



## ETHNO-BOTANICAL SURVEY OF ANTI-MALARIAL AND ANTI-DIABETIC PLANTS USE IN EBONYI STATE, SOUTH-EAST, NIGERIA

DAMILOLA ALEX OMOBOYOWA<sup>1\*</sup>

<sup>1</sup>Department of Biochemistry, Adekunle Ajasin University, Akungba-Akoko, Ondo State, Nigeria.

### AUTHOR'S CONTRIBUTION

The sole author designed, analyzed, interpreted and prepared the manuscript.

*Received: 02 March 2020*

*Accepted: 11 May 2020*

*Published: 15 May 2020*

*Original Research Article*

### ABSTRACT

**Background and Objective:** The use of medicinal plants has remains the kernel for the treatment of diabetes and malaria in recent times, as herbal therapies are being used for therapeutic purposes. Despite the relevance of medicinal plants to manage malaria and diabetes in many villages in Ebonyi state, there have been limited empirical studies to plants used by traditional healers to treat this life threatened diseases.

**Materials and Methods:** An ethno-botanical survey was conducted in ten out of thirteen local government areas in Ebonyi state, south-east Nigeria to ascertain the medicinal plants with anti-malarial and anti-diabetic potentials. Ethno-botanical data were collected from herb sellers, traders, civil servant and farmers using in-depth interview and a semi-structured questionnaire administered to one-hundred and eighty two (182) respondents in twenty communities across ten local government areas of the state.

**Results:** From the survey, a total of forty plant species were observed to be useful in the management of malaria and diabetes. Herbal remedies were either prepared from dry or freshly collected samples while the solvents of extract includes; water, honey or alcoholic solvents. Studied populations find the medicinal plants cheaper, readily available with fewer side effects compared with orthodox drugs.

**Conclusion:** Scientific validation of the traditional claims is imperative as it contribute positively to the search for newer and more effective anti-malarial and anti-diabetic drugs.

**Keywords:** Diabetes; malaria; ethno-botanical survey; orthodox drugs; plants.

### 1. INTRODUCTION

Medicinal plants have long been recognized as one of the oldest therapeutic remedies used by human in treatment of diseases. Many people in developing countries still rely on traditional healing practices and herbal medicine for their healthcare, in spite of the advancement in orthodox medicine. Different traditional healing practices worldwide are designated for either therapeutic or prophylactic use in human diseases [1]. There are several ancient knowledge of herbal remedies used to treat diseases in most culture

[2] which are gradually out of use since the administration of the native and traditional drugs has been on the hand of native herbalist who quite often, are old people in rural setting [3].

Several studies carried out in Africa showed that, medicinal plants are routinely used as remedy for human diseases [4]. In Nigeria, herb sellers and farmers are known to treat human diseases such as diabetes and malaria with herbs and other traditional practices before the advent of orthodox medicine.

\*Corresponding author: Email: damlexb@gmail.com, damilola.omoboyowa@aau.edu.ng;

Diabetes is a chronic diseases characterized by high level of blood glucose and abnormal metabolism of carbohydrate, protein and fat associated with a relative insufficiency of insulin secretion, glycosuria, polyuria and other metabolic disorders [5].

Malaria is a disease caused by parasites of the genus plasmodium, it places a health burden on human life [3]. Malaria is transmitted in 108 countries inhabited by roughly 3 billion people in 2010, caused an estimated 216 million cases and 655,000 deaths [3,6]. According to the history of Nigeria traditional medicine, thousands of plants have been used for many years in the treatment of diabetes and malaria in the course of practicing herbalism [7]. Indigenous medicinal plants in Nigeria used in combating malaria and diabetes are yet to be exhaustively projected in spite of the rich floral diversity. This study was conducted to ascertain the medicinal plants with anti-malarial and anti-diabetic potentials in Ebonyi state, Nigeria.

