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Ethnobotanical Survey of Medicinal Plants Commonly used by the People of Njikoka and Dunukofia Local Government Area, Anambra State, Nigeria.

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Abstract

Ethnobotanical survey was conducted in Njikoka and Dunukofia Local Government Areas, Anambra State, Nigeria, to document the indigenous medicinal plants used within the locality to treat various diseases including malaria. A total of 400 respondents (200 from each locality), represented by women (40%, 32%) and men (60%, 68%) respectively, that included traditionalists, herbalists, herb sellers, farmers and civil servants were interviewed using oral and structured interview, participatory observation, group discussion and a semi-structured questionnaire. Data collected include plant species, parts used, preparation methods, and medicinal applications. The diverse range of plant species used in treating common ailments, managing chronic illnesses, and spiritual ceremonies were recorded. Indigenous knowledge transmission mainly occurs within families and communities, highlighting the intimate connection between cultural practices and plant use. This survey revealed some challenges such as declining plant populations due to habitat loss and overharvesting. Eighteen (18) plant species belonging to fifteen (15) botanical families including Amaranthaceae, Asteraceae, Moraceae, Rubiaceae, Araceae, Lauraceae, Fabaceae, Bignoniaceae, Anacardiaceae, Annonaceae, Apocynaceae, Lamiaceae, Meliaceae, Myrtaceae and Caricaceae were used in this region for the treatment of malaria and other diseases with *Azadirachta indica* being the most mentioned. The study showed the importance of sustainable harvesting practices, collaborative efforts between ethnobotanists, conservationists, and local communities in protecting both traditional knowledge and biodiversity. The documentation of this knowledge can support the integration of traditional medicine into orthodox healthcare systems, promoting both cultural heritage preservation and sustainable plant resource management.

Keywords: Ethnobotanical survey, Njikoka, Dunukofia, Malaria treatment, Medicinal plants, Semi-structured questionnaire

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Introduction

Medicinal plants, have been discovered and used in traditional medicine practices since the earliest recorded history (Udeinya *et al*., 2006). A medicinal plant is any plant that contains substances that can be used for a therapeutic purpose or as a precursor for synthesizing valuable drugs (Ukaga *et al*., 2006). Plants play a vital role in World health and are essential sources of medicine (Namsa *et al*., 2011). The discovery of new plant-derived drugs may result from the local knowledge of the indigenous people (Oladeji, 2016). About two-thirds of the World's population depend on plants for primary health care mainly because; they present fewer side effects when compared with orthodox drugs, have better compatibility, and adaptability. The knowledge pertaining to the healing effects of medicinal plants have been passed on over the centuries within and among human ethnicities and communities (Sha'a *et al.,* 2011).

Ethnobotanical studies focus on the interactions between local people and their environment, including customs and cultural values connected to various plant applications. The poor populations worldwide depend on medicinal plants since 35,000–70,000 plant species are utilized as traditional medicine worldwide (WHO, 2015). The preservation of indigenous ethnomedicinal knowledge is crucial and might aid in the creation of new medications, additionally, this may support the preservation of indigenous culture and natural resource management (Ampitan, 2013). According to Aiyeloja and Bello, (2006), ethnobotany is the scientific study of how plants are classified and used traditionally in various regions. The documentation of traditional medicines aids towards future studies on the effectiveness and safety of medicinal plants, which are essential for developing standardized phytomedicines (Ngarivhume *et a*l., 2015). Ethnobotanical research is seen to be the most effective way to find novel therapeutic agents for use for further study (Cotton, 1996).

Though, medicinal plants used by the southern parts of Nigeria in the treatment of malaria has been reported (Iyamah and Idu, 2015). This survey was designed to study the traditional plants used by the people of Njikoka and Dunukofia.

