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URBANIZATION AND SYMPTOMATIC MALARIA IN RELATION TO RETROVIRAL SCREENING

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ABSTRACT

A descriptive cross - section analysis of five hundred patients who were symptomatically diagnosed of malaria in three locations: Saki (peri-urban), Ibadan (urban) and Lagos (highly urbanized) were recruited for this study using a well structured questionnaire between September 2005 and June 2006. The prevalence of both malaria and HIV infections were higher in Peri-Urban town than the other two locations. We observed that 80% were HIV positive in Saki, 20% in Ibadan and 37.1% in Lagos. Our data indicated that 74% were malaria positive in Saki, 87% in Lagos and 24% in Ibadan. The percentage of co-infection in Saki, Lagos and Ibadan were 69%, 16% and14.3% respectively. The high prevalence of co-infection in the two cross-border locations (Saki and Lagos) is suggestive of a high correlation between clinical symptomatic malaria and HIV infection with respect to cross border transmission of the two infections. This paper suggests that government should make provision to establish sentinels for screening immigrants.

Keywords: Highly-urbanized, co-infection, peri-urban, sentinels, symptomatic

INTRODUCTION

Malaria kills in one year the numbers of people that AIDS killed in 15 years, if 5 million have died of *AIDS* 50 million have died of malaria. Malaria ranks third among the major infectious diseases in causing deaths after *Pneumococal* acute respiratory infections and tuberculosis. It has been predicted that malaria is now expected that by the turn of the century malaria would be the number one infectious killer disease in the world. Every year 300 million to 500 million people suffer from malaria. As malaria incidence increases, so too will mortality and morbidity rates (40, 36). Since *AIDS* was first described in the early 1980s, the worldwide epidemic has claimed the lives of 22 million men, women, and children of all genders, ethnicities, and sexual orientations, another 40 million live with HIV, the virus that causes *AIDS* (41). But the bigger tragedy is that HIV infection is on a dramatic increase in those countries where malaria is already an uncontrollable problem (3). Both diseases are the scourge of developing nations in Africa, India, Southeast Asia and South America. But HIV is pandemic, spread from person to person by sexual contact in an increasingly mobile World. Malaria is endemic, dependent on a local symbiosis between infected anopheline mosquitoes and humans. The severe symptoms of malaria caused by the tiny parasite *Plasmodium falciparum* appear within days and bring death to 15 to 25% of those stricken when great quantities of infected red blood cells are destroyed in a single burst (5). HIV infection is a slow, insidious process that can take years to deplete immunologically crucial White Blood Cells (WBC). *AIDS* result in death for nearly all untreated patients. Both diseases can be transmitted by contaminated blood. In the eighties, some partially blamed the initial spread of HIV in Africa on the transfusion of infected blood to treat malaria associated anemia. Indeed a study in Brazil has investigated an outbreak of blood borne malaria among urban HIV infected intravenous drug users (4). The infection rates of both diseases can be reduced by behavioral change barrier protection (condom or bed net) and medical prophylaxis. Vaccine development for both diseases has been slow. But malaria can often be treated and cured with an inexpensive week long course of drugs whereas current HIV treatment is a life long prospect of daily medication at cost that have so far limited their use in developing countries. Most people who contact HIV or malaria are poor with shared geography and demographics, co-infection is common, yet surprisingly few obvious clinical associations between HIV and malaria are reported (5).

