiv)	Leaves, seeds	Smallpox, mouth wash,	Recipe Administration not specified
45.	*Khaya senegalensis*	Myrtaceae	Har (Tiv)	Leaves,	Convulsion	Recipe Administration not
	Calliandra portoriensis	Fabaceae		twig, root		specified
46.	*Danielia oliverii*	Fabaceae	Har (Tiv)	Gum, bark,	Urinaru track infection	Recipe Administration not specified
47.	*Maytenus senegalensis*	Celastraceae	Ato-elawu (Etulo)		Diabetes,	Recipe Administration not
	Delonix regia	Fabaceae			anthelmintics	specified
48.	*Diallium guinense*	Fabaceae	Anudeku (Hausa), Mkehem (Tiv)	Leaves, twig, fruit, bark	Cough, bronchitis	Recipe Administration not specified
49.	*Stereospermum kunthianum*	Bignoniaceae	Kpantembe,	Seeds	Laxative	Recipe Administration not
	Glycin max	Fabaceae	Daamyam (Tiv)			specified
50.	*S. kunthianum*	Bignoniaceae	Kpantembe (Tiv)	Leaves	Spleen	Recipe Administration not
	Syzygium guineense	Myrtaceae	Daamyam (Tiv)		infection	specified
	Irvingia gabonensis	Irvingiaceae				
51.	*Hurungena madagascariensis*	Hypericaceae	Otse-ogbe (Etulo)	Stem, bark	Pile,	Recipe Administration not

				root	trypanosomiasis	specified
52.	*Euphorbia hirta*	Euphobiaceae	Lisha (Tiv)	Whole plant	Asthma,	Recipe Administration not specified
53.	*Ficus ingens*	Moraceae	Andundu (Etulo)			Recipe Administration not specified
54.	*Gardenia aqualla* *Anona senegalensis* *Diosperos mespiliformi* *Jathropha curcas*	Rubiaceae Annonaceae Ebenaceae Euphorbiaceae	Iklaga (Idoma) Ukpokpo (Idoma) Ogbaklitu (Idoma) Ogbe-Gwa (Idoma)	Roots	Infertility in women.	Take three of the roots scrapped and pound fresh and the liquid squeezed out and put in a bottle. The liquid is taken and when that is exhausted the dried chaff is taken in bits and ground and then mixed with yam pottage and eaten for infertility in women. No dosage given
55.	*Solanum nigrum* *Jasminium dichotonum* *Chaemachrista tectorum* *Parinari curatrllifolia* *Paulinia pinnata*	Solanaceae Oleaceae Chrysobalanaceae Sapindaceae	Ebee (Idoma) Onyakwe-chi (Idoma) Itali-ekwu (Idoma) Ogbemlegede(Idoma) Odaubi (Idoma) Ikinibi-agwu (Idoma)	Leaves	Convulsion	All the Leaves or any three with ebee must be among the three, pound together and rubbed on the neck and also made into a neck-lace and hugged on the neck for convulsion. No dosage given
56.	*Terminalia avicenoides* *Piliostigma thonningii* *Annona senegalensis* *Sarcocephalus latifolia*	Combretaceae Fabaceae Annonaceae Rubiaceae	Okwo, Ontra (Idoma) Obankpanya (Idoma) Ukpokpo (Idoma) Oya (Idoma) Itali-onipi (Idoma)	Leaves Root Leaves	Typhoid/Malaria and eye disease	1. These plants are fairly dried and boiled and the liquid taken three times a day for the first 3 days and the twice a day for the next 3 days for typhoid and malaria fever. 2. The fresh leaves of this

					plant is macerated and the juice put in the eye once a day for three days. Three times a day for 3 day and twice a day for the next three days.
57.	*Phyllanthus amarus*	Euphorbiaceae	Whole plant	Jaundice, insomnia Snake bite	Drink decoction He has remedy for snake-bite but he is not ready to disclose the information. Meaning he only cures whenever a patient is brought to him
58.	*Euphorbia heterophylla*	Euphorbiaceae	Whole plant	Skin diseases	Drink decoction and bathe
59.	*Croton zambesicus*	Euphorbiaceae Light brown powder	Leaves, twig	Pile, gonorrhea	Recipe Administration not specified.
60.	*Anageissus leiocarpus* *Zanthozyllum zanthoxyloides* *And Terminalia avicennioides* *(root), honey.*	Combretaceae Rutaceae	Stem bark Stem bark Root	Asthma	Pound equal proportions of the three plant parts together (*Anageissus leiocarpus*, *Z. zanthoxyloides* and *Terminalia avicennioides*). Add 4 liters of water and boil for one hour. Leave to cool and add honey to the filtrate. Take ½ cup in the morning and ½ cup in the evening for 5-10 days
61.	*Senna mimosoides* *Xylopia aegiptiaca* *Capsicum annum* *Z. zanthoxyloides*	Fabaceae Annonaceae Solanaceae Rutaceae	Arial part Fruit Fruit Stem bark	Asthma	**Two stages**: 1. Slaughter the chicken (local) in the evening, burn the feathers, chop into

