Available online at www.pelagiaresearchlibrary.com

Pelagia Research Library

European Journal of Experimental Biology, 2013, 3(5):516-520

ISSN: 2248 –9215
CODEN (USA): EJEBAU

The rate of distribution of malaria (*Plasmodium falciparum*) among HIV positive individuals visiting Saint Theresa's Hospital Abakpa Nike Enugu, Enugu State, Nigeria

***A. C. Nwuzo[1], O. Ogbu[1], I. R. Iroha[1], F. N. Afiukwa[1], M. C. Ominyi[4], A. C. Uhuo[2] and M. E. Ogbanshi[3]**

[1]Department of Applied Microbiology, Ebonyi State University, Abakaliki, Nigeria
[2]Department of Applied Biology, Ebonyi State University, Abakaliki Ebonyi State, Nigeria
[3]Department of Biochemistry, Ebonyi State University, Abakaliki Ebonyi State, Nigeria
[4]Department of Biotechnology, Ebonyi State University, Abakaliki Ebonyi State, Nigeria

---

ABSTRACT

A total of 54 blood samples were collected from HIV positive patients visiting Saint Theresa's hospital Abakpa Nike Enugu. They were screened for the presence of Human Immunodeficiency Virus and malaria parasite (Plasmodium falciparum) using commercially available enzyme linked immunosorbent assay kits (ACON Diagnostic, USA and Biosystem, USA) and parasitological examination of blood stained films respectively. The HIV positive samples were further confirmed by a second stage confirmatory test using two rapid tests with different principles (Capillus HIV ½ Assay, Trinity Biotech Ireland and Determine kits, Japan Co. Ltd). The subjects were made up of 24 males and 30 females. Of the 54 seropositive samples for HIV, only 31 (57.41%) blood samples were positive for malaria (P. falciparum). The highest percentage occurrence of 10 (83.33%) and 5 (71.43%) of the coinfection were recorded among the age groups 21-30 years and 31-40 years respectively. Occupationally, students were more infected 23 (42.59%) with HIV while applicants and farmers had the highest prevalence of malaria infection with 3(75%) and 4 (80%) respectively. Divorced and singles yielded high percentage prevalence of 15 (65%) and 13 (52%) while the least prevalence was seen among married patients 3 (50%). The analysis of use, non-use of mosquito treated nets and insecticides showed that the patients used none of the two had 21 (70%) prevalence compared to HIV positive patients that used MTNs 5 (38.46%) and insecticides 5 (45.45%). The result also revealed high percentage prevalence of 21 (63.64%) among the illiterate while the least prevalence was recorded among the literate 10 (47.62%).

Keywords: Prevalence, *Plasmodium malariae*, HIV, Co-infection, Blood sample.

INTRODUCTION

Human immunodeficiency virus/ acquired immunodeficiency syndrome (HIV/AIDs) and malaria are among the most prevalent infectious diseases in sub-Saharan Africa which leads to increase morbidity and mortality [15]. HIV/AIDs and malaria together cause more than 4 million deaths annually, significantly affecting those in poverty and impeding sustainable development. The dual infection of malaria and HIV increases the risk of morbidity and mortality for all individuals infected.

Malaria is caused by protozoan parasites of the genus plasmodium (phylum Apicomplexa). In humans, malaria is caused by mosquito borne *Plasmodium falciparum, P. malariae, P. ovale* and *P. vivax*. However, *Plasmodium*

faciparum is the most important cause of the disease and is responsible for about 80% of the reported cases and 90% of deaths [9]. Malaria causes about 400-900 million cases of fever and approximately one to three million deaths annually [5]. A vast majority of cases occur in children under the age of 5 years [7] and more so, pregnant women are especially vulnerable.

Human Immunodeficiency Virus (HIV) is a lentivirus (classified into retroviridae family) and is the major etiological agent of acquired immunodeficiency syndrome (AIDs), a condition in humans in which the immune system begins to deplete, leading to life-threatening opportunistic infections [11, 13]. HIV is transmitted through direct contact of a mucous membrane or the blood stream with a contaminated body fluid such as blood, semen, vaginal fluid, seminal fluid and breast milk. The transmission can be through anal, vaginal or oral sex with infected individual, blood transfusion, infected contaminated blood, use of contaminated hypodermic needles, vertical route from mother to her baby during pregnancy or childbirth among other routes.

