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Efficacy of some treatment and control practices against malaria among patients attending general Hospital Isa, Sokoto State, Nigeria

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Abstract
This research was carried out to determine the prevalence of malaria among the patients attending General Hospital Isa, Sokoto State Nigeria. The investigation was conducted between October and November (after rainy season) in General Hospital Isa. The questionnaire was administered to obtained related information from the patients on the treatment practices and control measurements. A total of 100 blood samples were collected by pricking the thumb of the hand of each patient. The thick smear slides were prepared from the blood samples, stained with diluted giemsa stain and viewed under binocular light microscope. The result of this study showed the prevalence of the disease was very high (67%); with higher prevalence in females (70.2%). Individual from 1-9 years had the highest prevalence (87.9%) of the disease and individual with 40 years above had the lowest prevalence (50.00%). Prevalence of disease based on occupation of participants showed that students were highly infected (85.7%) while civil servents had least prevalence (508.8%). Efficacy of treatment practice showed that traditional medicines are highly effective in control of malaria while arthrodox together with traditional medicine are the least effective in treating disease. Mosquito net was found most effective in preventive mosquito bite and traditional methods were least effective. People in the study area were aware of malaria and its causative agent.

Keywords: Malaria, *Plasmodium falciparum*, rural life style, *Anopheles* mosquito, traditional Medicines, Mosquito control

Introduction
Malaria has been one of the worst killer diseases throughout recorded human history (WHO, 2005) [27, 28]. It remains endemic in 102 countries with more than half of the world's population at risk of infection (Bunza, 2010) [8]. It is a debilitating disease that affects the physical, economic and well-being of people living in endemic areas (WHO, 2012) [31]. In some areas where the disease is highly endemic, individuals may receive up to 10,000 infective bites from female *Anopheles* mosquitoes per year (Amadi *et al*, 2011) [3]. Anopheles mosquito transmits the malaria parasite which spends part of its life cycle in red blood cell of humans (CDC, 2010) [19].

Recent global estimates show that there were between 300-500 million clinical cases of malaria (UNICEF, 2000) [23]; while WHO recorded 207 million cases of malaria in 2012, with about 627,000 deaths, of which about 90% occurred in sub-Saharan Africa and 77% were children of under five years age (WHO 2013) [32]. In 2015, there were 214 million cases of malaria worldwide (WHO, 2016) [33], which resulted in an estimated 438,000 deaths, 90% of which occurred in Africa (WHO, 2016) [33]. The disease affect both, children and adults but its consequences are higher among children and pregnant women. Nigeria together with the Democratic Republic of Congo accounts for over 40% of total deaths caused by malaria (WHO 2013) [32]. Nigeria is known for high prevalence of malaria and it is a leading cause for morbidity and mortality in the country (Jimoh and Usman. 2007) [16]. It is responsible for 30% childhood and 11% maternal mortality (FMOH 2005) [13]. Malaria is commonly associated with poverty and has a major negative effect on economic development (WHO 2014; Gollin *et al.*, 2007).

There are up to 800,000 infantile deaths and substantial number of miscarriages, as well as very low birth weight babies per year due to the disease (WHO, 2005).

Alnwich (2001) [2] reported that malaria prevalence in Nigeria (notified case) in the year 2000 was about 3.4 million. The World Health Organization has estimated that in 2010 there were 216 million documented cases of malaria and around 655,000 people died from the disease (roughly 2000 per day) most of whom are children in Africa. The highest infection rate of the disease occur during the rainy season when there are abundance of *Anopheles* mosquito vectors involved in the transmission of the parasite, than during the dry season when most breeding habitats for *Anopheles* mosquito dries up (Amadi *et al*, 2011) [3]. Available records showed that at least 50% of the population of Nigeria suffers from at least one episode of malaria each year (Aribodor, *et. al*; 2011) [4]. Malaria is a severe and often rapidly fatal disease with a high potential cost for health, if diagnosis failed and infection is missed (Bello *et al*. 2006) [5]. Most victims of malaria still die, because they cann't afford modern antimalarial (Uzochukwu *et al*. 2009) [24], and a large fraction of population still dependent on traditional medicine. Traditional medicine are easily available, free of cost and do not produce any side effect like, vomiting, oesophagitis (especially in young children), Bruton *et al.* 2006 [7], as in case of Mefloquine; or bradycardia, nausea and abdominal pain as in case of Amodiaquine or hallucination as in case of Halfan (Bruton *et al.* 2006 [7], WHO 2003), and can be taken even in last trimester of pregnancy (WHO 2005 B, WHO 2006) [27, 29]. Therefore this research work was done on prevalence of malaria and efficacy of treatment practices used by the patients.

Materials and Methods

Study Area

This study was conducted at Isa. Isa is a town and local government area in Sokoto state, Nigeria. It is located at latitude 13^0N and longitude 6^0E. It shares border with Shinkafi in Zamfara state, Sabon Birni in Sokoto state and the Republic of Niger in the East.

