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Original Article

Prevalence of Malaria and Splenomegaly in children under 13 years in Awka South Local Government Area of Anambra State, Nigeria.

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ABSTRACT

The present study was designed to assess the prevalence of malaria and splenomegaly in children under the age of 13 years. A total of 720 children who presented with clinical signs and symptoms of malaria in the study area were recruited. Blood samples were collected in EDTA tubes. Giemsa stained thick and thin smears were microscopically examined to confirm malaria diagnosis. Haemoglobin (Hb) genotype was determined by alkaline cellulose acetate electrophoresis to exclude sickle cell anaemia as possible cause of splenomegaly. Splenic enlargement was determined by palpation. Out of the 720 subjects, 600 (83.3%) were positive for *P. falciparum* malaria while 114 (15.8%) of these children with malaria presented with splenomegaly. The result of the Hb genotype showed 576 (80%) of the children were HbAA while 144 (20%) were HbAS. No child with HbSS was seen. The finding showed that malaria is a major cause of splenomegaly in the study area which is an urban setting. The public health implication of the observation is discussed.

Keywords: Genotype, Children, Malaria, Spleen.

INTRODUCTION

Most of the victims of malaria reside in the tropics and subtropics with children and pregnant women forming the high risk groups [1]. High malaria prevalence has been reported in the above mentioned groups in the South Eastern Nigeria[2,3]. Malaria induces inflammatory response from the host and one of the body organs responsible for such inflammation is the spleen – a lymphoid organ which functions include among other things, the filtration of blood to remove deformed constituents and foreign antigens and as reservoir of immunocompetent cells [4]. The spleen gets easily enlarged in situations that provoke antigen-antibody reaction especially where such reactions are frequent and chronic. This condition is referred to as splenomegaly. Apart from inflammatory causes, so many other conditions have been associated with splenomegaly [5]. In endemic areas, malaria is believed to be one of the commonest causes of splenomegaly, ranking first beforevisceral leishmaniasis (kala-azar) and intestinal schistosomiasis. In children, splenomegaly or spleen rate is used as an indicator of malaria endemicity and is defined as the percentage of children aged 2-10 years showing palpable enlargement of the spleen [6,7]. Each attack of clinical malaria is accompanied by a degree of enlargement of the spleen due to congestion. The spleen regresses as soon as the attack resolves. In endemic areas, repeated attacks leads to a slowing down of the regression process leading to persistent splenomegaly [8]. A condition known as functional hypersplenism occurs in children with sickle cell anaemia as a

result of repeated vaso-oclusion of the splenic tissues attributable to the sickling process[9]. Spontaneous regression leading to a condition known as autosplenectomy has been reported in subjects with sickle cell anaemia [10]. The epidemiological value of splenomegaly in malaria endemic areas cannot be over emphasized. Decreasing spleen rates may indicate a reduction in the general immunity and this may predispose to the risk of epidemics. The present study therefore seeks to assess the prevalence of splenomegaly in a malaria endemic area with stable transmission, where other causes such as schistosomiasis and leishmaniasis are not endemic.

MATERIALS AND METHODS

Study Area: The study was conducted in Awka South Local Government Area (L.G.A.), one of the 21 L.G.A that make up Anambra State in the South-Eastern part of Nigeria, between January and September 2007. Awka South L.G.A. consists of nine autonomous communities with an estimated population of 180,000 [11]. It has a tropical rain forest climate with humid vegetation, which makes it a breeding ground for anopheles mosquitoes hence malaria transmission takes place through out the year and is stable. Most of the component communities are agrarian in nature. The local government area is not usually prone to schistosomiasis [12].

Subjects: A total of 720 children aged less than 13 years who presented with clinical signs and symptoms of malaria were recruited for the study from four different hospitals and clinics located at Awka, Nibo and Nise all within Awka and it's environ.