Malaria and Human immunodeficiency virus (HIV) often co-exist in patients in most parts of the world due to overlap of these two diseases [8]. An estimated 28 million individuals are infected with HIV in sub-Saharan Africa with almost 3 million deaths annually. These diseases demonstrate a great deal of an overlapping distribution. Co-infection with HIV and malaria is very common in sub-Saharan Africa, and an understanding of how the two infections interact is important for the control of both diseases.

Early diagnosis and prompt treatment is the key to minimizing the morbidity and mortality due to malaria, but the diagnostic capabilities for malaria remain a challenge for the laboratories and a hindrance for effective malaria control [10]. The quest for newer and easier diagnostic methods for malaria has picked up momentum in recent years and the development of the rapid diagnostic tests (RDTs) has opened a new avenue, calling for a review of the existing methods [10]. The factors that can have bearing on the identification and interpretation of malaria parasitemia on a diagnostic test include the different plasmodium species; the different stages of erythrocytic schizogony; the endemicity of different species; the population movements and the interrelation between the levels of transmission. Other factors are immunity, parasitemia, and the symptom. Recurrent malaria, drug resistance, persisting viable or non-viable parasitemia, sequestration of the parasites in the deeper tissues and the use of chemoprophylaxis or even presumptive treatment has been the problems facing clinical diagnosis of malaria.

Malaria transmission and mortality rates remain unchanged in endemic countries lacking adequate health care and malaria control programme despite the use of preventive measures and treatments against the disease [4]. A major obstacle for effective malaria control is the lack of affordable and accurate malaria diagnostics and prompt treatment. This has led to misuse and abuse of anti-malarial drugs of which the consequence is the development of drug resistance in strain.

Microscopic examination of blood smears as the conventional method for plasmodium species detection is still a gold standard. Malaria and HIV/AIDs remain a threat to many people in sub Sahara Africa for several reasons which include increasing poverty, poor public health services, increase resistance of malaria parasites to wide range of antimicrobial agents and lack of experienced microscopist [2]. This disease has been associated with major negative economic impact in regions where it is widely spread such as high costs of health care, working days lost due to sickness, days lost in education, decreased productivity due to brain damage from cerebral malaria, loss of investment and tourism etc (Ellis et al., 2006; Greenwood et al., 2005). In developing countries where there is a heavy malaria burden, the disease may account for as much as 40% of public heath expenditure, 30 - 50% of in-patient admission and up to 50% of outpatient visits [17]. The present study is aimed at determining the prevalence of malaria (*Plasmodium falciparum*) among HIV positive patients in Abakpa Nike Enugu, Nigeria and its relationship with epidemiological factors such as age,

MATERIALS AND METHODS

Blood samples were collected from 54 HIV Sero-positive individuals attending Saint Theresa's Hospital Abakpa Nike Enugu, Enugu State, from March, 2011-Nov. 2011. The blood samples were collected from males and females living with the virus. An easy-to-read and friendly questionnaire was provided for the collection of demographic and clinical data. Ethical approval was obtained from the ethical committee of the above mentioned health Institutions.

Blood collection

Blood samples were collected aseptically by vein puncture after swabbing the area with 70% alcohol. Five (5 ml) sterile syringe was used to draw 5 ml of blood sample and 2 ml each was aseptically introduced into sterile tubes while the remaining 3 ml was introduced into the ethylene diamine tetra-acetic acid (EDTA) bottle [6].

Serum preparation
Exactly 2 ml of blood sample was collected from patients and introduce into the sterile dry tubes and allowed to clot and retract after which it was centrifuged at 3,500 rpm for 5 minutes to give clear sera which was stored at -20^0 C.

Simple rapid HIV antibody assays
The HIV status of the patients was determined by Enzyme Linked Immunosorbent Assay (ELISA) method using commercially available ELISA kits: ACON ½, ACON Diagnostics, USA; Biosystem, USA) and was confirmed by a second stage confirmatory test of two to three rapid tests with different principles (Capillus HIV-1/2 Assay, Trinity biotech, Ireland and Determine kits, Japan Co. LTD) of antibodies and antigen testing methods as recommended by WHO for low resource countries including Nigeria.

***Plasmodium falciparum* identification:** Methods of thin and thick blood films preparation was strictly followed according to [6].

RESULTS

A total of 54 blood samples were collected from HIV seropositive patients that were asymptomatic for malaria infection. The samples were examined for malaria parasite *P. falciparum* and HIV using parasitological examination of the blood films and ELISA technique respectively. Twenty (20) apparently healthy individuals were used as control and the patients composed of 24 males and 30 females aged between 0 and 70 years.

