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Ethnobotanical Survey of Medicinal Plants Used to Treat Malaria by the Traditional Medicine Practitioners in Umuahia, Abia State, Nigeria

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ABSTRACT

In Umuahia, malaria constitutes a major public health problem just like in other part of Nigeria but, until now, the population still mostly relies on herbal medicines for healing. This study aimed to document medicinal plants used for malaria therapy in Umuahia, and for search of new antiplasmodial herbal medicines (HMs) for further investigation.

Semi-structured questionnaire interviews were used to gather ethnobotanical and sociodemographic data from traditional healers of the study area.

A total of 37 plant species belonging to 25 families were mentioned by respondents that cure malaria. *Rutaceae, Asteraceae and Apocynaceae* families, with 3 species each were the most represented, followed by *Lamiaceae, Gentianaceae, Fabaceae* and *Costaceae* with 2 species each. For the rest, 18 families were represented by only one species. The calculated RFC (Relative frequency of citation) indicated that species such as *Sarcocephalus latifolius* (RFC = 0.33), *Cymbopogon citratus* (RFC = 0.33), *Carica papaya* (RFC = 0.27), *Azadirachta indica* (RCF = 0.27), *Chromolena odorata* (RFC = 0.27) and *Uvaria cheame* (RFC = 0.27) were the most used in the treatment of malaria by traditional medicine healers in Umuahia.

Investigations results had identified 36 species commonly used in Umuahia traditional medicine to treat malaria.

Traditional Medicines Practitioners - TMPs of Umuahia understand and treat malaria using the available plant diversity from their huge forest and the herbal gardens within. The healers are very keen at plant conservation which is a good practice. Species like *Uvaria chaeme* may be investigated further for antiplasmodial assays to justify its efficacy.

Plant parts 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.

Keywords: RFC, Malaria, Herbal medicines, Umuahia, Traditional Medical Practitioners.

1.0 INTRODUCTION

The continuous spread of *Plasmodium falciparum* resistance to antimalarial drugs poses a serious threat to malaria control programs (WHO, 2002-2005). In Nigeria, a nationwide surveillance data on drug efficacy showed that chloroquine (CQ) and sulphadoxine-pyrimethamine (SP) are no longer viable therapeutic options for the effective treatment of human malaria. Although vaccines could be the best long term control option, they are still undergoing clinical trials (Idowu *et al* 2006, Adebayo *et al* 2012). This, in addition to the increased number of drug-resistant parasites, makes the development of novel antimalarials urgent. The

high cost of malaria treatment has left the poor masses of Nigeria heavily reliant on traditional practitioners and medicinal plants for the treatment of the disease (Adebayo *et al*, 2012).

Thus, it is of paramount importance that the knowledge of the traditional medicine practitioners on malaria be assessed as well as the information on the plant materials used for the treatment of malaria.

2.0 MATERIALS AND METHODS

2.1 Materials

In this study, semi structured guided open and close ended questionnaires were used. Direct questioning was used for the illiterate practitioners while the questionnaires were used for the practitioners that were literate enough to write.

The questionnaire contained 12 open-ended questions and five close-ended questions which includes

1. Gender
2. Age
3. Occupation
4. Symptoms used to diagnose the diseases
5. Name of plant
6. Method of collection
7. Life form of the plant used
8. Part of plant used
9. Time of harvesting
10. Processing of medicinal plants for crude drug preparation in the study area
11. Solvents used for the preparation
12. Plants used in combination
13. Dosage regimen
14. Method of administration
15. Duration of treatment
16. Side effects
17. Percentage success of treatment

2.2 Study Site

Umuahia town is the capital of Abia state, southern Nigeria. It lies along the railroad from Port Harcourt to Enugu. It is an agricultural market centre and (since 1916) collecting point on the railway for the crops of the surrounding region: yams, cassava (manioc), corn (maize), taro, citrus fruits, and palm oil and kernels. The town has a palm-oil-processing plant and several breweries, and the National Root Crops Research Institute, at Umudike, is adjacent to the town. Umuahia has teacher-training colleges, Trinity College (theological), and several hospitals.

This study was conducted in the following areas in Umuahia:

- Olokoro
- Ikwuano
- Ubakala
- Ibeku
- Ohuhu
- Old Umuahia
- Agbama

Fig. 1 Geographical location of Abia State in the map of Nigeria

2.3 Method

The study was conducted in 7 major villages in Umuahia. The objectives of the study were clearly explained and verbal consent was obtained from each participant. The study was conducted from February 2018 to May 2018. The data were collected, analysed and information on the drugs recorded.

3.0 RESULT

The ethnomedicinal investigations that was conducted in the Olokoro, Ikwuano, Ubakala, Ibeku, Ohuhu, Old Umuahia, and Agbama areas, with 17 traditional healers from the villages located in Umuahia, made it possible to identify 36 species of plants used in traditional medicine to treat malaria. The traditional practitioners use symptoms like high temperature, loss of appetite, insomnia, restlessness, shivering, discolouration of urine, among others in malaria diagnosis as an indication that they understand malaria.

3.1 Description Of Plants

1. Botanical name: *Chromolaena odorata*
Family: Asteraceae
Common names: Independent leaf, siam weed
Genus: Chromolaena
Order: Asterales
Parts used: Leaves
Description: *Chromolaena odorata* is a rapidly growing perennial herb. It is a multi-stemmed shrub to 2.5 m (100 inches) tall in open areas. It has soft stems but the base of the shrub is woody. In shady areas it becomes etiolated and behaves as a creeper, growing on other vegetation. It can then become up to 10 m (33 feet) tall. The plant is hairy and glandular and the leaves give off a pungent, aromatic odour when crushed. The leaves are opposite, triangular to elliptical with serrated edges. Leaves are 4–10 cm long by 1–5 cm wide (up to 4 x 2 inches). Leaf petioles are 1–4 cm long. The white to pale pink tubular flowers are in

panicles of 10 to 35 flowers that form at the ends of branches. The seeds are achenes and are somewhat hairy (Adamu *et al*, 2005, Sofowura 1993).

Fig 2. Leaf of *Chromolaena odorata*

2. Botanical name: *Psidium guajava*
Family: Myrtaceae
Common name: Guava
Genus: Psidium
Order: Myrtales
Parts used: Leaves

Psidium guajava is a shrubby evergreen tree up to 10 meters in height, with smooth reddish brown bark that is thin and scales off in thin sheets. It has oppositely arranged oblong or elliptic leaves with sunken parallel veins and minute glandular dots. The fragrant white flowers are large, measuring about 4 cm across the 4 or 5 large petals, and bear numerous showy brushlike stamens with slender white filaments averaging about 1.2 cm long. The flowers are mostly borne singly at leaf bases. The edible fruits are yellow and rounded (sometimes pear-shaped), 3 to 10 cm in diameter, with 4 or 5 retained sepals at the apex. (Traore *et al* 2013; Asase *et al* 2005)

Fig 3. *Psidium guajava* leaves

3. Botanical name: *Anthocleista vogelli*
Family: Gentienaceae
Common names:Forest fever
Genus: Anthocleista
Order: Gentianales
Parts used: leaves

*Anthocleista vogelii*is an evergreen tree growing from 6 - 20 metres tall. The bole can be 15 - 55cm in diameter, sometimes with stilt roots. The leaves are usually up to 40cm long, but in young plants they can be up to 150cm long and 45cm wide (Odugbemi *et al*, 2006, Orwa *et al 2009*)

Fig 4. *Anthocleista vogelli*

4. Botanical name: *Azadirachta indica*
Family: Meliaceae
Common names: Neem plant
Genus: Azadirachta
Order: Sapindales
Parts used: Leaves
Description: *Azadirachta indica* is a small to medium-sized tree, usually evergreen, up to 15 (30 max.) m tall, with a round, large crown up to 10 (20 max.) m in diameter; branches spreading; bole branchless for up to 7.5 m, up to 90 cm in diameter, sometimes fluted at base; bark moderately thick, with small,
scattered tubercles, deeply fissured and flaking in old trees, dark grey outside and reddish inside, with colourless, sticky foetid sap. Fruit 1 (max. 2)-seeded drupe, ellipsoidal, 1-2 cm long, greenish, greenish-yellow to yellow or purple when ripe; exocarp thin, mesocarp pulpy, endocarp cartilaginous; seed ovoid or spherical; apex pointed; testa thin, composed of a shell and a kernel (sometimes 2 or 3 kernels), each about half of the seed's weight (Orwa *et al,* 2009 , Isa *et al* 2003, Tor-Anyin *et al* 2003)

Fig. 5. *Azadirachta indica*

5. Botanical name: *Rauvolfia vomitoria*
Family: Apocynacea

Common names: poison devil's-pepper
Genus: Rauvolfia
Order: Gentianales
Parts used: Leaves
Description: *Rauvolfia vomitoria* is a shrub found mainly in West Africa. The roots, leaves, and stem are used in medicine. It is a shrub or small tree up to 26 feet (8 m).*Rauvolfia vomitoria* is a shrub or small tree up to 8 m. Older parts of the plant contain no latex. The branches are whorled and the nodes enlarged and lumpy. Leaves in threes, elliptic-acuminate to broadly lanceolate. Flowers are minute, sweet-scented, branches of inflorescences are distinctly puberulous with hardly any free corolla lobes. Fruits are fleshy and red in colour (Orwa *et al*, 2009).

