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MEDICINAL PLANTS USEFUL FOR MALARIA THERAPY IN OKEIGBO, ONDO STATE, SOUTHWEST NIGERIA.

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Abstract

There is increasing resistance of malaria parasites to chloroquine, the cheapest and commonly used drug for malaria in Nigeria. Artemisin, a product from medicinal plant indigenous to China, based on active principle of *Artemisia annua*, has been introduced into the Nigerian market. However not much has been done to project antimalaria properties of indigenous medicinal plants. This study thus, has the main objective of presenting medicinal plants used for malaria therapy in Okeigbo, Ondo State, South west Nigeria. Focus group discussions and interview were held about plants often found useful for malaria therapy in the community. Fifty species (local names) including for example: *Morinda lucida* (Oruwo), *Enantia chlorantha* (Awopa), *Alstonia boonei* (Ahun), *Azadirachta indica* (Dongoyaro) and *Khaya grandifoliola* (Oganwo) plants were found to be in use for malaria therapy at Okeigbo, Southwest, Nigeria . The parts of plants used could either be the barks, roots, leaves or whole plants. The recipes also, could be a combination of various species of plants or plant parts. This study highlights potential sources for the development of new antimalarial drugs from indigenous medicinal plants found in Okeigbo, Nigeria.

Key words: Malaria, Medicinal plants, antimalarial drugs, Okeigbo, Southwest Nigeria.

Introduction

Malaria is a global disease that is predominant in the tropics and caused by blood parasites, *Plasmodium falciparum, Plasmodium ovale, Plasmodium malariae* and *Plasmodium vivax.* In Nigeria, malaria is mostly caused by *P. falciparum* and *P. malariae.* The female anopheles mosquito transmits these parasites to humans. Malaria has a great morbidity and mortality than any other infectious diseases of the world (World Malarial Report, 2005; Smith, 1978; WHO, 2000). Survey shows that 90% of the world's cases of malaria occur in sub-Saharan Africa. Nine out of ten cases of this disease occur in this region and record over one million deaths annually (World Malarial Report, 2005; Africa Union Memoir, 2005). High mortality rate is recorded in children and pregnant women (WHO, 2000), also the disease has negative impact on the economy of prevalent countries (African Summit on Roll Back Malaria, 2000; Abuja Malaria Summit, 2000).

In Nigeria, malaria is endemic throughout the country. World Health Organization (WHO) estimated malaria mortality rate for children under five in Nigeria at 729 per 100, 000. The Ministry of Health reported in April 2004 that malaria is responsible for one out of ten deaths in pregnant women and has caused the Federal Government of Nigeria over one billion Naira annually in treating malaria (Government in action, 2005). Medicinal plants have been used in the treatment and prevention of malaria in various parts of the world. Quinine extracted from the bark of the cinchona tree, was used as an antimalarial agent as early as 1632 (Baird *et al*., 1996) and by the 19th century, it was still the only known antimalarial agent. Cinchona tree has been cultivated for this purpose all

over the world. Primaquine and quinacrine were produced after the first World War. Chloroquine followed shortly thereafter in 1934 (Thomson and Werbel, 1972), in 1946 it was designated the drug of choice for treatment of malaria (Coatney, 1963). It is known as the cheapest, and drug of choice for malaria treatment in Nigeria.

Recent surveys had shown the emergence of chloroquine – resistant strains of malaria parasites. In Africa, chloroquine resistant *Plasmodium falciparum* was first found in 1978 in nonimmune travellers from Kenya and Tanzania (Campbell *et al*., 1979; Fogh *et al*., 1979). This was followed 2 to 3 years later by reports from Madagascar (Aronson *et al*., 1981). Resistance spread from the African coastal areas inland and by 1983 had been observed in Sudan, Uganda Zambia and Malawi (Onori 1984; Ekue *et al*., 1983; Fogh et l., 1984; Slatter *et al*., 1983). The emergence of the ineffectiveness of chloroquine in combating malaria has led to additional studies, which had produced a new and effective antimalaria drug, Artemisin (World Malarial Report, 2005; Conference Report on the First International Meeting of the research initiative of Traditional Antimalaria Methods). The usefulness of this medicinal plant may hold the key to another new and effective antimalaria drug (UNESCO, 1998) in the future.

