A survey of medicinal plants used for the therapeutic management of malaria amongst the Yoruba people of Southwestern Nigeria

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ABSTRACT

Background: Traditional medicine, especially the use of herbs in the treatment of diseases has always been in practice from time immemorial, and it is gaining popularity worldwide due to affordability, availability and reliability.

Objective: This study appraised the various species of herbal medicinal plants used for the therapeutic management of malaria fever amongst the Yoruba people of Southwestern Nigeria.

Methods: The sampled population principally pediatrics herbal sellers, practicing herbalists, and herbal patrons were served questionnaires and oral interviews for information gathering as judged by natives thriving practices, which included the following: recipes for medicinal, local names for plant(s) and part(s) used in medical practices, modes of preparation and extraction, dose and duration of administration, state of part(s) used (fresh, dried or powdered), time of plant collection, and availability (occurrence) of the plants(s).

Results: A total of twenty (25) plant species belonging to different families were studied. Of the 360 questionnaires issued across the selected zones, 300 were returned for an overall response rate of 83%. Oral interview was also done with those returning the questionnaires. Investigations on the specific plant part(s) used and the method of preparation and administration indicated that water and occasionally alcohol was the main medium for all medicinal preparations.

Conclusion: In spite of the fact that the anti-malarial efficacy of the recipes described by the respondent is not known with certainty, this survey supports the efforts of the World Health Organization (WHO) in the search for natural anti-malarial drugs and provides a workable basis for future research on these plants.

Keywords: Anti-malarial medicinal plants, therapeutic management, Southwestern Nigeria.

Etude des plantes médicinales utilisées pour le traitement thérapeutique du paludisme chez les Yoruba du sud-ouest du Nigéria

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RÉSUMÉ

Contexte: La médecine traditionnelle, et plus particulièrement l'utilisation des plantes médicinales pour le traitement des maladies, est pratiquée depuis des temps immémoriaux et gagne en popularité dans le monde entier en raison de son accessibilité, de sa disponibilité et de sa fiabilité.

Objectif: Cette étude a évalué les différentes espèces de plantes médicinales utilisées pour la prise en charge thérapeutique du paludisme chez les Yoruba du sud-ouest du Nigéria.

Méthodes: La population échantillonnée, composée principalement de vendeurs de plantes pédiatriques, d'herboristes praticiens et de clients, a été soumise à des questionnaires et à des entretiens oraux afin de recueillir des informations sur les pratiques locales florissantes. Ces informations comprenaient les éléments suivants : recettes médicinales, noms locaux des plantes et parties utilisées dans les pratiques médicales, modes de préparation et d'extraction, dose et durée d'administration, état des parties utilisées (fraîches, séchées ou en poudre), période de la récolte des plantes et disponibilité (occurrence) des plantes.

Résultats: Au total, vingt (25) espèces végétales appartenant à différentes familles ont été étudiées. Sur les 360 questionnaires distribués dans les zones sélectionnées, 300 ont été retournés, soit un taux de réponse global de 83 %. Des entretiens oraux ont également été menés avec les personnes ayant retourné les questionnaires. Les recherches sur les parties spécifiques de la plante utilisées et sur le mode de préparation et d'administration ont indiqué que l'eau, et parfois l'alcool, constituaient le principal support de toutes les préparations médicinales, indépendamment de la plante, des parties ou des combinaisons utilisées.

Conclusion: Bien que l'efficacité antipaludique des recettes décrites par les répondants ne soit pas connue avec certitude, cette enquête appuie les efforts de l'Organisation mondiale de la santé (OMS) dans la recherche de médicaments antipaludiques naturels et fournit une base viable pour les recherches futures sur ces plantes.

Mots-clés: Plantes médicinales antipaludiques, prise en charge thérapeutique, sud-ouest du Nigéria.