Fig. 6. *Rauvolfia vomitoria*

6. Botanical name: *Pentaclethra macrophylla*
Family: Fabaceae
Subfamily: Caesalpinioideae
Common names: Oil bean
Genus: Pentaclethra
Order: Fabales
Parts used: Bark
Description:*Pentaclethra macrophylla* trees grow to about 21 m in height and about 60 cm girth. Have a characteristic low branching habit and an open crown, which allows substantial light under its canopy. The bole produces a reddish-orange coloration after a slash is made. Stem form is usually crooked and buttressed. Some are straight-stemmed and less buttressed trees, which can pass for good timber, are occasionally seen in the forests. Bark is greyish to dark reddish brown, thin and patchy with irregular pieces flaking off. Leaves possess a stout angular petiole. The compound leaves are usually about 20-45 cm long and covered with rusty hairs giving a scurry effect particularly along the upper surface but this eventually falls off. There are 10-12 pairs of stout opposite pinnae. The middle pairs are 7-13 cm long and also have rusty hairs along the central grove. There are usually 12-15 pairs of opposite stalkless pinnules (leaflets), each 12-15 cm long, 5-10 mm broad, with the middle pairs longest. Leaflets often have a rounded tip but are sometimes notched; the base is unequal. The inflorescences are spicate and the flowers pentamerous, creamy-yellow or pinkish-white and sweet smelling. In addition to the 5 stamens are 10-15 staminodes.The pods are 40-50 cm long and 5-10 cm wide. Fruit splits open explosively with the valves curling up. This is the form in which they appear on most trees. Usually, pods contain between 6-10 flat glossy brown seeds, which may vary in site. The seeds are up to 7 cm long (Orwa *et al*, 2009).

Fig. 7 *Pentaclethra macrophylla*

7. Botanical name: *Carica papaya*
Family: Caricaceae
Common names: Pawpaw
Genus: Carica
Order: Brassicales
Parts used: Root, leaf
Description: The papaya is a small, sparsely branched tree, usually with a single stem growing from 5 to 10 m (16 to 33 ft) tall, with spirally arranged leaves confined to the top of the trunk. The lower trunk is conspicuously scarred where leaves and fruit were borne. The leaves are large, 50–70 cm (20–28 in) in diameter, deeply palmately lobed, with seven lobes (Barnes and Anderson , 2007, Mukungu *et al* 2016).

Fig. 8 *Carica papaye*

8. Botanical name: *Cymbopogon citratus*
Family: Poaceae

Common names: Lemon grass
Genus: Cymbopogon
Order: Poales
Parts used: Leaves
Description: Lemon grass is a grass like plant with long slender foliage growing to about 2-3 feet tall. Leaves are grayish-green in color. Stems and leaves impart a strong lemon flavor when used in cooking. Because lemon grass is not winter hardy in colder climates, it is best grown as a container plant(Wilcox and Bodeker 2004, Ekeanyanwu 2011).

Fig 9 *Cymbopogon citratus*

9. Botanical name: *Emilia sonchifolia*
Family: Asteraceae
Common names: lilac tasselflower
Genus: Emilia
Order: Asterales
Parts used: Leaf
Plant used in combination: Coconut
Description: *Emilia sonchifolia* is an erect annual plant, often producing prostrate branches from the very base, growing 10 - 150cm tall (Orwa *et al* 2009).

Fig. 10 *Emilia sonchifolia*

10. Botanical name: *Viscum album*

Family: Santalaceae
Common names: mistletoe
Genus: Viscum
Parts used: all parts
Order: Santalales
Description: It is a hemi-parasitic shrub, which grows on the stems of other trees. It has stems 30–100 centimetres (12–39 in) long with dichotomous branching. The leaves are in opposite pairs, strap-shaped, entire, leathery textured, 2–8 centimetres (0.79–3.15 in) long, 0.8–2.5 centimetres (0.31–0.98 in) broad and are a yellowish-green in colour (Orwa *et al*, 2009).

Fig 12 *Viscum album*

11. Botanical name: *Platostoma africanum*
Family: Lamiaceae
Common names: Manding-Bambara
Genus: Platostoma
Order: Lamiales
Parts used: all parts
Description:*Platostoma africanum* is a mildly aromatic, slender, prostrate to erect annual or short-lived perennial herb with stems up to 100cm long (Orwa *et al*, 2009)

Fig. 13 *Platostoma africanum*

12. Botanical name: *Flagellaria indica*
Family: Flagellariaceae
Common names: Bush cane
Genus: Flagellaria
Order: Poales
Parts used: all parts
Description: A strong climber, it grows often up to 15 m tall, with thick cane-like stems exceeding 15 mm in diameter. Its leaves, without hairs, are 10 to 40 cm long, and 5 to 20 mm wide. A coiled apex of the leaf forms the holding part of the climbing plant. Fragrant white flowers form in panicles, 10 to 25 cm long. The fruit is an inedible, greenish-red drupe, 5 mm in diameter, usually with only one seed (Orwa *et al* 2009).

Fig. 14 *Flagellaria indica*

13. Botanical name: *Costus afer*
Family: Costaceae
Common names: Twisted ginger
Genus: Costus
Order: Zingiberales
Parts used: leaves
Description: *Costus afer*is a tall perennial semi-woody herb with leafy canes to 3 m high bearing terminal inflorescences of white and yellow flowers, of the forest zone in moist places(Orwa *et al* 2009).

Fig. 15 *Costus afer*

14. Botanical name: *Crysophyllum africanum*
*m*Family: Sapotaceae
Common names: African star apple
Genus: Chrysophyllum
Order: Ericales
Parts used: leaves
Description: A medium sized, evergreen three usually 70ft to 100ft high; bole straight, flitted, bark gray and riddget, slash thin, cale brown, darkening to orange, Heartwood whitish when first felled, turning a pink buff to an olive yellow and finally a yellowish brown, not demarcated from the sapwood. *Chrysophyllum africanum* bears edible fruits with large berries containing five large flattened seeds. It is greenish in colour when unripe and pale orange when ripe. It is pointed at both ends. The fruits are large and more than 4cm wide, shaped like orange or apple, it is often cultivated for its edible fruits and the pulp having a pleasant acid taste (Yetein *et al* 2013).

Fig. 16 *Crysophyllum africanum*

15. Botanical name: *Magnifera indica*
Family: Anarcardiaceae
Common names: Mango
Genus: Magnifera
Order: Sapindales
Parts used: all parts
Description:It is a large fruit-tree, capable of a growing to a height and crown width of about 100 feet and trunk circumference of more than twelve feet. The leaves are alternate, simple, leathery, oblong-lanceolate, 29-30 cm long X 3-5 cm wide on flowering branches, up to 50 cm on sterile branches. The young leaves are red, aging to shiny dark green above, lighter below, with yellow or white venation (Orwa *et al*, 2009)

Fig. 17 *Magnifera indica*

16. Botanical name: *Citrus latifolia*
Family: Rutaceae
Common names: seedless lime
Genus: Citrus
Order: Sapindales
Parts used: all parts
Description: The tree is nearly thornless. The fruit is about 6 centimetres (2.4 in) in diameter, often with slightly nippled ends, and is usually sold while green, although it yellows as it reaches full ripeness.

Fig. 18 *Citrus latifolia*

17. Botanical name: *Costus barbatus*
Family: Costaceae
Common names: Spiral ginger
Genus: Costus
Order: Zingiberales
Parts used: leaves

Description: *Costus barbatus* is a perennial plant with a red inflorescence. Its foliage is dark green and fuzzy underneath. The long red inflorescences are complimented with bright yellow tubular flowers. Clumps spread easily and produce plants that normally get to six feet tall.