	honey, *whole chicken*, *Allium cepa*, *Salt*	Amaryllidaceae	Bulb		pieces, wash and put in an earthen pot. Add *A. cepa*, C. annum, and, salt, put the *S. mimosoides* and add 1L honey. Cover the pot and bury till the next day. Cook the mixture and eat one piece of the meat three times each day until it finishes. 2. Grind ginger, and pepper together. Grind alligator pepper separate and mix. Add 1L of honey to the mixture. Then take two table spoons full in the morning and 2 in the evening. The space b/w stage 1 and 2 is 1-2 weeks.
62.	*Zingiber officinalis* *Aframomum melagueta* *Capsicum annum* *Xylopia aegyptiaca* *Zanthozyllum zanthoxyloides* Honey.	Zingiberaceae Zingiberaceae Solanaceae Annonaceae Rutaceae	Rhizome Seeds Fruits Fruit Stem bark	Asthma	½ mudu of *Zingiber officinalis*, 10 seeds of *Aframomum melagueta*, 10-15 fruits of *C. annum* and Z. zanthoxyloides (s/b) Grind together and add 1L of honey. Take two spoons in the morning and two spoons in the evening for seven days.
63.	*Zanthozyllum zanthoxyloides* *Vernonia amygdalina* Honey.	Rutaceae Asteraceae	Stem bark Leaves and roots	Asthma	Take 6 leaves of bitter leaf in a pot, add the root also and add s/b of

					Zanthozyllum zanthoxyloides add water and boil. Take 1cup a day for when you feel better.
64.	*Ocimum gratissimum* *Periscopsis laxiflora* *Maytenus senegalensis*	Lamiaceae Fabaceae Celastraceae	Leaves Roots Roots	Asthma	*Ocimum gratissimum* (leaves), *Periscopsis laxiflora* (root), *Maytenus senegalensis* (root). Boil all together and drink filtrate 3 times a day (morning, afternoon and evening) for 6 days.
65.	*Zingiber officinalis* *O. gratissimum (leaves)*	Zingiberaceae Lamiaceae	Rhizome Leaves	Asthma	*Zingiber officinalis* (rhizome), *O. gratissimum* (leaves) Mix the two plants cook and drink the filtrate. Drink a cup 2 times a day, morning and evening.
66.	*Andropogon schirensis* *Ficus sur* *Anthocleista djalensis*	Poaceae Moraceae Loganiaceae	Leaves Roots Roots	Dysentery	Put in a pot as arranged as in the list. Boil with water and take 1 cup of the filtrate morning and evening for 6 days.
67.	*Periscopsis laxiflora* *Occimum gratissimum* *Senna accidentalis*	 Lamiaceae Fabaceae	Stem bark Leaves Leaves	Ear pain	Add little water to the three plants and crush, squeeze and put in your two ears 2 times in day for as long as no more pains in the ear.
68.	*Bryophylum pinnata*		Leaves	Ear pain	Roast the leaf for 2 minutes, squeeze and put liquid in the ear

69.	*Periscopsis laxiflora* *Ocimum gratissimum* *Senna occidentalis* *Capsicum annum*	Fabaceae Lamiaceae Fabaceae Solanaceae		Stem bark Leaves Leaves Fruits	Ear pain/ Mombs	Add little water and squeeze the liquid and put in the two ears. Two times a day for as long as no more pains. Mix and grind the first 3 plants with 6 fruits of capsicum annum and make a paste and rub on affected ear.
70.	*Ficus platyphylla* *Kigelia africana*	Moraceae Bignoniaceae		Leaves Leaves and stem	Infection in private part	
	Gladiolus spp		Okpendu (Idoma)	Rhizome		Add to gruel/kunu
71.	*Croton lobatus*	Euphorbiaceae		Root, leaves	Worms HIV/AIDS	He lives in wukari but from Benue state. He claims he has remedy for HIV/AIDS. Refused to disclose the recipes. He only cures.
72.	*Kigelia Africana* *Anropogon schirensis* *Red potash* *Senna occidentalis*	Bignoniaceae Poaceae Fabaceae		Root Whole plant Root	Prostate cancer	Combine and boil. Filter and take a cup full two times (morning and evening) a day Recipe Administration not specified
73.	*Croton zambezicus*	Euphorbiaceae		Plant	Anti-thunder plant	Plant the tree beside the house to prevent thunder from doing any damage in the house
74.	*Mangifera indica*			Stem bark	Blood booster Hepatitis A &	Any three of the roots scrapped and pound fresh

				B	and the liquid squeezed out and put in a bottle. The liquid is taken and when that is exhausted the dried chaff is taken in bits and ground and then mixed with yam pottage and eaten for infertility in women. No dosage given
75.	*Carica papaya*	Caricaceae	Leaves, seeds, fruit	Gonorrhea , mental disorder	
	Cleome gynandra/	Capparaceae	Leaves, seeds	Rheumatism, easy labour	Recipe Administration not specified

KEY: Numbering on the table represent number of participants in the interview.

Table 3. Medicinal Plants for Asthma/cough/Catarrh/Nasal congestion/Bronchitis from the survey

S/N	Plant Name	Part used
1.	*Citrus limon*	Leaves, fruits
2.	*Urena lobata*	Seeds
3.	*Baccopa minifera*	Whole plant
4.	*Syzygium guineense*	Leaves
5.	*Rahia sudenica*	Leaves
6.	*Napoleona imperialis*	Leaves and stem
7.	*Dialium guineense*	Leaves, twig, fruits and bark
8.	*Senna mimisoides*	Whole plant
9.	*Xylopia aegyptica*	Fruit

10.	*Capsicum annum*	Fruit
11.	*Zanthozylum xanthozyloides*	Stem bark
12.	*Zingiber officinalis*	Rhizume
13.	*Aframomum melagueta*	Seeds
14.	*Vernonia amygdalina*	Leaves
15.	*Maytenus senegalensis*	Roots
16.	*Allium sativa*	Bulb
17.	*Terminalia avicennioides*	Leaves
18.	*Piliostigma thonningii*	Bark and leaves

Fourteen (14) LGAs of Benue state were represented in the study. Eleven (14.67%) TMPs were female and 64 (60.33%) were males. Twenty-six of the people who took part in the study were above the age of 50 years, fifteen were in the age range of 40-50, eleven in the range of 30-40 and one in the range of 20-30. Some did not respond (Table 3 &). This shows that the younger generation have little or no interest in the Traditional herbal practice.

