



Utilization of Wild Plants for Medicinal Purposes in Selected Tiv Communities of Benue State, Nigeria: An Ethnobotanical Approach

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Authors' contributions

This work was carried out in collaboration between all authors. Authors SAS and RM designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript.

Author BID managed the analyses of the study and the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aims: An ethnobotanical survey of wild plants used for the treatment of ailments was carried out among randomly selected sub-tribes in Tiv communities of Benue State.

Study Design: Group Interviews were carried out with herbalists in each kindred from selected Local Government Areas (LGAs) within the Tiv ethnic territory of Benue State, Nigeria.

Place and Duration of Study: The study was carried out in selected kindreds in Guma, Gboko and Kwande LGAs of Benue state between January and August, 2011.

Methodology: Focused Group Interviews were held with herbalists in each selected kindred in the LGAs to elicit information on plants used in the treatment of ailments in the communities. Ailments treated were listed by the herbalists and plant/plant parts used, mode of preparation and administration were documented and validated by the respondents.

Results: Forty (40) plant species were used in treating twenty-two (22) ailments in Guma LGA, with *Anona senegalensis* Pers. being the most utilized species in the treatment of different ailments

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(6 ailments). It was followed by *Uvaria chamae* P. Beauv. used in the treatment of 4 ailments. In Gboko LGA, 26 plants species were utilized in the treatment of 19 ailments with *Maytenus senegalensis* [Lam] Excell utilized in the treatment of 5 ailments, followed by *Burkea africana* Hook.F and *Annona senegalensis* (3 ailments each). Twenty-eight plant species were utilized in the treatment of 21 ailments in Kwande LGA. *Maytenus senegalensis* was utilized in treating 4 ailments followed by *Burkea africana* (3 ailments). Main plant parts utilized for treatment of ailments were leaves (30%), bark (32%) and root (27%).

Conclusion: The respondents admitted that they preferred herbal treatment due to its affordability, accessibility and effectiveness. These claims though not verified could be useful for the identification of plants with medicinal potential for scientific investigation, validation and manufacture of drugs.

Keywords: Medicinal plants; utilization; Tiv communities; ethnobotany.

1. INTRODUCTION

Medicinal plants have important contributions in the healthcare system of local communities as the main source of medicine for the majority of the rural population [1]. About 80% of the population of the world depends on traditional medicine, mostly herbal remedies for their primary health care needs [2]. More than 3.5 billion people in the developing world rely mainly on medicinal plants as components of their healthcare [3]. [4] affirmed that the African continent has a long history with the use of plants and in some African countries, up to 90% of the population rely on medicinal plants as a source of drugs. Traditional medicine refers to practices, knowledge and belief systems which use minerals, plants and animal based remedies, spiritual therapies and exercises to prevent, treat and maintain well being [5]. A medicinal plant is any plant, which in one or more of its organs contains active ingredients which can be used for therapeutic purposes or contain foundational compounds that can be used for the synthesis of useful drugs [6]. The absence or inaccessibility of modern healthcare services, affordability, cultural acceptance and under certain circumstances, effectiveness has caused a large percentage of the population to rely mostly on plant based traditional medicines for their primary health care needs [7]. This is more obvious among rural dwellers who through their long histories of dependence and utilization of plants have found some useful in the wellbeing of their bodies.

Documentation of traditional knowledge, especially on the medicinal uses of plants, has provided many important drugs of modern day medical practice [3,8]. Plants have been major sources of medicine and plant secondary metabolites have been credited for most plants' therapeutic activities [9,10]. The use of natural

products with healing properties is as old as human civilization and for a long time, minerals, animal and plant products were the main sources of drugs [11]. It is the first choice of healthcare treatment for at least 80% of rural Africans who suffer from high fever and other common ailments [3]. The local uses of plants and their products in health care are even much higher in areas with little or no modern health services [12]. Globally, there are about 120 plant-derived drugs in professional use with three quarters obtained from traditional medicinal plants [13]. According to [14], medicinal plants play a key role in the development and advancement of modern studies by serving as a starting point for the development of novelties in drugs. An estimated 25% of prescription drugs and 11% of drugs considered essential by the World Health Organization (WHO) are derived from plants and a large number of synthetic drugs are obtained from precursor compounds originating from plants [11].