Fig 19 *Costus barbatus*

18.Botanical name: *Solanum nigrum*
Family: Solanaceae
Common names: Black nightshade
Genus: Solanum
Order: Solanales
Parts used: Leaves

Description: Black nightshade is a common herb or short-lived perennial shrub, found in many wooded areas, as well as disturbed habitats. It reaches a height of 30 to 120 cm (12 to 47 in), leaves 4.0 to 7.5 cm (1.6 to 3.0 in) long and 2 to 5 cm (1 to 2 in) wide; ovate to heart-shaped, with wavy or large-toothed edges; both surfaces hairy or hairless; petiole 1 to 3 cm (0.5 to 1 in) long with a winged upper portion. The flowers have petals greenish to whitish, recurved when aged and surround prominent bright yellow anthers. The berry is mostly 6 to 8 mm (0.24 to 0.31 in) in diam., dull black or purple-black (Orwa *et al*, 2009).

Fig. 20 *Solanum nigrum*

19. Botanical name: *Kalanchoe pinnata*
Family: Crassulaceae
Common names: Cathedral bells

Genus: Kalanchoe
Order: Rosales
Parts used: Leaves
Description:*Kalanchoe pinnata* is a succulent perennial plant that grows 3-5 feet tall. t has tall hollow stems, fleshy dark green leaves that are distinctively scalloped and trimmed in red, and bell-like pendulous flowers (Orwa *et al*, 2009).

Fig. 21 *Kalanchoe pinnata*

20. Botanical name: *Ocimum gratissimum*
Family: lamiaceae
Common names: saint leaf
Genus: Ocimum
Order: Lamiales
Parts used: Leaves
Description: It is an erect perennial herb or soft shrub, up to 2 m. Leaves opposite, ovate-lanceolate, variously pubescent on both surfaces, gland dotted below. Margins often only dentate in the upper half. Inflorescences terminal, simple or sparingly branched (Orwa *et al*, 2009).

Fig. 22 *Ocimum gratissimum*

21. Botanical name: *Quassia amara*
Family: Simaroubaceae
Common names: Bitter ash
Genus: Quassia
Order: Sapindales
Parts used: leaves and wood
Description: *Quassia amara* is a small tropical tree, growing only 2-6 m in height. The leaves are compound and alternate, 15–25 cm long, and pinnate with 3-5 leaflets, the leaf rachis being winged. It has beautiful red flowers and fruits that turn red as they mature. (Odugbami *et al*, 2006)

Fig. 23 *Quassia amara*

22. Botanical name: *Citrus hystrix*
Family: Rutaceae
Common names: kaffir lime
Genus: Citrus
Order: Sapindales
Parts used: Fruit
Description:*C. hystrix* typically grows 3 to 6 m (9.75 to 19.5 ft) tall. The aromatic leaves, which are evergreen, have a distinctive structure, with a winged petiole (leaf stem) that is similar in size to the leaf itself, giving the appearance a laterally divided leaf. The flower buds open into fragrant flowers with 4 to 5 petals and around 30 stamens; petals are white with reddish or pink on the outside. The sub-globose to ellipsoid fruit is small, from 3 to 5 cm (1 to 2 in) wide by 5 to 7 cm (2 to 3 in) long--similar in size to slightly larger than a kumquat--with a rough skin with numerous small oil glands, and ripens to lemon yellow (Yetein *et al*, 2013)

Fig. 24 *Citrus hystrix*

23. Botanical name:*Hedychium gardnerianum*
Family: Zingiberaceae
Common names: Ginger lily
Genus: Hedychium
Order: Zingiberales
Parts used: Leaves
Description:*Hedychium gardnerianum* is a coarse perennial herb with leafy shoots 1.5-2m tall. It grows from large branching rhizomes (tuberous shoots) of up to 3.5cm in diameter. Rhizomes are internally pale and fragrant (Orwa *et al*, 2009). Rhizomes grow vertical stems, grow up to 10cm long and form rhizome beds of up to a metre thick. Leaves are oblong to lanceolate, 20-45 (-60)cm long, 5-10 (-12.5)cm wide, upper surface glabrous, lower surface sparsely pubescent, apex acuminate, sessile, entire, pubescent, sheaths glabrous. Flowers fragrant, inflorescences erect, basically ovoid, 15-20cm long. 8cm wide, primary bracts green, membranous along margins, loosely imbricate, broadly ovate to elliptic, 5-8cm long, apex usually obtuse, pubescent to glabrate, rachis permanently concealed, cincinni usually 4-flowered, calyx cylindrical, 4-5cm long, pubescent or rarely glabrate; corolla yellow, the tube slender, 8-9cm long, the lobes linear to linear-lanceolate, 4-5cm long; labellum often centrally flushed with dark yellow, broadly obovate, about as long as staminodes, (2.5-) 3-4cm wide, the base tapered into a claw; stamen yellow, about as long as labellum or slightly longer; lateral staminodes white, spatulate to lanceolate, (2.5-) 4-6cm long. (Wagner *et al*, 1999)

Fig. 25 *Hedychium gardnerianum*

24. Botanical name: *Citrus sinensis*
Family: Rutaceae
Common names: Orange
Genus: Citrus
Order: Sapindales
Parts used: leaves, fruits
Description: Citrus sinensis is an evergreen Tree growing to 9 m (29ft 6in). The species is hermaphrodite (has both male and female organs) and are pollinated by Apomictic, insects (Yetein, 2013)

Fig.26 *Citrus sinensis*

25. Botanical name:*Lupinus arboreus*
Family: Fabaceae
Common names: Yellow bush
Genus: Lupinus
Order: Fabales
Parts used: leaves
Description: *Lupinus arboreus* is an evergreen perennial shrub growing to 2 meters tall (hence the alternative common name, tree lupine) in sheltered situations, but more typically 1-1.5 meters tall. It has green to gray-green palmate leaves, with 5-12 leaflets per leaf. The leaflets are 2-6 centimeters long, often sparsely covered with fine silky hairs. The species is hermaphrodite (has both male and female organs) and is pollinated by Bees (Odugbami *et al*, 2006).

Fig. 27 *Lupinus arboreus*

26. Botanical name:*Garcina kola*
Family: Clusiaceae

Common names: Bitter kola
Genus: Garcinia
Order: Malpighiales
Parts used: all parts
Description: *Garcinia kola*, often known as Bitter kola, is a flowering plant found mostly in the tropical rain forest region of Central and West Africa. Bitter kola is an evergreen tree, with a heavy, spreading crown, that can grow up to 30 metres tall, but is more usually around 12 - 15 metres (Sofowora, 1993).

Fig. 28 *Garcina kola*

Source: Scamperdale
27. Botanical name: *Phyllanthus amarus*
Family: Euphobiaceae
Common names: Stone breaker
Genus: Phyllanthus
Parts used: all parts
Description: Phyllanthus amarus is an erect, annual plant growing from 10 - 50cm tall, but usually less than 30cm. The stem can be branched or unbranched. (Sofowora , 1993).

Fig. 29 *Phyllanthus amarus*

28. Botanical name: *Musa acuminata*
Family: Musaceae
Common names: Dwarf banana
Genus: Musa
Order: Zingiberales
Description: *Musa acuminate* is a perennial growing to 3m (9ft 10in). It has both male and female organs.

Fig. 30 *Musa acuminata*

29. Botanical name: *Gangronema latifolium*
Family: Apocynaceae
Common names: Utazi
Genus: Gongronema
Order: Gentianales
Parts used: leaves
Description: *Gangronema latifolium* is a climbing shrub with broad, heart-shaped leaves that has a characteristic sharp, bitter and slightly sweet taste, especially when eaten fresh. The stems have soft/hairy that yields milky latex or exudates (Orwa *et al* 2009).

Fig: 31 *Gangronema latifolium*

30. Botanical name: *Picralima nitida*
Family: Apocynaceae
Common names: Akuama seed

Genus: Picralima
Order: Gentianales
Parts used: seed
Description: *Picralima nitida* is a shrub or a tree that can reach a height of 35 metres, but is usually less. The bole can be up to 60cm in diameter (Traore *et al*, 2013).

