Studies on the Prevalence of Malaria Parasite among Children with Splenomegaly in Aba Metropolis, Abia State, Nigeria

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ABSTRACT

Malaria has been one of the prominent and ancient diseases which has been profiled and studied. It is the second leading health problem in sub-Saharan Africa, accounting for over 1 million deaths yearly in the region. This study was conducted in six treatment centres to determine the prevalence level of malaria parasite among children with splenomegaly. The role of treatment option, age, gender and control measures in the prevalence of malaria parasite and splenomegaly was studied. 403 patients in clinical state with confirmed cases of splenomegaly were tested with carestart^{TM2} malaria test kit for the presence of malaria parasite. Questionnaires were issued to their parents to help collect information relating to age, gender and malaria control measures. Out of the 403 persons sampled, 338(83.9%) were infected with malaria while 65(16.1%) were not. There is a significantly positive relationship between malaria incidence and splenomegaly. Of the 403 infected with splenomegaly, 114(75.4%) consulted qualified medical doctors for diagnosis and treatment while 289(87.2%) consulted traditional healers for treatment. The persons that consulted traditional healers recorded higher prevalence rate 252(87.2%) of

concomitant malaria infection than those that visited qualified doctors 86(75.4%). The difference in the prevalence level was however insignificant (X^2 cal =0.62, P < 0.05, df = 1). Age group 1 – 3 years recorded the highest infection rate 172(89.5) while age group 13 – 15 years recorded the least infection rate 21(100%). The role of age in the prevalence level of malaria was found to be insignificant (X^2 cal = 2.7, P < 0.05 and df = 4). Of the 403 people found with SPR, 237(58.8%) were males while 166(41.2%) were females. The prevalence of malaria was higher 199(84%) in males than in female 139(83.7%), but this was statistically insignificant (X^2 cal = 0.0032, P < 0.05 and df = 1). Children living in homes where no control measures was adopted recorded the highest infection rate of malaria 125(95.4%) while those that used insecticide spray together with windows and door nets had the least prevalence of infection 33(78.6%). The difference in prevalence rate among people using different control measures was however insignificant (X^2 cal = 2.51, P < 0.05 and df = 4).Traditional healers though not yet well recognized play an important role in the management of splenomegaly in Aba metropolis. Some well known control measures for malaria failed to reduce prevalence significantly in this study.

Keywords: Prevalence, Malaria, Splenomegaly, Children,

INTRODUCTION

Nigeria bears up to 25% of the malaria disease burden in Africa, hence contributing significantly to the millions of lives lost per year in the region, which mostly consist of children and pregnant women. Malaria in Nigeria is endemic and constitutes a major public health problem. Despite the curable nature of the disease; malaria related deaths accounts up to 11% of maternal mortality, 25% of infant mortality and 30% of under five mortality (WHO, 2012), resulting in about 300,000 childhood death annually. The vast majority of deaths occur among children below five years of age and pregnant women (Philips, 2011), especially in remote rural area with poor access to health.

Despite the combined efforts by 102 countries to eradicate malaria, it remains the major disease in the world today in terms of lives lost and economic burden. Progress has been made however in some countries. In countries such as United States, eradication of endemic malaria is

complete. *Falciparum* malaria is the most dangerous form of the disease resulting in life threatening complication such as anaemia and cerebral malaria. The pattern of exposure to malaria infection, the type of treatment and the degree of compliance with the anti-malaria regimen, local drug resistance patterns, and an individual's age and genetic makeup all tend to influence the severity of the disease.

The parasite attacks and destroys the red blood cell and may affect vital body organs like brain, liver, etc. Splenomegaly occurs in all forms of malaria with repeated attack causing a greatly enlarged spleen. Parasitized cells also lose their deformability and are rapidly phagocytosed and destroyed in the spleen. The production of red blood cells in the bone marrow is also reduced and an immune destruction of the red cells may occur (Cheesebrough, 1998). The epidemicity of malaria is measured by the rate of splenic enlargement and parasite count (WHO, 2005).

METHODS

Study Area and Population

The study was conducted in Aba metropolis, Abia state Nigeria (see figures 1a and 1b). The population of Aba town was estimated to be 1,020, 900 in 2004. The vegetation is typical of the tropical rain forest with a relief of about 0-200 ft (0-61m) above the sea level. The mean annual temperature ranges from 25.5^0C to 26.5^0C. It has a wet/rainy season (April-early October) and a dry season (late October-March) with peak rainy period in June/July. The maximum annual rainfalls are 2250-2500mm and mean relative humidity is 80%.

The inhabitants of Aba metropolis are predominantly traders, with a few civil servants and others who work in industries. There are also owners of small and medium scale enterprises. *Plasmodium falciparum* is the predominate malaria specie accounting for more than 90% of all infections, the rest being *Plasmodium malariae* and *Plasmodium ovale.*

Study Design

The study was a prospective study that involved six treatment centres (three medical centres and three traditional centres), which was conducted from

August 2012 – December 2012. The study involved individual, aged 1 – 15 years who were found visiting the treatment centres.