Thus, the documentation of the traditional therapeutic know-how could lead to the discovery of new drugs as well as contribute to the conservation and sustainable management of plant resources [7]. Also, due to changing lifestyles, extreme secrecy of traditional healers and negligence by youngsters, the practice and dependence of ethnic societies in folk medicines is in a rapid decline globally [15-17] and hence the need to document the practices among the Tiv people of Benue State.

2. METHODOLOGY

Ethno-botanical data was obtained through semi-structured interviews with elders and other local users and the collection of plant specimens [1,18], using group discussions at focal group and community levels [19]. The plants utilized for

the study were obtained from forestlands, farmlands and fallowlands in the study communities. Three kindreds, representing at least 60% of kindreds in each of the study Local Government Areas (LGAs) were randomly selected to investigate local knowledge on use of plants for medicinal purposes. The study LGAs were Guma (Benue North), Gboko (Benue Central) and Kwande (Benue South), purposively selected within the Tiv ethnic territory to reflect the vegetation transition from the northern guinea savannah to the relics of the rainforest in the South and cultural delineations of the ethnic group.

Focused Group Interviews were held with between 15-20 randomly selected herbalists within their associations in each kindred, with the aim of obtaining information on plants utilized in the treatment of ailments, mode(s) of preparation and administration in their respective communities. Before commencement of interviews, the purpose of the study was clearly explained and a verbal Prior Informed Consent (PIC) sought in each of the sub-tribes [20-22] to obtain their consent and create a favourable environment for the discussions. The interviews were done in the local language (Tiv), taped recorded and later transcribed into English for documentation. The free listing method [23,24] was adopted to facilitate naming of all plant(s) utilized in treating each of the ailments. The plant species were identified by their local names [25] and botanical information obtained with the aid of standard texts [26,27].

3. RESULTS AND DISCUSSION

3.1 Results

3.1.1 Ailments treated with plants in Guma LGA

Forty (40) plant species were used in treating twenty-two (22) ailments in Guma LGA (Table 1), with *Anona senegalensis* being the most utilized plant species (roots and bark used in the treatment of 6 different ailments). It was followed by *Uvaria chamae* roots used in the treatment of 4 different ailments. Four species; *Ocimum gratissimum*, *Ficus thonningii*, *Bridelia ferruginea* and *Ficus sur* were used in the treatment of 3 ailments each. Sixty-four (64) plants/plant parts ranging from roots, bark, leaves, flowers and seeds were used singly or mixed in the treatment of ailments with roots utilized most (40%),

followed by the bark (30%) and leaves (28%). These harvesting methods according to the respondents are reducing the abundance of the tree species especially those frequently harvested for the treatment of ailments and other purposes in the community. No respondent had in the past planted any of the tree species utilized. They added that some of the species like *Prosopis africana* were difficult to raise and would need support to plant the seedlings and nurture them.

3.1.2 Ailments treated in Gboko LGA

In Gboko LGA, 26 plants species were utilized in the treatment of 19 ailments (Table 2) with *Maytenus senegalensis* utilized in the treatment of 5 ailments, followed by *Burkea africana* and *Annona senegalensis* (3 ailments each). Out of 42 plant parts utilized in the treatment of different ailments in the kindreds, the most utilized parts were the bark (33.3%), leaves (33.3%) and roots (28.5%), while the use of whole plant was the least (2.4%). The respondents expressed concern with the rate at which *Maytenus senegalensis* was harvested in the community by vendors outside Benue state whom they said seek for the plant and harvest its root and bark for medicinal purposes. None of the respondents admitted that they plant any of the tree species.

3.1.3 Ailments treated with wild plants in Kwande Local Government Area

Twenty-eight (28) plant species were utilized in the treatment of 21 ailments in Kwande LGA (Table 3). Plant parts utilized for treatment were leaves (30.2%), bark (30.2%) and root (25.6%). The respondents claimed that the plants were very useful to their health care needs, agreeing with [1] that medicinal plants have important contributions in the healthcare system of local communities as the main source of medicine for the majority of the rural population. It was noted that most of the people consider the use of plants in treating ailments as the first choice due to their long held beliefs, accessibility and cost effectiveness as compared to orthodox medicine. *Maytenus senegalensis* was reported to be scarce in the LGA due to its method of harvest (gradual removal of roots and bark) for herbal treatment of ailments in the communities. No conservation measure or replanting of utilized species was reported among the respondents for all the plants utilized.