Fig: 32 *Picralima nitida*

31. Botanical name: *Vernonia amygdalina*
Family: Asteraceae
Common names: Bitter leaf
Genus: Vernonia
Order: Asterales
Parts used: Leaves
Description: *Vernonia amygdalina*, a member of the daisy family, is a small shrub that grows in tropical Africa. It typically grows to a height of 2–5 m (6.6–16.4 ft). The leaves are elliptical and up to 20 cm (7.9 in) long. Its bark is rough (*Traore et al*, 2013).

Fig. 33 *Vernonia amygdalina*

32. Botanical name: *Alnus glutinosa*
Family: Betulaceae
Common names: Black alder
Genus: Alnus
Order: Fagales
Parts used: Leaves
Description:*Alnus glutinosa* is a tree that thrives in moist soils, and grows under favourable circumstances to a height of 20 to 30 metres (66 to 98 ft) and exceptionally up to 37 metres (121 ft). Young trees have an upright habit of growth with a main axial stem but older trees develop an arched crown with crooked branches. The base of the trunk produces adventitious roots which grow down to the soil and may appear to be propping the trunk up. The bark of young trees is smooth, glossy and greenish-brown while in older trees it is dark grey and fissured. The branches are smooth and somewhat sticky, being scattered with resinous warts. The buds are purplish-brown and have short stalks. The leaves of the common alder are short-stalked, rounded, up to 10 cm (4 in) long with a slightly wedge-shaped base and a wavy, serrated margin. They have a glossy dark green upper surface and paler green underside with rusty-brown hairs in the angles of the veins. The buds and young leaves are sticky with a resinous gum. The species is monoecious and the flowers are wind-pollinated; the slender cylindrical male catkins are pendulous, reddish in colour and 5 to 10 cm (2 to 4 in) long; the female flowers are upright, broad and green, with short stalks. The seeds are flattened reddish-brown nuts edged with webbing filled with pockets of air. This enables them to float for about a month which allows the seed to disperse widely (Traore *et al*, 2013, Odugbami *et al* 2006).

Fig. 34 *Alnus glutinosa*

33. Botanical name: *Cinchona officinalis*
Family: Rubiaceae
Common names: Cinchona
Genus: Cinchona
Order: Gentianales
Parts used: Bark
Description: Cinchona plants belong to the family Rubiaceae and are large shrubs or small trees with evergreen foliage, growing 5–15 m (16–49 ft) in height. The leaves are opposite, rounded to lanceolate and 10–40 cm long. The flowers are white, pink or red, produced in terminal panicles. The fruit is a small capsule containing numerous seeds. A key character of the genus is that the flowers have marginally hairy corolla lobes (Odugbami *et al*, 2006).

Fig. 35 *Cinchona officinalis*

34. Botanical name: *Gentiana verna*
Family: Gentianaceae
Common names:
Genus: Gentiana
Order: Gentianales
Description:*Gentiana verna* is a low, tufted plant, 7.5 centimeters high. The leaves form a basal rosette. The deep blue flowers are solitary and nearly stemless. They vary from 2 to 3 centimeters across. (Orwa *et al* 2009)

Fig. 36 *Gentiana verna*

35. Botanical name: *Sarcocephalus latifolius*
Family: Rubiaceae
Common names: pin cushion tree
Genus: Morinda
Order: Gentianales
Parts used: Root
Description: *Sarcocephalus latifolius* is a multi-stemmed tree or shrub up to 12 m. It has an open canopy. It has flowers with terminal spherical head-like cymes of small whitish flowers (Orwa *et al*, 2009).

Fig. 37 *Sarcocephalus latifolius*

Source: Atamari

36. Botanical name: *Uvaria cheame*
Family: Annonaceae
Common name: Finger root
Genus:Uvaria
Order: Magnoliales
Parts used:Root, leaves
Description:*Uvaria chamae* is a scandent or scrambling shrub to about 3–4 m with dark brown stem, twining branchlets rusty-pubescent becoming glabrous. The Leaves are alternate, shortly petiolate, coriaceous, elliptical oblong or oval, apex obtusely pointed, base obtuse to slightly cordate, with minute stellate hairs becoming glabrous with age and midrib is impressed above with minute hairs on midrib in lower surface, 9–13 pairs of lateralsand entire with slightly undulating margin.The flower is 2.20–2.5 cm across, greenish-brown, bisexual, in 2–5 flowered cluster usually axillary with a more or less hemispherical receptacle. It's calyx is brownish green, tomentose, three sepals valvate and connate near the base with petals which are greenish-beige, usually six, distinct, the outer three often larger and differentiated from the inner, slightly imbricate. Stamens are usually numerous, packed into a ball-like or disk-like configuration, distinct, carpels rusty- tomentose, numerous. Fruit-carpels 20 or fewer, rusty-pubescent, oblong, terete, on stipes, sometimes rough, with irregularly spaced, blunt projecting points. The fruits occur in finger-like clusters and are yellow when ripe with sweet aril enclosing the seeds. Seeds few, more or less compressed, shining and pale brown (Orwa *et al*, 2009, Linde and Jonas 199).

Fig: 38 *Uvaria cheame*

3.2 Data Analysis

Microsoft Excel was used to calculate the different average and to draw graphics. The importance of each plant in the treatment of malaria was assessed by the relative frequency of citation (RFC) calculated using

the following formula (Tardío *et al*, 2008). Where FC was the number of people who mentioned the use of the species and N the total number of individuals.

3.3 Demographic data and knowledge about malaria

Investigations were conducted with 15 respondents who had knowledge of antimalarial plants including 3 women and 12 men. The knowledge of plants uses was received from parents and society, by learning from other traditional healers or in academic or professional studies.

Table 1.0: Overview of interviewed traditional healers per visited village

Villages	Traditional healers (Number)	Sex		Age (years)
		Male	**Female**	
Olokoro	04	03	01	50-80
Agbama	02	02	00	30-70
Umudike	02	02	00	30-40
Old Umuahia	02	01	01	50-70
Ibeku	01	00	01	60-70
Ubakala	01	01	00	60-70
Ohuhu	01	01	00	60-70
Isi gate	02	02	00	36
Total: villages8	**15**	**12**	**03**	30-80

Malaria diagnosis in patients was done with some clinical signs that include fever (82.25%), headache (70.97%), shivering (51.61%), weakness (29.03%), and lack of appetite (16.13%). However, 7 respondents (11.29%) asserted that they used parasitological diagnosis of malaria before the treatment.

Table 2.0: Overview of the description of plants and the part of plants used

	BOTANICAL NAME	FAMILY	COMMON NAME	INDIGENOUS NAME	GENUS	ORDER	PART USED
1	*Alus glutinosa*	Betulaceae	Black alder		Alnus	Fagales	Leaves
2	*Anthocleista vogelli*	Gentianaceae	Forest fever	Akwukwo obodobo	Anthocleista	Gentianales	Leaves
4	*Azadirachta indica*	Meliaceae	Neem plant	Dogoyaro	Azadirachta	Sapindales	Leaves
5	*Carica papaya*	Caricaceae	Pawpaw	Popo	Carica	Brassicales	Roots, leaves, fruit
6	*Chromolena odorata*	Asteraceae	Independent leaf	Ogburunnenanwa	Chromolena	Asterales	Leaves
7	*Cinchona officinalis*	Rubiaceae	Cinchona		Cinchona	Gentianales	Root, bark

8	*Citru latifolia*	Rutaceae	seedless lime	Oroma nkirisi	Citrus	Sapindales	fruit
9	*Citrus hystrix*	Rutaceae	Kaffir lime	Rarandi	Citrus	Sapindales	fruit
10	*Citrus sinensis*	Rutaceae	Orange	Epe	Citrus	Sapindales	Leaves
11	*Costus afer*	Costaceae	Twisted ginger	Shrub	Costus	Zingiberales	Leaves, stem
12	*Costus barbatus*	Costaceae	Spiral ginger	Shrub	Costus	Zingiberales	Stem
13	*Crysophyllum africanum*	Sapotaceae	African star apple	Udara	Chrysophylum	Ericales	Leaves, fruits
14	*Cymbopogon citratus*	Poaceae	Lemon grass		Cymbopogon	Poales	Leaves
15	*Emilia sonchifolia*	Asteraceae	lilac tasselflower	Nti-ele	Emilia	Asterales	leaves
16	*Flagellaria indica*	Flagellariaceae	Bush cane		Flagellaria	Poales	Leaves
17	*Garcinia kola*	Clusiaceae	Bitter kola	Aki ilu	Garcinia	Malpighiales	Seeds
18	*Gentiana verna*	Gentianacea e	Gentia		Gentiana	Gentianales	Leaves
19	*Gongronema latifolium*	Apocynaceae		Utazi	Gongronema	Gentianales	Leaves
20	*Hedychium gardnerium*	Zingiberaceae	Ginger lily		ychium	Zingiberales	leaves
21	*Kalanchoe pinnata*	Crassulaceae	Cathedral bells	Chanka chanka	Kalanchoe	Rosales	Leaves
22	*Lupus arboreus*	Fabacea	Yellow bush		Lupinus	Fabales	Leaves
23	*Magnifera indica*	Anarcardiaceae	Mango	Mangoro	Magnifera	Sapindales	Leaves,roots, bark
24	*Musa acuminata*	Musaceae	Dwarf banana	Unele nwankita	Musa	Zingiberales	Leaves,Fruit
25	*Ocimum gratissimum*	Lamiaceae	Scent leaf	Nchanwu	Ocimum	Lamiales	Leaves
26	*Pentaclethra macrophylla*	Fabaceae	Oil bean	Ugba	Pentaclethra	Fabales	Bark
27	*Phyllanthus amarus*	Euphobiaceae	Stone breaker	Enyikwonwa	Phyllantus	Malpighiales	Leaves

