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THE STATUS OF MALARIA AMONG HIV-POSITIVE INDIVIDUALS IN CALABAR – NIGERIA

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ABSTRACT

The concomitant infection of malaria with HIV infection was evaluated in Calabar Municipality known to be endemic with multiple antimalaria drug resistance and known for high profile rise in HIV infection in Nigeria. Malaria prevalence of 300 HIV-seropositive (HIVSP) and 300 HIV-sero negative (HIVSN) children and adults aged 1 to 30 years who attended the University of Calabar Teaching Hospital were determined. The HIV sero-positives served as the test while the HIV sero-negatives served as the control. Blood samples of the patients were collected and screened for malaria parasites and HIV antibodies. Malaria infection was established following the examination of thick and thin smears made from the samples and stained with 2% Giemsa stain and examined in 1000X magnification under the microscope. Malaria parasite count was done using standard methods. The HIV screening was performed using two different kits core™ HIV 1 and 2 test and capillus™ HIV 1/HIV 2 Test. Of the 600 participants (test and control) enlisted 462 (77%) had *Plasmodium falciparium* malaria parasite in their blood. There was no difference in malaria infectivity of the two groups. The sero-negative had 78% while the sero-positive had 76% infectivity rate which was not statistically significant ($p>0.05$). The mean parasite density was rather higher in HIV sero-positive (2384 ± 747) than in HIV sero-negative (1883 ± 645) and this was statistically significant ($p<0.05$) showing that HIV infection is associated with an increased frequency of clinical malaria and parasitaemia. The study shows that malaria infection may exacerbate the epidemic of HIV infection since severe malaria infections that attract blood transfusion encourage HIV spread in view of the level of infection of both diseases in the community. Even in the already sero-positive HIV infected person, severe malaria may also encourage multiple sero-type HIV infection.

KEYWORDS: Malaria, Co-infection, Parasite density, HIV-Seropositive

Background

Concomitant infections are a continuous problem in tropical countries (Rooth and Bjorkman 1992). Malaria, a life-threatening protozoan parasitic disease transmitted by female anopheles mosquitoes, is a killer and debilitating disease that affects the physical and economic well being of people in endemic areas where it is found. The burden of malarial disease continues to increase as the countries in which it is endemic face increasing and ever more widespread drug resistance in the parasite and increasing resistance of the vector to insecticides (Webster and Hill, 2003). Patients with severe malaria are vulnerable to bacterial infections particularly of the lungs and urinary tract (following catheterization) (Sherma,1998). Spontaneous gram-negative septicaemia may occur and occasionally pyogenic meningitis and severe malaria occur together. Salmonella septicaemias are an important complication of falciparum malaria in

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African children (Sherma, 1998). Malaria is a disease of poverty. Today approximately 40% of the world's poorest countries is at risk of malaria. Ninety per cent of deaths due to malaria occur in Africa South of the Sahara – mostly among children. Malaria is alive and well killing 3000 African children everyday (WHO, 2003). Pregnant women and their unborn children are also particularly vulnerable to malaria which is a major cause of prenatal mortality, low birth weight, and maternal anaemia (WHO, 2000).

As the number of patients with Human Immune Deficiency Virus (HIV) infection rises in tropical countries, the two infections (malaria and HIV) encounter each other with increasing frequency (Sherman, 1998). Initial studies suggested that there was no interaction with malaria but more recent data suggest that HIV – positive patients tend to have higher parasitaemia (White,1992). In pregnancy, parasitaemia is more pronounced in HIV-positive mothers and the therapeutic response to anti-malaria is impaired (Sherman, 1998).

Human Immunodeficiency Virus (HIV) causes slowly progressing disease, often with a long incubation period. Malaria, together with Human Immunodeficiency virus /Acquired Immune Deficiency Syndrome (HIV/AIDS) is one of the major public health challenges undermining development in the poorest countries in the world (WHO, 2002).

.Calabar the study area in Cross River State of Nigeria has malaria transmission of 57.9% (Alaribe *et al*, 2006) and the current rate of resistance to chloroquine and sulfadoxine pyrimethamine exceeds 80% (Ezedinachi *et al* 1992, Meremikwu *et. al.*, 2002). More than 3 million Nigerians are estimated to be living with HIV/AIDS (UNAIDS 2002). In Cross River State the prevalence rate of 12% has been reported, being the highest in all the states of the federation (CATIP, 2005). This study highlights the status of co-infection with malaria and HIV in Calabar municipality.

