

Full Length Research Paper

# The prevalence of malaria and its therapeutic implication: A case study of Katcha Community

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Malaria is highly endemic in tropical and subtropical regions of the world, including Nigeria. In view of this, the prevalence of malaria in Katcha community of Nupeland, was studied. The data presented were collated from Munawwarat Hospital. A total of 6,193 registered cases were treated. The medical cases were registered between January, 2000 and December, 2004 and malaria cases were identified using clinical signs and microscopy. Blood samples were collected by finger prick and the method of cheesebrough for the laboratory identification of malaria parasites was employed. Out of 6,193 treated medical cases, 3,014 (48.7%) had suffered from malaria and 3,179 (51.3%) had suffered from other medical cases. However, 138, 374, 808, 1,239, and 455 people suffered from malaria in the years 2000, 2001, 2002, 2003, and 2004, respectively. Out of 1,775 treated malarial cases, 1451 (80.9%) were treated with chloroquine, while 228, 53, and 10 cases were treated with sulfadoxine-pyrimethamine, quinine, and proguanil/sulfadoxine-pyrimethamine, respectively. The malarial cases were not influenced by other medical cases ( $P>0.05$ ), and there was an association among therapeutic regimens ( $P<0.05$ ). Therefore, the decreased prevalence rate observed may be attributed to polypharmacy adopted in the treatment of malaria cases among Nupes.

**Key words:** Resistance, prevalence, malaria, chloroquine, Katcha.

## INTRODUCTION

Malaria is an infectious disease caused by a parasitic protozoan of the genus *Plasmodium* transmitted by the female mosquito of the genus *Anopheles* when it feeds by sucking blood and whose life cycle alternates between man and mosquitoes (Smyth, 1996). Malaria in man is caused by four species of *Plasmodium*, *Plasmodium vivax*, *Plasmodium malariae*, *Plasmodium ovale*, and

*Plasmodium falciparum* (Bertram, 2004) of which the last named is not only the most common in Africa, but is the most virulent and enjoys the reputation as the greatest killer of mankind, being particularly dangerous for children (Ukoli, 2003) and responsible for nearly all serious complications and deaths related to malaria (Bertram, 2004). Malaria is responsible for deaths before

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the age of 5 years in 1/5 and 1/3 of children in urban and rural areas, respectively (Akubue, 2006). In Nigeria, *P. falciparum* predominates (75%), *P. malariae* (15%), and *P. ovale* (3%) with *P. vivax* not found (James and Gilles, 1985). Malaria may also be transmitted by transfusion of infected blood, contaminated syringe and through placenta of non-immune infected pregnant women to the fetus (Brabin, 1989; Bruce Chawtt, 1983). Repeated cycles of infection can lead to the infection of many erythrocytes and complications (Ukoli, 2003). Malnutrition, splenomegaly and anaemia are the expected complications of repeated attacks of malaria (Ukoli, 1984).

Nigeria accounts for a quarter of all malaria cases in the African region and almost all cases are caused by *P. falciparum* with 57,506,430 malaria cases and 225,426 deaths in 2006. In 2007, Nigeria was the 7th malaria country (WHO, 2008). In Nigeria, malaria affects more people than it did in the 1960 (Ukoli, 1992). Fifty percent (50%) of Nigerian population experience one episode of malaria every year and one in four suffer from malaria at one time or the other (Ukoli, 2003). Resistance of *Anopheles* mosquito to insecticides and *Plasmodium* parasite to antimalarials has been responsible for unchanging, or increasing malaria prevalence in Africa (WHO, 1999).

Funding for malaria control in Nigeria was increased from US \$17 million in 2005 to US \$60 million in 2007 provided by the government, Global Fund, and World Bank (WHO, 2008).

The case of Katcha Community was investigated, because of its proximity to River Niger and other network of streams, drainages, which favour the breeding of mosquitoes, the main reservoir of malaria parasites. Hence, the aim of the study was to determine the prevalence rate of malaria and its relation to antimalarial chemotherapy in Katcha Community.

## MATERIALS AND METHODS

The present day Nupeland is essentially the old Nupe kingdom presently spread among three states (Niger, Kwara, and Kogi) of the Nigerian federation. Nupeland, predominantly occupied by Nupe speaking people falls within the low basins of the Rivers Niger and Kaduna, between latitudes 9°30' and 8°30' North (Nadel, 1942). It covers about 11,200 km<sup>2</sup> with River Niger dividing it into equal parts (Idrees, 1998). The economic life of the Nupes is predominantly agrarian with riverine communities combining agriculture with fishing (Mann et al., 2003).