28	*Picralima nitida*	Apocynaceae	Akuama seed	Mkpuru Osu	Picralima	Gentianales	Seeds
29	*Platostoma africanum*	Lamiaceae	Manding-Bambara		Platostoma	Lamiales	Whole plant
30	*Psidium guajava*	Myrtaceae	Guava	Gova	Psidium	Myrtales	Leaves
31	*Rauwolfia vomitoria*	Apocynaceae		Akata	Rauwolfia	Gentianales	Root
32	*Solanum nigrum*	Solanaceae	Black nightshade		Solanum	Solanales	Seed, leaves, stem
33	*Vernonia amygdalina*	Asteraceae	Bitter leaf	Onugbu	Vernonia	Asterales	Leaves
34	*Viscum album*	Santalaceae	mistletoe		Viscum	Santalales	Leaves
35	*Quassia amara*	Simaroubaceae	Bitter ash		Quassia	dales	Leaves
36	*Sarcocephalus latifolius*	Rubiaceae	pin cushion tree	Nvulodo	Sarcocephalus	Gentianales	Root,bark
37	*Uvaria cheame*	Annonaceae	Finger root	Mmimi ohia	Uvaria	Magnoliales	Root

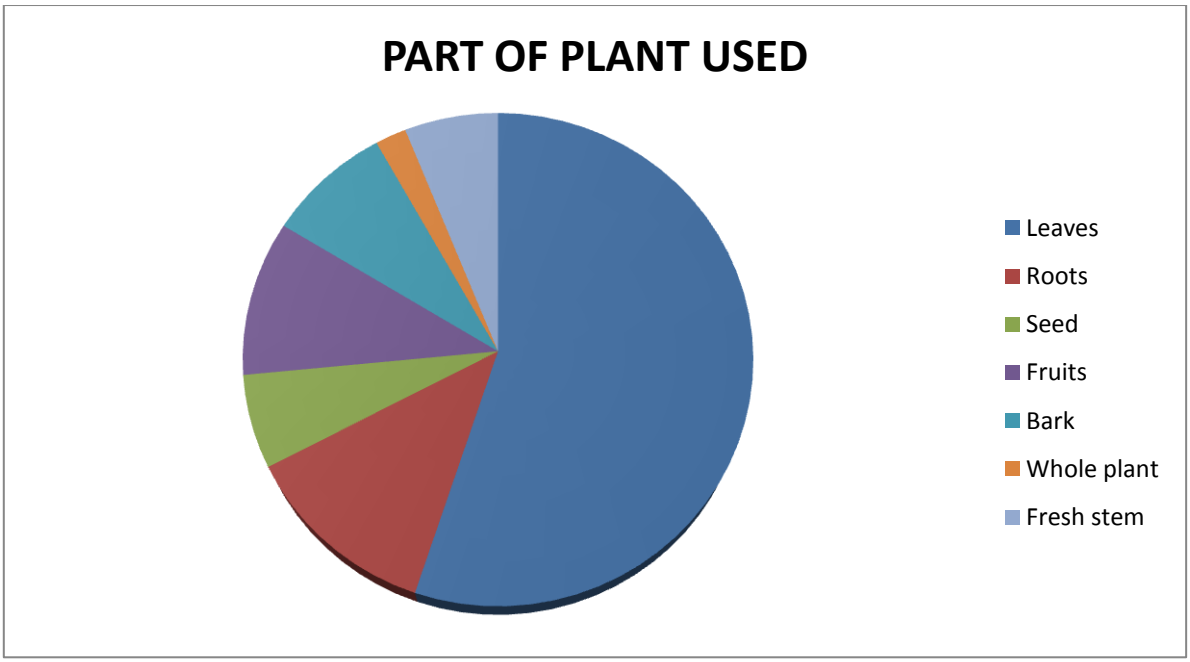

Fig.39 Part of plant used

3.4 Plants used for the treatment of malaria

A total of 37 plant species belonging to 25 families were mentioned by respondents to cure malaria. *Rutaceae, Asteraceae and Apocynaceae* families, with 3 species each were the most represented, followed by *Lamiaceae, Gentianaceae, Fabaceae* and *Costaceae* with 2 species each. For the rest, 18 families were represented by only one species. The calculated RFC indicated that species such as*Sarcocephalus*

latifolius(RFC = 0.33),*Cymbopogon citratus* (RFC = 0.33), *Carica papaya* (RFC = 0.27), *Azadirachta indica* (RCF = 0.27), *Chromolena odorata* (RFC = 0.27) and *Uvaria cheame* (RFC = 0.27) were the most used in the treatment of malaria in traditional medicine in Umuahia.

TABLE 3.0: RFCs and type of plant

S/N	BOTANICAL NAME	TYPE OF PLANT	Fc	RFC
1	*Alus glutinosa*	Shrub	1	0.07
2	*Anthocleista vogelli*	Tree	2	0.13
3	*Azadirachta indica*	Tree	4	0.27
4	*Carica papaya*	Tree	4	0.27
5	*Chromolena odorata*	Shrub	4	0.27
6	*Cinchona officinalis*	Tree	1	0.07
7	*Citrus latifolia*	Tree	1	0.07
8	*Citrus hystrix*	Tree	2	0.13
9	*Citrus sinensis*	Tree	2	0.13
10	*Costus afer*	Shrub	1	0.07
11	*Costus barbatus*	Shrub	1	0.07
12	*Crysophyllum africanum*	Tree	1	0.07
13	*Cymbopogon citratus*	Grass	5	0.33
14	*Emilia sonchifolia*	Herb	1	0.07
15	*Flagellaria indica*	Herb	1	0.07
16	*Garcinia kola*	Tree	2	0.13
17	*Gentiana verna*	Shrub	1	0.07
18	*Gongronema latifolium*	Climber	2	0.13
19	*Hedychium gardnerium*	Shrub	1	0.07
20	*Kalanchoe pinnata*	Shrub	1	0.07
21	*Lupus arboreus*	Shrub	1	0.07
22	*Magnifera indica*	Tree	3	0.2
23	*Musa acuminata*	Tree	1	0.07
24	*Ocimum gratissimum*	Shrub	1	0.07
25	*Pentaclethra macrophylla*	Tree	2	0.13
26	*Phyllanthus amarus*	Herb	1	0.07
27	*Picralima nitida*	Tree	1	0.07
28	*Platostoma africanum*	Herb	1	0.07
29	*Psidium guajava*	Tree	3	0.2
30	*Rauwolfia vomitoria*	Shrub	2	0.13
31	*Solanum nigrum*	Herb	1	0.07
32	*Vernonia amygdalina*	Shrub	1	0.07
33	*Viscum album*	Epiphyte	1	0.07
34	*Quassia amara*	Shrub	1	0.07
35	*Sarcocephalus latifolius*	Tree	5	0.33
36	*Uvaria cheame*	Tree	4	0.27