SUBJECTS AND METHODS

Study area and population

This work was conducted in Calabar Municipality which is the capital of Cross River State in Nigeria. This area lies within the tropical rainforest belt of southeastern Nigeria. The annual rainfall is between 2000 – 3000 mm, with the rainy season lasting from April to October. Calabar is highly populated with Efiks, Ibibios, Annang, Ibos and some minor tribes from Northern Cross River State. It has a population of 222,100, with 44,420 being under five years. Malaria is holoendemic in this area with high and perennial transmission (especially in the rainy season) from April to October. The study was conducted among people attending clinics at the University of Calabar Teaching Hospital in Calabar during the months of June, July, August and September, 2006. The participants fall within the age range 1 – 30 years . A total of 600 subjects participated. Of this number, 300 who were sero-positive for HIV infection were used as test while 300 who were HIV sero-negative served as control.

LABORATORY METHODS

Sample Collection

Blood samples were collected from 600 subjects (subjects sent to the laboratory for HIV screening). About 3ml of blood was collected by venepuncture of the forearm using disposable syringes. Part of the blood samples were dispensed into plastic tubes and the remainder used for preparation of thick and thin blood films for malaria diagnosis. The aliquot in plastic tubes were centrifuged (3000 rpm for 10 minutes) and the serum used for HIV screening. Two rapid HIV test methods, Core TM HIV 1 and 2 (Core Diagnositcs, United Kingdom) and a capillus HIV-1/HIV-2 (Cambridge Diagnositics, Wicklow, Ireland) were used as directed by the manufacturer. After the screening, the results were noted and recorded accordingly and the slides separated and labelled according to the HIV test results (positive or negative). The age and sex of the patients were also noted.

Staining

Microscopic diagnosis of malaria parasites was done by staining the thick and thin blood smears in 2% Giemsa stain for 30 minutes after fixing the thin film in absolute methanol. Parasite densities were calculated for leukocytes assuming a leukocyte count of 8,000 per µl. A blood film was considered negative if no parasites were detected in 100 microscopic fields using a magnification of 1000x.

RESULTS

Examination of 300 samples of HIV seropositve and 300 samples of HIV – seronegative individuals showed the prevalence rate of malaria parasite among HIV –seronegative (HIVSN) subjects to be 78% and HIV- seropositive (HIVSP) subject to be 76% (Table 1). However, the difference was not statistically significant (P > O.O5). The mean parasite densities (MPD) of HIVSP and HIVSN subjects showed that the value for HIVSP group was higher (2384±747) than that of HIVSN group (1883±645) and the difference was significant (P < O.O5) (Table 2).

The prevalence of malaria parasite by sex of HIVSP subjects are shown in Table 3. There was no significant difference in the prevalence of infection between males and females (P > O.O5). However, males were slightly more infected (76.2%) than females (75.8%). Similarly, males had a higher mean parasite density (2385±782) than females (2383±717) and the difference was not statistically significant (P > O.O5) as indicated in table 4.

Table 5 shows the prevalence of malaria parasites amongst the age groups of the study population. Malaria parasite rate was 77% in the study subjects. It was observed that infection was highest amongst children ≤ 10 years (85.7%) in the test subjects and even higher in the control group (Table 5,6).

The mean parasite density of both groups appear similar. Infectivity rate between the test and control group is considerably high in all the age ranges. The mean parasite density was higher in children than the other age ranges.

Table 1: Prevalence of Malaria Parasite among HIV Seropositive and Hiv Seronegative Subjects

SUBJECTS	NO. EXAMINED	NO. (%) WITH MALARIA PARASITE	NO.(%) WITHOUT MALARIA PARASITE
HIV-Seropositive subject	300	228(76)	72(24)
HIV-seronegative subject	300	234(78)	66(22)
Total	600	462(77)	138(23)

P > O.05

Table 2: Comparison between the Mean Parasite Density of HIV Seropositive and HIV Seronegative Subjects

SUBJECT		NO. EXAMINED	NO. (%) WITH MALARIA PARASITE	MEAN PARASITE DENSITY (x ± S.D)
HIV subjects	Seropositive	300	228(76)	2384 ± 747
HIV subjects	Seronegative	300	234(78)	1883 ± 645
Total		600	462(77)	2130 ± 740

P < O.O5

Table 3: Prevalence of Malaria Parasite by Sex of HIV Seropositive Subjects

SEX	NO. EXAMINED	NO. (%) INFECTED	NO. (%) NOT INFECTED
Males	143	109(76.2)	34(23.7)
Females	157	119(75.8)	38(24.2)
Total	300	228(76)	72(24)

P > O.O5

Table 4: Comparison Between The Mean Parasite Densities Of Male And Female HIV Seropositive Subjects

SEX	NO. EXAMINED	NO (%) INFECTED	MEAN PARASITE DENSITY ($\bar{x}$±S. D)
Males	143	109 (76.2)	2.385 ± 782
Females	157	119 (75.8)	2383 ± 717
Total	300	228(76)	2384 ± 747

P > O.O5

Table 5: Prevalence of Malaria Parasite among the Age Groups of the Seropositive Subjects