The sampling station was Munawwarat Hospital, the only functional hospital located in Katcha, the headquarter of Katcha Local Government Area of Niger State. The study was carried out between January 2000 and December 2004. The medical cases were registered, including malarial cases which were identified and diagnosed using clinical signs, which include paroxysm of fever, headache, fatigue, loss of appetite, muscle pains, chills, thirst, nausea, vomiting, delirium and convulsion in children, as well as microscopy for identification of *Plasmodium* species. The treatment regimens were instituted using various antimalarial drugs. Blood samples were collected using sterile lancet (finger prick). Sterile

cotton wool moistened with methylated spirit was used in cleaning the thumb. The method of cheesebrough (Cheesebrough, 1991) was employed to identify *Plasmodium* species and the blood sample collected from finger prick was used to prepare thick blood smears. A thick blood smear was prepared by placing a drop of blood on the center of a clean grease-free slide. This was allowed to air dry and stained with Giemsa stain for 10 min. It was then rinsed with distilled water, air-dried, and a drop of immersion oil placed on it, and examined at  $\times 100$ . Stained thick blood smear was used to concentrate and indicate the presence or absence of malarial parasite. Urine, stool, mucus, and blood microbiology was adopted for detection of other infectious agents. Chi-square method was used to analyze the results (Frank and Althoen, 1995).

## RESULTS

Out of 6193 medical cases presented at the hospital and registered between 2000 and 2004, 3014 (48.7%) suffered from malaria, while 3179 (59.3%) suffered from other diseases. One hundred and thirty-eight (138), 374, 808, 1239, and 455 suffered from malaria in the years 2000, 2001, 2002, 2003, and 2004, respectively.

On the other hand, a total of 3,179 had suffered from other diseases during the period of study. Two hundred and fifty-six (256), 178, 512, 1830, and 403 suffered from other illnesses in the years 2000, 2001, 2002, 2003, and 2004, respectively. The total number of cases registered in 2000, 2001, 2002, 2003, and 2004 were 394, 552, 1320, 3069, and 858, respectively (Table 1).

Out of 3,014 patients with malaria, the therapeutic records of 1239 for the year 2003 were missing. But of the remaining 1,775 malarial cases, 1,451 (81.7%) cases were treated with chloroquine translating to 80.9% treated malarial cases using chloroquine. While 228, 53, and 10 cases were treated with sulfadoxine-pyrimethamine, quinine, and proguanil/sulfadoxine-pyrimethamine, respectively. But dihydroartemisinin, halofantrine, and proguanil/sulfadoxine-pyrimethamine were used to treat one patient each. However, 7, 4, 3, and 2 cases were treated with sulphadoxine-pyrimethamine, proguanil, pyrimethamine, and quinine/sulfadoxine-pyrimethamine, respectively (Table 2). But 48.7% of malaria prevalence rate was recorded during the period. But a total of 72.5% of the recorded malarial cases was treated using chloroquine with malarial prevalence rate of 53% in 2004. The malarial cases were not influenced by other medical cases ( $P > 0.05$ ) as there was an association among therapeutic regimens ( $P > 0.05$ ).

## DISCUSSION

The results revealed that 3,014 out of 6,193 registered medical cases had suffered from malaria giving a malaria prevalence rate of 48.7% during the period under review. These results are supported by the findings of Ruth and Fedel (1997) that each year 300 to 500 million people living in the tropics and subtropics become infected with

**Table 1.** Prevalence rate of malaria among Katcha people as categorized from 2000 to 2004.

Medical case	Years under review				
	2000	2001	2002	2003	2004
Malaria (%)	138 (35.0)	374 (67.8)	808 (61.2)	1239 (40.4)	455 (53.0)
Other cases (%)	256 (65.0)	178 (32.2)	512 (38.8)	1830 (59.6)	403 (47.0)
Total No. of cases (%)	394 (100.0)	552 (100.0)	1320 (100.0)	3069 (100.0)	858 (100.0)

**Table 2.** Therapeutic regimens instituted during the period under review.

Drug	2000 (%)	2001 (%)	2002 (%)	2004 (%)
Cotexcin (%)	0 (0)	0 (0)	0 (0)	1 (0.2)
Metakelfin (%)	0 (0)	0 (0)	3 (0.4)	4 (0.9)
Fansidar (%)	0 (0)	22 (5.9)	102 (12.6)	104 (22.9)
Chloroquine (%)	137 (99.3)	330 (88.2)	654 (80.9)	330 (72.5)
Quinine (%)	0 (0)	15 (4.0)	38 (4.7)	14 (3.1)
Chloroquine + Fansidar (%)	0 (0)	1 (0.3)	8 (1)	1 (0.2)
Quinine + Fansidar (%)	0 (0)	2 (0.5)	0 (0)	0 (0)
Paludrine (%)	1 (0.7)	2 (0.5)	1 (0.1)	0 (0)
Halofantrine (%)	0 (0)	1 (0.3)	0 (0)	0 (0)
Daraprim (%)	0 (0)	1 (0.3)	1 (0.1)	1 (0.2)
Paludrine + Fansidar (%)	0 (0)	0 (0)	1 (0.1)	0 (0)
Total (%)	138 (100)	374 (100)	808 (100)	455 (100)