Indigenous medicinal plants in Nigeria used in combating malaria are yet to be projected in conferences as the foreign plants in spite of our rich flora diversity. Therefore, this present study has the main objective of presenting medicinal plants useful for malaria therapy in Okeigbo, Ondo State, Southwest of Nigeria.

Materials and Methods

This study was carried out in Okeigbo, Ondo State, Southwestern Nigeria. Okeigbo is a heterogeneous community, consisting of various groups of people from different parts of Southwest, Nigeria – Ife, Ifewara, Egbas, Owu, Offa, Ilorin, Ibadan, Ijebu, Ondo, Ilesha to mention a few and it is located at about 250km north of Lagos-State. This community has a single primary health care centre. The main occupations of the people are farming, teaching, hunting and petty trading. Some are also artisans, traditionalists and herbalists.

Focus group discussions and interviews were held with members of this community. Members involved in this study were mainly the traditional herbal chief (Asosanyin) who sees to the management and control of traditional practices of the use of herbs, traditional practitioners, herb sellers, primary and secondary school teachers, elderly members of the community 60 years and above; middle age members between the ages of 35-59 years old and health workers in the local Primary health centre.

Selections of these members were based on social status, occupation and those adjudged by the community to be knowledgeable in the ethno botanical uses of plants. Questions bothered on types and parts of plants often used for malaria therapy; methods for preparation and administration. Information on medicinal plants was compiled according to Generic name, family names, local names and parts of plants used. Collection of these plants cut across various locations in the community. Starting from the local garden at the back of houses, roadsides, farms, and mountain bases, secondary forest to primary forest. This was done with the aid of traditional practitioners.

Samples of plants collected were dried using absorbent paper, moistened with methylated spirit and mounted in accordance with conventional herbarium practice. Taxonomists in the Herbarium of Forestry Research Institute of Nigeria (FRIN), Ibadan, Oyo State led by Dr. G. Ugbogu and Mr. T.K. Odewo did scientific confirmation of some of the medicinal plants.

Results

Table 1 shows the list of medicinal plants often used for malaria therapy in Okeigbo, Ondo State, Nigeria. Table 2 shows medicinal plants that can be used alone in malaria therapy (monotherapy) while Table 3 shows plants used in combination of two, three, four, five or more different plants. Table 4 shows medicinal plants that are included as adjuncts in malaria herbal recipes, which are used as blood tonic or for clearing coated tongue (one of the symptoms of malaria).

Table 1: Medicinal plants that are used for malaria therapy in Okeigbo, Ondo state, southwest Nigeria