Ethical Consideration

The work was approved by the Ethical Committee of Abia State University Teaching Hospital (ABSUTH).

Figure 1a: Map Showing the Study Area, in Abia State

Clinical Examination, Blood Collection and Laboratory Analysis

Splenomegaly was suspected on noticing a palpable abdomen. The patient's abdomen was examined physically by medically qualified persons according to the method adopted by Jack *et al.*, in 1991. Samples from confirmed cases of splenomegaly were tested for malaria using carestart^{TM2} as adopted by Jessica *et al.*, in 2010. Questionnaires were given to the parents of the sampled children in order to collect certain demographic and epidemiological data such as age, gender and control measures adopted.

RESULTS

A total of 431 children with confirmed cases of splenomegaly (SPR) were examined. 28 children were excluded from the study because they did not fulfill the inclusion criteria.

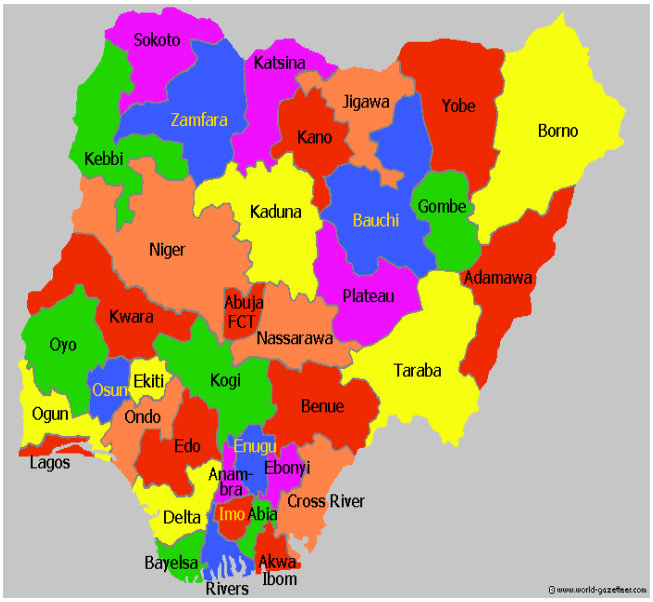

Figure 1b: Map of Nigeria

Out of the 403 persons sampled, 338 (83.9%) were infected with malaria while 65(16.1%) were not. There is a significantly positive relationship between malaria incidence and

splenomegaly. Of the 403 infected with SPR, 114(28.3%) consulted qualified medical doctors for diagnosis and treatment while 289(71.1%) consulted traditional healers for treatment. The persons that consulted traditional healers recorded higher prevalence rate 252(87.2%) of concomitant malaria (mal) infection than those that visited qualified doctors 86(75.4%). (See table 3.1). There was no significant association in the prevalence level of mal among the treatment options. (X^2 cal =0.62, P < 0.05, df = 1)

Out of the 403 people sampled, 172(42.7%) were below the age of 1 – 3 years and recorded the highest infection rate. Age group 13 – 15 years recorded the least rate of splenomegaly 21(5.2%) while age group 10 – 12 years, 7 – 9

Table 1: Prevalence Level of Malaria among People Using Different Treatment Options

Treatment Options	Number Infected with Splenomegaly	Number Infected with Splenomegaly and Malaria
Medical	114 (28.3%)	86 (75.4%)
Traditional	289 (71.7%)	252 (87.2%)
Total	**403 (100%)**	**338 (83.9%)**

Table 2: Age Related Prevalence Level of Splenomegaly And Malaria Among People Sampled.

Age Group (Years)	Number Infected with Splenomegaly	Number Infected with Splenomegaly and Malaria
1 – 3	172 (42.7%)	154 (89.5%)
4 – 6	117 (29.0%)	92 (78.6%)
7 – 9	61 (15.1%)	40 (65.6%)
10 – 12	32 (7.9%)	31 (96.9%)
13 – 15	21 (5.2%)	21 (100%)
Total	**403 (100%)**	**338 (83.9%)**

Table 3: Gender Related Prevalence of Infection Among Children Sampled.

Gender	Number Infected with Splenomegaly	Number Infected with Splenomegaly and Malaria
Male	237 (58.8%)	199 (84.0%)
Female	166 (41.2%)	139 (83.7%)
Total	**403 (100%)**	**338 (83.9%)**

Table 4: Prevalence of Infection among Persons Using Different Control Measures.

Types of Control Measures Used	Number that Used Measures	Number Infected with Malaria and Splenomegaly
Insecticide Treated Bed Net	66 (16.4%)	46 (69.7%)
Insecticide Spray	91 (22.6%)	79 (86.8%)
Windows and Door Nets	72 (18.1%)	55 (75.3%)
Insecticide Spray And Windows And Door Nets	42 (10.4%)	33 (78.6%)
None	131 (32.5%)	125 (95.4%)
Total	**403 (100%)**	**338 (83.9%)**

years and 4 – 6 years had 32(7.9%), 61(15.1%) and 117(29.0%) cases of splenomegaly respectively.

