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RESEARCH ARTICLE

MALARIA AND HEPATITIS B VIRUS CO-INFECTION AMONG HIV PATIENTS IN A TERTIARY HOSPITAL IN PORT HARCOURT, RIVERS STATE, NIGERIA

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ABSTRACT

Background*:* Malaria, Hepatitis B virus (HBV) and Human Immunodeficiency virus (HIV) are some of the infectious diseases with great public health importance. This study aimed to evaluate the prevalence of malaria-HBV co-infection among HIV subjects in a tertiary hospital in Rivers State. ***Method:*** Blood samples were collected from HIV positive subjects and examined for *Plasmodium* parasite and HBV using standard laboratory procedures. ***Result****:* The results obtained showed that out of the 200 samples examined for both malaria and hepatitis B virus (HBV), 61.5% were tested positive for *plasmodium* infection while 7% were positive to HBV. Males, 71(70.30%) recorded a significantly higher infection than females, 52(52.52%) in malaria ($p<0.05$). in HBV, males 11(10.89%) also recorded a significantly higher prevalence than the females 3(3.03%) ($p<0.05$). Age-wise, those >30yrs (62.28%) had the highest prevalence in malaria than those <20yrs (42.86%) and within 20-30yrs (62.03%) ($p>0.05$). Co-infection was recorded in 7% of the cases, with males 11(10.89%) recording a higher prevalence than females, 3(3.03%) ($p<0.05$). Result revealed the presence of malaria, HBV and a combination of both in HIV subjects. ***Conclusion:*** This suggests the need for active surveillance and implementation of preventive measures against infections among immunocompromised individuals.

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INTRODUCTION

The human immunodeficiency virus (HIV) and malaria are regarded as two of the deadliest diseases in the world, and still present as an unsurmountable public health challenge especially in sub-Saharan Africa (SSA), Southeast Asia and the Indian subcontinent. These infectious diseases and widespread with overlapping incidences in SSA. Malaria is vectored to humans through the bite of an infected female Anopheles mosquito (WHO, 2020), with over 247 million cases and over 500 000 deaths in 2021 (WHO, 2022). Fifteen countries accounted for 80% of all malaria-related deaths, mainly in the African region (WHO, 2020). Malaria also accounts for majority of hospitalization and outpatient visits in health facilities (Omoya and Ajayi, 2020). Malaria prevalence varies across, sex, age and locality in Nigeria in which prevalence of 58.0% (Awosolu *et al*., 2021), 64.0% (Nmadu *et al*., 2015) and 66.7% (Dawaki *et al*., 2016) have been reported. The human immunodeficiency virus (HIV) is reported to have infected about 38 million people globally, and it is also a disease of major public health importance (Joris, 2012); and in SSA, it is the leading cause of morbidity and mortality, with over 70% of people living with the virus resident in SSA (Roth *et al*., 2018; James *et al*., 2018), although many cases go unreported. With an estimated 1.9 million infected with HIV, Nigeria ranks third in the burden of the infection with a prevalence of 1.4% (Ukaegbu *et al*., 2022).

HIV infection is mainly through unprotected sex intercourse, sharing of contaminated sharp objects such as razor blades and needles, through blood transfusion and from mother to children during pregnancy. HIV has no known cure but infection load can be managed (WHO, 2017). Globally, hepatitis B virus (HBV) is a common viral infection agent of public health importance also, with about 350 million sufferers of the infection from about 2 billion infected people (Ott*et al.,* 2012). HBV has a mortality risk of 25%, with more than 50 million people infected in Africa. In SSA, carrier rates ranges from 9-20% (Walana *et al.,* 2014). It has been reported to cause liver cirrhosis and hepatocellular carcinoma (Zou*et al.,* 2001). The combination of HIV, HBV and malaria accounts for more than 2.3 million deaths worldwide (Mukandavire *et al*., 2009). Women and adolescent girls are the most prone to HIV infection, and the risk of malaria infection and deaths is highest in children and pregnant women (WHO, 2015). Annually, in SSA, more than 500,000 pregnancies are complicated by malaria and HIV co-infection, putting at grave risk the lives of the pregnant women and their developing foe tuses. Pregnancy-associated adverse effects of malaria and HIV co-infection include severe anaemia, slow gestational development, low birth weight, preterm delivery and increased rate of neonatal mortality (Brentlinger*et al*., 2006; Flateau *et al*., 2011). The poorest members of a society are the most severely affected by infectious diseases, due to lack of access to quality health care and education and state services, all which are characteristics of SSA. In effect, trio infections are aggravated and reinforced by poverty by affecting young people who would be members of workforce of the economy of a society.

The co-endemicity of both diseases have generated much interest in their study because of drug-drug interaction in patients suffering trio infection and receiving medications concomitantly, as well as impact on the control of both diseases (Herrero *et al*., 2007; Whitworth and Hewitt, 2005). Therefore, this study was aimed at assessing prevalence of malaria, HBV and HIV co-infection in Rivers State.