Method

Study area

Njikoka Local Government Area in Anambra state, south-eastern Nigeria is located between 6° 11′ 3″ North, 6° 58′ 36″ East (*Figure* 1). Towns covered in Njikoka Local Government Area were Abagana, Nimo, Enugwu-Ukwu, Enugwu-Agidi, Abba, and Umuriam-Nawfia. The Local Government Area has an area of 2050 km^2 and a population of 218,744 according to the 2006 census. The local government area is considered a malaria endemic area as the climatic favor the parasite vector. It has a tropical savanna climate with two distinct seasons in the year on the basis of the mean monthly rainfall. The rainy season begins in April and ends in November of the same year. These months have an average monthly rainfall of 2600 mm (www.manpower.com.ng). The mean monthly temperature and relatively humidity of the area is 25.5 °C and 72.5% respectively. The area is located on a valley that is always surrounded by grassy hills. Dunukofia Local Government Area is in Anambra State, Nigeria, has its administrative center at Ukpo, it is made up of towns and settlements such as Ifitedunu, Umudioka, Nawgu, Ukwulu, and Umunnachi. There are 162,088 residents in the Dunukofia LGA according to 2006 census. Although the majority of the population is still rural, significant progress has been made in business and education.

Data collection

This ethnobotanical survey was carried out between May 3rd to 6th 2023 to obtain the relevant information about medicinal plants used by the two (2) LGAs. The collection of data was on the basis of oral interviews with the respondent, in their local dialect, with the aid of a well-structured questionnaire. The criteria proposed by Willcox *et al*, (2011) for a good ethnobotanical survey were used. The informed consent of the respondents was acquired. The respondents were of Igbo ethnicity so no interpreter was needed. A total of 200 correspondents were interviewed. The various medicinal plants used by these people were collected, identified and authenticated. The vouchers numbers for all plant specimen were prepared and deposited at the herbarium of the Department of Pharmacognosy and Environmental Medicine, University of Nigeria, Nsukka. Plant specimens were shade-dried, pressed, mounted, and labeled on herbarium sheets. (Table 3).

Results

The solvent of choice for the extraction was water and ethanol. The method of extraction depended on the volatility of the phytoconstituents of interest, cold maceration was used mainly in the preparation of plant materials which contained volatile constituents that could be destroyed by heat. All the preparations were administered orally either singly or as a combination in liquid form. Generally, there was no standardized volume of administration but they were usually given using a tumbler or a glass cup which was estimated to be equal to 300 ml, taken a tumbler daily or half a tumbler twice a day.

For this survey, a total of 200 respondents for each LGA (21 years and above), both male and female who use medicinal plants to treat either themselves or others of malaria and

other diseases were all interviewed. The respondents were herbalists, traditionalists, herb sellers and civil servants that reside in the study area (Tables 1 and 2). There were more male respondents than females, and age 61 and above were more common amongst the respondents. A larger number of the respondents were traditionalist and herbalist. A very few numbers of them were