The result of our study showed that age groups 21-30 and 31-40 years had the highest HIV prevalence of 12(22.22%) and 11(20.37%) respectively. The least prevalence 5 (9.20%) was recorded against age group of 41-50 years. The high prevalence 10 (83.33%) of malaria infection was observed within the age group of 21-30 years (Table 1).

When the sex distribution of the co-infection was analyzed, female subjects gave the highest prevalence 30 (55.56%) for HIV and 18 (60%) for the malaria infection while male recorded least 24 (44.44%) prevalence (Table 2).

The occupation of the patients is shown in Table 3. The result revealed that students ranked highest prevalence 23 (42.59%) while civil servants yielded least prevalence 3 (5.56%) for HIV infection. The highest malaria infection was recorded against farmers 4 (80%) while least prevalence 2 (22.22%) was seen among Drivers.

The marital status of the patients showed that singles and divorced had the highest prevalence 25 (46.30%) and 23 (42.59) respectively for HIV infection while least 6 (11.11%) was recorded for married patients (Table 4).

The evaluation of the patients residential place revealed that 34 (62.96%) HIV prevalence against urban residents and least malaria prevalence of 16 (47.09%) (Table 5)

The results of use or none use of mosquito treated nets (MTNs) and insecticides by the HIV positive individuals are presented in (Table 6). The result of the investigation observed that HIV patients that were not using either of the two sleeping materials had high prevalence 21 (70%) of malaria infection.

Table 1. Age distribution of malaria parasite (*Plasmodium falciparum*) and HIV coinfection

Age (yrs)	Number tested	% tested positive for HIV	% tested positive for malaria
0 – 10	7	12.96	5 (71.43)
11-20	10	18.52	6 (60)
21-30	12	22.22	10 (83.33)
31-40	11	20.37	5 (45.45)
41-50	5	9.26	2 (40)
>51	9	16.67	3 (33.33)
Total	**54**		**31(57.41)**

Table 2. Sex Distribution of malaria (*P. falciparum)* among HIV positive individual

Sex	Number tested	% tested positive for HIV	% tested positive for malaria
Male	24	44.44	13 (54.17)
Female	30	55.56	18 (60)
Total	**54**		**31 (57.41)**

Table 3 . Distribution of malaria (*P. falciparum)* among HIV positive individual with respect to patients occupation

Occupation	Number tested	% tested positive for HIV	% tested positive for malaria
Students	23	42.59	14 (60.87)
Applicants	4	7.41	3 (75)
Traders	10	18.52	6 (60)
Farmers	5	9.26	4 (80)
Drivers	9	16.67	2 (22.22)
Civil Servants	3	5.56	2 (66.67)
Total	**54**		**31(57.41)**

Table 4 . Distribution of malaria (*P. falciparum)* among HIV positive individual screened with respect to patients marital status

Marital Status	Number tested	% tested positive for HIV	% tested positive for malaria
Married	6	11.11	3 (50)
Single	25	46.30	13 (52)
Divorced	23	42.59	15 (65)
Total	**54**		**31 (57.41)**

Table 5 . Distribution of malaria (*P. falciparum)* among HIV positive individual screened with respect to the patients place of resident

Residential place	Number tested	% tested positive for HIV	% tested positive for malaria
Urban	34	62.96	16 (47.09)
Rural	20	37.04	15 (75)
Total	**54**		

Table 6 . Distribution of malaria (*P. falciparum)* and HIV co-infection with respect to the patients use/ none use of mosquito treated nets and insecticide

Nature of sleeping material	Number tested	% tested positive for HIV	% tested positive for malaria
Mosquito treated Nets (MTNs)	13	24.07	5 (38.46)
Insecticide	11	20.37	5 (45.45)
No MTNs nor Insecticide	30	55.56	21 (70)
Total	**54**		**31**

DISCUSSION

Malaria infection in sub-Sahara Africa is of public health importance due to its adverse effect on mostly people living with HIV/AIDS. *Plasmodium falciparum* is one of the four plasmodium species that cause disease in man [4]. The overall prevalence of 31 (57.41%) of *P. falciparum* among HIV sero-positive individuals obtained from this study is high. This finding is in agreement with the work of [9] in which they observed 80% prevalence.

The epidemiological data showed that the prevalence of 22.22%, 20.37% of HIV infection is higher among the age groups 21-30, 31-40 years and lower among the age group 41-50 years. The above findings are not surprising because patients within these age groups are usually more sexually active. Age groups of 0-20 and 21-30 years recorded high malaria prevalence of 77.43% and 83.33% respectively. The susceptibility of children to malaria infection could be attributed to their low immune status and adults might be due to HIV infection which has degenerative effect on the immune system. This is in consonance with [12].