Table 1. Ailments treated with wild plants in Guma Local Government Area

S/No	Ailment treated	Botanical name /plant part(s) used	Local name (Tiv)	Preparation	Administration/Dosage
1	Insanity	<i>Mimosa pigra</i> L.(s) <i>Uvaria chamae</i> P. Beauv.(r)	Wavikyo Ikkyo	Boil plant parts and allow to cool.	Drink a cup 3 times daily for 12 days
2	Stroke	<i>Justicia shimperi</i> Hochst. (l) <i>Ocimum gratissimum</i> L(l) <i>Daniella oliveri</i> [Rolfe] Hutch & Dalz(l) <i>Khaya senegalensis</i> [Desr.] A. Juss(l,b)	Ityenger Kungureku- tamen Chiha Haa	Boil plant parts, allow to cool	Drink a cup twice a day until pot is empty.
		<i>Pterocarpus erinaceus</i> Poir. (s,r) <i>Uvaria chamae</i> (r) <i>Pericopsis laxiflora</i> [Benth] V.Meeuwen(b,r) <i>Erythrophleum suaveolens</i> [Gull. & Perr.] Brenan(b)	Ngaji Ikkyo Giragba	Boil plant parts and Drink, massaged affected area	Drink a cup and massage twice daily
3	Weak penis erection	<i>Prosopis africana</i> [Gull. & Perr.] Taub. (r) <i>Grewia tenax</i> [Forssk.] Fiori.(r) <i>Ficus thonningii</i> Blume(l)	Kor Gbaaye Hwerbaa Akinde	Boil plant parts and allow to cool	Drink a cup twice a day for 2 days
4	Infertility	<i>Ficus sur</i> Forssk.(r) <i>Trema orientalis</i> [L.] Blume(r) <i>Ficus thonningii</i> (l)	Tur Chiese Akinde	Boil plant parts and allow to cool	Drink a cup a day for 12 days
5	Swollen stomach	<i>Annona senegalensis</i> Pers. (r) <i>Bridelia ferruginea</i> Benth.(r) <i>Annona senegalensis</i> (r) <i>Lagenaria siceraria</i> [Mol.] Standl.(w) <i>Psorospermum senegalense</i> Spach(r)	Ahur Kpine Ahur Jondugh	Boil plant parts and allow to cool	Drink a cup twice daily for 24 days
6	Pains in the eye	<i>Ocimum gratissimum</i> (l)	Kpikyegh Kungureku-utamen Gbaaye	Boil and allow to cool	Wash eyes with the solution
7	Snake bite	<i>Prosopis africana</i> (br) <i>Uvaria chamae</i> (r) <i>Annona senegalensis</i> (r) <i>Bridelia ferruginea</i> (r)	Ikkyo Ahur Ikpine	Boil plants and allow to cool	Drink a cup twice a day for 6 days