S/No.	Scientific Name (Species)	Family Names	Local Names	Common Names	Parts Used
1.	*Sphenocentrum jollyanum*	*Menispermaceae*	Akerejupon		Roots
2.	*Rauvolfia vomitoria*	*Apocynaceae*	Asofeyeje		Roots, barks, leaves
3.	*Enantia chlorantia*	*Annonaceae*	Osopa Awopa Dokita igbo	African yellow wood	Bark
4.	*Khaya grandifoliola*	*Meliaceae*	Oganwo	Mahogany	Bark
5.	*Melicia excelsa*	*Moraceae*	Iroko	Iroko	Root, Bark
6.	*Senna siamea*	*Caesalpiniaceae*	Kasia	Senna	Bark
7.	*Senna podocarpa*	*Caesalpiniaceae*	Asunwonibile		Bark, leaves
8.	*Azadirachta indica*	*Meliaceae*	Dogonyaro	Neem	Bark, leaves
9.	*Mangifera indica*	*Anacardiaceae*	Mangoro	Mango	Bark, leaves
10.	*Physalis angulata*	*Solanaceae*	Koropo		Leaves, whole plant
11.	*Chromolaena odorata*	*Compositae*	Ewe Akintola Ewe Awolowo	Siam weed	Root, leaves
12.	*Carica papaya*	*Caricaceae*	Ibepe	Pawpaw	Leaves, fruit
13.	*Tithonia diversifolia*	*Compositae*	Jogbo Agbale	Tree marigold	Leaves, stem twings
14.	*Psidium guajava*	*Myrtaceae*	Gilofa	Guava	Bark, leave
15.	*Lecaniodiscus cupanioides*	*Sapindaceae*	Akika		Roots
16.	*Curcuma longa*	*Zingiberaceae*	Laali-pupa	Turmeric	Rhizome
17.	*Zingiber officinale*	*Zingiberaceae*	Ajo, Ata-ile	Ginger	Rhizome
18.	*Nauclea latifolia*	*Rubiaceae*	Egberesi Gberesi	African peach	Root, bark, leaves
19.	*Citrus aurantifolia*	*Rutaceae*	Osan wewe	Lime	Root, bark, stem-twigs, leaves, fruit
20.	*Citrus aurantium*	*Rutaceae*	Osan-ganinganin	Sour lime	Root, bark, stem-twigs, leaves, fruit.
21.	*Citrus paradisi*	*Rutaceae*	Osan gerepu	Grape	Fruit, stem-twigs, leaves, root
22.	*Mondia whitei*	*Periplocaceae*	Isirigun		Root, whole plant
23.	*Gossypium barbadense*	*Malvaceae*	Owu	Cotton	Leaves
24.	*Gossypium hirsutum*	*Malvaceae*	Ela owu	Cotton	Leaves
25.	*Alstonia boonei*	*Apocynaceae*	Ahun	Stool wood	Root, bark, leaves.
26.	*Parquetina nigrescens*	*Periplocaceae*	Ogbo		Whole plant, leaves
27.	*Ananas comosus*	*Bromeliaceae*	Ope-Oyinbo Ehin-ahun Ekunkun	Pineapple	Unripe Fruit
28.	*Harungana madagascariensis*	*Hypericaceae*	Asunje	Dragons blood tree	Bark, leaves
29.	*Funtumia africana*	*Apocynaceae*	Ako-ire	Funtumia	Root
30.	*Xylopia aethiopica*	*Annonaceae*	Erinje Eeru		Fruits, bark, leaves.
31.	*Hyptis suaveolens*	*Labiatae*	Jogbo		Leaves

32.	*Acanthospermum hispidum*	*Compositae*	Egungun-arugbo	Starrburr	Leaves, whole plant.
33.	*Morinda lucida*	*Rubiaceae*	Oruwo	Brimstone tree	Bark, leaves
34.	*Vernonia amygdalina*	*Compositae*	Ewuro	Bitter leaf	Leaves
35.	*Chrysophyllum albidum*	*Sapotaceae*	Agbalumo	African star apple	Bark, leaves
36.	*Anacardium occidentale*	*Anacardaceae*	Kasu	Cashew nut tree	Bark, leaves
37.	*Canna indica*	*Cannaceae*	Ido	Indian shot	Leaves
38.	*Ocimum gratissimum*	*Labiatae*	Efirin-nla	Tea bush	Leaves
39.	*Cymbopogon citratus*	*Poaceae*	Kooko-Oba	Lemon grass	Leaves
40.	*Ceiba pentandra*	*Bombacaceae*	Araba	Kapok tree	Leaves
41.	*Trema orientalis*	*Ulmaceae*	Afefe		Leaves, bark
42.	*Musa sapientum*	*Musaceae*	Ogede were ibile	Banana	Fruits
43.	*Capsicum frutescens*	*Solanaceae*	Ata-Ijosi	Cayenne	Fruits
44.	*Pergularia daemia*	*Asclepiadaceae*	Atufa, isirigun		Root, leaves
45.	*Allium sativum*	*Liliaceae*	Ayuu	Garlic	Bulb
46.	*Diospyros mespiliformis*	*Ebeneceae*	Igi dudu	Ebony tree	Bark, leaves
47.	*Bridelia ferruginea*	*Euphorbiaceae*	Ira odan		Bark, leaves
48.	*Pycnanthus angolensis*	*Myristicaceae*	Akomu		Bark
49.	*Solanum nigrum*	*Solanaceae*	Odu		Leaves
50.	*Heliotropium indicum*	*Boraginaceae*	Ogberi-akuko	Heliotrope	Whole plant.