The sex distributions of the patients examined showed that female had a high prevalence of 55.56% for HIV and 60% for the malaria infection while the least prevalence of 44.44% for HIV infection and 54.17% for malaria were recorded against male patients. From this study it is not surprised that the prevalence of the HIV and malaria co-infection is higher in females than males. Generally, women are more vulnerable to HIV infection than men because during sexual intercourse the receptive partner (the person who is penetrated) is more at risk than the incentive partners. This finding strongly agrees with [15]

The occupational distribution of malaria (*P. falciparum*) among the HIV positive patients examined revealed high prevalence 80%, 75% among farmers and applicants respectively while least prevalence of 22.22% was recorded against drivers. The high prevalence of malaria recorded against farmers and applicants in this study may not be surprising due to some epidemiological factors like poor sanitation such as dirty surroundings and stagnant water, deplorable hygiene practices, quary industries holes, after using the stones the excavated area left unfilled and they later form ditches and breeding environment for mosquitoes. Introduction of different outdoor and sleeping outside in the night make them more vulnerable to mosquito bites. This observation is in line with the work done by [16].

Residential places of the HIV positive individuals examined for *P. malariae* in this study recorded that patients living in the rural areas had the highest prevalence of 15 (75%) while the least recorded prevalence of 16 (47.09%)

was seen among urban dwellers. To the rural dwellers, poor sanitary environment, presence of water logged / swampy areas and presence of bushes around living houses can make them vulnerable. This is not out of place with [1] citation.

The spatial distribution of malaria in HIV positive patients as it affect the use, none use of mosquito treated nets (MTNs) and insecticides was evaluated, results shows that patients that use either MTNs or insecticides had low prevalence of 38.40% while none users of either of the two sleeping materials had high prevalence of 70%. In view of the above findings and negative effect malaria has on people living with the virus, this study advocate for early diagnosis of malaria (*P. malariae*) among HIV positive patients as that will help to improve on HIV/AIDs patient's management.

REFERENCES

[1] A. C. Nwuzo, R. A. Onyeagba, I. R. Iroha, O. Nworie and A. E. Oji **2009**. *Scientific Research and Essay*. 4 (10), 966-971.
[2] Alnwich .D **2001**. *Afr. Health* 23: 18-19.
[3] Balls, M.J; Bodker R; Thomas C.J; Kisinza. W; Maangeni. H.A and Lindsay S.W **2004**. *Tro Med Hyg*; 98: 400-408.
[4] Bell, D., C. Wongsrichanalai, and J. W. Barnwell**. 2006**. *Nat. Rev. Microbiol*. **4:**S7-S20.
[5] Breman JC **2001**. Am. J. Trop. Med. Hyg. 64: 1-11.
[6] Cheesbrough M **2002**. District Laboratory practice in Tropical Countries part 2 ed. Cambridge University Press, New York Pp 320-329.
[7] Greenwood BM, Bojang K, Whithy CT, Targett GA **2005**. *Lancet* 365: 1487-1498.
[8] Hewitt, K. R; Mwapasa, V and Whitworth, J.G **2008**. *Clinical Microbial Review, 5 (1)* 26-35.
[9] Mendis K, Sina B, Marchesini P, Carter R 2**0**01. *Am. J. Trop. Med. Hyg.* 64: 97-106.
[10] Moody, A. **2002**. Clin. Microbiol. Rev. **15:**66-78
[11] Mueller, I., I. Betuela, M. Ginny, J. C. Reeder, and B. Genton. **2007**. J. Clin. Microbiol. **45:**627-630.
[12] Vangeertruyden, J.P; Menten, J; Colebunders, R; Korenromp, E and Darlessandro, U 2008. *Malaria Journal* 22: 7-134.
[13] Weiss. R.A **1993**. *Science* 260 (5112). 1273-9.
[14] Westling .J and Yowell, C.A **2001**. *Exp. Parasitolo.*, 87 (3): 185-193.
[15] WHO, **1997**. World malaria situation in **1994**. part 1. population at rick. Wkly Epidemiology Rev. 72:269-274.
[16] WHO**. 2003**. Malaria is alive and well and killing Africa children every day. WHO, Geneva, Switzerland.
[17] WHO**. 2006**. The use of malaria rapid diagnostic tests. WHO, Geneva, Switzerland.