S/No	Ailment treated	Botanical name /plant part(s) used	Local name (Tiv)	Preparation	Administration/Dosage
8	Stomach ache	<i>Uvaria chamae</i> (r) <i>Annona senegalensis</i> (r)	Ikyo Ahur	Boil plants and allow to cool	Drink twice daily until pains are no longer felt.
		<i>Hannoa undulata</i> [Gull. & Perr.] Planch.(r) <i>Maytenus senegalensis</i> [Lam.] Excell(r)	Gbur Alomade	Peel root bark, boil the roots and allow to cool.	Drink a cup a day until aches are felt no more.
9	Headache	<i>Allophyllus africanus</i> P. Beauv.(l) <i>Ocimum basilicum</i> L. (l)	Apaapa Kungureku-ukiriki	Pound dry leaves and eat Squeeze leaves or grind	Soak in a cup of water and drink Rub on the fore head and around the head twice within a day.
10	Swellings	<i>Pericopsis laxiflora</i> (l)	Giragba	Grind plant parts	Rub on affected area twice a day until it clears.
		<i>Pericopsis laxiflora</i> (b) <i>Grewia venusta</i> Fresen.(b) <i>Kigelia africana</i> (s) <i>Piliostigma thonningii</i> t (s) <i>Hymenocardia acida</i> Tul (b) <i>Pachystela pobeguiniiana</i> Pierre ex Lecomte(s)	Giragba Hwer-za Tyembegh Nyihar likwar-to		
11	Jedi jedi	<i>Allophyllus africanus</i> (l)	Kpagh Apaapa	Boil leaves and allow to cool.	Drink solution twice a day until it stops.
12	Yellow fever	<i>Parinari curatellifolia</i> Planch. Ex Benth.(b) <i>Kigelia africana</i> [Lam.] Benth(b)	Bua –ikuna Tyembegh	Boil and allow to cool.	Drink a cup a day until it stops.
		<i>Cochlospermum planchonii</i> Hook.ex Planch (r) <i>Ficus thonningii</i> (l)	Kpavande Akinde	Boil the plants and allow to cool	Drink a cup twice a day for 3 days.
13	Purging	<i>Piliostigma thonningii</i> (b)	Nyihar	Peel the bark, boil and allow to cool.	Drink twice a day until it seizes.
14	Cough	<i>Terminalia avicennioides</i> Guill. &Perr.(l)	Kwegh	Get some tender leaves and chew.	Swallow the juice as you chew the leaves. Do it twice a day until clears.
		<i>Annona senegalensis</i> (b)	Ahur	Soak in water for about 30 minutes	Drink a cup 3 times a day until it clears.
		<i>Hibiscus asper</i> Hook.f. (w) <i>Ocimum gratissimum</i> (w)	Dedooko Kungureku	Boiled whole plants	Drink a cup twice daily x 3days

S/No	Ailment treated	Botanical name /plant part(s) used	Local name (Tiv)	Preparation	Administration/Dosage
15	Amoebic dysentery	<i>Ficus sur</i> (b) <i>Bridelia ferriginea</i> (b) <i>Parkia biglobosa</i> [Jacq.] R. Br.ex G. Don. (b)	Tur Ikpine Nune	Boil the plant parts and allow to cool.	Drink a cup twice a day until symptoms clear.
16	Typhoid	<i>Flueggea virosa</i> [Roxb. Ex Willd.] Voigt (w) <i>Annona senegalensis</i> (s)	Yaregh-agum/Azizo, Ahur	Boil plants and allow to cool.	Drink a cup twice a day for 7 days.
17	Diarrhoea	<i>Ficus ingens</i> [Miq.]Miq. (l,r b)	Hon	Boil leaves, root and bark together and allow to cool Pound fresh leaves	Drink a cup 3 times a day until it stops. Rub on the affected parts, repeat until wound heals.
18	Fire burns	<i>Cissus pulponea</i> Guill. & Perr. (l)	Ager	Grinded plant parts, boiled in a clay pot and massaged	Incise joint and rub twice daily x 3 days
19	Dislocation	<i>Khaya senegalensis</i> (b) Clay soil <i>Capsicum annuum</i> L(fr)	Haa Nya-tuu Mkem	Grind tender leaves and roots, rub on the wound	Rub on the wound after bath until wound heals.
20	Wounds	<i>Terminalia avicennioides</i> (l,r)	Kwegh	Pluck unripe fruits and allow the exudates to flow out.	Rub the exudates on the wound and the blood flow will reduce gradually and seize.
20	Blood clotting	<i>Ficus sur</i> (f) <i>Terminalia avicennioides</i> (r) <i>Entada africana</i> Guill. & Perr.(b)	Tur Kwegh Liemen	Squeeze root bark on the wound Peel bark (rope) and tie round the wound.	Do it immediately after the cut and the flow will seize. Allow it to be tied for an hour with less activity.
21	Heartburn	<i>Stereospermum kuntianum</i> Cham.(b)	Umanatumba	Grind bark with little salt and eat to prevent heartburn	Eat preparation twice a day for 2 days
22	Jaundice	<i>Hannoa undulata</i> [Guill. & Perr.] Planch. (r,b,l)	Gbur	Peel root bark + bark + leaves, boil and allow to cool.	Drink twice a day for 7 days

