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Prevalence of Malaria Parasites among Nnamdi Azikwe University Students and Anti-Malaria Drug Use

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Abstract
The prevalence of malaria parasites and antimalarial drug of choice were investigated among students of Nnamdi Azikiwe University, Awka, Anambra State between February and May, 2008. A total of 800 blood samples were randomly collected from students aged 17-31 years. Thick films were prepared and microscopic examination carried out. In addition, structured questionnaires were administered to the same students whose blood were being screened. The result showed that a total of 512 (64%) students made

up of 284 males and 228 females were infected. The difference in infection were not statistically significant (p>0.05). Information from the questionnaire revealed that antimalarial drugs used by the students include Chloroquine® (8.50%), sulphonamides {Amalar®, Fansidar®, Malareich® and Maloxine®} (41.50%), Artesunate® and Artemisinin based combination {Coartem® and Camosunate®} (26.00%) and native herbs {mixtures of crude extracts from Morida lucida and Azardirachta indica leaves} (24.00%). The study also revealed factors governing drugs by the students which include cost of drugs (26.00%), effectiveness of drugs (19.00%), availability of drugs (12.50%) and adverse reaction to drugs (3.50%). Government should therefore intensify efforts geared towards control of malaria among students.

Key words: Prevalence, malaria parasite, antimalaria and students.

Introduction

Malaria is an infectious disease caused by the parasite *Plasmodium spp* and is usually transferred from one person to another through the bite of an infected female Anopheline mosquito while taking a blood meal. Malaria infection is largely distributed throughout the warmer regions of the world where the vector breeds. In Nigeria, malaria is holoendemic (Bruce-Chwatt, 1983). It is worst hit in the poorest countries and those under difficult and impoverished conditions (WHO, 1987; Uko et al., 1994) and accounts for about 1 million episodes annually with a mortality rate of 1% (Ajayi et al., 1995). About four species of *Plasmodium* have been found to commonly infect man. These are *Plasmodium vivax, Plasmodium ovale, Plasmodium falciparum and Plasmodium malaria*.

The clinical symptoms of malaria are caused by the development of the parasite in red blood cells. The principal symptom of malaria is fever. Others are headache and in acute cases, paroxysm, high fever, chills, fatigue, chest and abdominal pain and nausea. In malignant malaria, enlargement of the spleens, kidneys and liver occurs. *P. falciparum* malaria is the most dangerous form of the disease resulting in life threatening complications such as anaemia, cerebral malaria, renal disease, black water fever, pulmonary edema and dysenteric malaria (Markell and Voge, 1992). The disease also impairs physical and mental development in children, as such a major cause of death due to anaemia in young children (Ademola, 1989; Najera et al., 1993; Miller et al., 1994). Additionally, among students, malaria infection

has resulted to absenteeism, leading to poor academic performances (WHO, 1993).

Malaria control in Nigeria is based almost exclusively on chemotherapy mainly with chloroquine which is believed to be the cheapest antimalarial drug. The control of falciparum malaria is becoming increasingly challenging in many developing areas of the world including Nigeria (Chukwuani, 1991; Mbanugo and Okpalaononuju, 2003) not only because *Plasmodium falciparum* have developed resistance to commonly used antimalarial drugs, but also due to individual and household drug use pattern. Alternative drugs like Amodiaquine and Sulfadoxine-pyrimethamine were being used in other parts of Africa. However, many African countries are seeking evidence to change from these alternatives to combination therapies hence change to artemisinin and Artemisinin Combination Therapy (ACT).

The aim of this work is to find out the prevalence of malaria infection among students of Nnamdi Azikiwe University, Awka and drug of choice in the treatment of malaria infection.

Materials and Methods

The study was carried out in Nnamdi Azikiwe University Campus, Awka metropolis between February and May, 2008. Awka is in the tropical rain forest region with a rainy season period which ranges from 22.1^{o}C to 36.5^{o}C stretching from April to October and a dry season period which ranges from 26^{o}C to 36.5^{o}C lasting from November to March. The climatic and poor sanitary condition and trailing vegetation at certain periods of the year create favourable breeding sites for *Anopheles* species which are the known vectors of *Plasmodium* parasites (Mbanugo and Okpalaononuju, 2003). The University campus is well laid out, some of the roads are tarred and there is no clustering of houses. There is a lot of natural vegetation in and around the halls of residence and faculties. Most of the students who live off-campus reside in Temporary site, Permanent site, Ifite and Aroma. In some of these areas, the houses are clustered and there is water pollution due to lack of hygiene. Pot holes from bad roads and gutters lead to the accumulation of stagnant water, thus providing a good breeding ground for mosquitoes.

Data Collection

This was done by the use of questionnaires and blood samples and consisted of students of Nnamdi Azikwe University, Awka. A total of 800 students comprising 440 males and 360 females of age range 17-31 were sampled.