METHODS

Study Area: Port Harcourt, which is the capital and largest city in Rivers State, located within the South-South geopolitical zone of Nigeria, with geographical coordinates of 404721 North and 605955 East, has an estimated population of 1,382,592 (Natiional Bureaue of Statistics, 2006). Port Harcourt is a major petroleum industrial center and locations of many multinational firms as well as other local and indigenous industries. The city is located in the tropical rain forest of the Niger Delta region. Average temperature ranges between 25ºC-28ºC.

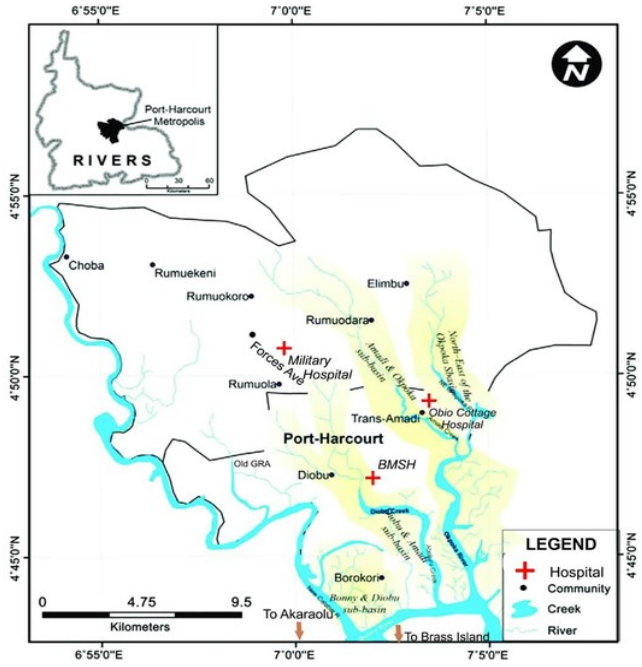

Figure 1. Map of Study Area

Research Design: A cross sectional study was conducted among 200 consented persons living with HIV/AIDS (PLH) receiving treatment at the Rivers State University Teaching Hospital, Port Harcourt Rivers State. The Rivers State University Teaching Hospital was selected as a result of their strategic functions: being a referral center for HIV patients and a provider based facilities providing specific medical services to the communities. A simple random sampling technique was adopted on the consenting participants. The study was carried out between November 2022 to January 2023.

Inclusion and Exclusion Criteria: All HIV subjects that visited the clinic for their regular checkup and gave consent were recruited in the study. All subjects that were critically ill were excluded from the study.

Ethical Clearance: The research was conducted after approval from Research Ethics Committee of the University of Port Harcourt and University of Port Harcourt Teaching Hospital.

Data collection: Two millimeter of blood was collected via venipuncture with the assistance of the laboratory technician using the vacutainer needle, transferred into ethylene diamine tetra-acetic acid (EDTA) bottles and immediately transported to the parasitology laboratory of the Department of Animal and Environmental Biology, University of Port Harcourt for parasitological analysis.

Parasitological Examination: Thick and thin blood films were made on the surface of a clean grease-free glass slide, thereafter, the thin film was fixed in absolute alcohol. Both were stained with 1:10 Dilution of Giemsa stain for 10minutes, the slides were air-dried and viewed under the microscope using x100 objective lens after mounting with immersion oil according to Onoja *et al*., (2021).

HBV Examination: Rapid diagnostic test kits (Nantong Egens Diagnosis Biotechnology Co. Ltd., Rugao Jiangsu Porvince, China) were used. For HBV, Swecare Rapid One-Step strips, which test based on the chromatographic immunoassay method, were used according to Malu *et al*., (2020). The HBsAg strip wrapped in a pouch was removed. The strip was placed on a flat, clean surface, using a pipette, screening was done by applying 2drops of the plasma onto the kits and observed after 15 minutes. Two simultaneously positive test results were interpreted as positive while single line was interpreted as negative result.

Data analysis: The data on demographic characteristics were analyzed using SPSS version 22 windows. Statistical comparison was done using Chi-square (X2) test at 95% confidence and level of significance of less than 0.05.

RESULTS

Results showed that of the 200 samples examined for both malaria and Hepatitis B virus (HBV), 61.5% were tested positive to *plasmodium* infection while 7% were positive to HBV. Males, 71(70.30%) recorded a significantly higher infection than females, 52(52.52%) in malaria ($p<0.05$). in HBV, males 11(10.89%) also recorded a significantly higher prevalence than the females 3(3.03%) ($p<0.05$) (Table 1). Age-wise, those >30years (62.28%) had the highest prevalence in malaria than those <20years (42.86%) and within 20-30years (62.03%) ($p>0.05$). While <20 years had the highest prevalence of HBV infection followed by those within 20-30yrs, and then, >30 years with a prevalence of 4.39% ($p>0.05$) (Table 2). Co-infection was recorded in 7% of the cases, and based on sex, males 11(10.89%) recorded a higher prevalence than females, 3(3.03%) ($p<0.05$) (Table 3). Age-related prevalence revealed that those >30yrs, (7.89%) recorded a higher prevalence than those within 20-30 years (6.33) ($p>0.05$) as shown in Table 4.