INTRODUCTION

Malaria is widespread in many parts of the world mainly in the tropical and subtropical regions, but extending into some of the temperate areas. Because of its reputation as the greatest scourge of man, a running battle has been waged on the parasite and its mosquito vectors since the early part of the millennium. Malaria has continued to be the most dreaded infection in tropical areas of the world. In Africa alone, the infection rate for malaria is estimated over one hundred million people annually and remains the leading cause of morbidity and one of the leading causes of death in Nigeria. The annual world total of malaria cases was put at 250 million with 2.5 million of them ending in death. In areas where the disease is common, the greatest impediment to malaria treatment has been the increasing problem of drug resistance, occasioned by lack of faithful compliance with prescriptions for conventional anti-malarial and self-medication by most infected persons.[1]

In many indigenous African communities, these actions are compound by the absence of basic infrastructure (including hospitals), crushing poverty, and cultural beliefs. Consequently, these indigenous communities rely on natural medicines for treatment of malaria and other diseases. Indeed, an estimated 80 percent of the rural population of African depends on traditional medicines for health care. Albeit, 240 million Africans are still not covered by any meaningful malaria control programme, and malaria is responsible for 10 percent of the attendance at hospital and still accounts for one million deaths of infants and children annually.[2]

The most characteristic symptom of malaria is the occurrence of paroxysm of fever at regular intervals, alternating with 'good' periods of no fever. These peaks of fever are correlated with the discharge of metabolic wastes along with the merozoites into the blood stream when the red blood corpuscles rupture during schizogony. It is believed that the high fever is the host's inflammatory response to the presence of the toxic products, although a lot still remains to be known about the mechanism. People living in endemic areas who have been victims of a few attacks of malaria can recognize the onset of an attack even before the first paroxysm-headache, lassitude, loss of appetite, muscle pain, and chills resulting in violent shivering (rigor) with the teeth chattering. These are the first symptoms, to be followed by a rapid rise in temperature up to 40^{o}C (104- 106^{o}F) in some cases. This is accompanied by thirst, nausea, vomiting, and sometimes by delirium and convulsion (in children), usually more pronounced in falciparum malaria. This hot stage may last for up to 8 hours after which the temperature falls to normal and the patient, though weak, enjoys some respite before the next paroxysm.[3]

Diagnosis is based partly on the clinical symptoms, but since there is likelihood of confusion with a host of other tropical fevers, diagnosis is usually confirmed by detection of the parasites in stained thick and thin smear from peripheral blood. However, in cases of fever in endemic areas, treatment for malaria, particularly in children, is usually commenced before a definitive diagnosis is made, because any delay with falciparum malaria may have fatal consequences.[4] The drugs of choice for malaria are chloroquine which is an alkaloid extracted from the bark of the cinchona tree, Cinchona ledgeriana, had been in widescale use in peru for centuries before it was 'discovered' by the Europeans in the nineteenth century. Although there is now evidence of chloroquine resistance in falciparum malaria in Africa and other parts of the world, hence the need for traditional herbal alternatives.[5]

The Yoruba people dominate the South-western part of Nigeria. The population was approximately 30 million, which was about 21 % of the entire Nigerian population. The Yoruba nation has several sub-groups like the Ekiti, Ijesa, Oyo, Egba, Ijebu, Yewa and igbomina, in addition to Ondo, Akoko and even the Edos. Yoruba land is characterized by forest vegetation as well as patches of derived savanna types arising basically from human activities like bush burning for agricultural and hunting purposes. The main traditional occupations of the people include farming, blacksmithing, pottery and indigenous medicinal practices.[6]

Several local names have been used to describe Traditional medical practitioners in Yoruba land, and these include Onisegun Ibile, Elegbogi, Olosanyin, as well as Babalowo. Although Oloogun and Onisegun are used as synonyms, they are distinct from Elegbogi in the sense that the oloogun use amulets, incantations, charms, in their magical practices. They are more dreadful in the community where they live. Different areas of specialization include bone settings (teguntegun), stroke and hypertension healers, general practitioners (gbogbonise) local traditional pharmacist (lekuleja) and traditional pediatrician (elewe omo) that specializes in using natural plants for the treatment of malaria and other allied diseases.[7] The goal of this research was to document information on the plants and recipes used by the Yorubas of South Western Nigeria for treatment of malaria fever.

MATERIALS AND METHODS

Study area

The study location where some selected locations within the six south west zones of Nigeria with an area of about 191, 843 square kilometres was studied. The entire south west zone lies between the longitude 300 and 7^{o}E and latitude 4^{o} and 9^{o}N coordinates which include Oyo, Ogun, Osun, Ondo, Ekiti and Lagos States.