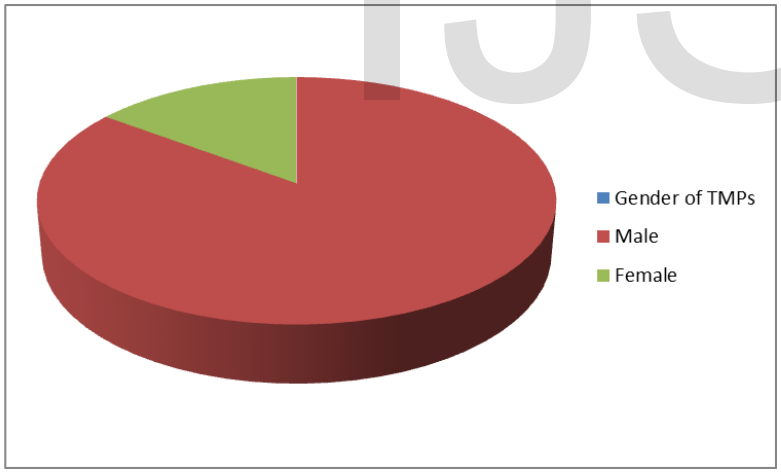


Figure 10a. Gender of TMPs

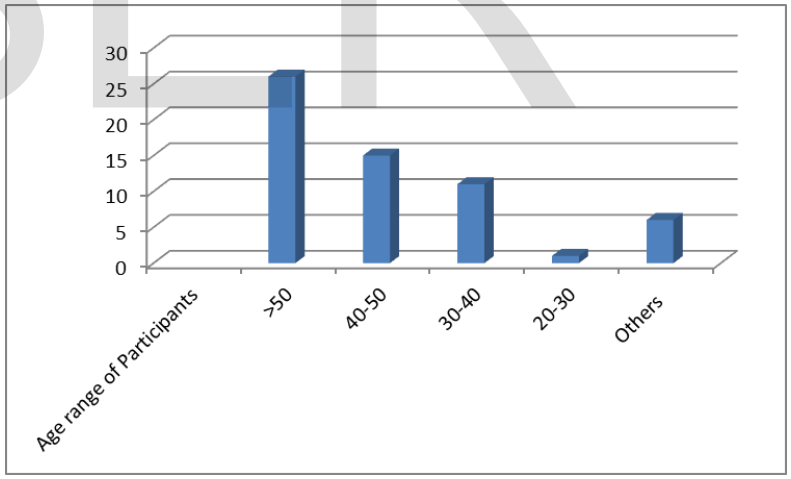


Figure 10b. Age range of Participants

Plant Parts Used to Treat Human Diseases and how materials are obtained

The plant materials are obtained using different methods (e.g. from the wild, purchased and from the farms) or a combination of these. From the study, TMPs of the study area harvest different plant parts for the preparation of traditional remedies (e.g., leaves, roots, seeds, barks, and fruit). In the study area, 47 species (44.8%) were harvested for their leaves. In the study leaves had the higher number (53 species) of plant species used for medicinal purposes, stem bark had 27 species and roots had 24 species. Bulb and rhizomes had 4 species and 5 species respectively. A harvest involving roots, rhizomes, bulb, bark, and stem has a serious effect on the survival of the parent plant in its habitat. The findings of [Alemeyehu & Yawhalaw, 2007; Lulekal, 2013; Abera, 2003; Bekalo *et al*, 2009; Kitata & Amanta, 2017] indicated that traditional medicinal preparations mainly involve the use of leaves. As leaves of medicinal plant species were also reported to be harvested for most remedy preparations. Collection of leaves could be promoted as a more sustainable method since in most cases at least many leaves are left over on the parent plant [Luleka *et al.*, 2013].

Table 5. Collection of plant materials by the TMPs

S/No.	Methods	Number of respondents
1.	Wild collection	2
2.	Purchase	3
3.	Personal Farm collection	3
4.	Wild collection and purchase	38
5.	Wild collection and personal farm	6
6.	Wild collection, farm and purchase	8
7.	Purchase and personal farm	2
8.	Others (those that did not respond)	8