Blood samples were collected randomly from symptomless students and from students manifesting clinical features of malaria.

Blood samples were taken from students with the aid of sterile disposable lancets. The blood was collected by making a little puncture on the thumb or any finger tip. Pressure was applied to express blood from the finger. The first drop of blood was cleaned off with cotton wool soaked in 70% alcohol and subsequent drops of blood were collected with a clean microscope slide for the preparation of thick film.

Preparation of Thick Film

The drop of blood was spread to moderate thickness using the tip of the pipette and then allowed to dry. The thickness was such that prints could be seen through it when still wet. Air dried film was stained with 10% Giemsa stain. This stain was prepared by measuring out 10ml of Giemsa solution with the aid of a measuring cylinder and then diluting with 90ml of clean water giving a 1:10 dilution. The slides were placed well on the staining rack and then flooded with the stain. The stain was allowed to stay for 10 minutes before washing off with clean water. The slide was then places vertically and allowed to dry. When dried, a drop of immersion oil was placed on the slide and examined under the microscope using x100 objective.

Administration of Questionnaires

Pretested questionnaires were given to students of Nnamdi Azikiwe University to provide information on the drugs commonly used in the treatment of malaria and what factors determine their choice of drugs as well as preventive methods. The content of the questionnaire include address, sex, age, anti-malarial drug(s) used, factors that determine the choice of drug(s), etc. These questionnaires were pretested among a few individuals before it was administered to the study population.

Data Analysis

The data generated was statistically analysed using Chi-square [X^2] test to determine if there is significant relationship in infection between location, sex and age respectively.

Results

The findings of the study showed that out of 800 students examined, 512 (64.00%) were infected with malaria parasite. Table 1 showed that out of five locations, students residing in the University hostel appeared to be more infected (78.75%) than those in other locations. The least infection rate was

observed among those that live in Temporary site (48.75%). The analysis of data (Table 1) showed that there was a highly significant prevalence of infection between students who live in the University hostels and those at the Temporary site ($p<0.05$).

Table 2 shows that of the positive cases, 284 (64.55%) were males while 228 (63.33%) were females. There was no significant difference in the sex-related prevalence ($p>0.05$).

Table 3 shows the age –related prevalence which revealed that 66.88% of the students in the age group 17-21 years recorded the highest prevalence while the least 61.05% was recorded in the age group 27-31 years. However, the difference was statistically insignificant ($p>0.05$).

On the drug of choice (Table 4) 332 (41.50%) of the students use sulphonamde-pyrimethamine, 204 (26.00%) use Artesunate® and Artemisinin base combinations (such as Coartem®, Camosunate®), 68 (8.50%) use Chloroquine® while 192 (24.00%) rely on native herbs.

On the factors which determine drug of choice, (Table 5) factor with the highest frequency is cost of drugs 208 (26.00%) while the least is adverse reaction to drugs 28 (3.505). Analysis of data showed that there was a significant difference in the cost of drugs and adverse reaction to drugs ($p<0.05$).

Discussion

Out of the 800 students who were tested for malaria parasite infection, a prevalence rate of 64% was obtained. This result collaborates with the findings of Mature et al (2001), who reported a prevalence of 61.1% among undergraduate students in Abuja. Anumudu et al (2006) recorded a low prevalence of 17% for students of University of Ibadan, Oyo State. Although the latter study was conducted between June and September (rainy season), a good knowledge of the disease, prompt treatment upon infection and control measures taken by the students probably brought about the low prevalence of infection.

The differences in prevalence of malaria parasites among the different locations could be attributed to poor sanitary conditions of these areas and the socio-economic status of the students which influenced their spending power. This was reflected in their approach to malaria prevention. The higher prevalence recorded in University hostel (78.75%) may be explained by the facts that there is a lot of natural vegetation and stagnant water around the

hostel which create favourable breeding sites for *Anopheles* species and most of the students belong to the low socio-economic status and therefore cannot afford using insecticides, sleeping under insecticide treated bed nets, installing nets on doors and windows. On the other hand, the natural vegetation in Temporary site is not much although stagnant water could be seen around and most students that reside there are of the high socio-economic status and therefore can afford sleeping under insecticide-treated bed nets, using insecticides and installing nets on their doors and windows.

In this study, the overall infection was higher for males 284 (64.55%) than females 228 (63.33%). The higher infection rate for males than females are attributable to the variations in the frequency and intensity of exposures to the mosquito vector responsible for the transmission of *Plasmodium* parasites. The male students are fond of removing their clothes during hot weather thus exposing their bodies to bites of mosquito vector. Again, females prefer treating themselves at the onset of every infection. They visit medical centres and hospitals more than males who prefer enduring illness. Furthermore, studies have shown that the genetic and hormonal factors in the females ensure better immunity to malaria and a variety of other parasitic diseases (Molineaux and Gramiccia, 1980).