## 2. METHODS

### 2.1 Study Site

The studied populations were selected from ten different local government areas (Abakaliki, Afikpo North, Afikpo South, Ezza North, Ikwo, Ivo, Izzi, Ohaozara, Ohaukwu and Onicha) out of the thirteen local government areas in the state (Fig. 1). Ebonyi state is a state in the south-east Nigeria. It is inhabited and populated primarily by the Igbos. Its capital and largest city is Abakaliki. The state was created in 1996 by the then federal military government from Enugu state and Abia state.

Ebonyi state is primarily an agricultural region. It is a leading producer of rice, yam, potatoes, maize and cassava in Nigeria. Rice and yams are predominantly cultivated in Edda, a region within the state. Ebonyi state has several solid mineral resources including lead, crude oil and natural gas, but few large-scale commercial mining/mines. Ebonyi is called “The Salt of the Nation” for its huge salt deposit at the Okposi and Uburu Salt Lake.

The state receives heavy rains during the rainy season from June – September. According to the National population and housing census projection of 2016, Ebonyi state has a total population of 2,176,947 people. The relative socio-economic situation in the state compares poorly to most parts of the country.

### 2.2 Data Collection

Most of the rural communities surveyed have limited access to modern medical facilities largely due to poor

road network. The study covered a period of three months from April – June, 2016. A well-structured, open-ended questionnaire and guided dialogue techniques [1,7] were used to interview respondents. The questionnaire was designed by the team based on the required information and validated by the Agriculture extension unit of Akanu Ibiam Federal Polytechnic, Unwana, Nigeria. Also, the treatment practices of the herbal practitioners were obtained by the use of a local interpreter.

After explaining the objectives of the research and seek their consent, the traditional healers, farmers, civil servants and herb sellers were engaged in a semi structured interview. During the dialogue, data on the local name of plants, plant parts, methods of extraction and methods of administration were obtained on the medicinal plants used to manage diabetes and malaria. Farmers and herb sellers were used as guide during the field trips to collect plant specimens which were later identified at the Botany Department of University of Nigeria, Nsukka, Nigeria.

### 2.3 Informed Consent

The purpose of the study was explained to the local traditional herb sellers, farmers, mothers, and community leaders in the studied Local Government Areas. Consent to conduct the study was given by the traditional herb sellers and community leaders. Informed consent was obtained from each of the participants. An approval for the study was obtained from the traditional heads of the communities.

### 2.4 Statistical Analysis

Data obtained were entered and verified using Epi-Info software version 6.04 (Centers for Disease Control Prevention, Atlanta, GA) and analyzed using SPSS version 16.0 (SPSS Inc., Chicago, IL, USA).

## 3. RESULTS

### 3.1 Gender Distribution of the Studied Population

Fig. 2 shows the gender distribution of the studied population base on the senatorial zones. It was observed that, majority of the study populations were from Ebonyi South senatorial district. While the least sample for this study was the female participants from Ebonyi North senatorial district. More male (participant) volunteers responded to the questionnaires for this study in all the senatorial district compared to the female volunteers as shown in Fig. 2.