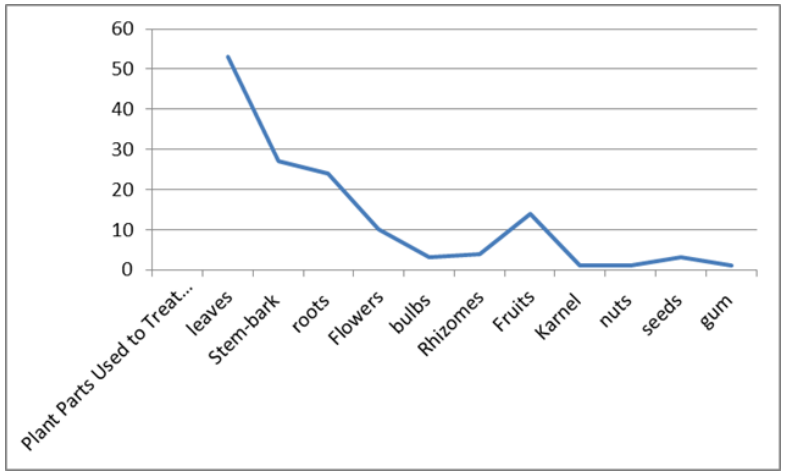


Figure 11a. Plant Parts Used to Treat Human Diseases

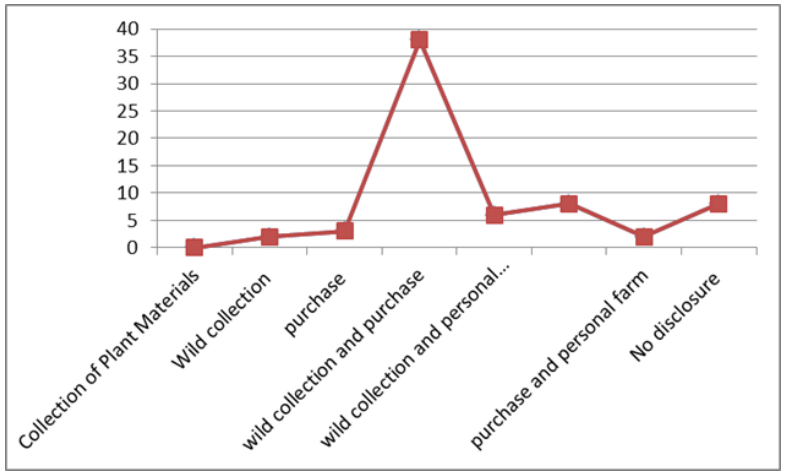
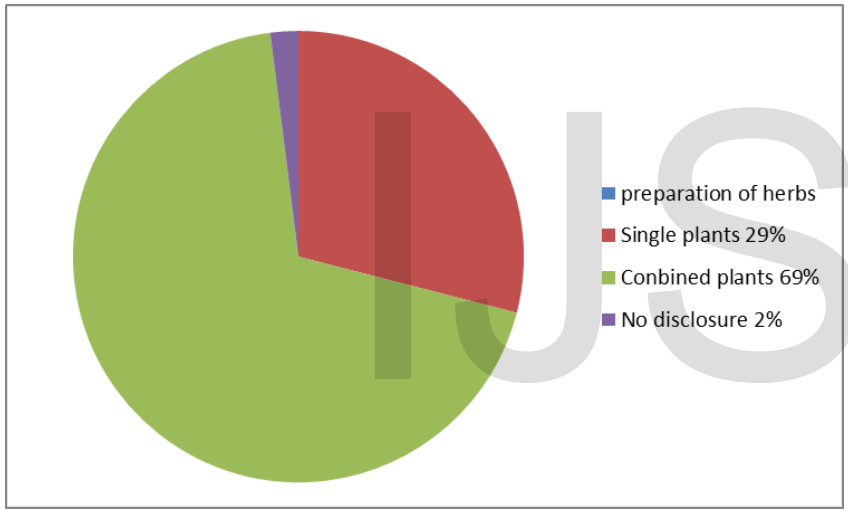


Figure 11b. Collection of plant materials by TMPs

Method of Preparation, Dosage, and Administration

In the collection of data concerning the preparation of medicine, participants reported various skills associated with herbal preparation. The results showed that the most remedies were prepared from a single plant or plant parts (70%) and preparation from combined plant species was 40%. Similarly, various research findings reported the use of single plant species or parts for traditional remedy preparation [Eshete *et al.*, 2016; Megersa *et al.*, 2013, Chekole, 2017]. The potency of using a mixture of different plant or plant parts increased compared to using a single plant to cure a disease is evident.



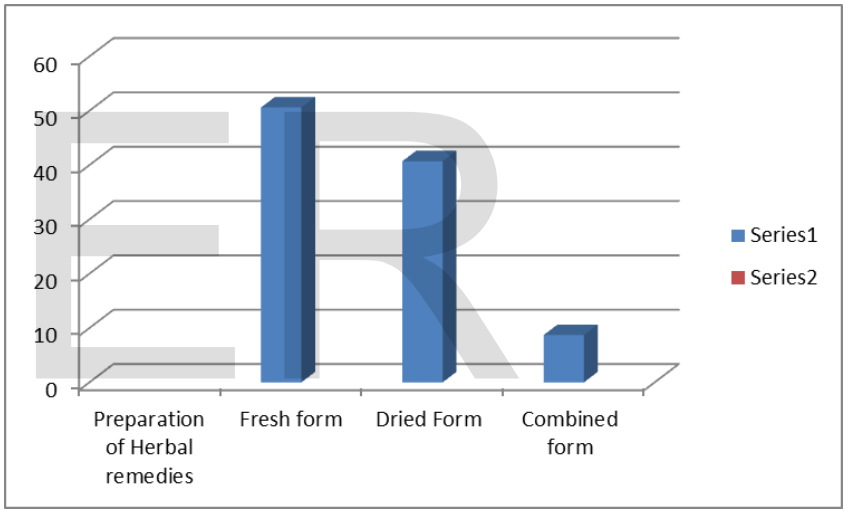


Figure 12a. Preparation of Herbal Remedies (Single and Combined recipes) 12b. Fresh, Dried and Combined form

The majority of the remedies (50.6%) in the study area were prepared from fresh parts of medicinal plants followed by dried form (40.7%) and (8.7%) prepared either from dry or fresh plant parts. The study conducted by [Abdurhmm, 2010] indicated that 86% of preparations were in fresh form and [Getahum, 1976] reported that most of (64%) medicinal plants were used in fresh form and 36% in dried form. The dependency of local people on fresh materials is mostly due to the effectiveness of fresh medicinal plants in treatment as the contents are not lost before use compared to the dried forms.