malaria. The malaria prevalence rate of 48.7% among Nupes agrees with the report of Saganuwan and Adelaiye (2007) indicating that 55% malaria cases is prevalent among males in the middle belt. However, our finding disagrees with the report of (Ukpai and Ajoku, 2001) that high prevalence rates of malaria in Owerri and Okigwe are 75 and 85%, respectively. Hence, the prevalence rate of malaria in the Southeast is higher than that of the middle belt. Ukoli (1992) reported that 50% of Nigerian population experience at least one episode of malaria each year, the financial implication could amount to ₦400 million (2 million in US dollars) every year. Therefore, in Nigeria today, malaria affects more people than it did in the 1960s and one in four people suffer from malaria fever at one time or the other (Ukoli, 1984) and the numbers affected are growing (Knell, 1991). Nigeria accounts for a quarter of all malaria in WHO African region and that transmission is more seasonal (WHO, 2008). Almost all cases are caused by *P. falciparum*, but most are unconfirmed. There is no evidence of a systemic decline in malaria burden, the upward trend in numbers of cases and deaths is probably due to improvements in reporting (WHO, 2008), although in 2003, the low prevalence rate (40.4%) of malaria infection was experienced (Table 1). This might have resulted from 80.9% treated malaria cases in 2002 (Table 2). The incessant use of chloroquine in 2000, 2001, 2002, and 2004 might have led to the development of

resistance by *Plasmodium* parasites against chloroquine. Therefore, in 2004, the prevalence rate of malaria increased to 53%. This agrees with the report of Ukpai and Ajoku (2001) indicating that in Eastern Nigeria, 40 to 60% of malaria cases do not respond to chloroquine. WHO (1999) reported that for decades, chloroquine was the main drug used but increasing resistance forced its replacement in African countries as from 1990. High prevalence of mutations in candidate genes conferring chloroquine resistance in *P. vivax* has been identified (Golassa et al., 2015). The increased prevalent rate observed in 2004 confirms the report of the Health Exchange (2001) indicating that the Roll Back Malaria (RBM) global initiative to reduce malaria deaths by 50% by 2010 amongst the most vulnerable population has never been greater. A high prevalence rate of malaria among Katcha people clearly confirms the report of Ukoli that malaria remains Nigerian and the world's worst health problem (Ukoli, 2003). Having noticed high prevalence rate of malaria in 2002, the emphasis on malaria chemotherapy was shifted from chloroquine to sulphadoxine-pyrimethamine and some other antimalarial drugs in 2004. Sulphadoxine-pyrimethamine efficacy for acute malaria treatment has been compromised by resistance, but it retains partial activity among pregnant women with asymptomatic parasitaemia and might be useful (Gutman et al., 2015). High prevalence of mutations in sulphadoxine-pyrimethamine associated

drug resistance genes have been reported indicating that it should be discontinued (Lau et al., 2013). Therefore, there is need for reinforced surveillance of drug efficacy (Zatra et al., 2012). Use of sulphadoxine-pyrimethamine for malaria treatment is common during pregnancy. This may be contributing to adverse pregnancy outcomes. Antenatal care providers should endeavor to emphasize pregnancy (Odongo et al., 2015). Prolonged time to recrudescence may occur in pregnancy, regardless of anti-malarial treatment. Long intervals to recrudescence are more likely with the use of artemisinin containing treatments and also observed with intercalated *P. vivax* infections treated with chloroquine. Accurate determination of drug efficacy in pregnancy requires longer duration of follow-up, preferably until delivery or day 63 (Laochan et al., 2015). Difference in preventive anti-malarial chemotherapy regimes used during pregnancy had limited impact of malarial-immunity in a low transmission region (Teo et al., 2015). There was no change in the prevalence rate despite immunity amongst malarial patients living in endemic area, racial differences in susceptibility, and certain genetic factors of haemoglobin S which is common amongst Africans with sickle cell anaemia trait with lethal effect confer resistance to *P. falciparum* malaria, just as in those whose erythrocytes are deficient in the enzyme G6PD (Ukoli, 2003). Though, malarial parasites were not characterized, the highest prevalence (67.8%) noticed in 2001 may be due to the infection of *P. falciparum*, the predominant species in Nigeria and known to be chloroquine- and pyrimethamine-resistant (Ukoli, 1992; Ilobachei et al., 1995).

The use of polypharmacy for the treatment of malaria in Nupeland was strongly recommended. To treat drug-resistant *P. falciparum*, WHO recommends artemisinin-based combination therapy (ACT), which is currently being used in many neighboring African countries. This together with the use of mosquito net, bush clearing, and good drainages of the water networks in the area would not only assist in reduction of malaria endemicity, but would also aid in lowering the malaria prevalence rate. A well-educated public could lead to a vast proportion of the disease disappearing.

### Conflict of interest

The authors have not declared any conflict of interest

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