Fig. 1. Map of Ebonyi State showing all the Local Government Areas

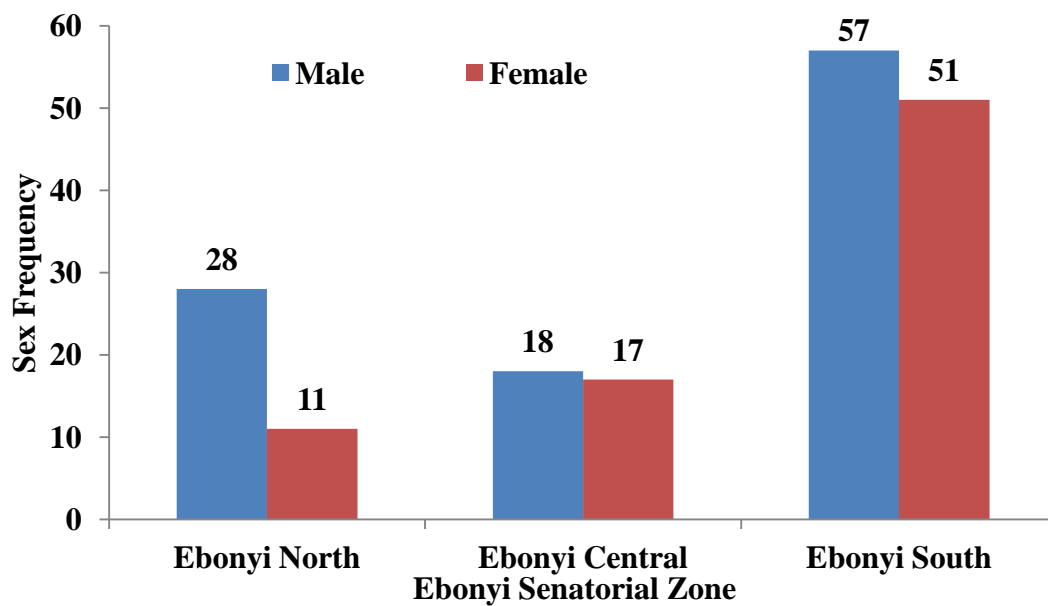


Fig. 2. Gender distribution of studied population based on the senatorial zone of Ebonyi state

### 3.2 Age Distribution of the Studied Population

Fig. 3 shows the age distribution of the studied population base on the senatorial zone. It was observed that, in Ebonyi South, from 61 years and above respondents respond more than the other senatorial zone. While from 51-60 and 61 years above under Ebonyi South, responded to the questionnaires for this study among all other senatorial zone in Fig. 3.

### 3.3 Occupational Distribution of the Studied Population

Fig. 4 shows the occupational distribution of the studied population base on senatorial zones. It was observed that farmers and herb sellers from Ebonyi South responded more among the three senatorial districts. While a high sample was also recorded among Traders (participants) from Ebonyi North senatorial district. More Farmers (participant) volunteers responded to the questionnaires for this study in all the senatorial district compared to the other occupations across the senatorial zones as shown in Fig 4.

### 3.4 Methods of Malarial Treatment of the Studied Population

Fig. 5 shows the frequency of methods use in malarial treatment among the studied population base on the senatorial zones. It was observed that, majority of the studied population from Ebonyi North, central and south senatorial zone preferred the use of herbs for the treatment of malaria. None of the respondents from Ebonyi central senatorial district uses both herbs and antimalarial drugs while few respondents from Ebonyi North and South senatorial district use both herbs and antimalarial drugs in the treatment of malaria.

### 3.5 Medicinal Plants with Anti-malarial and Anti-diabetic Efficacy

Tables 1 and 2 shows the list of medicinal plants, the parts used and methods of preparation for treatment of malaria and diabetes among the studied populations in Ebonyi state, Nigeria. It was observed that, majority of the herbs used for malarial treatment were always prepared by boiling the plant part while those for diabetes management were either chewed or boiled.