Sample Collection: The above hospital/clinics were first written to obtain their permission and co-operation. Consent was sought for and obtained from the parents or guardians. 1ml of whole blood was collected from each participant through venipuncture under sterile conditions and the specimen was placed in a tube containing EDTA, which was properly covered and labeled.

METHODS

Parasitological Examination

Giemsa staining technique of thin and thick smears as described by Cheesbrough [13] was used. On a single slide two blood films (thin and thick) were prepared and stained with 10% Giemsa for 10 minutes. The slide was washed with clean water and air-dried. The blood films were microscopically examined using 100x objectives (oil immersion) and 7x eyepiece as recommended by World Health Organization [14]. Malaria parasites and pigments were identified using standard charts [12].

Determination of Hb Genotypes

The alkaline cellulose acetate electrophoresis as described by Cheesbrough [13] was used. This method employs a cellulose acetate membrane. The materials used included a genotype machine, Tris-EDTA borate buffer (PH 8.5) and standard Hb genotype samples. The blood samples were first haemolyzed by applying drops of distilled water (in a ratio of 1 drop of blood to 2 drops of water). The heamolysates and the standard Hb genotypes were then applied on the cellulose acetate membrane using an applicator. This was then placed in the electrophoretic chamber and ran under stable electric current for 5 minutes to obtain Hb genotype variants.

Examination for Splenic Enlargement

This was by palpation according to Hamilton Bailey [15].

RESULTS

Out of 720 subjects that participated in the study 600 (83.3%) were positive for malaria parasite and *P. falciparum* was the only parasite species identified. A total of 114 children had enlarged spleen representing 15.8%. All the children with splenomegaly had positive malaria parasite while none of the children with negative malaria result presented with splenomegaly. See table 1. Out of the 720 subjects, 576 (80%) were HbAA, 144 (20%) were HbAS. There was no HbSS encountered in the study. See table 2.

Table 1: Prevalence of Malaria and Splenic Enlargement in Children Under 13 Years.

Total No. Screened	No. Positive for *P. falciparum*	No. children with both P. falciparum and enlarged spleen
720	600 (83.3%)	114 (15.8%)

Table 2: Determination of Genotypes in Children under 13 years.

Total No. Screened	Hb Genotypes		
	AA (%)	AS (%)	SS (%)
720	576 (80%)	144 (20%)	0 (0%)

DISCUSSION

The high prevalence rate of *P. falciparum* malaria (83.3%) observed in this study could be attributed to the fact that all the children were symptomatic hospital based subjects as opposed to studies in Ghana and Uganda [16,17] respectively where asymptomatic subjects had been used. However, similar reports of high prevalence of malaria in children in the study area have been documented previously by Mbanugo and Ejims [2]. Lower values have been reported in asymptomatic children in Northern Nigeria [18]. The high level of malaria attacks means that the spleen, which is involved in clearing the malaria parasites is constantly challenged. In the present study splenic enlargement was observed in only 15.8% of the children with *P. falciparum malaria*. This finding possibly suggests that the children with splenic enlargement may be presenting with multiple re-infections at the rate the spleen is overwhelmed, thus resulting in enlargement. This suggests that the study area is mesoendemic. The fact that no sickler participated in the study ruled out the possibility of sickle cell anaemia (SCA) being responsible for the observed splenomegaly. Schistosomiasis and leishmaniasis are not common in the study area [12] either.

Splenomegaly has also been reported in normal new born and 10% of children may have a palpable spleen [19]. However none of the children who participated in this study was less than 6 months old. A spleen rate of 60% has been reported in Lagos Nigeria[1] where the study population had consisted of people with normal HbAA, HbSS and HbAS. Spleen rate is of much epidemiological value where malaria chemoprophylaxis is not practiced. The public health importance of the present study lies in the fact that most children get exposed to malaria transmission very early in life leading to early development of splenomegaly. This trend needs to be checked by environmental measures like improved housing and environmental sanitation to reduce the incidence of mosquito bites and malaria transmission.

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