Sample collection

Information was sought by administering questionnaires and using oral interview. The interviewees were accompanied to the field to ensure identification and collection of the plant specimens.

Sample documentation

Collected specimens were identified systematically and archived at the herbarium of the Department of Pharmacognosy, Faculty of Pharmacy, Olabisi Onabanjo University.

RESULTS

The results of the studies were itemized and tabulated parameter-wise.

Table 1: Selected Locations surveyed within the Southwest Zones

Zone	State	Selected Locations
SW1	Oyo	Idi-Ayunre, Akanran, Ajibode, Akinyele, igbo - Ora and Igangan
SW2	Ogun	Ipokia, Odeda, Agoi-Iwoye, Papalanto, Ijebu-Igbo and Ayetoro
SW3	Osun	Idominasi, Osogbo, Ede, Osu, Ikirun and Ibokun
SW4	Ondo	Akoko SW, Okiti -Pupa, Ikare, Oke-Igbo, Akungba and Ifon
SW5	Ekiti	Erio-Ekiti, Ado-Ekiti, Oke-mesi, Ikere-Ekiti, Ikole-Ekiti and Ido-Osi
SW6	Lagos	Ikorodu, Epe, Ojo, Somolu, Akesan and Yaba.

Table 2: Responses on the use of anti-malarial medicinal plants from the respondents

Zone		Respondents		Respondents	
	State	Herbal Patrons number replying	Response rate (%)	Traditional pediatricians number replying	Response Rate (%)
SW1	Oyo	27	18.2	33	15.6
SW2	Ogun	22	14.7	38	17.9
SW3	Osun	30	20.3	30	14.1
SW4	Ondo	21	14.2	39	18.4
SW5	Ekiti	20	13.5	40	18.8
SW5	Lagos	28	18.9	32	15.1
Total Respondents	360	148		212	

Table 3: Anti-malarial medicinal plants and preparation for therapeutic purposes[8-12]

SN	Plant material	Yoruba name	Preparation	Treatment	Remarks
1	*Azadirachta indica A. Juss*	Dongoyaro	Macerate or boil Fresh leaves & twigs in clean water	Drink extract (ca. 250mL) 3 or 4 times per day for 7 days	Symptoms expected to disappear by end of treatment interpreted as cure
2	*Khaya senegalensis (Desr) A. Juss*	Oganwo	Macerate fresh bark in clean water and filter	Dink filtrate (ca. 250mL) 2 or 3 times per day until symptoms disappear	Disappearance of symptoms interpreted as cure
3	*Bridelia ferruginea Willd*	Eepo- ira	Make aqueous Decoction of fresh or Dried leaves	Drink decoction (ca. 250mL) 3 times per day for 6 days	Symptoms expected to disappear by end of treatment, interpreted as cure
4	*Vernonia amygdalina Delile*	Ewuro	Squeeze fresh leaves with clean water and filter	Drink bitter filtrate (ca. 250mL) 2 or 3 times a day for 3 days	Disappearance of symptoms Interpreted as cure
5	*Chromolaena odorata (L.) R.M.King & H.Rob & Ocimum gratissimumL.*	Ewe Akintola ati Efinrin	Make aqueous Concoction of fresh Leaves & twigs of both plants use only *C. odorata* if O. gratissimum not available	Drink concoction (ca. 250mL) 3 or 4 times per days for 5 days and bathe with extract twice daily	Symptoms expected to disappear by end of treatment, interpreted as cure
6	*Sterospermum Kunthiamum Charm.*	Ayada	Make aqueous decoction from fresh roots	Drink decoction (ca. 250mL) 3 times per day for 7 days	Symptoms expected to disappear by end of treatment, interpreted as cure
7	*Zingiber officinale Roscoe*	Atale	Make aqueous decoction of dry, powdered rhizome	Drink decoction (ca. 250mL) 3 times/day for 6 days	Disappearance of symptoms interpreted as cure
8	*Sterculia setigera Delile & Parkia biglobosa (Jacq.) R.Br.exG.Don*	Ose-awere ati Iru	Make aqueous concoction from equal mixture of fresh or dry bark from each plant	Drink concoction (ca. 250mL) 3 times per day until symptoms disappear	Disappearance of symptoms Interpreted as cure