s-seed, r-root, l-leaves, b-bark, f-flowers, fr-fruit, w-whole plant

Table 2. Ailments treated with wild plants in Gboko Local Government Area

S/No	Ailment treated	Botanical name /plant part(s) used	Local name (Tiv)	Preparation	Administration/Dosage
1	Arrow poison	<i>Burkea africana</i> Hook. F (b)	Gbagbongum	Grind bark and rub on affected part.	Apply morning and evening on the wound until it heals.
2	Diabetes	<i>Mitragyna inermis</i> [Willd.] Kuntze (b,l)	Sohonor	Boil bark and leaves and allow to cool.	Take solution twice a day for 2 weeks.
3	Ulcer	<i>Khaya senegalensis</i> (b) <i>Burkea africana</i> (b) <i>Sterculia setigera</i> Del. (b) <i>Annona senegalensis</i> (l) <i>Daniella oliveri</i> (l)	Haa Gbagbongum Kumendur Hur, Ahur Chiha	Obtain the bark of the tree species with just a small quantity of <i>Khaya senegalensis</i> , boil and allow to cool Boil all plants and allow to cool	Take solution 3 times daily for 3 days. Sip a cup a day for 1 week
4	Diarrhoea	<i>Tephrosia bracteolata</i> Gull et Perr (w) <i>Parkia biglobosa</i> (b) <i>Annona senegalensis</i> (r)	Agea-viha Nune Hur, Ahur	Obtain dry bark, grind and mix with palm oil Pound, add 2 seeds of pepper and squeeze.	Eat finger-full twice a day for 2 days. Take the juice twice a day for 3 days.
5	Toothache	<i>Sterculia setigera</i> (l) <i>Prosopis africana</i> (l)	Kumend-ur Gbaaye	Boil the leaves Boil leaves and allow to cool	100ml twice daily for 2 days Hold the solution in the mouth for 10 minutes, once a day for 2 days.
6	Prolonged labour in women	<i>Khaya senegalensis</i> (l) <i>Hymenocardia acida</i> (l) <i>Crossopteryx febrifuga</i> [G. Don.] Benth. (l)	Haa likwar-gbande likwar	Boil and allow to cool	Let the woman drink the water and she will deliver.
7	Yellow fever	<i>Bridelia ferruginea</i> (r) <i>Cochlospermum planchonii</i> (r) <i>Crossopteryx febrifuga</i> (r) <i>Cochlospermum planchonii</i> (r) <i>Maytenus senegalensis</i> (r) <i>Sarcocephalus latifolius</i> [JE Sm] EA Bruce (r) <i>Gardenia erubescens</i> (r)	Kpine Kpavande Ingbian-kpande Kpavande Alomade Ikyura-ukase Ibohogh	Boil plant roots and allow to cool. Do not eat palm oil and potash during treatment. Boil plant parts and drink. Peel the root and pound the peels, add water and sieve.	Drink a cup 3 times a day for 3days. Drink a cup, twice a day, do not eat palm oil. Drink a cup twice a day. The patient will vomit and become better.
8	Snake bite	<i>Maytenus senegalensis</i> (r)	Alomade	Boil roots and allow to cool.	Drink a cup 3 times a day for 7 days.

S/No	Ailment treated	Botanical name /plant part(s) used	Local name (Tiv)	Preparation	Administration/Dosage
9	Wounds	<i>Maytenus senegalensis(b)</i>	Alomade	Boil bark and allow to cool.	Drink a cup 2 times a day for 5 days.
		<i>Piliostigma thonningii (f)</i>	Nyihar	Obtain unripe fruits, squeeze and rub on affected area.	Rud until wound heals.
10	Dysentery	<i>Maytenus senegalensis (b,l)</i>	Alomade	Boil plant parts and allow to cool.	Drink a cup 2 times a day for 3 days.
11	Cough and bronchitis	<i>Piliostigma thonningii (b,l)</i>	Nyihar	Boil bark and leaves, allow to cool.	Drink a cup 2 times a day until it heals.
12	Hookworm	<i>Syzygium guineense</i> [Willd.] DC. (s,l)	Mho	Stems and leaves boiled and allowed to cool.	Drink a cup 2 times a day for 3 days.
13	Amoebic dysentery	<i>Anona senegalensis(l)</i>	Ahur	Boil leaves and allow to cool	100ml twice daily for 5 days
		<i>Maytenus senegalensis(r)</i>	Alomade	Boil and drink	100ml 3 times daily for 1 week
14	Fractures and injured joints	<i>Ficus ingens (r)</i>	Hon	Grind roots and rub on affected parts.	Twice a day after bath.
15	Malaria and fever	<i>Cassia sieberiana</i> DC (b)	Yogbo	Boil stems and allow to cool.	Drink a cup 3 times a day for 3 days.
16	Recovery from child birth	<i>Uvaria chamae(b)</i>	Ikyo, Ikyoh	Grind root bark and stem bark with little water.	Take 3 finger-full twice a day for 3 days.
17	Blood clotting	<i>Bridelia ferruginea(b)</i>	Kpine	Peel bark of live stems, squeeze and apply juice on the wound. Wound heals fast.	Apply immediately after injury.
18	Blood shortage	<i>Ficus sur(l)</i>	Tur	Boil in water	100ml twice daily for 1 week
19	Stomach ache	<i>Burkea africana(b)</i>	Gbagbongum	Soak plant parts in for atleast 1 hour	Drink the water throughout the day (make it your drinking water).
		<i>Stereospermum kunthianum(b)</i>	Umanatumba		
		<i>Cassia sieberiana.(r)</i>	Yogbo	Peel root bark and drop the root in water for about 30 minutes.	Drink a cup twice a day.