Sample Collection

A total of 100 blood samples were collected. The blood samples were collected from the thumb of patients using sterile lancets (finger prick method). Firstly, the thumb was cleaned with cotton wool soaked in 70% alcohol after drying, it was pricked using sterile lancets. The oozing blood was deposited (one to two drop) on clean slide to make a circular patch (Thick blood film) then it was allowed to dry on a draining rack. Before the collection of blood permission was taken from hospital authority and a questionnaire was introduced to each patient for related information.

Staing of the Blood Film Using Diluted Giemsa Stain

Each Dried thick blood film was stained by pouring 2-4 ml of the diluted Giemsa stain (45 ml of buffered water measured followed by 5 ml of Giemsa stain mixed gently, Monica, 2009) [19], and was allowed to act for 30 minutes, and then it was gently flushed with tap water and placed on the slide rack to dry (Wilcox, 2007) [25].

Detection of Malaria Parasite

Each stained blood film was examined microscopically, a drop of oil immersion was placed on the stained blood film. The oil immersion lens was lowered until it just touches the drop of oil. The result was seen and recorded.

The result was analyzed using Chi-square to determine the significance variation between gender, age, groups, treatment practice, occupation and the control measure. 5% ($p<0.05$) was considered significant.

Results

The results showed that out of the 100 samples examined for malaria, 67 were positive, indicate the prevalence of 67%. In all the samples examined for malaria parasites, only *Plasmodium falciparum* species was observed. Prevalence based on sexes showed that out of the 67 positive samples, 70.2% were females and 62.8% were males. Chi-square analysis showed no significant difference between the sexes (Table 1).

Prevalence based on aged group showed that the age group 1-9 years showed high prevalence of 87.9% followed by 10-19 years with 61.9%, 20-29 years with 57.1%, 30-39 years with 54.5%, while the least prevalence was found among the age groups 40 years and above with 50.0%. Chi-square analysis showed no significant difference between the age groups (Table 2).

Prevalence based on occupation showed that students were more infected having the prevalence of 85.7%, followed by business persons (small scale traders) with 65.4%, farmers with 63.2% and the least prevalence was observed among the civil servants, with 58.8%. Chi square analysis showed no significant difference among occupation (Table 3).

Table 1: Prevalence of malaria among the participants based on gender

Sexes	No. Examined	No. Positive	Prevalence (%)
Males	43	27	62.8
Females	57	40	70.2
Total	100	67	67.0

X^2- Cal = 0.15, df = 1, P>0.05

Table 2: Prevalence of malaria based on age group

Age group	No. Examined	No. Positive	Prevalence (%)
1-9	33	29	87.9
10-19	21	13	61.9
20-29	21	12	57.1
30-39	11	6	54.5
40+	14	7	50.0
Total	100	67	67.0

X^2- Cal = 2.18, df = 4, P>0.05

Table 3: Prevalence of malaria based on occupation of participants

Occupation	No. Examined	No. Positive	Prevalence (%)
Students	21	18	85.7
Farmers	19	12	63.2
Civil Servant	34	20	58.8
Business persons	26	17	65.4
Total	100	67	67.0

X^2- Cal = 0.836, df = 3, P>0.05

Prevalence of malaria based on marital status of the respondents showed unmarried had more prevalence of infection (68.3%) than married (66.1%).

Table 4: Prevalence of malaria based on marital status

Occupation	No. Examined	No. Positive	Prevalence (%)
Single	41	28	68.3
Married	59	39	66.1
Total	100	67	67.0

Prevalence of malaria based on control measures, showed that people practicing traditional method to avoid mosquito bite had the highest prevalence of 86.4% followed by insecticides with 80.9%, mosquito coil with 69.2% and the least prevalence was found among the mosquito net control method with 43.75% (table 5). Prevalence of malaria parasite based on treatment practices showed that 81.8% were used both traditional and orthodox medicine, 65.4% were use orthodox medicine only and the individuals used only traditional medicine with 65.1% was found with least prevalence (table 6).

Prevalence based on awareness of the fever headache and fatigue as symptoms of malaria parasite showed that 77.4% were aware (Table 7).

Table 5: Prevalence of malaria based on control measures against malaria transmitting agent (*Anopheles* mosquito)

Control measures	No. Examined	No. Positive	Prevalence (%)
Traditional herbs	22	19	86.4
Insecticide spray	20	16	80.0
Mosquito coil	26	18	69.2
Mosquito nets	32	14	43.8
Total	100	67	67.0

X^2 – cal = 2.871, df = 3, p>0.05

Table 6: Prevalence of malaria based on treatment practice

Treatment	No. Examined	No. Positive	Prevalence (%)
Both traditional and orthodox medicine	33	27	81.80
Orthodox medicine	26	17	65.40
Traditional medicine	41	23	56.10
Total	100	67	67.0

X^2 – cal = 2.490, df = 2, p>0.05

Table 9: Awareness of the fever, headache, and fatigue as symptoms of malaria

Item	No. Examined	No. Positive	Prevalence (%)
Yes	69	43	62.3
No	31	24	77.74
Total	100	67	67.0

Discussion

It is clear from this study, that malaria maintained high prevalence in Isa local government area. The 67% prevalence of malaria in this study was found to be in lined with (Abdullahi. *et. al;* 2010) [1], which was carried out Gusau, local government area, Zamfara state. The rural communities where there is low level of education, sanitation and lack of access to health care delivery service has contributed towards high prevalence of the infection (Amadi. *et. al;* 2011) [3]. According to (Adbullahi. *et. al;* 2010) [1], prevalence of malaria may be due to nature of the environment which influence the development and population density of mosquitoes, stagnant gutters, refuse dumps which include tins and plastic materials and areas flooded with water which provide a good breeding sites for mosquitoes. The high prevalence can also be attributed to lack of awareness of the malaria, ignorance of the exact cause and correct treatment to the disease.