9	*Terminalia catappa L.*	Epa	Make aqueous decoction of yellowing or red fresh leaves	Drink decoction (ca. 250mL) every 6 hours until recovery	Recovery is judged by the disappearance of symptoms
10	*Sarococephalus latifolius Sm.*	Ogbesi	Squeeze fresh leaves with a little water between palms	Drink exudates (ca. 250mL) 2 times per day until symptoms disappear	Symptoms expected to disappear by end of treatment, interpreted as cure
11	*Cymbopogon citratus (D.C) Stapf*	Ewe tii/Kooko oba	Make aqueous Decoction of aerial parts	Drink decoction (ca. 300mL) 4 times per day for 8 days	Symptoms expected to disappear by end of treatment, Interpreted as cure
12	*Gossypium barbadense &Gossypium hirsutum*	Owu ati Ela Owu	Make aqueous Concoction of fresh Leaves of both plants	Drink concoction (ca. 250mL) 3 or 4 Times per days for 5 days	Symptoms expected to disappear by end if treatment, interpreted as cure
13	*Crossopteryx febrifuga (Afzel.Ex.G.Don) Newbouldia laevis,(P.Beauv) Seem.Ex.Bureau & Morinda lucida Benth*	Ayetintin Ewe Akoko ati Oruwo	Make aqueous Decoction of mixed fresh leaves	Drink concoction (ca. 250mL) 4 times/day for 5 days	Disappearance of symptoms interpreted as cure
14	*Carica papaya ,L. Mangifera indica L, Psidum guajava L., & Cymbopogon citratus(D.C.) Stapf*	Ewe Ibepe Ewe mangoro Ewe girofa ati Kooko oba/ Ewe tii	Make aqueous Concoction from Fresh leaves & twigs Of plants	Drink concoction (ca. 250mL) 3 times/ day for 5 days; boil concoction & inhale steam twice a day (morning and night) during treatment	Symptoms expected to disappear by end Of treatment, interpreted as cure
15	*Annona senegalensis Pers.*	Abo ibobo/ Arere	Make aqueous Decoction of fresh Leaves	Drink decoction (ca. 250mL) 4 times/day for 8 days	Symptoms expected to disappear within treatment period, interpreted as cure
16	*Imperata cylindrical (L.)P.Beauv & Alchornea cordifolia Mull.Arg.*	Koriko Erin ati Ewe Ipa	Make aqueous Decoction of *I.cylindrica* rhizomes & fresh leaves of A. cordifolia	Drink concoction (ca. 250mL) 3 times/day for 7 days	Symptoms expected to disappear by end of treatment, interpreted as cure

Table 4: Reported bioactive composition of anti-malarial medicinal plants investigated

	Plant material	Plant parts	Class of compounds	References
1	*Azadirachta indica*. A. Juss	Seeds	Limonoids	13
2	*Khaya senegalensis* (Desr.) A. Juss.	Bark	Alkaloids Flavonoids	13
		Stem bark	Limonoids	
		Seeds	Lipids	
3	*Bridelia ferruginea* Benth	Leaves & roots	Tannins, glycosides, & phlobatannins	14
		Bark	Tannins	
4	*Vernonia amygdalina Delile*	Roots	Glycosides	15
5	*Chromolaena odorata (L.)R.M.King&H.Rob*	Seeds	Alkaloids	15
6	*Sterospermum kunthiamum .Cham*	Leaves	Saponins & glycosides	14
7	*Zingiber officinale Roscoe*	Rhizome	Essential oils and resinoid	16
8	*Sterculia setigera Delile*	Bark	Alkaloids and tannins	15
9	*Terminalia catappa L.*	Kernels	Fixed oils	9
		Leaves	Saponins & tannins	14
10	*Sarococephalus latifolius Sm.*	Leaves	Alkaloids	17
		Stem bark	Alkaloids and tannins	
11	*Cymbopogon citratus* (DC) *Stapf*	Leaves	Saponins & tannins	15
12	*Ocimum gratissimum L.*	Whole plant	Essential oils	18
13	*Newbouldia laevis (P.Beauv.) Seem.Ex.Bureau*	Stem bark	Tannins	15
14	*Carica papayaL.*	Latex	Alkaloids	15
		Roots	Glycosides	15
	Mangifera indica L.	Stem bark	Tannins, polyphenols	
	Psidium guajava L.	Leaves	Gingerol and glycosides	
15	*Annona senegalensis Pers*	Stem bark	Tannins, saponins, sardinolides, & polyphenols	19
		Leaves & roots	Anthraquinones	
16	*Imperata cylinrica (L.) Beauv*	Rhizomes	Saponins, triterpenoids, & reducing sugars	14