Table 2: Medicinal plants that are used alone (not in combination) for malaria therapy in Okeigbo, Ondo state, Nigeria.

S/No.	**Botanical Names**	**Parts Used**	**Method of Extraction**
1.	*Nauclea latifolia*	Bark, roots	Tincture, Decoction
2.	*Morinda lucida*	Roots, leaves	Tincture, infusion
3.	*Enantia chlorantha*	Bark	Decoction, tincture, infusion
4.	*Alstonia boonei*	Bark	Infusion, tincture, decoction.
5.	*Curcuma longa*	Rhizome	Tincture, Decoction
6.	*Allium sativum*	Bulb	Concoction, tincture
7.	*Carica papaya*	Fruit, leaves	Infusion
8.	*Tithonia diversifolia*	Leaves	Infusion
9.	*Azadirachta indica*	Bark, leaves	Decoction
10.	*Vernonia amydalina*	Leaves	Infusion
11.	*Rauvolfia vomitoria*	Root	Infusion
12.	*Funtumia africana*	Root	Infusion
13.	*Leconiodiscus cupanioides*	Root	Infusion
14.	*Khaya grandifoliola*	Bark	Decoction, Infusion

Table 3: Medicinal plants that are used in combination in Okeigbo.

Combination of two plants	Combination of three plants	Combination of four plants	Group of five or more plants
A *Alstonia boonei* (bark) *Capsicum fructescens* (fruit) **B** Gossypium barbadense *(leaves)* *Citrus aurantium* (fruit) **C** *Vernonia amygdalina* (leaves) *Citrus aurantium* (fruit) **D** *Enantia Chlorantha* (bark) *Alstonia boonei* (bark) **E** *Chrysophyllum albidum* (leaves, bark) *Citrus aurantifolia* (leaves, fruit) **F** *Lecaniosdiscus cupanoides* (root) *Citrus aurantium* (fruit) **G** *Carica papaya* (leaves) *Psidium guajava* (leaves) **H** *Enantia chlorantha* (bark) *Curcuma longa* (rhizome)	**A** *Chromolaena Odorata* (leaves) *Physallis angulata* (leaves) *Tithonia diversifolia* (leaves) **B** *Funtumia africana* (root) *Enantia chlorantha* (bark) *Zanthoxylum zanthoxyloides* (root) **C** *Gossypium barbadense* (leaves) *Ocimum gratissimum* (Leaves) *Citrus aurantium* (fruit) **D** *Enantia Chlorantha* (bark) *Alstonia boonei* (bark) *Diospyros mespiliformis* (bark) **E** *Curcuma longa* (rhizome) *Cymbopogon citratus* (leaves) *Citrus aurantifolia* (leaves) **F** *Citrus paradisi* (fruit) *Carica papaya* (fruit) *Ananas comosus* (fruit)	**A** *Vernonia amygdalina* (leaves) *Ocimum gratissimum* (Leaves) *Azadirachta indica* (bark, leaves) *Cymbopogon citratus* (leaves) **B** *Canna indica* (leaves) *Citrus paradisi* (fruit) Ananas comosus *(fruit)* *Citrus aurantifolia* (fruit) **C** *Alstonia boonei* (bark) *Mangifera indica* (bark, leaves) *Psidium guajava* (leaves) *Carica papaya* (leaves)	**A** *Curcuma longa* (rhizome) *Harungana madagascariensis* (bark, leaves) *Rauvolfia vomitoria* (bark, leaves) *Mangifera indica* (bark, leaves) *Psidium guajava* (bark, leaves) *Enanthia chlorantha* (bark) **B** Sphenocentrum jollyanum *(root)* *Citrus aurantifolia* (twigs, leaves, fruit) *Cymbopogon citratus* (leaves) *Lawsonia guineensis* (leaves) *Carica papaya* (root) *Citrus aurantium* (fruit) **C** *Citrus aurantifolia* (leaves) *Chrysophyllum albidum* (leaves) *Mangifera indica* (bark, foliage leaves) Anarcadium occidentale (bark) *Sorghum bicolor* (leaves, stem) **D** *Ocimum gratissimum* (Leaves) *Anarcadium occidentale* (foliage leaves) *Lecaniodiscus cupanioides* (foliage leaves) *Curcuma longa* (foliage leaves) *Citrus aurantifolia* (foliage leaves)