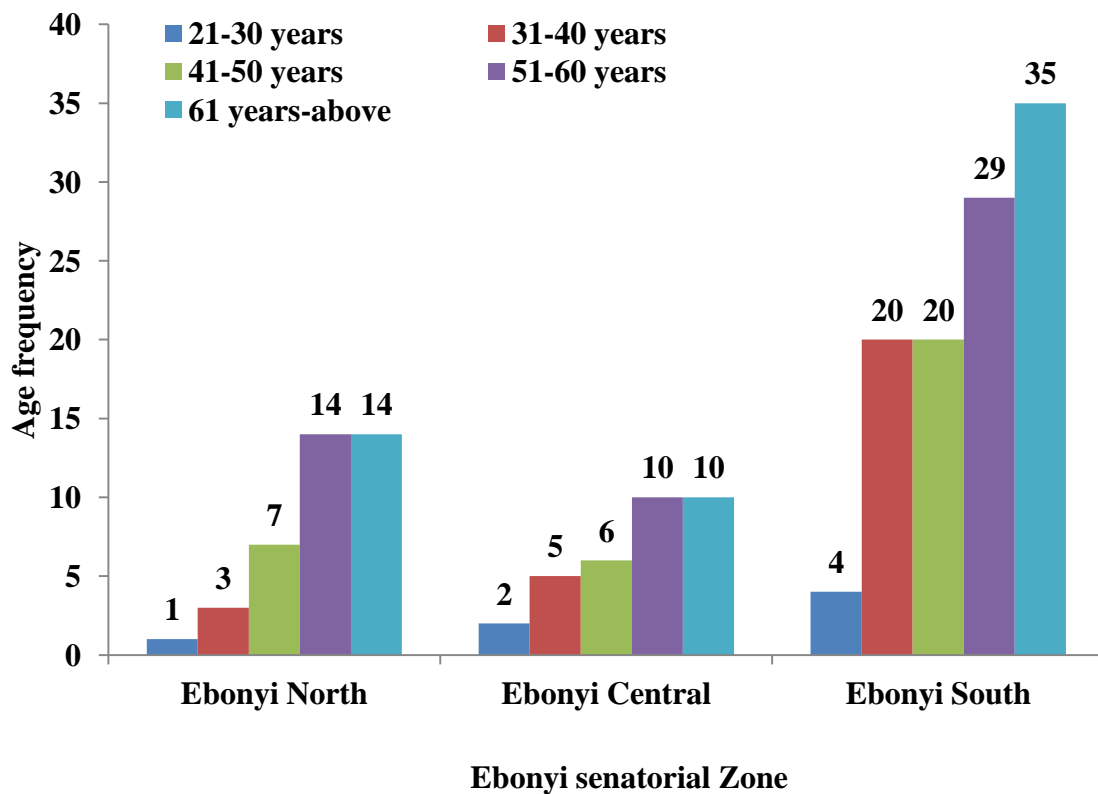


Fig. 3. Age distribution of studied population based on the senatorial zones of Ebonyi state