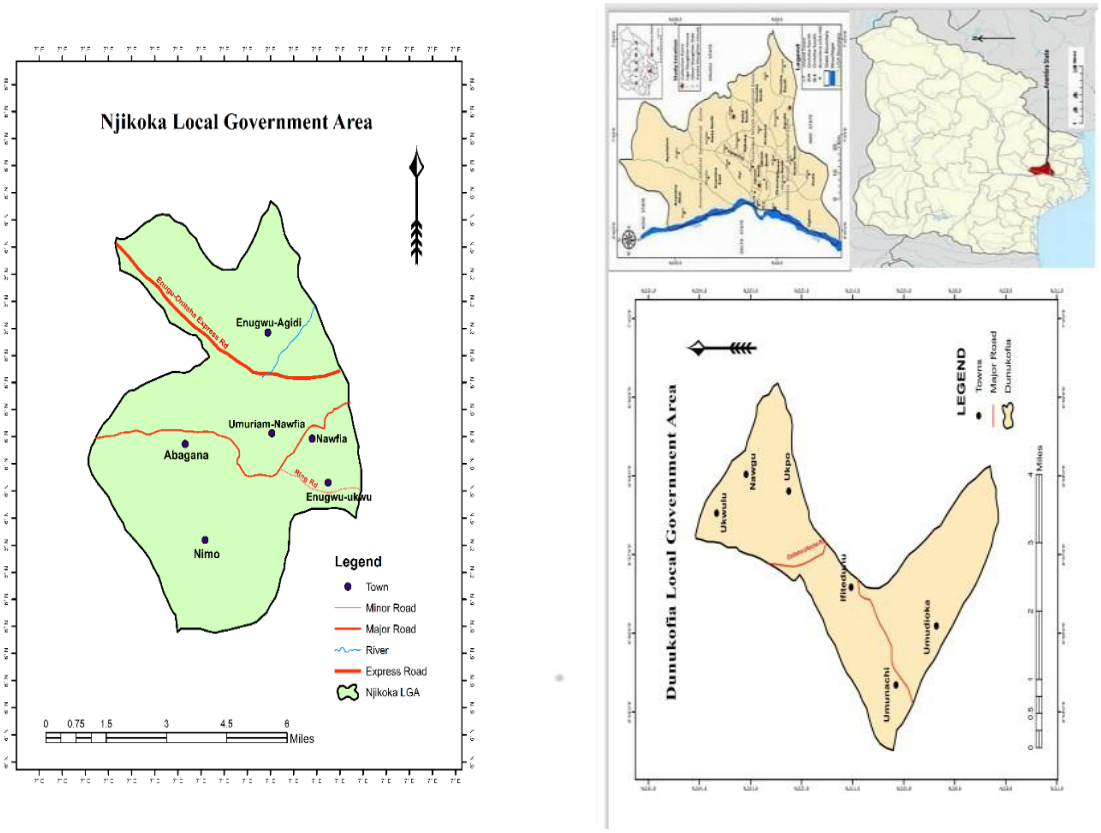

Figure 1: Map of Njikoka and Dunukofia Local Government Area showing the study region. (Source; Department of Geography, Faculty of Social Sciences, University of Nigeria, Nsukka).

Christians. Most of the respondents have some basic level of education as those having at least a secondary education were more than those with no formal education and tertiary education (Tables 1 and 2). In addition, the majority of the respondents claimed to have acquired their knowledge from the parents as knowledge passed down from time immemorial, or through some form of informal training. A reasonable number of the respondents accepted that their knowledge was acquired through other means such as apprenticeship in the hands of experienced persons and extensive study of medicinal books. Only a handful said their knowledge of medicinal plants was acquired through divination. The respondents explained that their method of diagnosing a condition is to critically observe any of or a combination of the signs of the illness. Example, for malaria fever, chills, headache, body weakness and vomiting would be observed by these practitioners, same goes for other disease states.

Table 1: Demographic characteristics of the respondents (n= 200) in Njikoka Local Government Area, Anambra State.

Parameter	Specifications	N (%)
Sex	Male	120 (60)
	Female	80 (40)
Age	21-30	0 (0)
	31-40	48 (24)
	41-50	24 (12)
	51-60	48 (24)
	61 and above	80 (40)
Occupation	Traditional medicine practitioner	90 (45)
	Herb sellers	30(15)
	Herbalists	50 (25)
	Traditionalists and herb sellers	8 (4)
	Farmers	16 (8)
	Civil servants	6 (3)
Educational status	Tertiary institution	16 (8)
	Secondary school	40 (20)
	Primary school	24 (12)
	No formal education	120 (60)
Religion	Christianity	32 (16)
	Islam	0 (0)
	Traditional	168 (84)
Source of knowledge	Parental	80 (40)
	Training	40 (20)
	Parental/ training	64 (32)
	Divination	16 (8)
	Other	0 (0)

Table 2: Demographic characteristics of the respondents (n = 200) in Dunukofia Local Government Area, Anambra State.