The local communities employ various methods of preparation of traditional medicines for different types of diseases. The preparations vary based on the type and actual site of disease treated. The principal methods of remedy preparation were reported to be through crushing, which accounted for 35 preparations followed by pounding which accounted for 10 preparations, powdering accounted for 15 preparations, squeezing accounted for 6 preparations, decoction accounted for 10 preparations, crushing and pounding together accounted for 3 preparations, and 3 of traditional medicines were prepared using concoction. Crushing as the most common mode of preparation is in agreement with the findings of [Yinegar and Yawhalaw, 2007; Deone et al,. 2018] who noted that the principal method of remedy preparation was through crushing. However, [Mesfin and Teklehaymanot, 2009] in a similar study on people reported that powdering was a dominant method of preparation of remedy.

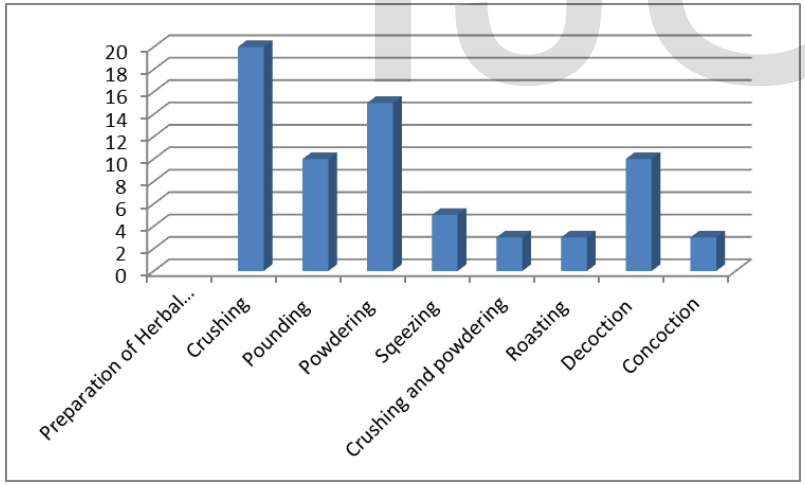


Figure 13a. Preparation of Herbal Remedies

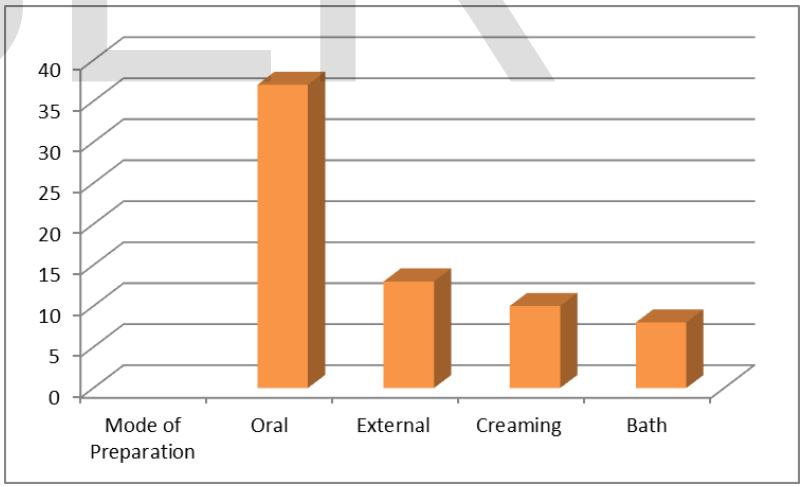


Figure 13b. Mode of Preparation

Mode of preparation of medicinal plants in the study area

Medicinal plants were applied through different routes of administration. In the study area, the substantial proportions of prescriptions were administered orally (37), followed by external application (13), creaming (10), and bath (8). This result is in line with the findings of [Abdurhmm, 2003 and Yenegar *et al*., 2008]. Internal ailments were commonly treated by making the patient drink herbal preparations; Tooth infection was treated by crushing and applies on the remedial plant part on the tooth surface; skin infections such as ringworm and eczema were treated by creaming herbal preparations on an infected skin.

When it comes to the dosage, local people of the study area used various units of measurement such as finger length (for root, bark, and stem), pinch (for powdered), and numbers (for leaves, seeds, fruits, and flowers) and locally made spoons from plants were used to estimate and fix the amount or dosage of medicine. The lack of precise dosage is one of the drawbacks of traditional medicinal plants [Getahum, 1976, Yirga, 2010]. Tip part of the index figure is commonly used as a measurement of dose [Birga, 2010]. The result of [Adefa and Abraha, 2017] showed that about 31 preparations were taken with known dosages mostly quantified by spoon, cup of tea, palm, and other equipment. The majority of plant remedies (61), however, are taken with no fixed dosage.

According to respondents, preparations were prescribed to patients differently for different age groups, sex, and other conditions. The dosage prescription for children was mostly lower than for adults. The amounts of remedy and prescription rates were generally dependent on the degree and duration of the ailment. In this study treatment durations varied between 3 and 10 days. While the result of [Bekalo *et al.,* 2009] in which treatment durations varied between 1 and 7 days.