AGE	NO. EXAMINED	NO. (%) INFECTED	MEAN PARASITE DENSITY
1 – 10	28	24(85.7)	2290.8 ± 1359
11 – 20	162	118(73)	1760.3 ± 1230.6
21 – 30	110	86(78)	1728.5 ± 1164.8
TOTAL	300	228(75.6)	

Table 6: Prevalence of Malaria Parasite among the Age Groups of the Seronegative Subjects

AGE	NO. EXAMINED	NO. (%) INFECTED	MEAN PARASITE DENSITY
1 – 10	42	36(85.7)	2205.7 ± 904
11 – 20	185	126(68)	1442.5 ± 959.6
21 – 30	73	72(98)	1262.1 ± 930.3
TOTAL	300	234(78)	

DISCUSSION

Malaria and retroviruses (HIV) are co-endemic in vast areas of the tropics and sub-tropics and are two of the commonest infections in sub-saharan Africa and to a lesser extent in other developing countries (Whitworth,2000). The interaction between these two infections is of public health importance. Current understanding of the human immune response to malaria and HIV leads us to expect that either infection might influence the clinical course of the other (Kalyesubula *et al.*, 1997) Many other types of infections have been documented to cause at least a transient increase in HIV viral load. Hence it is logical to expect malaria to do the same and thus accelerate HIV disease progression.

The evaluation of the prevalence of malaria parasite amongst HIV seropositive individuals in this study has demonstrated that malaria parasite was present in a good proportion of the populace whether HIV seronegative or HIV seropositive as was shown in the distribution of the parasite in both groups. However, what is more pertinent is the distribution of the parasite load in the infected individual. It is obvious that malaria strikes hard at individuals whose immunity is compromised. This study shows that malaria parasite infectivity was uniform in both HIV infected persons and none HIV infected people ($p>0.05$). However, it was observed that HIVSP group of subjects had a significantly higher parasite density than the HIV sero-negative subjects ($p< 0.05$). The high parasite density in HIVSP subjects shows that HIV infection is associated with an increased frequency of clinical malaria and parasitaemia (Whitworth *et al.*, 2000). This is explained by the fact that infection with HIV causes progressive cellular immunosuppression and any resulting impairment in immune response to malaria might be associated with failure to prevent infection or to suppress parasitaemia and clinical disease. Previous studies had confirmed that parasite density tended to be higher in subjects with lower CD4 cell counts (Whitworth *et.at.*, 2000). CD4 T cells are the principal mechanism of protective immunity against erythrocytic stage malaria parasite that lives in the blood (Kaufman,1988). It is also the CD4 T cells that the HIV virus destroys in infected individuals. This may explain why more malaria parasites are found circulating in the HIV seropositive people than in HIV seronegative. Though CD4 cell count was not performed in this work it is rational to believe that HIVSP groups would have lower CD4 counts than the HIVSN group. A study in Malawi observed that the prevalence of parasitaemia appeared to be raised in HIV-infected multigravidae whereas the parasite density was higher in HIV-1 infected women of all parities. They observed that placental malaria was more common in HIV infected women especially multigravidae (Steketee *et al.*, 1996). Incidence of *Plasmodium falciparum* malarial fever increases with advancing HIV immunosuppression (French *et.al.*, 2001) Studies have found that some components of

the human immune response to *Plasmodium falciprum* are modified by HIV-1 (Moore *et.al.*, 2000). On the other hand *P. falciprum* has been shown to stimulate HIV-1 replication through the induction of the cytokines –tumor necrosis factor-alpha (Xiao *et. al.*, 1998). These observations may provide the explanation to why the HIVSP group should have higher mean parasite density than the HIVSN group.

Age was a factor in malaria distribution in this study. There was no difference in the infection rate of HIVSN and HIVSP for the 1 – 10 year old range. The explanation to this is based on immune status. The implications of this is that with HIV epidemic on the increase the under 10 years would be worse hit and this can be very disastrous. A closer look at all the age groups revealed high.

In conclusion therefore it can be said that malaria co-infection with HIV is yet another parasite rate for both the test and control but the age group 21-30 years had high infection rate though it was more pronounced in HIVSP than in sero-negatives public health problem that calls for concern in medical practice. Since it affects all age groups whether HIVSP or HIVSN in high and almost equal proportions what appears very crucial is that the parasitaemia which actually translates to the degree of clinical illness is exacerbated in HIV infection and should be kept in check while managing people living with AIDS. The burden of HIV is bound to increase with increased parasitaemia hence malaria control and treatment should receive more attention in areas with high HIV prevalence. Malaria infection may exacerbate the epidemic of HIV infection since severe malaria infections that attract blood transfusion encourage HIV spread in view of the level of infection of both diseases in the society. Even in the already seropositive HIV infected persons severe malaria may also encourage multiple HIV serotype infection. Malaria is actually re-emerging

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