Table 4: Medicinal plants that are adjuncts included in malaria therapy recipes

S/No.	Coated Tongue	Blood Supplement
1.	*Heliotropicum indicum* (Leaves)	*Sorghum bicolor* (Shoot)
2.	*Chrysophyllum albidum* (Bark)	*Parquetina nigrescens* (Leaves)
3.	*Solanum nigrum* (Leaves)	*Khaya grandifoliola* (Bark)
4.	*Pycanthus angolensis* (Bark)	
5.	*Anacardium occidentale* (Bark)	
6.	*Mangifera indica* (Bark, Leaves)	
7.	*Khaya grandifoliola* (Bark).	

Discussion

From the array of medicinal plants used for malaria therapy in Oke-Igbo, Ondo-State, this study has shown that indigenous medicinal plants exist, that can be exploited in the development of new antimalarial drugs. (Table 1). These plants are similar to those used for malaria therapy in Ghana (UNESCO, 1997), Sierra Leone (Agbovie *et al*., 2002) and agree with the work of Oliver (Barnish and Samai, 1992) and Singha (Oliver, 1960) on medicinal plants of Nigeria.

In preparation of herb recipes for malaria therapy, single plants (monotherapy) can be used (Table 2) or in combination of more than one plant (table 3). The combination of these different plants is claimed to cure several ailments and dysfunctions associated with malaria in the body. For instance, plants claimed to cure coated tongue and those that replenish blood cells during malaria attack are included in herbal recipes for malaria as shown in Table 4. They are also regarded as plants useful for malaria therapy. The treatment is observed to be traditional with deep socio-cultural expression as recognized by WHO, 1978).

Significantly, majority of these plants when prepared are very bitter in taste. More so, it is believed that each active principle of component parts making up the recipe complement one another in the fight against malaria parasite. Further studies would be required to explain this activity among component parts of malaria recipes.
Furthermore, selections of these component parts are often based on the severity of the disease. The active principle of these plants are often extracted through, infusion, decoction and tincture (Taylor, 2004). However, component of different herbal recipes in this study differ along lineage, class, cultural group, occupation, status and age group, suggesting the pluralistic and diverse nature of traditional medicine (Singha, 1965). In addition, during administration of these drugs, recipes that are considered to be very potent are required to be taken in little quantity to avoid side effects like stomach disorders.

Consequently, the ability of people, encountered in the course of this study, in giving at least an herbal prescription for malaria shows the prevalence of the disease and how it has been tackled over time. Therefore, these findings suggest that medicinal plants used for malaria therapy in Okeigbo, Ondo State, Nigeria are potential sources for the development of new antimalarial drugs from indigenous plants in Nigeria.

Conclusion

This study has attempted to highlight medicinal plant claimed to be used or associated with malaria therapy in the indigenous Yoruba community as prescribed or suggested by individuals or groups in Okeigbo, Southwest, Nigeria. These medicinal plants may probably contain yet undiscovered anti-malarial properties, which can serve as a template for the production of cheap anti-malaria drug from indigenous plants in Nigeria. There is a need for a multidisciplinary approach to develop potentially effective drugs while noting dangerous drugs and practices that should be discarded.

Conflicts of interest statement

The authors do not have conflicts of interest concerning the medicinal plants work reported in this paper.

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