s-seed, r-root, l-leaves, b-bark, f-flowers, w-whole plant

Table 3. Ailments treated with wild plants in Kwande Local Government Area

S/No	Ailment treated	Botanical name /plant part(s) used	Local name (Tiv)	Preparation	Administration/Dosage
1	Arrow poison	<i>Burkea africana (b)</i>	Gbagbongum	Grind bark and rub on affected part.	Apply morning and evening on the wound until it heals.
2	Diabetes	<i>Mitragyna inermis (b,l)</i>	Sohonor	Boil bark and leaves and allow to cool.	Take solution twice a day for 2 weeks.
3	Ulcer	<i>Khaya senegalensis(b)</i> <i>Burkea africana(b)</i> <i>Sterculia setigera(b)</i>	Haa Gbagbongum Kumendur	Obtain the bark of the tree species with just a small quantity of <i>Khaya senegalensis</i> bark, boil and allow to cool	Take solution 3 times daily for 3 days.
		<i>Annona senegalensis(l)</i> <i>Danniella oliveri(l)</i> <i>Tephrosia bracteolate (w)</i>	Hur, Ahur Chiha Agea-viha	Boil all plants and allow to cool	Sip a cup a day for 1 week
4	Diarrhoea	<i>Parkia biglobosa (b)</i>	Nune	Obtain dry bark, grind and mix with palm oil	Eat finger-full twice a day for 2 days.
		<i>Annona senegalensis (r)</i>	Hur, Ahur	Pound, add 2 seeds of pepper and squeeze.	Take the juice twice a day for 3 days.
5	Toothache	<i>Prosopis africana (l)</i>	Gbaaye	Boil leaves and allow to cool	Hold the solution in the mouth for 10 minutes, once a day for 2 days.
6	Rheumatism	<i>Trema orientalis(l)</i>	Chiese	Grind leaves and rub affected area	2ce daily after bath, ongoing
7	Prolonged labour in women	<i>Khaya senegalensis(l)</i> <i>Hymenocardia acida (l)</i> <i>Crossopteryx febrifuga (l)</i>	Haa likwar-gbande likwar	Boil and allow to cool	Let the woman drink the water and she will deliver.
8	Yellow fever	<i>Bridelia ferruginea(r)</i> <i>Cochlospermum planchonii(r)</i> <i>Crossopteryx febrifuga(r)</i>	Kpine Kpavande/ Hweregh Ingbian-kpande	Boil plant roots and allow to cool. Do not eat palm oil and potash during treatment.	Drink a cup 3 times a day for 3days.
		<i>Cochlospermum planchonii(r)</i> <i>Maytenus senegalensis(r)</i> <i>Sarcocephalus latifolius(r)</i> <i>Gardenia erubescens(r)</i>	Kpavande Alomade Ikyura-ukase Ibohgh	Boil plant parts and drink. Peel the root and pound the	Drink a cup, twice a day, do not eat palm oil. Drink a cup twice a day. The