Of the 338(83.9%) that had SPR and mal, age 13 – 15 years had the highest infection rate 100%, age 7 – 9 years had the least infection rate 65.6% while age 10 – 12 years, 1 – 3 years and 4 – 6 years had 96.9%, 89.5% and 78.6% respectively. (See Table 3.2) There was no significant association in the age related prevalence level of infection among the people sampled. (X^2 cal = 2.7, P < 0.05 and df = 4).

Of the 403 people found with SPR, 237(58.8%) were males while 166(41.2%) were females. Among the males, 199(84%) had mal with SPR while 38(58.5%) had only SPR. Females recorded a slightly lower incidence of concomitant mal infection with SPR 139(83.7%) than males. (See Table 3.3)

There was no significant association in gender related prevalence of malaria parasite among the children sampled. (X^2 cal = 0.0032, P<0.05 and df = 1).

Those that did not apply control measures had the highest infection of mal 125(95.4%). Those that used insecticide spray together with windows and door nets had the least prevalence of infection 33(78.6%) while those that used insecticide spray, windows and door nets and insecticide treated bed net had 79(86.8%), 55(75.3%) and 46(69.7%) respectively. (See table 3.4) There was no significant association with respect to the different control measures adopted by patients. (X^2 cal = 2.51, $P<0.05$ and df = 4).

DISCUSSION

The observations of 403 children with confirmed cases of splenomegaly in six healing centres in Aba metropolis is of immense public health concern. The number of people that patronized the traditional healing centres even in the presence of modern facilities is also alarming. Peter in (1995) and Merlin in (2004) have emphasized the role of traditional medicine in modern times. Parts of reason that have continued to make traditional healers attractive to their clients include their informal approach, cost, proximity and quick service delivery.

Bertrand *et al.,* in (2011) noted that patients use traditional treatment for many reasons. They may belong to communities whose habits and treatment seeking behavior resorts to traditional medicine as the first choice. They may prefer traditional medicine, believing for example that they produce fewer side effects and cures them more effectively or faster. They may have experienced a failure with the modern treatment and want to try traditional treatment. They may want to avoid modern health facilities because they perceive them as expensive, unfriendly, dangerous or ridden with corruption. Patients may also avoid modern drugs sold in the market because they are aware of the fact that many of them are counterfeit or "fake" drug.

However, it is worthy to note that malaria parasite is found more in children obtaining traditional treatment 252(87.2%) than those obtaining medical treatment 86(75.4%). The reason may include poor management of the disease as a result of non-compliance to the African herbal remedy. It could also be as a result of poor nutritional status of the people, as most people visiting traditional healers are usually poor with little or no formal education.

The high level of concomitant infection 338 (83.9%) of malaria and splenomegaly among people sampled goes further to demonstrate the relationship between malaria and splenomegaly. This is similar to the result of Marsden *et al.*, in (1967) who observed higher malaria antibody titre in patients with splenomegaly during their research in New Guinea.

The observation of very high rate of splenomegaly among young children between the ages of 1 – 3 years and 4 – 6 years agrees with the observations of Victoria *et al.*, in (1991) while working on the relationship between splenomegaly and severity of *falciparum* malaria at the Bangkok Hospital for Tropical diseases. This may be because of the low immunity of these young children in fighting malaria. Hence, there may have been cases of poorly managed malaria episodes that resulted in splenomegaly. The high malaria infection recorded among older children contradicts the reports of Trape *et al.,* in (1987). This may be because of the socio-cultural environment of the study area which encourage child hawking both during the day and night.

Observation of the male and female pattern of prevalence in the study group showed that out of 237(58.3%) male examined, malaria parasite and splenomegaly was found in 199(84%) while 139(83.7%) out of 166(41.2%) females examined had malaria parasite and splenomegaly. Though males had higher prevalence of malaria and splenomegaly than females, the difference is however statistically insignificant.

This observation is contrary to the opinion of Mohanna, Ghout and Raja'a in their research in Yemen in (2007) among asymptomatic children of 6 – 15 years age group where prevalence was found more in females. Environmental factors, age difference, parental habit in caring for their children and socio-cultural factors may not be far from the reasons for the different observations in these researches as they were carried out in different environment with different cultures. However, in the individual modern and traditional healing centres, it was noticed that males had greater infection than the females, which can also be as a result of the reasons stated above.

The observation of high infection rates among people using diverse intervention methods could be suggesting that the parasite have developed resistance to antimalaria drugs and to insecticide. This agrees with the work of Corbel *et al.*, in (2012), which says that resistance

is often associated with alterations (point mutations) in the sodium channel gene, causing reduced neuronal sensitivity. However, it is worthy of note that those who used no control measures recorded the highest prevalence rate of infection (95.4%). Prevalence in the other group was significantly lower with the least rate seen among those using insecticide spray and windows and door nets (78.6%). This shows that the use of some form of control measures against mosquito bites can reduce the prevalence of malaria parasite in the study population. The apparent failure of some control measures could also be as a result of poor adherence culture of people, for instance many people using neted windows do not replace torn parts while others using bed nets sleep outside the nets especially during dry season.

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