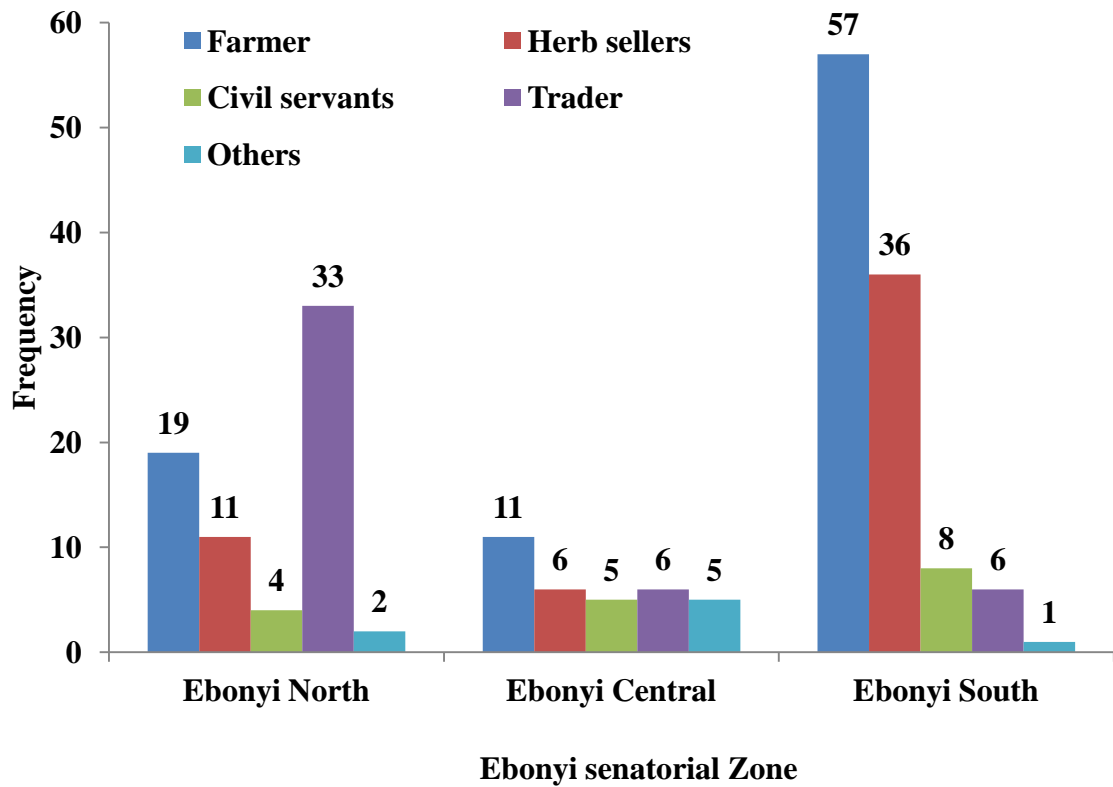


Fig. 4. Occupational distribution of studied population based on the senatorial zones of Ebonyi state

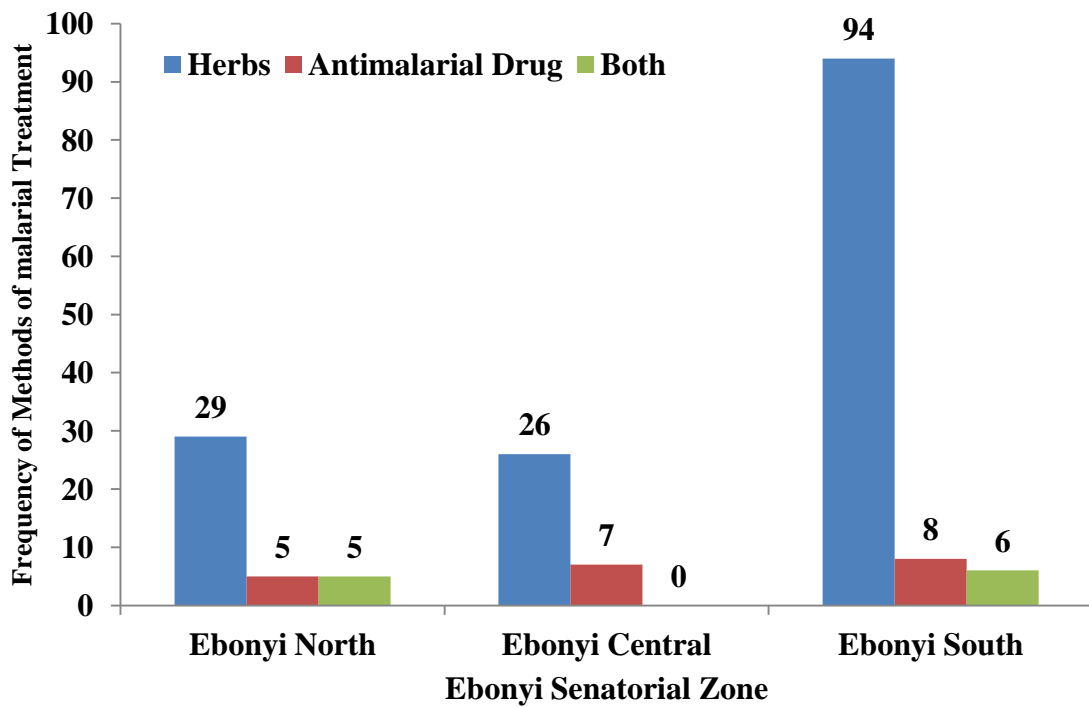


Fig. 5. Methods of malarial treatment of studied population based on the senatorial zones of Ebonyi state