S/No	Ailment treated	Botanical name /plant part(s) used	Local name (Tiv)	Preparation	Administration/Dosage
9	Snake bite	<i>Maytenus senegalensis(r)</i>	Alomade	peels, add water and sieve. Boil roots and allow to cool.	patient will vomit and become better. Drink a cup 3 times a day for 7 days.
10	Ulcers and wounds	<i>Maytenus senegalensis(b)</i>	Alomade	Boil bark and allow to cool.	Drink a cup 2 times a day for 5 days.
11	Dysentery	<i>Maytenus senegalensis (b,l)</i>	Alomade	Boil plant parts and allow to cool.	Drink a cup 2 times a day for 3 days.
12	Wounds	<i>Piliostigma thonningii (f)</i>	Nyihar	Obtain unripe fruits, squeeze and rub on affected area.	Rud until wound heals.
13	Itching	<i>Sarcocephalus latifolius(l)</i>	Ikyura-ukase	Boil leaves and wash with solution	2 times a day for 2 days
14	Toothache	<i>Pericopsis laxiflora(s)</i>	Jiagba	Boil stems in water	Drink and hold water in the mouth for 2 minutes
15	Cough	<i>Piliostigma thonningii (b,l)</i>	Nyihar	Boil bark and leaves, allow to cool.	Drink a cup 2 times a day until it heals.
16	Hookworm	<i>Syzygium guineense</i>	Mho	Stems and leaves boiled and allowed to cool.	Drink a cup 2 times a day for 3 days.
17	Fractures and injured joints	<i>Stereospermum kunthianum(r,l)</i>	Umanat-umba	Leaves and root	100ml twice daily for 3 days
		<i>Ficus ingens (r)</i>	Hon	Grind roots and rub on affected parts.	Twice a day after bath.
18	Malaria and fever	<i>Cassia sieberiana (b)</i>	Yogbo	Boil stems and allow to cool.	Drink a cup 3 times a day for 3 days.
19	Recovery from child birth	<i>Uvaria chamae(b)</i>	Ikyo, Ikyoh	Grind root bark and stem bark with little water.	Take 3 finger-full twice a day for 3 days.
20	Blood clotting	<i>Bridelia ferruginea(b)</i>	Kpine	Peel bark of live stems, squeeze and apply juice on the wound.	Apply immediately after injury.
21	Stomach ache	<i>Burkea africana(b)</i>	Gbagbongum	Soak plant parts in for atleast 1 hour	Drink the water throughout the day (make it your drinking water).
		<i>Stereospermum kunthianum(b)</i>	Umanatumba		
		<i>Cassia sieberiana(r)</i>	Yogbo	Peel root bark and drop the root in water for about 30 minutes.	Drink a cup twice a day.

s-seed, r-root, l-leaves, b-bark, f-flowers, w-whole plant

3.2 Discussion

Twenty-two ailments were treated in Guma, while 19 were treated in Gboko and 21 in Kwande (Fig. 1). Common ailments treated in the study area were Diarrhea, cough, snake bites, wounds, yellow fever, dysentery and worms, similar to those reported by [28] among ethnic people groups. Methods of preparation and administration were mainly by decoction (72%), followed by grinding and rubbing (12.8%) prepared mainly from a mixture of plant species as opposed to the people groups in East Ethiopia [29] which made their decoctions mostly from single species. 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 [4,7]. Some plants were used in the treatment of similar ailments across the LGAs, for example, *Maytenus senegalensis* was either combined with other plants or used singly for the treatment of stomach ache in Guma, snake bites, wounds/ulcers, dysentery and yellow fever in Gboko and Kwande LGAs. [26] confirmed the use of *Myatenus senegalensis* bark for wounds/ulcer and root, bark and leaves for the treatment of dysentery. The plant was said to be highly sought for by herbal practitioners in Gboko and Kwande LGAs, maybe due to its utilization in the treatment of more ailments and harvesting method. In all the LGAs, destructive methods of harvesting plants were used more in the treatment of ailments. Bark harvesting accounted for 32% of ailments treated, followed by leaf harvesting (30%), while 27% of the ailments utilized the roots of plants. The flowers and