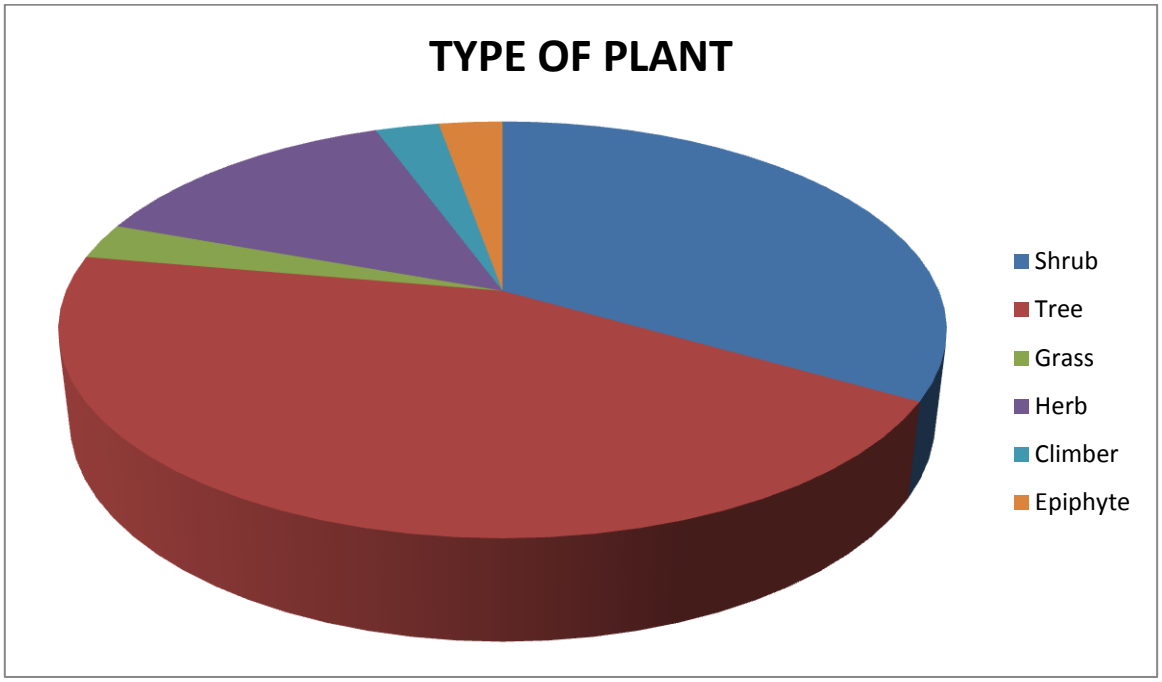

Fig.40 Type of plants used

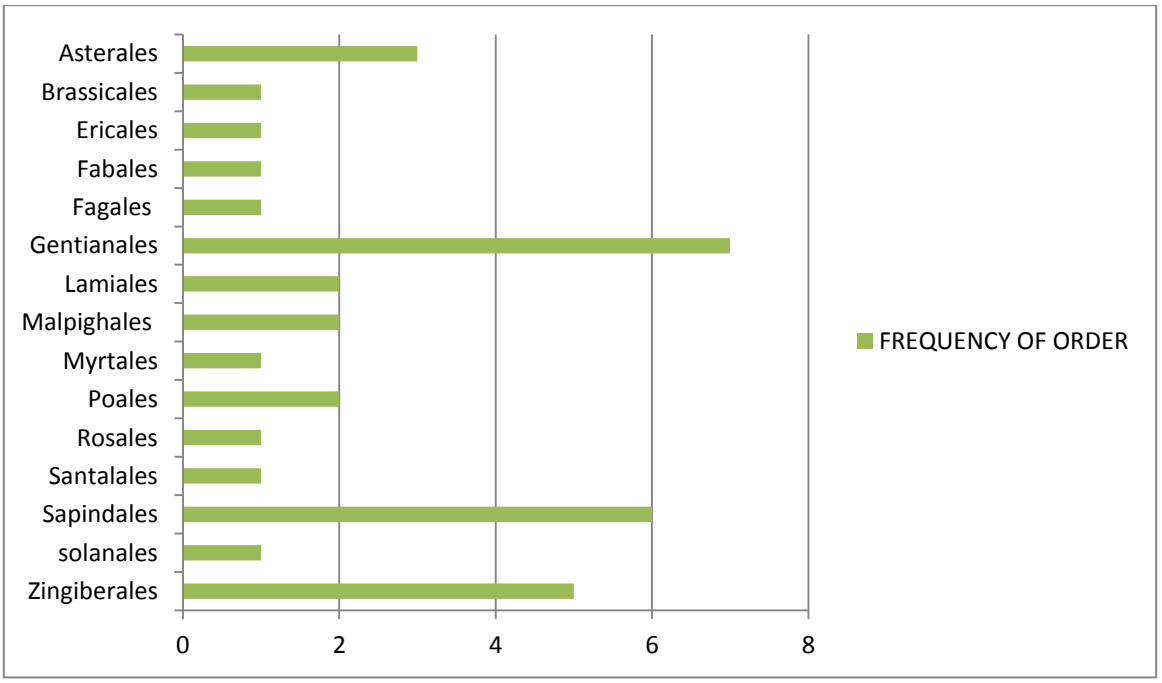

Fig 41 Antimalarial plant species distribution among Order.

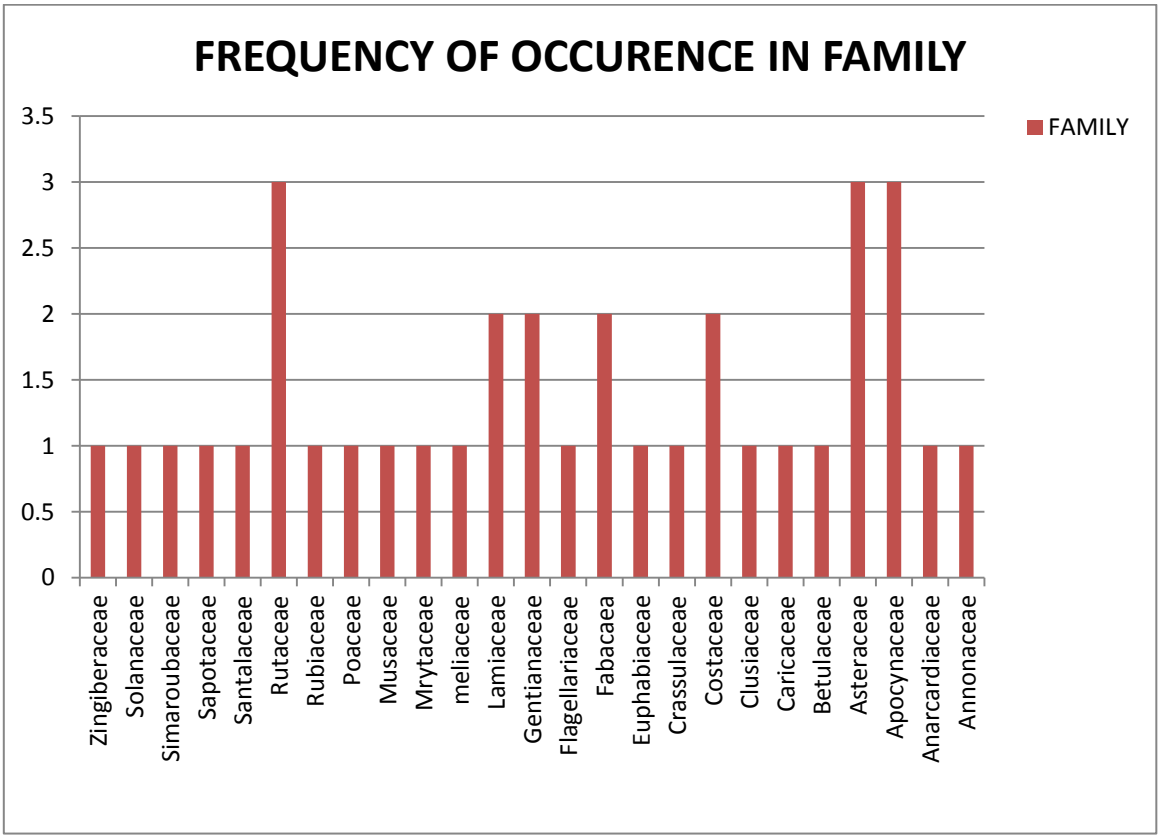

Fig 42 Antimalarial plant species distribution among families

3.5 Source Of Plants And Use Of Other Plants

Some of the plants could easily be accessed in gardens, farms and pathways while some of the plants could only be found in thick bushes. Also some of the practitioners imported some of the plants like *Cinchona officinalis* and *Gentiana verna*. This is demonstrated in table below and summarized in figure.