Age-specific prevalence shows that infection rates decreased with increasing age. This is in line with a recent study in Igbo Ora (Nwuba et al., 2002), where it was found that parasitaemia declined with age. The acquisition of immunity by age may be due to gradual build up of immunological memory covering higher and larger parts of the parasites antigenic repertoire, or to a physiological effect of age, which makes adults more effective in combating disease. Again, the period of this research happened to fall within the examination period of first year students, most of which belong to the age group 17-21 years. Most of them prefer reading outside their rooms at this time. This act which is mainly done in the evening and night exposes them to bite of mosquito vector whose activity is always at its peak during the late hours of the day.

On the anti-malaria drugs used, Chloroquine®, Sulphonamides (Maloxine®, Amalar®, Malareich®, Fansidar®), Artesunate® and Artemisinin based combination (Coartem® and Camosunate®) and herbal preparations were used by students for treatment of malaria. These anti-malaria drugs have varying degrees of efficacy. Although resistance to these drugs have been reported, their success rate in treatment of malaria is still high (Olanrewaju

and Johnson, 2001). Chloroquine is still used by the students in the treatment of malaria because of its low price. This might be that incidence of resistance to the drug may not be as much as being publicized (Brieger et al., 2001). Sulphonamides which include Amalar®, Maloxine®, Malareich® and Fansidar® are often used because of their low prices. For example, a single dose treatment of Amalar® costs ₦50, Malareich® costs ₦ 100 while Fansidar® costs ₦ 150. The more expensive anti-malaria drugs such as Artesunate (unit cost ₦ 350) were used by few students. Clearly, the low prices of the drugs enhanced the practice of self medication in malaria treatment among students and influence the drug of choice. This is similar to the findings of Brieger et al (2001) in a study on urban malaria treatment in Lagos. Although the drugs were affordable and within reach of the students, some of the students used native herbs which include mixture of crude extracts of *Azardirachta indica* and *Morida lucida* leaves in treating malaria. Again, many off-campus students use native herbs than on-campus students. This may be due to its affordability and availability.

Some factors were found to determine the choice of drugs taken by students. These include cost of drugs, cost and effectiveness of drugs, effectiveness of drugs, availability of drugs and adverse reaction to drugs (for example pruritis, nausea, visual disturbances and abdominal discomfort). Most students preferred drugs that are cheap like sulphonamides to the expensive ones such as Artesunate® and Artemisinin based combinations. This is in line with their socio-economic status which influences their spending power. For some of the students, their use of anti-malaria drug depends on its cost and effectiveness like the sulphonamides which are cheap and also effective. Artesunate® and Artemisinin based combination were probably used because of their property of being effective for almost all cases of malaria. Availability and effectiveness probably influenced the use of herbs by the students particularly those residing off campus. Adverse reaction to drugs also militated against the use of certain antimalaria drugs. For example, Chloroquine® is known to cause reactions such as pruritis and visual disturbances when taken by some individuals.

Thus, proper environmental management such as well maintained drainage system, drastic change in socio-cultural behavours and health education is required for drastic reduction in both morbidity and mortalilty caused by malaria infections.

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Table 1: Prevalence of malaria parasites among students of Nnamdi Azikiwe University, Awka by location

Location	Number examined	Number positive	Prevalence (%)
University hostel	160	126	78.75
Ifite	160	104	67.50
Permanent site	160	102	63.75
Aroma	160	98	61.25
Temporary site	160	78	48.75
Total	800	512	64.00

Table 2: Sex-specific prevalence of malaria parasites among students

Sex	Number examined	Number positive	Prevalence (%)
Male	440	284	64.55
Female	360	512	63.33
Total	800	512	64.00

Table 3: Age-specific prevalence of malaria parasites among students of Nnamdi Azikiwe University, Awka

Age group (years)	Number examined	Number positive	Prevalence (%)
17-21	320	214	66.88
22-26	290	182	62.76
27-31	190	116	61.05
Total	800	512	64.00

Table 4: Anti-malaria drug of choice used by the students of Nnamdi Azikiwe University, Awka

Anti-malaria drug	Frequency	Percentage frequency
Sulphonamides (Amalar®, Fansidar®, Malareich® and Maloxine®)	332	41.50
Artesunate® and Artemisinin based combination (Coartem® and Camosunate®)	208	26.00
Native herbs (mixture of extracts from *Morida lucida* (Ezeogwu) and *Azardirachta indica* (Dogonyaro)	192	24.00
Chloroquine	68	8.50

Table 5: Factors that determine the choice of drugs taken by students of Nnamdi Azikiwe University, Awka

Factor	Frequency	Percentage frequency
Cost of drugs	208	26.00
Cost and effectiveness of drugs	176	22.00
Effectiveness of drugs	152	19.00
Availability of drugs	100	17.00
Adverse reaction to drugs	28	3.50