whole plant harvesting methods were the least with 2% and 3% respectively as shown in Fig. 2. The harvesting of roots and bark of plants utilized could lead to damage of tissues, making it difficult for optimal water and nutrient absorption which may affect carbon fixation [30]. [31] reported use of leaves more than other plant parts in Ethiopia which has less impact on the survival of plant species utilized. Despite these harvesting methods, no conservation measure was reported to promote sustained availability of tree species for the traditional medicine practice and other purposes in the communities. The harvesting of leaves, roots, flowers, stem and bark of tree species and whole plants could pose a threat to the abundance of these species within the communities. It was also noted that some of the species such as *Prosopis africana*, *Khaya senegalensis*, *Vitex doniana*, *Vittelaria paradoxum* etc were highly sought for craft making, timber and charcoal production which are destructive methods of utilization. The herbalists had a dosage measure called "kucha", a medium sized calabash that can be likened to between 250-300 mls depending on the variety and location. It was difficult to ascertain dosage though the practitioners affirmed that they had no cases of effects of overdose in administering the concoctions, being a practice that has been tested and carried on from one generation to the other. Differences in kindreds did not reflect in local names of plants mentioned in the study except for *Fluggea virosa* called Yaregh-agum in Guma area and referred to as Azizo in Gboko and Kwande LGAs and *Cochlospermum planchonii* referred to as Kpavande in Guma and called Hweregh in Kwande LGA.

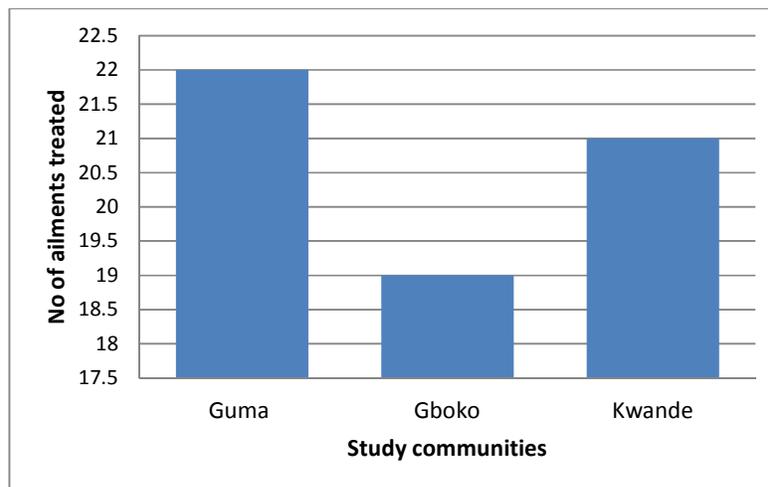


Fig. 1. Number of ailments treated in study communities

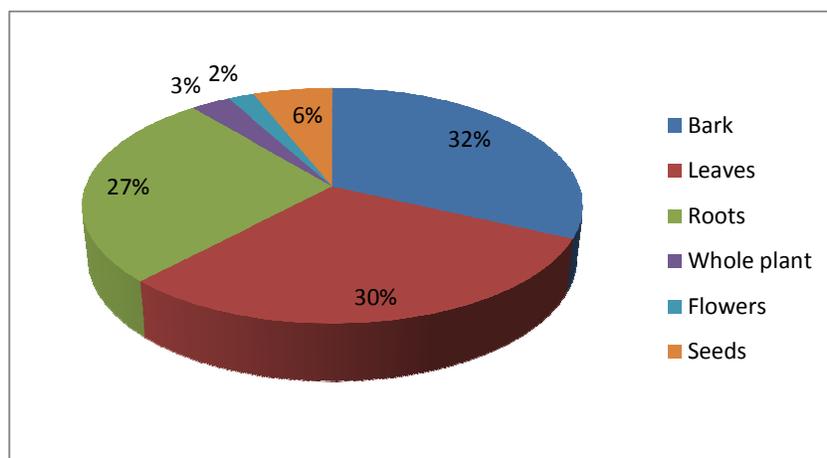


Fig. 2. Plant parts used for treatment of ailments in the study area

4. CONCLUSION

The claims of the people in the study area indicate that some ailments were treated using plants/plant parts mainly in the form of decoctions. These claims though believed and practiced by the people require scientific investigation and validation. Methods of plant harvesting were found to be mostly destructive with negative implications on the availability and conservation of the species which the practitioners and other users will continue to utilize. None of the practitioners agreed to have engaged in the planting and conservation of these plant species utilized in herbal medicine practice, posing a threat to the practice of herbal medicine in the area. The propagation of these plant species within the communities is strongly advocated for sustained availability of the species, not just for herbal practitioners but also other user groups in the area.

The side effects of using these plants were not investigated as ailments treated were not followed up, thus the need to investigate the possible side effects of the plant(s) preparations/concoctions is encouraged.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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