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The incidence of malaria is no more common in HIV infected patient (25, 11). The response to antimalarial treatment is identical in HIV infected and non-infected patients (25). Although high level of malaria parasitemia has been observed in African children with symptomatic HIV infection, these children have been found to be protected against cerebral malaria and deaths due to cerebral malaria. This has been attributed to lower levels of Tumor Necrosis Factor in HIV infected children. TNF is reported to have a potentiating effect on the endothelial adherence and clogging of microcirculation by parasitized red cells (11). In an animal study using mice, AIDS was found to confer protection against the severity of neurological manifestations of experimental cerebral malaria and this protection was higher with longer duration of immunodeficiency. Interleukin (IL-10) from splenic cells was shown to play a crucial role in this protection (12). It appears that malaria does more harm to HIV patients and HIV transmission than vice versa. It is a common knowledge that in areas where malaria is endemic, the health workers are assigned the job of conducting active surveillance by screening the population for malaria by peripheral smear examination. It is feared that this practice of controlling peripheral smears on a mass scale can certainly heighten the risk of transmission of HIV infection through needle pricks (39). Also in areas where malaria is common, children, and pregnant women often suffer from malaria related anemia and may require transfusion of either whole blood or packed cells. This also increases the risk of transmission of HIV infection as it may not be possible to ascertain the serological status of the donor in an area where HIV is also rampant (16, 9, 13, 22). It has been found that patients with HIV infection who contact malaria tend to deteriorate rapidly into *AIDS* related complex or *AIDS*. Malaria infection supposedly accelerates the replication of HIV virus (15). In 1998, a review of clinical studies concluded that the numerous studies published to that date had failed to show any convincing and consistent link between the infections, with the exception of an increased rate of placental malaria in HIV infected pregnant women (7).This review included several urban hospitals or clinic based cross sectional, retrospective, and longitudinal studies in African children and adults (26, 29, 1, 15, 10, 19.2) all of which found no interaction of major clinical importance between HIV and malaria. The only study in a rural setting found a significantly increased prevalence of malaria parasitemia and fever in HIV positive adults at a rural clinic in Tanzania (27). Two studies of severe malaria in Urban Burundi and urban Zambia found higher, but non significant case fatality ratios in HIV-1 positive adult (24,14). Infection with HIV-1 causes progressive cellular Immunosuppression, and any resulting impairment in immune response to malaria might be associated with failure to prevent infection or to suppress parasitemia and clinical disease (21). An important study from Malawi showed that HIV-1 Plasma viral load are significantly higher in patients with malaria infection than in those without, and these levels remain higher for up to 10 weeks after treatment (32).

MATERIALS AND METHODS

Study area/Subjects: Four hospitals were selected in three cities in south western Nigeria. The classification into, urban (Ibadan) peri-urban (Saki) and highly Urbanized (Lagos) was according to (35, 17) and (20): to mean a geographic region, whose boundaries are specified by a municipal/ national government authority; which contains one or more areas with a high concentration of businesses, housing, paved streets and roads; with a high population density; where agriculture is regulated by a municipal authority; and with total population size that exceeds 15,000 people. Five hundred patients older than 6 years, with reported clinical symptoms of malarial infection were recruited for the study between September 2005 and June 2006.Using a well structured questionnaire and based on the clinical visual diagnoses by the clinicians at the outpatient Department of Baptist Medical Centre (BMC) Saki Oyo State Nigeria, University College Hospital, Ibadan, Crystal Specialist Diagnostic Centre and Agbado Scan diagnostic Clinic Lagos. Five millimeters of blood sample was collected from each patient and preserved in NaEDTA anticoagulated bottle, out of which a drop of blood was used on microscopic slide for malaria parasite screening; some of the blood was collected into a capillary tube to up to three-quarter of the whole length for determination of packed cell volume (PCV) of the patients ABO and Rhesus grouping was also determined. The whole blood was then separated into erythrocyte and plasma, the plasma was used for HIV tests (screening and confirmation) by using HIV1/2VIH1/2 test strips *(Abbott Japanco, Minatu/KU, Japan Ltd)* according to the manufacturer's Instructions. Western Blot Assay was used for confirmation at Virology Department of the University College Hospital (UCH), Ibadan for HIV.

PROCEDURE FOR P C V

Blood was collected into the heparinzed capillary tube which was then sealed with plasticine. Capillary tubes were centrifuged in the Heamatocrit for 10 minutes and the patched cell volume read with a Heamatocrit reader.

RESULTS

Table 1: Sex distribution of patients

Sex	UCH[a]	BMC[b]	ASC[c]	CSH[d]
Male	90(51.4)	85(48.6)	50(58.8)	15(23.1)
Female	85(48.6)	90(51.4)	35(41.2)	50(76.9)
Total	175(100)	175(100)	85(100)	65(100)

a = University College Hospital, Ibadan b = Baptist Medical Centre, Saki c = Akowonjo Scan Centre, Lagos d = Crystal Specialist Diagnostic Centre, Lagos

Table 2: Age Distribution of Patients

Hospitals Age (Years)	Urban UCH[a] Ibadan n(%)	Peri-Urban BMC[b] Saki	Highly urbanized ASC[c]	CSH[d]
11-20	10(5.7)	10(5.7)	20(23.5)	5(7.7)
21-30	70(40.0)	70(40.0)	10(11.8)	10(15.4)
31-40	65(37)	50(28.6)	40(47.1)	15 (23.1)
41-50	20(11.4)	35(20.0)	15(17.7)	30(46.2)
51-60	10(6.3)	5(2.9)	-	5(7.7)
Total	175(100)	175(100)	85(100)	65(100)

a = University College Hospital, Ibadan b = Baptist Medical Centre, Saki c = Akowonjo Scan Centre, Lagos d = Crystal Specialist Diagnostic Centre, Lagos