Parameters	Specifications	N (%)
Sex	Male	136 (68)
	Female	64 (32)
Age	21–30	16 (8)
	31–40	48 (24)
	41–50	88 (44)
	51–60	40 (20)
	61 and above	8 (4)
Occupation	Traditional practitioners	56 (28)
	Herb sellers	40 (20)
	Herbalists	42 (21)
	Traditional practitioners/herb sellers	24 (12)
	Farmers	16 (8)
	Civil servants;	22 (11)
Level of education	Tertiary institution	46 (23)
	Secondary school	68 (34)
	Primary school	40 (20)
	No formal Education	46 (23)
Religion	Christianity	140 (70)
	Islam	0 (0)
	Tradition	60 (30)
Source of knowledge	Parental	110 (55)
	Training	20(10)
	Parental/training	36(18)
	Divination	34(17)

A total of 26 plants belonging to 15 families were identified and documented. The most mentioned plant families were Amaranthaceae (*Amaranthus viridis, Alternanthera rasiliensis*), Loganiaceae (*Anthocleista djalonensis*), Asteraceae (*Eringeron bonariensis, Vernonia amygdalina*), Moraceae *(Ficus sur)*, Rubiaceae (*Brenania brieyi*), Araceae (*Anchomonas difformis*), Lauraceae (*Cassytha filiformas*), Fabaceae (*Baphia nitida*) , Bignoniaceae (*Newbouldia laevis*), Anacardiaceae (*Mangifera indica*), Annonaceae (*Annona muricata*), Apocynaceae (*Amaranth globe*), Lamiaceae (*Ocimum gratissimum*), Meliaceae (*Azadirachta indica*), Myrtaceae (*Psidium guajava*) and Caricaceae (*Carica papaya*). (Table 3)

Table 3: List of plants used by the people of Njikoka and Dunukofia Local Government Area, Anambra State for the treatment of malaria and other diseases**.**

S/n	Family	Botanical name	Common name	Igbo name	Nature	Plant part	Cultivated/wild	Method of preparation	Diseases
1.	Amarylidaceae	*Allium sativum*	Garlic	Galiki	Bulb	Bulb	C	Cold maceration	Hypertension
2.	Anacardiaceae	*Anacardium occidentale*	Cashew	Kashiu	Tree	Leaf, bark	C	Decoction	Diabetes
	Anacardiaceae	*Mangifera indica*	Mango	Mangoro	Tree	Leaf, stem bark	C	Decoction	Malaria
3.	Annonaceae	*Annona muricata*	Soursop	Shawashop	Tree	Leaf	C	Decoction	Malaria
4.	Apocynaceae	*Amaranth globe*	Amaranth globe	Utazi	Climber	Leaf, stem bark	C	Cold maceration	Anaemia
5.	Araceae	*Xanthosoma sagittifolium*	Cocoyam	Ede red	Shrub	Root	W	Decoction	Constipation
6.	Asteraceae	*Vernonia amygdalina*	Bitter leaf	Onugbu	Shrub	Leaf	C	Cold maceration	Diabetes
7.	Bignoniaceae	*Newbouldia laevis*	Ogilisi tree	Ogilisi	Tree	Leaf	W	Decoction	Constipation
8.	Bromeliaceae	*Ananas comosus*	Pineapple	Okwuru bekee	Sucker	Unripe fruit	C	Cold maceration	Dyspepsia
9.	Capparaceae	*Buchhlozia coriacea*	Wonderful kola	Wondaful kola	Tree	Seed, leaf stem bark	C	Cold maceration	Migraine
10.	Caricaceae	*Carica papaya*	Pawpaw	Mgbimgbi	Tree	Seed, leaf, fruit	C	Decoction	Malaria, diarrhoea
111	Clusiaceae	*Garcinia kola*	Bitter kola	Akiilu	Tree	Seed	C	Cold maceration	Malaria
2.	Fabaceae	*Baphia nitida*	Camwood	Aboshi	Tree	Leaves	W, C	Decoction	Diarrhoea and pain
13.	Irvingiaceae	*Irvinga gabonensis*	Wild mango	Ujuru	Tree	Seed	C	Decoction	Malaria
14.	Lamiaceae	*Ocimium gratissium*	Scent leaf	Nchuanwu	Shrub	Leaf	C	Cold maceration	Dyspepsia
15.	Lauraceae	*Persea americana*	Avocado pear	Ube oyibo	Tree	Leaf	C	Decoction	Malaria