Recovery from the disease, disappearance of the symptoms of the diseases, fading out of the disease sign, and judgment of the healer to stop the treatment were some of the criteria used in determining duration in the administration of the dosage. Most of the remedies were reported to have no serious adverse effects except vomiting and temporary inflammations. This could be attributed to the low toxicity of the remedy preparations of the medicinal plant species used by the traditional healers in the study area. A similar study by [Yirga, 2010] indicated that some herbal preparations are considered harmless.

Knowledge Transfer on Medicinal Plants

Ethnomedicinal knowledge is concentrated in the elderly and relative members of the community and difficult in its transfer from the elders to the young generation. Most of the respondents (60) preferred to transfer their indigenous knowledge to their family verbally and the remaining participants (15) through apprentices and showing the medicinal plants in the fields. Indigenous knowledge transfer

to the young generation is considered poor which may cause erosion of the practice. The study revealed that medicinal plant knowledge transfer to the young generation is affected by modernization. This might be related to the diminishing of interest of the young generation on indigenous knowledge. Similar result was reported by [Yineger and yawhalaw, 2007] where young people showed disinterest on traditional medicinal plants.

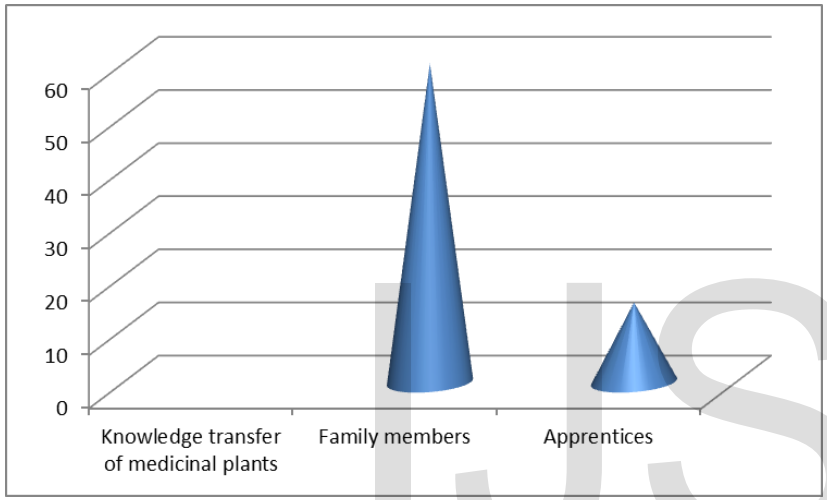


Figure 14a. Knowledge of Tranfer of Medicinal Plants.

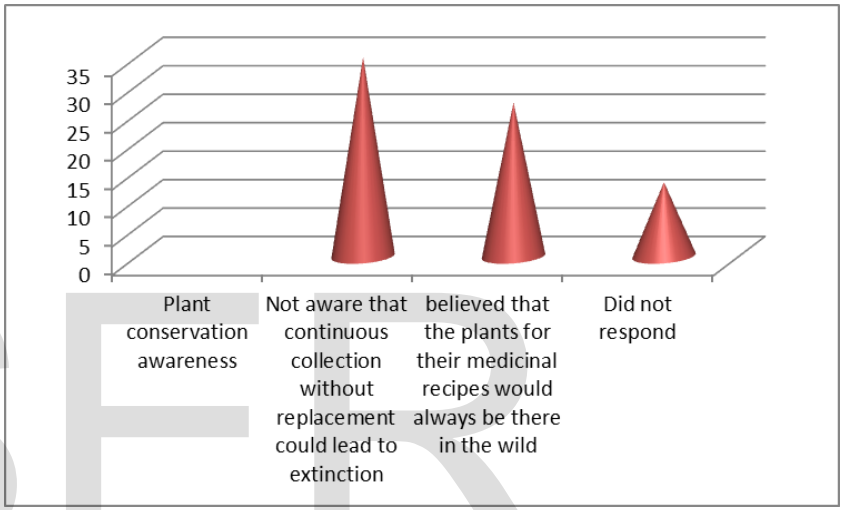


Figure 14b. Plant conservation awareness

Threat and Conservation of Medicinal Plants of Study Area

Medicinal plants are at increasing risk from destruction of their habitats (agricultural expansion, fire, construction, overgrazing, and urbanization) and over harvesting of known medicinal species [Cumingham, 1992]. According to [Roberson, 2008] about 15,000 medicinal plant species may be threatened with extinction world widely due to habitat loss and over harvesting and it is estimated that the earth is losing one potential major drug every two years. In the study area, the people also rely on medicinal plants for various purposes such as charcoal, medicine, firewood, construction, and food. The major threat to medicinal plants in the study area was agricultural expansion (since Benue state is mostly an agricultural state) which accounted for over 60%, charcoal production (14%), and fire wood accounted for 27%. The result of [Roberson, 2008] indicated that intense deforestation became the major threat to

medicinal plants of the peaple. In Benue state deforestation, Agriculture and construction activities are the major threats. According to [Yineger and Yawhalaw, 2007] deforestation (40%) and agricultural expansion (12.5%) were the major threat to medicinal plants. Overgrazing is reported to be the major threat to medicinal plants in [Amsalu et al, 2018].

The survey analysis showed about 35 people were aware that continuous collection of plants without replacement could lead to the plant species being endangered and scarce, and eventually becoming extinct. Mesfin and Teklehanymanot, 2009 believed that the plants for their medicinal recipes would always be there in the wild. (Figure 7). Thirteen (13) did not respond to this question.

This indicates that due consideration should be given for conservation of these plants since they are being widely exploited for purposes other than their medicinal value. Availability of medicinal plants has been affected by a drastic decrease in the area of native vegetation due to agricultural expansion, deforestation, fire, overgrazing, and charcoal and firewood [Cuminggham, 1992, Giday, 2008].