In this study prevalence of malaria was higher in females, this contrast sharply with other study which showed that males had more malaria than the females (Amadi. *et. al;* 2011) [3] or may be due to the fact that most females sampled for this study were pregnant, and during pregnancy immunity is greatly reduced and a single bite of infected mosquito or even low inoculation of parasite in blood can cause a noticeable malaria.

Prevalence of malaria based on age group of participants showed that 1-9 years had the highest prevalence (87.9%), which could be due to the fact that this age group, being more playful in habits used to stay out side from home and can get more mosquito bites, as well as the infection could be acquired at schools and through other outdoor activities. In addition, the immunity in this age group appeared to be low leading high occurrence rate of disease, but as age increased, stronger immunity is built up due to proper nutrition and maturation of immune system as well as repeatedly occurrence of malaria itself contribute in the development of immunity against the disease in the host body.

With regard to preventive measures against malaria transmitting agent, in this study people those, practicing traditional methods to avoid mosquito bite had the highest prevalence of 86.4% follow by insecticides with 80.9%, mosquito coil with 69.2% and the least prevalence was found among the mosquito net control method with 43.7%. The high prevalence recorded among people practicing traditional methods to avoid mosquitoes bites can may be due to the fact that the study area have no proper drainage system, and stagnant water serves as breeding sites for mosquitoes, where mosquitoes lay their eggs; thus population of mosquitoes is very high; on the other hand, people living in the study area are predominantly muslims, they do not like to stay indoors specially during dusk time. Traditional herbs are effective only if they are used indoors to keep mosquitoes away, but not in open environment. Those that used mosquito net were the least infected, which showed the effectiveness of the measure taken.

Prevalence based on the treatment taken against malaria showed that those that practice traditional and orthodox medicine had the highest level of infection followed by orthodox treatment; while those that practice only traditional method to treat malaria were the least infected. In this case it is possible that village people start with orthodox treatment when had malaria, leave in between and embark on traditional method, when the fever is just relieved, which cause malarial to survive in the body of host as well as develop resistance in the parasite. In turn if the same drug is taken next time will not be able to cure the disease. Least prevalence was recorded among people practicing traditional method only, can be attributed to the fact that medicinal plants have varieties of chemicals that not only treat illness but, they boost immune system of the person. A continuous and persistent dependency on medicinal plants can boost not only their immune system but improve, over all health in general as well as being rich in antioxidants they detox the body too. Also these traditional medicine are available at free of cost, so, when people feel malaria symptoms they start using these drugs, which may reduce progression of the disease in their body, and thus can be easily treated, making it more effective over orthodox treatment.

Traditional treatment practices used by the people in the study area against malaria infection include drinking of extract of bark of *Azadirachta indica*, together with *Fiscus polita* or a mixture of *Azadirachta indica, Fiscusa polita* and *Citrus sinensis* have been reported to be used by people (Oparaocha, 2007) [20]. *A. indica* is known for many kind of

medicinal properties; the active compound azadirachtin and nimbolide, a tetranortriterpenoid limonoid, is one of the important contributors to a variety of antimicrobial and cytotoxic activity, Cohen *et al.* (1996) [10]; hepatoprotective effect (Devmurari and Jivani, 2010); anticancer, (Raja Singh *et al*. 2014) [22]; antiradical scavenging activity (Priyadarshini *et al.* 2009) [21] and potentiality of cell wall breakdown (Alzohairy, 2016) [18]; while essential oil of *C. cinensis* is known to increase cell permeability, decrease in intracellular pH and membrane potential of the cell (Fisher and Phillips, 2009) [14]. These specific effects must play some vital role in supression of malaria when taken in human system. At molecular level azadirachtin is known to interfere with the formation of mitotic spindles and the assembly of microtubules into typical axonemes in gametes, thus inhibiting the formation of mobile microgametes, Jones *et al*. (1994) [17] and Billker *et al*. (2002) [6].

Those that used mosquito net were the least infected in this study, may be due to the fact that they are more familiar in using mosquito nets due to the many progamme in the media such as radio and television. During the rainy season, prevalence of malaria may increase due to the available stagnant water where mosquitoes lay eggs (Davidson, 2006) [11] and the life cycle strategy adopted by mosquitoes (Gratz, 1999) [15].

Occupation in the study area include Business persons, farmers, civil servant and student. From this study it was observed that students had the highest prevalence. Which may be due to the fact that the students acquired the infection at school or through other outdoor activities.

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