Table 3: Weight of the patients

Weight (Kg)	UCH	BMC	ASC	CSH
11-20	5(2.8)	-	10(11.8)	-
21-30	-	10(5.7)	25(29.4)	5(7.7)
31-40	-	25(14.3)	25(29.4)	10(15.4)
41-50	10(5.7)	20(11.4)	5(5.9)	15(23.1)
51-60	45(25.7)	65(37.1)	15(17.7)	5(7.7)
61-70	85(48.6)	45(25.7)	5(5.9)	15(23.1)
71-80	10(5.7)	10(5.7)	-	5(7.7)
81-90	20 (11.4)	-	-	10 (15.4)
Total	175(100)	175(100)	85(100)	65(100)

a = University College Hospital, Ibadan b = Baptist Medical Centre, Saki c = Akowonjo Scan Centre, Lagos d = Crystal Specialist Diagnostic Centre, Lagos

Table 4: Malaria Status/HIV Status among patients

	UCH	BMC	ASC	CSH
Status				
Positive	25(14.3)/35(20.0)	130(74.3)/	80(94.0)/25(29.4	50(76.9)/5(7.7)
Negative	150(85.7)/140(80.0	140(80)	)	15(23.1)/60(92.3
Total	)	45(25.7)/35(20.0	5(6.0)/60(70.6)	)
	175(100)	)	85(100)	65(100)
		175(100)		

a = University College Hospital, Ibadan b = Baptist Medical Centre, Saki c = Akowonjo Scan Centre, Lagos
d = Crystal Specialist Diagnostic Centre, Lagos

The male–female ratio was 1:1 in UCH and BMC, and 2:1 in Lagos hospitals (table 1). Most of the patients enrolled in this study were in the 21-50 years category (table 1). The most educated patients were seen in UCH, while as expected in Saki, most patients had not a tertiary education. Monogamy was not a very serious undertaking as only about half of the patients in all centers practiced it. From our data, (not shown) we observed that more than half of the patients in urban, peri urban or highly urbanized centers had a good PCV level of below 35-40% of the 500 smears examined in the four hospitals, 24% were malaria positive in (UCH). 74.3% in Peri-urban (BMC). 94.0% and 76.9% were parasitic in the two highly-Urbanized. The prevalence of HIV in Lagos (ASC and CSH) was 29.4% and 7.7% respectively. This study shows a high80.0% HIV prevalence in peri-Urban and 20.0% in Urban hospitals (Table 4). Approximately 69.0 % patients had co-infection (malaria/HIV) in peri-urban, 14.3% in Urban, and 16.0% in highly urbanized medical center (data not shown).

DISCUSSION

Our data indicated that people diagnosed with malaria are more likely to be seropositive than aparasitic individuals although malaria did not appear to act as a classic opportunist in seropositive individuals (39, 7). This work agrees with the study of *terKuile (34)* that HIV-infected pregnant women experience more malaria and higher density malaria parasitemia and anemia. We observed that of 80% sero- positive individuals in peri-urban centre, majority (57.1%) were not anemic with a moderate Packed Cell Volume of 31-40%. In a 15 year review of the available information since the study by Steketee in 1996, terKuile *et al*; 2004 observed that malaria also increases HIV viral replication and viral load and with adequate antimalarial treatment, may worsen HIV disease progression. Unfortunately our study failed to observe a probable synergistic interaction in parasitic patients and seropositive individuals. In a study in Malawi (21), mean parasite rate s with the highest of 34% was found in peri-urban and the lowest rate (14%) in central urban zones of Malawi. Our data corroborate with (21). We observed the highest parasite rate (80%) in peri-urban and lowest 24% in urban hospitals. The prevalence of HIV/ malaria co infection in our study was 24% and compared well with s53.9% found by Verhoeff (37) in 1994 in rural hospital in Malawi; although frequency of co-infection was 56% in women. We did not investigate the immunological connection between HIV and malaria although there are several points in the immune system where malaria and HIV could interact (33, 34). This study could add weight to the suggestion that suppressing malaria infection may result in a lowered HIV viral burden (18). In the future, our study would investigate the probable relationship between antiretroviral drugs and antimalarial according to studies which suggested that some antimalarial drugs (Chloroquine and hydroxy-chloroquine) been have antiretroviral activity *in vivo* (32, 8, 28) and *in vitro* (31, 32). As might be expected, a significantly higher risk of epidemic in peri-urban and highly urbanized cities was observed. Hence much effort to control malaria and HIV should be intensified in border towns by establishing sentinels for both HIV and malaria screening for immigrants

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