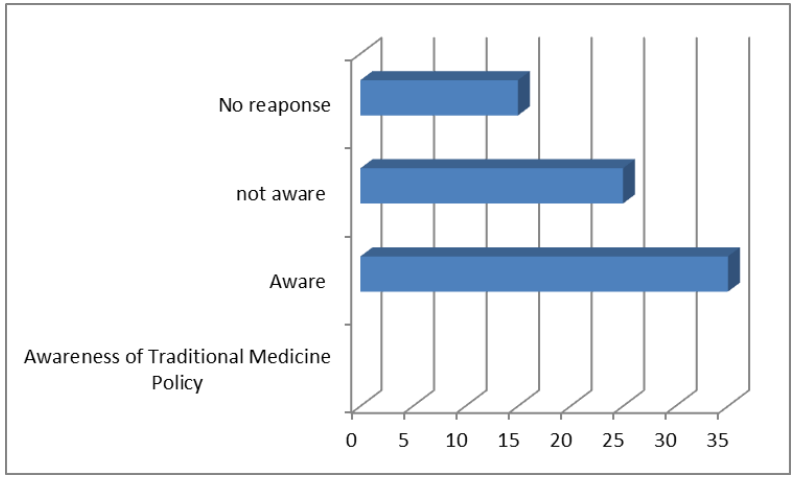
The influences of human on the natural habitat of medicinal plants are the problems for the conservation of medicinal plants and associated knowledge. The effort to conserve medicinal plants in the Benue state was observed to be very poor. Some participants have started to conserve medicinal plants by cultivating at home gardens, though the effort was minimal. About 10.8% of the medicinal plants collected were reported as found cultivated at home gardens and these include plants like *Carica papaya*, *Jatropha curca*, *Cajanus cajan*, *Hibiscus spp. Lawsonia inermis*, *Aloa vera* etc. The result of [Abdurhman, 2010] indicated that only 5.7% of medicinal plants were cultivated in home garden showing minimal effort of medicinal plant conservation.

Suggestion given by [Yineger and Teketay, 2008] stated that natural resources could be utilized best in sustainable way if management practices are complete. In fact, such valuable activities require appropriate action, and changes by the full range of societies and stakeholders involved in the conservation, production, and management as well as use of medicinal plants. Since an action on conservation and sustainable use of medicinal plants need involvement of various sectors like public support, it needs a continuous task of creating public awareness [Schippmann and Cumingham, 2002]. The review made by Megersa *et al*., 2013 suggested that identifying serious threats to medicinal plants and how local people manage medicinal plants will help to understand the best conservation strategies.

Awareness of Traditional Medicine Policy, NAFDAC and Training Needs

In 2007, the Traditional Medicine Policy for Nigeria policy document was formulated to address issues of regulation, strategy, system and information management, human resources development, technology, financing, conservation of biodiversity, IPR, indigenous knowledge, and partnering between traditional and conventional medicine practitioners. The policy aimed at facilitating the integration of TM into the national healthcare delivery system of the country. The interest of various stakeholders (e.g. researchers, TMPs, regulatory agency, etc.) involved in TM was addressed in the policy.

The major players or stakeholders addressed the document was the TMPs. The section E of the questionnaire aimed at testing the level of awareness by the TMPs of the existence of this policy and what it contains, and also to get feedback on the policy and possible contributions for the review of the document 35 TMPs said they were aware of the existence of the Traditional Medicine Policy document while 25 said they were not aware of this document. Fifteen (15) did not respond to the question (Figure 10a). Fifteen (15) of those who said they were aware of the existence of the document did not know what the document was all about or what it contained, the remaining 10 had a faint idea of what the policy was about (Figure 10). Those that were aware of the document however wished that the policy could include the names and pictures of plants used in TMP in Nigeria for ease of identification, protection of the practitioners through appropriate regulation and professionalism in order to eliminate quacks, registration of every traditional medicine practitioner with NANTMP, training of TM practitioners through workshops, seminars, etc., testing of herbal medicines and recipes to ascertain efficacy and inclusion in the national essential drug list.



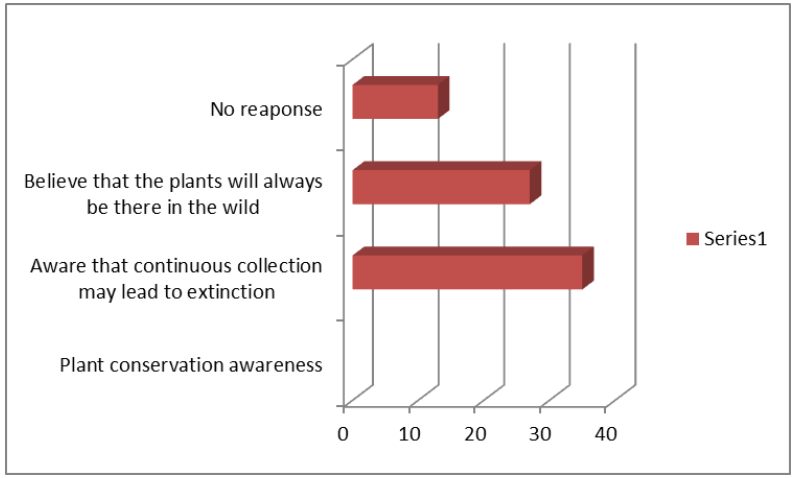


Figure 15a. Awareness of Traditional Medicine Policy **Fig.15b. Plant conservation awareness**

Level of Education of Participants and Duration of Practice of Participants

The level of education of participants in the survey showed: Modern or Adult education (17); primary education, (19); secondary education (14); tertiary education (13) and 10 participants did not respond. The majority of the respondents, (19), had Primary education. Thirteen of the respondents were observed to have post-secondary education which showed that people with high educational qualification were beginning to have interest in the practice. Ten of the participants did not have any formal education. (Fig. 11a). The duration of practice of the TMPs is shown in Fig. 11b where 23 of them had practiced for 1-10 years; 18 practiced for 11-20 years; 10 practiced for 21-30 years; 6 practiced for 31-40 years; 3 for 41-50 years and 1 for 51-60 years.