16.	Malvaceae	*Cola acuminata*	Kola nut	Oji Awusa	Tree	Stem bark	C	Decoction	Dysentery
17.	Meliaceae	*Azadirachta indica*	Neem	Dogoyaro	Tree	Root, stem bark, leaf	C	Decoction	Malaria, typhoid
18.	Moraceae	*Ficus sur*	Broom cluster	Akakoro	Tree	Seed and fruit	W	Decoction	Boils ,throat and lung infections
19.	Moringaceae	*Moringa oleifera*	Moringa	Okwe oyibo	Tree	Leaf, seed	C	Cold maceration	Constipation,
20.	Musaceae	*Musa paradisiaca*	Plantain	Unere Igbo	Shrub	Leaf	C	Decoction	Malaria
21.	Myrtaceae	*Psidium guajava*	Guava	Gova	Tree	Leaf	C	Decoction	Malaria
22.	Poaceae	*Cymbopogon citratus*	Lemon grass	Lemon grass	Herb	Leaf	W	Decoction	Convulsion
23.	Rubiaceae	*Brenania brieyi*	De Wild	Mgbunsi	Tree	Root	W	Decoction	Malaria
24.	Rutaceae	*Vitis vinifera*	Grape	Grepu	Tree	Fruit	C	Cold maceration	Epilepsy
25.	Solanaceae	*Nicotiana tobacum*	Tobacco snuff	Utaba	Tree	Leaf	W	Decoction	Migraine, malaria
26.	Xanthorrhoeaceae	*Aloe barbadensis miller*	Aloe vera	Alo vera	Herb	Leaf	C	Cold maceration	Skin burns
26.	Zingiberaceae	*Zingiber officinale*	Ginger	Jinja	Herb	Rhizome	C	Cold maceration	Nausea

C = cultivated; W = wild, *all administered orally.

Discussion

This is the first ethnobotanical survey of Njikoka and Dunukofia Local Government Areas, Anambra State, Nigeria. Our study shows that the 26 plant species identified were useful in treatment of different ailments, showing that traditional medical practice is an important component of everyday life. Elujoba *et al.,* (2005) suggested the need to institutionalize the traditional medicine in concert with orthodox medicine to achieve an effective National health care system in Nigeria. Most people in the Metropolis depend on traditional medicine for their health needs because of their poor economic conditions. This is one of the major reasons why traditional medicine has continued to thrive in both rural and urban areas in Nigeria. Gender and age influenced the traditional knowledge of our respondents. Males (68%) had medicinal knowledge than females. This may be due to their involvement in trade or personal experience of using these plants for a very long time. Our findings also show that the indigenous people value some of these herbs for medicinal purposes and food condiments. For instance, garlic, onions, ginger, scent leaf, thyme and curry is more useful in treating cough, constipation, asthma, nervous disorder, hypertension, ulcer and anthelminthic than used as seasoning of food. There is need for closer collaboration between herbal medical practitioner, medical doctors and other stakeholders in medical field to bring traditional healers closer by engaging them in laboratory work, training as well as getting information on traditional prescriptions for diseases.

Medicinal plants have been known to play a major role in the local communities for the treatment of various diseases including malaria (Ngarivhume *et al.,* 2015). Amaranthaceae family are useful for treating infections, it has been shown to have antimalarial, immune-modulating, anti-inflammatory, antibacterial, and antioxidant properties (Mukungu *et al.,* 2016; Olorunnisola *et al*., 2013). The huge blooming plant family known as Asteraceae has therapeutic properties such diuretic, expectorant, antiparasitic, respiratory support, blood control, and antibacterial (Abosi *et al.,* 2003). Inulin, a natural polymer with prebiotic characteristics, is also abundant in them. A wide range of conditions affecting the reproductive, respiratory, endocrine, and digestive systems have been treated using Moraceae in traditional medicine. *Galium verum* (Rubiaceae) has been used traditionally to treat gout, epilepsy, spasms, and as a sedative, and diuretic. *Galium mollugo* has been used as a vulnerary and to treat hysteria and epilepsy, while *Galium aparine* is reportedly used to decrease infection and inflammation, treat wounds, burns, and skin problems.