**Table 1. Herbs for the treatment of malaria**

Local names	Scientific names	Family	Plant part (s)	Method of preparation
Ekwukwo Tea	<i>Camelia Sinensis</i>	Theaceae	Leaves, Stem	Boiling
Ekwukwo Gimkpa	<i>Murraya koenigi</i>	Rutaceae	Leaves	Boiling
Cahew	<i>Anacardium occidentace</i>	Anccardaceae	Leaves	Boiling
Oroma nkirisi	<i>Citrus aurantitolia</i>	Rutaceae	Leaves	Boiling
Dogoyaro	<i>Azadirachta Indica</i>	Melicaea	Root	Boiling
Cotton	<i>Gossypium barbadense</i>	Malveceae	Leaves	Boiling
Acara	<i>Oxytenanthera abyssinica</i>	Poaceae	Stem, Leaves	Boiling
Akwukwo Akoyi	<i>Musa Saprentum</i>	Musaceae	Leaves	Boiling
Ngbi-Ngbi	<i>Carica Papaya</i>	Caricaceae	Pawpaw Fruit (Unripe)Leaves	Boiling
Ginger	<i>Zungiben Officianale</i>	Zingiberaceae	Rhizome	Boiling
Moringa	<i>Moringa Oleifera</i>	Moringaceae	Leaves	Boiling
Ekwukwo guava	<i>Psidium guajava</i>	Myrtaceae	Leaves, Stem Bark	Boiling
Nkwelu	<i>Raphia Africana</i>	Arccaceae	Pineapple soccer	Boiling
Ekwukwo mangoro	<i>Mangifera indica</i>	Anacardiaceae	Leaves, Bark	Boiling
Akilu	<i>Garcinia kola</i>	Sterculiaceae	Leavea, root	Chewing
Independe			Leaves	Boiling
Olugu uda	<i>Veronia amygerlina</i>	Compositae	Leaves, Stem	Chewing
Palm tree (Nkwe, Ake)	<i>Eleais giuneneses</i>	palmae	Leaves	Squeezing
Nuke	<i>Morinda Lucinda</i>	Rubiaceae	Leaves	Pounding
Lemon grass	<i>Cymbopogon atratus</i>	Poaceae	Leaves	Boiling
Oriirishi Igbo	<i>Millcia excels</i>	Millcia	Leaves	Boiling
Fiofio	<i>Cajanus Cajan</i>	Fabaceae	Leaves	Roasting/Squeezing
Egbuora	<i>Alstonia boonei</i>	Apocynacea	Bark	Boiling
Ahuji	<i>Occimum gratissimum</i>	Labiatae	Leaves	Boiling

**Table 2. Herbs for the treatment of Diabetes mellitus**

Local names	Scientific names	Family	Plant part (s)	Method of preparation
Utazi	<i>Gongronema Latifolium</i>	Asclepiadaceae	Leaves	Eating raw
Ukom Leaf	<i>Bellis perennis</i>	Composite	Plantain Pitch	Roasting
Bitter Leaf	<i>Veronica amygdlanina</i>	Compositate	Leaves, Stem	Chewing
Kagoro	<i>Azadirachta indeca</i>	Meliaceae	Bark	Extraction with ethanol
Akuilu	<i>Garcinea cola</i>	Clusiaceae	Root	Chewing
Unere (Banana)	<i>Musa paradisca</i>	Musaceae	Unripe Plantain	Pounding
Aleo Vera			Leaves	Chewing
Cabbage	<i>Porassica oleracea</i>	Brassicaceae	Leaves	Chewing
Ukom (Plantain)	<i>Musa sapuntum</i>	Musaceae	Fruit	Boiling
Opioro (mango)	<i>Mangifera ndica</i>	Anacandiaceae	Root, Leaves	Boiling
Egburu (Cassava)	<i>Manhot esseleta</i>		Root	Soaking
Nkasu (Cocoyam)			Root	Soaking
Garlic	<i>Allium sativum</i>	Lillaceae	Leaves	Boiling
Onah(yellow yam)	<i>Genus dioscorea</i>	Dioscoreaceae	Tuber	Boiling
Water yam	<i>Dioscorea alata</i>	Dioscoreaceae	Tuber	Boiling
Cameroon Banana (Banana without sugar)			Root	
Moringa	<i>Moringa olifera</i>	Moringaceae	Leaves	Boiling

#### 4. DISCUSSION

From the list of herbs frequently used and the plant parts, it was observed that 31 plants with antimalarial activity and 21 plants with anti-diabetes activity were documented from Ebonyi state, Nigeria. Majority of the herbs were administered by boiling, chewing, soaking, extracted with ethanol and squeezing the plants. Utazi and Olugbo popularly called bitter leaf is also used by some respondents as “blood tonic”, thus believing that it has a multiple effects. Studies also confirm that *S. latifolius*, *Alstonia boonei*, *Petivera alliacea*, *Mangifera indica* and *Khya grandifolia* have significant anti-malaria properties [8]. The combination of different plants and parts in the preparation of anti-malaria and anti-diabetic herbal remedy are not uncommon among respondents and it is believed that some plants enhance the action of the other herbs [9].