DISCUSSION

An ethnobotanical survey was conducted among the Yoruba people of south west Nigeria, using a questionnaire and oral interview. To ensure uniform survey coverage, the study area was divided into six zones as shown in Table 1 and a selected sample population of sixty interviews or questionnaires was administered in each zone. The sample population was, principally, traditional medicine practitioners pediatrics herbal sellers and their patronizers. A total of thirty-six (36) selected locations within the six south west states were surveyed for anti-malaria medicinal plants, thefinding showed that the majority plants and recipe identified were commonly used for the treatment of malaria throughout the six geopolitical zones. These could be due to uniform forest span that are unique with the selected zones that support the growth of these medicinal plants with anti-malarial activity, which corroborates the study of Temitope *et.al*.[8] on historical perspective of traditional medicine practices among the Yoruba people of Nigeria.[8]

A total of 16 species of plants were explored, most involved a single plant with water as the common extraction solvent either by maceration or boiling while some required combination of recipe in equal proportions. Administration of preparations of either aqueous or alcoholic extracts was mainly by drinking cupfuls (approximately 250 mL) of the extract one to three times a day for five days or more until the symptoms disappear. In the course of interviewing respondents, a good number of the recipes described were clearly indigenous to the Yoruba's, although some were apparently acquired through share information and experiences at annual meetings of alternative medicament fairs, traditional medicine practitioners, herbal paediatrician markets, personal contacts and herbal medicines workshops. More recently, the Nigerian government and National Administration of Food, Drug and Control (NAFDAC) has supported such interactions in a deliberate attempt to identify, register, recognize and harmonize the operations of the traditional medical practitioners and medicinal formulations in order to be added to therapeutic treatments into the mainstream conventional health care delivery system of Nigeria.[9]

Albeit, none of the identified recipes were administered on any patient or animal model to test efficacy, the fact that the herbal sellers are well patronized suggests the recipes may indeed be efficacious and safe. Most practicing respondents claimed their patients were completely cured and clients claimed complete relief from malaria after treatment.[10]

The attention and recognition being accorded traditional medicine by the World Health Organization (WHO) and Drug regulatory agencies in some countries serves an indication of confidence that those institutions have on their claims on herbal formulation coupled with the testimonies of their seemingly teeming patronizers of their herbal products for therapeutic purposes.[11] Phytochemical screening of medicinal plants is usually required to establish the nature of the active bioactive components in the plants. Such screening was not done in the present study, since the primary focus was documenting plants and recipes used in the treatment of malaria.[12] However, many of the identified plants are known to contain alkaloids, tannins, saponins, and polyphenols and other bioactive compounds as shown in Table 2 though information referenced in Table 4 were obtained through secondary data mining of relevant published papers and books.[9, 13 - 19]

Limitations to the study

The few limitations encountered include geographical restrictions in some states, financial paucity for effective coverage of the expanse of the entire land, reliance on traditional healers' knowledge, challenging in standardizing herbal preparation and potential biases in data collection hence the study be suitably endorsed as a microcosm of a macrocosm.

CONCLUSION

In the same manner that the World Health Organization increases efforts to locate new anti-malarial drugs that can combat the resistance of malarial parasites to synthetic drugs, medicinal plant materials could contribute to new drugs or supplements for existing conventional synthetic drugs. Combination of drug derivatives in synergism has been shown to reduce malaria transmission, limit development of parasite resistance, increase efficacy and increase the life span of anti-malaria compounds. Though the claims in this study have been scientifically demonstrated, further investigation to establish the authenticity are recommended.

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