The treatment of malaria in Dunukofia local government area with *Azadirachta indica, Mangifera indica, Annona muricata, Carica papaya,* and *Psidium guajava* was documented in this present study, either alone or in combination. A similar study in southern Nigeria reported that *Azadirachta indica* is the most cited plant for malaria treatment (Bero *et al.,* 2009; Dike *et al.,* 2012; Iyamah and Idu, 2015). Similarly, a study conducted on the ethnobotanical survey in Maiduguri, north-eastern Nigeria, revealed that the plants commonly used by the three major ethnic groups in Nigeria (Hausa, Yoruba and Igbo) for the treatment of malaria are *Azadirachta indica, Mangifera indica*, *Cymbopogon citratus*, *Psidium guajava*, *Carica papaya*, *Citrus limon* and *Musa sapientum* (Awe *et al.,* 1998; Ene *et al*., 2010). Other reports in southern Nigeria, including Abia State (Omosun *et al*., 2013) and Port-Harcourt metropolis (Nwauzoma and Dappa, 2013) have corroborated our present findings. *Azadirachta indica* is also reported effective against typhoid (Dike *et al.,* 2012), and *Vernonia amygdalina* against antimalaria (Gauthier *et al.,* 2011). Chinsembu, (2015) documented that many of the identified plants in the present study are used in several countries of Africa for the treatment of malaria and other disease. Use of leaves is advocated since it is less destructive and ensures biodiversity conservation (Maroyi, 2013; Asnake *et al*., 2016). Malaria has historically been treated using medicinal plants by indigenous tribes (Ngarivhume *et al.,* 2015).

Medicinal plant species identified in this study were employed both singly and in combination with other plants for the treatment of malaria and other diseases probably due to their synergistic effect (Dike *et al*., 2012). Several methods were used in the preparation of herbal medicines and they include; decoction, infusion, cold maceration, boiling, and percolation, however, there was no standardization of the herbal remedies (Olorunnisola *et al*., 2013). The choice for use of solvent is purely dependent on the medicinal plant, the phytoconstituents of interest, and the volatility of the constituents. This present findings showed that the solvent of choice for the extraction were water and ethanol. Cold maceration is used in herbal preparation, as it is one way to extract delicate or highly volatile herbal essences without applying heat. Plants such as *Amaranth globe* and *Ocimum gratissimum* were prepared using cold maceration.

It is interesting to note that the majority of the identified plants have been investigated (*in vitro* and/or *in vivo*) for anti-malarial activity and pharmacological potentials against other diseases. *Allium sativum,* commonly known as garlic, is used worldwide as a seasoning agent. This medicinal plant has a number of traditional medicinal uses including malaria and other disease conditions like constipation. The combination of Ajoene and chloroquine was found to show synergistic activity against *P. falciparum* (Perez *et al*., 1994). Allicin was found to be effective against the erythrocytic stages of the plasmodium parasite *in vivo* (Coppi *et al*., 2006).

Anacardium occidentale (Cashew) is a medicinal plant commonly found throughout the tropics in West Africa. The

leaf and bark are traditionally and locally used to treat malaria, relief toothache and sore gums (Odugbemi *et al*., 2007; Sha'a *et al*., 2011). *Annona muricata* (Soursop) is a broad-leaf, flowering, evergreen tree. It is used traditionally for malaria treatment. It is reported to have several biological properties such as antiparkinsonian, antileishmanial, molluscicidal, antitumor, antiviral and antidepressive activities (Hasrat *et al*., 1997, Betancur-Galvis *et al*., 1999; Champy *et al*., 2004; Menan *et al*., 2006). *Azadirachta indica* L. commonly called Neem is native to India and is naturalized in most of tropical and subtropical countries. It is of great medicinal value and distributed wide spread in the world. The leaf is useful in the treatment of malaria, eczema, ringworm, acne, and have anti-inflammatory activity. It also has antihyperglycemic, anticancer, hepato-renal protective and hypolipidemic effects (Deshpande *et al*., 2014). The anti-malarial activity of the plant has been reported to be superior to chloroquine and gametocytocidal against *plasmodium falciparum* (Udeinya *et al*., 2006).