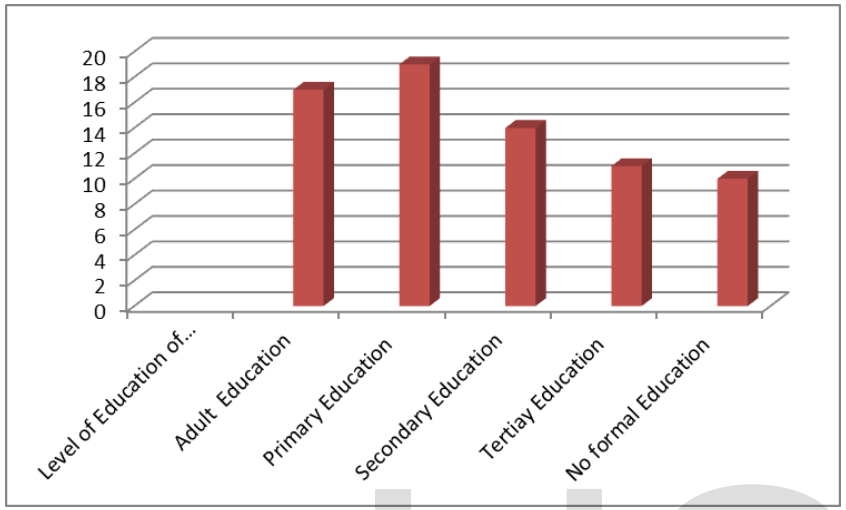


Figure 16a. Level of education of Participants.

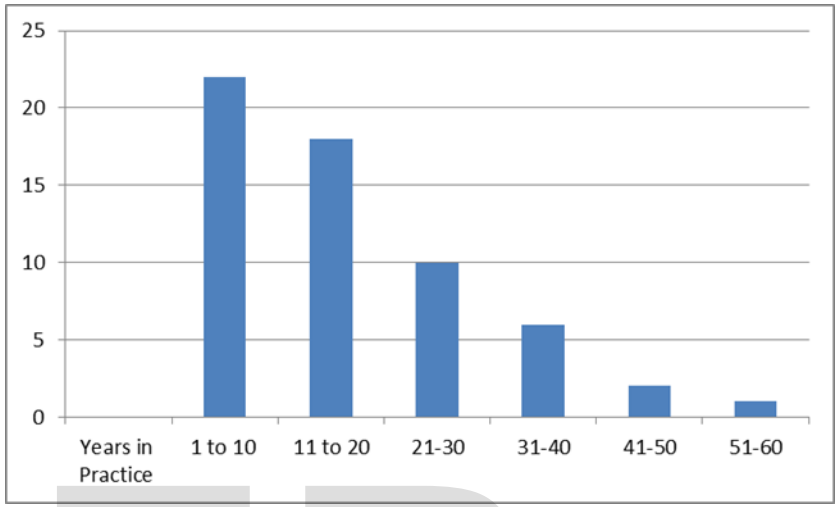


Fig. 16b. Duration of Practice of Participants

4. Conclusions

A study on medicinal plant utilization in the area revealed that the communities commonly use medicinal plants for maintaining their primary healthcare. The study respondents affirmed that use of traditional recipes was their preferred option for medical needs due to their long history in plant use, its accessibility and affordability. This was also affirmed by Shomkegh *et al.*, 2016. The study resulted in documenting 105 medicinal plants species where Euphorbiaceae is the leading family with the highest proportion of medicinal plants uses. Most of (58) medicinal plants in the study area were harvested from wild. Shrubs were found to be the dominant growth form of medicinal plants used for preparation traditional remedies and followed by herbs. Leaves were found to be the most frequently used plant parts for the preparation of traditional remedies. Traditional medicine preparation mostly involves a single plant and the method of preparation was mainly crushing followed by pounding. Depletion of indigenous knowledge among the people of the study area was serious due to disinterest of young generation to gain the knowledge. Oral based knowledge transfer, unavailability of the

species, and influence of modern education were considered as the main factors. The main threat on medicinal plants in the study area arises from agricultural expansion. Utilization of root plant parts for traditional medicine preparation could also be considered as a threat. Although Benue state was found to be rich in medicinal plant diversity, the effort to conserve the plants and associated indigenous knowledge was observed to be very poor. Thus, conservation of medicinal plants by local communities and responsible bodies is vital to avoid further loss. Moreover, phytochemical and pharmacological investigation is recommended with due consideration to frequently used medicinal plants. Disease states like Cough, breathlessness/asthma and bronchitis which are symptoms of COVID-19 were some of the diseases being treated by the TMPs in the survey. Sixteen (16) plants were documented in the study for the treatment of Covid 19 symptoms (Table 3). Such plants can be analyzed and used in preparation of drugs for the cure of COVID-19.

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