Most of the practitioners used the plants in combination with other plants that are already part of the result of the study and other plants that are not part of the result while some plants where used alone in the treatment of patients as demonstrated in table and summarized in figure.

TABLE 4.0: Plants used in combination

S/N	PLANT	NUMBER OF PLANTS USED IN COMBINATION	PLANT USED IN COMBINATION
1	*Alus glutinosa*	0	None
2	*Anthocleista vogelli*	2	*Sarcocephalus latifolia, mmimi ohia*
3	*Azadirachta indica*	4	*Carica papaya, magnifera indica, citrus hystrix*
4	*Carica papaya*	3	*Cymbopogon citratus,Psidium guajava, Citrus sinensis*
5	*Chromolena odorata*	6	*Citrus sinensis, Psidium guajava, Magnifera indica,Carica papaya, Azadirachta indica, Musa acuminata*
6	*Cinchona officinalis*	1	None
7	*Citru latifolia*	6	*Citrus sinensis, Psidium guajava, Magnifera indica,Carica papaya,*

			Azadirachta indica, Musa acuminata
8	*Citrus hystrix*	6	*Citrus sinensis, Psidium guajava, Magnifera indica, Carica papaya, Azadirachta indica, Musa acuminata*
9	*Citrus sinensis*	6	*Psidium guajava, Magnifera indica, Carica papaya, Azadirachta indica, Musa acuminata*
10	*Costus afer*	0	None
11	*Costus barbatus*	1	*Carica papaya*
12	*Crysophyllum africanum*	0	None
13	*Cymbopogon citratus*	2	*Citrus latifolia,, rarandi*
14	*Emilia sonchifolia*	1	*Cocos nucifera*
15	*Flagellaria indica*	1	*Carica papaya*
16	*Garcinia kola*	0	None
17	*Gentiana verna*	0	None
18	*Gongronema latifolium*	2	*Carica papaya*, sugar cane
19	*Hedychium gardnerium*	1	*Carica papaya*
20	*Kalanchoe pinnata*	0	None
21	*Lupus arboreus*	0	None
22	*Magnifera indica*	6	*Citrus sinensis, Psidium guajava, Musa acuminate, Carica papaya, Azadirachta indica,Citrus latifolia*
23	*Musa acuminate*	6	*Citrus sinensis, Psidium guajava, Magnifera indica,Carica papaya, Azadirachta indica,Citrus latifolia*
24	*Ocimum gratissimum*	1	*Chromolena odorata*
25	*Pentaclethra macrophylla*	0	None
26	*Phyllanthus amarus*	0	None
27	*Picralima nitida*	2	*Rauvulfia vomitoria, Anthocleista vogelli*
28	*Platostoma africanum*	0	None
29	*Psidium guajava*	1	*Carica papaya*
30	*Rauwolfia vomitoria*	3	*Sarcocephalus latifolia, Anthocleista vogelli, mmimi ohia*
31	*Solanum nigrum*	O	None
32	*Vernonia amygdalina*	1	*Citrus latifolia*
33	*Viscum album*		Honey
34	*Quassia amara*	0	None
35	*Sarcocephalus latifolius*	4	*Rauvolfia vomitoria, Picralima nitida, Anthocleista vogelli, Uvaria cheame*
36	*Uvaria cheame*	2	*Anthocleista vogelli, Sarcocephalus latifolia*

3.6 Mode of Preparation And Administration

The practitioner used different modes of preparing the drug products from the plants as well as different solvents for the preparation and different mode of drug administration although a majority of the practitioners used water as the solvent of extraction and oral route of administration respectively as shown in table and summarized in figures

TABLE 5.0: Indications on the methods of preparation and administration of medicines

S/N	PLANT	MODE OF PREPARATION	SOLVENT	ROUTE OF ADMINISTRATION
1	*Alus glutinosa*	Decoction	Water	Oral
2	*Anthocleista vogelli*	Decoction	Water	Oral
3	*Azadirachta indica*	Decoction	Water	Oral
4	*Carica papaya*	Juice	Water	oral
5	*Chromolena odorata*	Decoction	Water	Oral
6	*Cinchona officinalis*	Infusion	Water	Oral
7	*Citru latifolia*	Decoction	Water	Oral
8	*Citrus hystrix*	Decoction	Water	Oral
9	*Citrus sinensis*	Decoction	Water	Oral
10	*Costus afer*	Juice	water	Oral
11	*Costus barbatus*	Juice	Water	Oral
12	*Crysophyllum africanum*	Juice	Water	Oral
13	*Cymbopogon citratus*	Decoction	Water	oral
14	*Emilia sonchifolia*	Decoction	Water	Oral
15	*Flagellaria indica*	Juice	Water	Oral
16	*Garcinia kola*	Juice	Water	Oral
17	*Gentiana verna*	Decoction	water	Oral
18	*Gongronema latifolium*	Juice, decoction	Water	Oral
19	*Hedychium gardnerium*	Juice	Water	Oral
20	*Kalanchoe pinnata*	Decoction	Water	Oral
21	*Lupus arboreus*	Decoction	Water	oral
22	*Magnifera indica*	Decoction	Water	Oral, topical
23	*Musa acuminate*	Decoction	Water	Oral
24	*Ocimum gratissimum*	Decoction	Water	Oral
25	*Pentaclethra macrophylla*	Decoction	Water	Oral
26	*Phyllanthus amarus*	Decoction	Water	Oral
27	*Picralima nitida*	Decoction	Ethanol	Oral
28	*Platostoma africanum*	Decoction	Water	Topical
29	*Psidium guajava*	Decoction	Water	Oral
30	*Rauwolfia vomitoria*	Decoction	Water	Oral
31	*Solanum nigrum*	Decoction	Water	Oral

32	*Vernonia amygdalina*	Juice	water	Oral
33	*Viscum album*	Infusion	water	Oral
34	*Quassia amara*	Decoction	Water	Oral
35	*Sarcocephalus latifolius*	Decoction, infusion	Palm wine	Oral, topical
36	*Uvaria cheame*	Decoction	Water	Oral