The use of either freshly collected herbal recipes or preserved (dried) plant parts seem not to make any difference in its perceived efficacy as the respondents showed no peculiar preference to one. However, studies had shown that there was quantitative and qualitative difference in the essential oil components of fresh and dry plant materials [10] thus; dried plant materials might not be as potent as freshly collected herbs. Pharmacological laboratory studies have also employed the drying of plant parts during the preparation of plant extracts.

There is no scientific reason backing the preference to the use of clay pots for herbal preparations, but some of the respondent said that preference is given to the use of clay pots because clay pot have been used before the advent of aluminium pots and even cheaper than aluminium pots.

Respondents also show preference for the arrangement of plants in cooking pots although this has not been studied in relation to plant/herb efficacy. However, respondents believed that “ingredients” are soaked better in that arrangement especially when boiling is to be employed.

Preference for solvent of herbal remedy is because of the belief that some solvents are efficient than others and depending on the plant parts. However, aqueous extract from fermented maize was shown more preference than water and alcohol. Laboratory studies had also confirmed efficacy of one solvent over another as solvent of extraction in relation to the Anti-malaria and Anti-diabetic property of plant. For example, the methanolic extraction of *Flueggea virosa* and *maytenus undata* has higher percentage of chemo-suppression of parasitaemia *in vivo* than the water extract of the plants [11].

Boiling as a method of preparation was frequently mentioned than soaking. This is partly because of the choice of solvent and the type of plant parts to be used in preparing the herbal remedy, from this study; it was also observed that the dose of the herbal remedy used is dependent on disappearance of symptoms of malaria fever and diabetic disease. Most of the respondents believe that herbal remedies can be consumed as much as possible, even as prophylactics but they are ignorant of the toxic effects of most of these herbs. Studies had however proved that some anti-malarial and anti-diabetic herbs have dose dependent effect, for example; high levels of Chemosuppression were produced at high doses of the leaf and root –bark extracts of *Vernonia amygdalina* [12]. Studies had also shown that some plants are highly toxic despite their high Chemosuppression of Parasitaemia. *Morinda Lucida* for example, which is top on the list of frequently used plants, was observed for its *in-vitro* Cytotoxicity and the stem bark was found to be extremely toxic [13]. The seed of *Lawsonia inermis* have also been found to be toxic in Mulluses [14].

#### 5. CONCLUSION

It was revealed that, the inhabitants of Ebonyi State South-East, Nigeria comprising of the three senatorial district of Nigeria still relied on the use of plants as a primary health care. However, the phytochemical characterization and pharmacological validation of these plants are to be carried out.

However, awareness regarding the conservation status of rare medicinal plants, domestication strategies as well as appropriate methods of exploitation is crucial for further studies to ensure a sustainable utilization and availability of these plants.

#### SIGNIFICANCE STATEMENT

This study discover the variety of medicinal plants use for the treatment of malaria and diabetes in Ebonyi state, southeast, Nigeria. The plant parts and methods of preparation were revealed. This information can be beneficial for scientific research and people that prefer the use of herbs to orthodox drugs for the treatment of this life threatening diseases. This study will help researchers to uncover the critical areas of phytotherapy that many researchers were not able to explore. Thus, a new theory on these herbs and possible combination of these herbs may be arrived at.

#### COMPETING INTERESTS

Author has declared that no competing interests exist.