The antimalarial activity of *Azadirachta indica* have been similarly reported *in vivo* and *in vitro* (Gathirwa *et al*., 2011; Igwenyi *et al.,* 2017). *Azadirachta indica* contains many biologically active compounds including alkaloids, flavonoids, triterpenoids, phenolic compounds, carotenoids, steroids and volatile oils. Meliantriol, salannin and nimbin, nimbolide, gedunin and azadirachtin have also been isolated from the plant (Verkerk and Wright, 1993, Deshpande *et al*., 2014).

Carica papaya (pawpaw). is used in traditional treatment of malaria and several other ailments such as cancer, warts, nervous pains, asthma and jaundice. The young leaves are rich in flavonoids (kaempferol and myricetin), alkaloids (carpaine, pseudocarpaine, dehydrocarpaine I and II), phenolic compounds (ferulic acid, caffeic acid, chlorogenic acid), the cynogenetic compounds (benzylglucosinolate). Both leaf and fruit of the *Carica papa*ya possess carotenoids namely β-carotene, lycopene, anthraquinone glycosides and hence possess medicinal properties like anti-inflammatory hypoglycaemic, anti-fertility, abortifacient, hepatoprotective, wound healing, antihypertensive and antitumor activities. *Carica papaya* fruit has been studied for its antifungal (Giordani *et al*., 1991), antibacterial (Osato *et al*., 1993) and anthelminthic (Satrija *et al*., 1994) activities. The plant shows anti-plasmodial activity against *Plasmodium falciparum in vitro* (Bhat and Surolia, 2001; Dabo *et al*., 2013). Okpe *et al*, (2016) demonstrated that the individual administration of aqueous leaf extract of *Carica papaya*, *Vernonia amygdalina*, and the combination of both plants significantly decreased plasmodium parasite load in animal and enhanced their survival.

Persea americana (Avocado pear) is a valuable fruit that is cultivated in the tropical and Mediterranean regions of the world. The plant is used in traditional medicine for the treatment of various ailments, such as menorrhagia, hypertension, stomach ache, bronchitis, diarrhoea, malaria and diabetes. Compounds which are reportedly present in the plant include the following: peptone, b-galactoside, glycosylated abscisic acid, alkaloids, cellulose, polygalactourease, polyuronide, cytochrome P-450, and volatile oils (Yasir *et al*., 2010). The fatty alcohols (avocadenols), 1, 2, 4-trihydroxyheptadec-16-ene (14) and 1, 2, 4, 15- tetrahydroxyheptadecane-6, 16-diene were isolated from the seeds of *Persea americana* and investigated for anti-plasmodial activity *in vitro*. They exhibit promising anti-plasmodial activity (Falodun *et al.,* 2014).

Vernonia amygdalina (bitter leaf) is a perennial herb belonging to the Asteraceae family. Besides its use as a vegetable in the popular bitter leaf soup, all parts of the plant have found usefulness in folk medicine (Atangwho *et al*., 2009). Extracts of the plant have been used in traditional medicine to treat diseases like helminthic, protozoal and bacterial infections, diabetes and malaria. Steroidal saponins with antimalarial activity were isolated from the leaves of the plan, in addition to sesquiterpenes, vernodalin, vernodalol, vernolide and hydroxyvernolide (Ohigashi *et al*., 1994; Ajaiyeoba *et al.,* 2006).

Conclusion

This study has shown that trado-medical methods are widely accepted by the people of the Njikoka and Dunukofia local government areas, perhaps due to their belief in its efficacy A total of 26 plant species were mentioned. *Azadirachta indica, Mangifera indica, Carica papaya, Cymbopogon citratus, and Psidium guajava* were the most commonly used. The present findings showed that the people of Njikoka and Dunukofia use a large variety of medicinal plants for the treatment of malaria and other diseases.

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