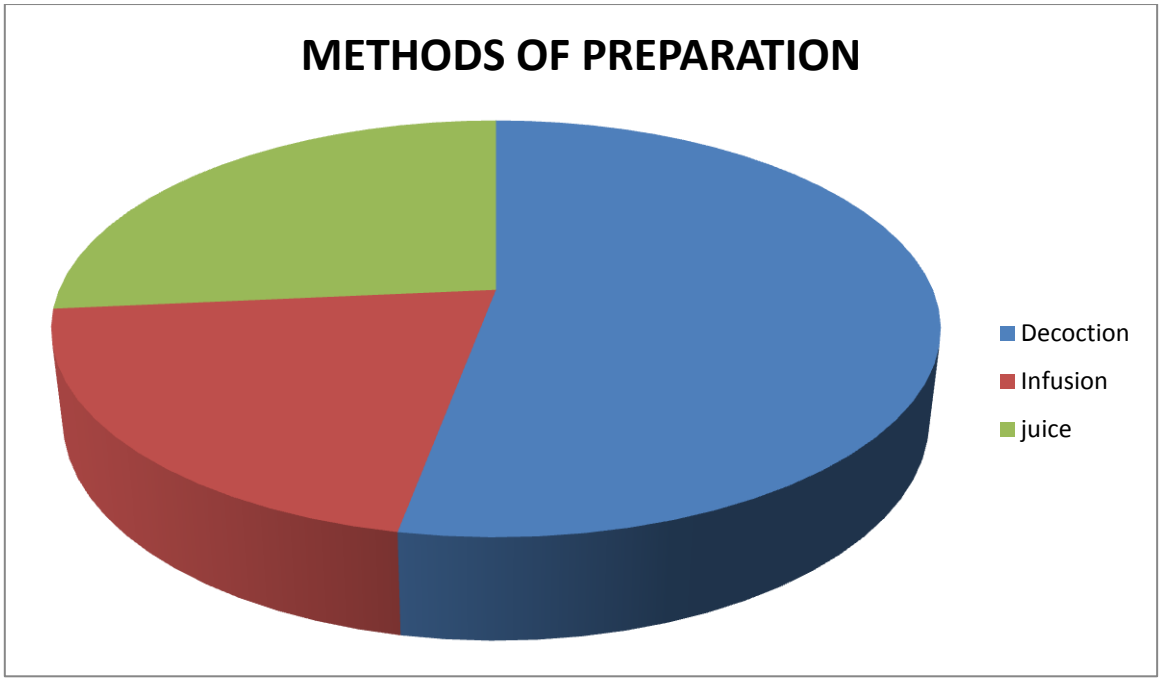

Fig 43 Various methods of preparation of the herbaldrugs

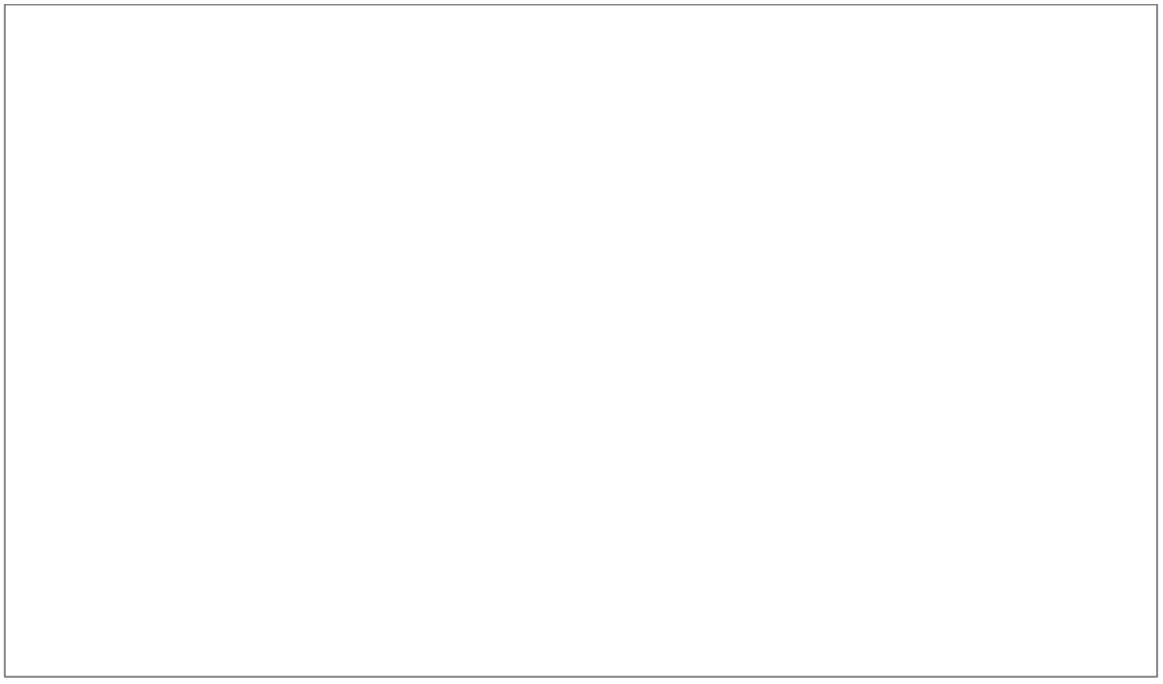

Fig 44 Various routes of administration

3.7 Duration of Treatment and Treatment Outcome

Most of the practitioners recorded successful treatment outcomes with minimal side effects as determined by patient feedback while treatments were without side effects.

TABLE 6.0: Summary of the duration of treatment and treatment outcome

S/N	PLANT	DURATION OF TREATMENT	SIDE EFFECTS	% SUCCESS OF TREATMENT
1	*Alus glutinosa*	5 days	None	75 %
2	*Anthocleista vogelli*	14 days	None	75%
3	*Azadirachta indica*	5 days	Frequent urination	70%
4	*Carica papaya*	7 days	None	95%
5	*Chromolena odorata*	14 days	None	75%
6	*Cinchona officinalis*	7 days	None	75%
7	*Citru latifolia*	3 days	None	75%
8	*Citrus hystrix*	3 days	None	75%
9	*Citrus sinensis*	3 days	None	75%
10	*Costus afer*	3 days	None	85%
11	*Costus barbatus*	14 days	None	95%
12	*Crysophyllum africanum*	8 days	None	99%
13	*Cymbopogon citratus*	4-7 days	Insomnia	70%-85%
14	*Emilia sonchifolia*	14days	None	65%
15	*Flagellaria indica*	14 days	None	95%
16	*Garcinia kola*	8 days	None	75%
17	*Gentiana verna*	5 days	None	50%
18	*Gongronema latifolium*	4-5 days	Mild purging (occurs with overdose), mild dizziness	80%
19	*Hedychium gardnerium*	14 days	None	95%
20	*Kalanchoe pinnata*	7 days	Frequent urination with overdose	80%
21	*Lupus arboreus*	7 days	None	50%
22	*Magnifera indica*	3 days	None	75%
23	*Musa acuminata*	3 days	None	70%
24	*Ocimum gratissimum*	5 days	Nausea	65%
25	*Pentaclethra macrophylla*	5 days	Heart palpitation (occurs with overdose)	100%
26	*Phyllanthus amarus*	3days	None	50%
27	*Picralima nitida*	7 days	None	75%
28	*Platostoma africanum*	4 days	None	50%
29	*Psidium guajava*	14 days	None	100%
30	*Rauwolfia vomitoria*	3 days	None	90%
31	*Solanum nigrum*	14 days	None	98%
32	*Vernonia amygdalina*	5 days	None	95%
33	*Viscum album*	7 days	None	85%
34	*Quassia amara*	5 days	None	75%
35	*Sarcocephalus latifolius*	5- 14 days	None	85%
36	*Uvaria cheame*	14 days	None	85%

4.0 DISCUSSION

This investigation revealed that plants of families Rutaceae, Asteraceae, and Apocynaceae widely used and contribute to malaria treatment, used either alone or in combination with other species. The most cited plants by traditional medicine practioners are *S. latifolius* and *C. citratus* followed by *Uvaria cheame, Azadirachta indica, Carica papaya* and *Chromolena odorata* . The species *A. glutinosa, C. barbatus, C. africanum, E. sonchifolia, F. indica, G. verna, H. gardnerium, L. arboreus, S. nigrum,* and *U. cheame* were not found in the literature for their antimalarial uses and need be explored. Antimalarial activities of some recorded species in this study were also reported by previous studies focused on *in vitro* antiplasmodial activity of these species. For example, the aqueous extract of root of *S. latifolius* tested *in vitro* against the strains of *P. falciparum* FCB1 was active with IC50 = 0.6 μg/ml (Zofou *et al*, 2011, Iyama and Idu 2015).

Leaves were the most used part of the plant (55%) followed by root (12%). The same result was found by Lakouetene in 2008 with 60%; and 68% by Yetein *et al*. in 2013. This implies that the chances of plant extinction is very slim considering the fact that the leaves were the mostly used and had little or no effect on plant survival Tabuti *et al* 2012).

Samples were collected in bushes, farms, and home gardens that grow rare species while some of the learned practitioners imported some plants like *C. officinalis, A. glutinosa,* and *G. verna.*

Most recipes used were prepared by decoction (53%) followed by juice and then infusion.

In general, plant material and the volume of water used and preparation duration were not precisely defined. The oral route of administration was the most used route of administration for taking antimalarial traditional recipes.

The drugs were taken with glass (beer or liquor), spoon, or cup. In general, the amount administered to the patient is not very accurately measured, and the dosage is very difficult to estimate. In all cases, there was a wide variation depending on the experience of each traditional therapist. These inaccuracies make difficult the standardization of the use of these plants.

Traditional medicine practitioners of Umuahia sometimes had used combinations of plants to increase the efficiency of the recipe in the treatment of malaria and its symptoms such as fever, headache, jaundice, vomiting, and anemia. These combination of plants when mismatched, are sometimes very toxic and long term use can produce long-term complications such as kidney and liver failure.

Only 3/15 respondents had used parasitological diagnostic of malaria (thick blood film, blood smear, and rapid diagnostic test) before treatment. The rest had used signs such as fever, headache, vomiting, conjunctival pallor, diarrhea, chills, and generalized tiredness and this has raised the problem of definitive diagnosis before treatment because other diseases can also have almost same clinical signs as malaria.

Informants ranged from 29 to 75 years old. Old informants were more represented than younger. The educational level of the interviewees was low as only 2/15 respondents had a degree, 7/15 had secondary school certificate, 4/15 had primary school certificate while 2/15 were not educated at all. Many of the traditional medical practitioners were semi- illiterate and as such could not properly document their practice. Inheritance was the major source of knowledge acquisition as related by the practitioners.

Therefore it is advocated that the knowledge of treatment of the disease acquired by inheritance and training be documented for the future generation.

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