## REFERENCES

1. Offiah NV, Makama S, Elisha IL, Makoshi MS, Gotep JG, Dawurung CJ, Oladipo OO, Lolilum AS, Shamaki D. Ethnobotanical survey of medicinal plants used in the treatment of animal diarrhea in Plateau State, Nigeria. *BMC Veterinary Research*. 2011;7:36-45.  
DOI: 10.1186/1746-6148-7-36
2. Raul P, Pedraza M, Manuela P. Animal health care in India. *Information Centre for Low External Input in Sustainable Agriculture (ILEIA) Newsletter*. 1990;8(3):22-23. View at Google Scholar.
3. Omoboyowa DA, Nwodo OFC, Joshua PE, Soniran OT. Anti-malarial activity of bioassay-guided fractionation of the crude ethanol extract of *Tithonia diversifolia* leaves. *Nigerian Journal of Parasitology*. 2017;38(2):198-204.  
Available: <http://dx.doi.org/10.4314/njpar.v38i2.12>
4. Odugbemi TO, Akinsulire OR, Aibinu IE, Fabeku PO. Medicinal plants useful for malaria therapy in Oke-igbo, Ondo State, Southwest, Nigeria. *Afri. J. Trad. CAM*. 2007;4(2):191-198.  
DOI: 10.4314/ajtcam.v4i2.31207
5. Omoboyowa DA, Igara EC, Otuchristian G, Olugu KD. Anti-diabetic activity of methanolic extract of seed cotyledon of *Chrysophyllum albidum* in alloxan induced diabetic rats. *Biokemistri*. 2016;28(2):88-95.  
Available: <http://nisebpublications.org>
6. Kantele A, Jokiranta TS. Review of cases with the emerging fifth human malaria parasite, *Plasmodium knowlesi*. *Clin. Infect. Dis*. 2011;52:1356–62.  
DOI: 10.1093/cid/cir180.
7. Jacob MO, Farah KO, Ekaya WN. Indigenous knowledge: The basis for the Maasai ethnoveterinary diagnostic skills. *Journal of Human Ecology*. 2004;16(1):43-48.  
DOI: abs > 09709274.2004.11905714
8. Agbedahunsi JM, Elujoba AA, Makinde AMJ. Anti-malaria activity of *Khaya grandifolia* stem bark. *Pharmaceutical Biol*. 1998;36:8-12.  
Available: <https://doi.org/10.1076/phbi.36.1.8.4613>
9. Alexandros SB. Plants used traditionally to treat malaria in Brazil: The archives of flora medicinal. *J. Ethnobiol. Ethnomed*. 2007;3:18.  
DOI: 10.1186/1746-4269-3-18
10. Fatameh S, Khadijah A, Gholamreza BK. Influence of drying and extraction methods on yield and chemical composition of the essential oil of *Satureja hortensis*. *Food Chem*. 2006;99:19-23.  
DOI: 10.1016/j.foodchem.2005.07.026
11. Mathaura CN, Rukunga GM, Chabra SC, Omar SA, Guantaiu AN, Hatinwa JW, Tolo FM, Mwitari PG, Keter LK, Kirira PG, Kuimani CW, Munga GM, Njagi ENM. Antimalaria activity of some plants traditionally used in the treatment of malaria in Kwale district of Kenya. *J. Ethnopharmacol*. 2007;112(3):545-551.  
DOI: 10.1016/j.jep.2007.04.018
12. Abosi AO, Raseroka BH. *In-vivo* antimalaria activity of *Veronia amygdalina*. *Br. J. Biomed. Sci*. 2003;60(22):89-91.  
DOI: 10.1080/09674845.2003.11783680
13. Ajaiyeoba EO, Oladepo O, Fawole OL, Bolaji OM, Akinboye DO, Ogundahunsi OA, Falade CO, Gbotosho GO, Itiola OA, Happi TC, Ebong OO, Onaniwu IM, Osowole OS, Oduola OO, Ashidi JS, Oduola AM. Cultural categorization of febrile illnesses in correlation with herbal remedies used for treatment in South-Western Nigeria. *J. Ethnopharmacol*. 2006;85(2-3):179-185.  
DOI: 10.1016/s0378-8741(02)00357-4
14. Singh A, Singh DK. *Molluscicidal* activity of *Wawsomia inermis* and its binary and tertiary combination with other plant derived *molluscides*. *Indian J. Exp. Biol*. 2001;39(3): 263-268.  
Available: <https://www.ncbi.nlm.nih.gov/pubmed/11495286>