Table 1. Prevalence of malaria and HBV among HIV subjects based on sex

	No. examined	No infected	
		Malaria (%)	HBV (%)
Male	101	71(70.30)	11(10.89)
Female	99	52(52.52)	3(3.03)
Total	200	123(61.5)	14(7)
χ^2		6.669	4.745
P		0.010	0.029

Table 2. Prevalence of malaria and HBV among HIV subjects based on age

Age groups	No. examined	No infected	
		Malaria (%)	HBV (%)
<20 yrs	7	3(42.86)	1(14.29)
20-30	79	49(62.03)	8(10.13)
>30yrs	114	71(62.28)	5(4.39)
Total	200	123(61.5)	14(7)
χ^2		1.066	2.954
P		0.587	0.228

DISCUSSION

In the current study, the prevalence of HBV and malaria infections among HIV positive patients in a tertiary hospital in Rivers State revealed prevalence of 7% and 61.5% respectively while co-infection of 7% was also recorded.

Table 3. Co-infection of malaria and HBV among HIV patients based on sex

Sexes	No. examined	No. co-infected (%)	χ^2	p
Male	101	11(10.89)		
Female	99	3(3.03)		
Total	200	14(7)	4.745	0.029

Table 4. Co-infection of malaria and HBV among HIV subjects based on Age

Age groups	No. examined	No. co-infected (%)	χ^2	p
<20 yrs	7	0(0)		
20-30	79	5(6.33)		
>30yrs	114	9(7.89)		
Total	200	14(7)	0.722	0.697

The HBV prevalence was lower than those of Ahizechukwu *et al.,* (2011), and Luka *et a*l., (2008) who reported prevalence's of 8.3% and 11% respectively. Although this study recorded a higher prevalence than those of Ajuwon *et al.,* (2021) and Abah*et al* 2019. This difference may be as a result of the type of population studied, different geographical regions, socioeconomic status, differences in educational level, seeking of health-care assistance, and utilization of health-care facilities (Ajayi*et al.,* 2013). The difference might also be related with the method used by us in the quantification of HBsAg which has a high sensitivity and specificity. The application of exclusion criteria may have skewed the participating population compared with general population. Studies have indicated that a combination of insecticides treated bednets (ITN) use with the provision of anti-retroviral therapy (ART) and cotrimoxazole prophylaxis reduced malaria incidence among HIV-positive people by 95% (Kasirye *et al.,* 2016; Kamya *et al.,* 2012). Also, adherence to ART can help improve their immune system and reduce the percentage of trio co infection among the subjects Udeh *et al* 2023. Co-infection of malaria-HIV leads to adverse birth outcomes, low birth weight, abortion and preterm delivery among pregnant women (Dibua *et al*., 2013), contributing to morbidity and mortality by affecting patients' health and nutritional status (Wondimeneh*et al*., 2013). Moreover, people with malaria-HIV co-infection are reported to have reduced CD4 count, anaemia and low immunity (Jegede*et al.,* 2017) with reported higher risk of mortality due to low adherence to ART treatment (Winiarti*et al.,* 2019). Hepatitis B viral infection was significantly more in males than females in this study. Incidence of HBV in males have been linked to circumcision, presence of tribal mark, occupation and sharing of sharp objects such as razor blades and needles. Males circumcision is practiced till date in Nigeria, and it is one of the oldest surgical procedures carried out by traditional birth attendants in the country (Osifo and Ovueni, 2009; Abdur-Rahman *et al.,* 2012). The co-infection of trio malaria-HBV-HIV in the current study had a prevalence of 7%. This rate was higher than 0.4% reported by Afolabi *et al.,* (2018) in Akure, Nigeria. This difference could be due to study population, geographical location, culture and education. Also, it has been observed that the trio of malaria, HIV and HBV can co-habit people whose immune systems have been compromised (Afolabi *et al*., 2018). This implies that the trio of infectious agents can co-habit in a host. In addition, it was observed that malaria parasite, hepatitis B virus and Human Immunodeficiency Virus can co-habit in immunodeficient or immunocompromised hosts. All the individuals that were positive for hepatitis B and HIV/AIDS tests were also positive for malaria test. This also suggests that individuals with HIV/AIDS have higher risk of contracting hepatitis B virus. It shows that malaria and HIV/AIDS could co-exist in human host. This co-infection characteristic of malaria.

CONCLUSION

Routine screening for malaria, HBV and HIV is necessary to enable governments and NGOs plan adequate intervention measures. The presence of malaria and HBV in HIV positive people suggests that these subjects should always be encouraged to employ preventive measures and to also seek for treatments whenever they fall ill. Subjects should also ensure strict adherence to ART to reduce their chances of co-infections

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Footnotes

Authors Contribution: Dr Austin E. Abah designed and supervised the study. He also corrected the manuscript while Dr Helen Onoja contributed to the data collection and analysis. She also prepared the manuscript. Ruth O. Soberekon contributed in the data collection and analysis.. All authors read and approved the final manuscript.

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Limitations: The Hepatitis test was at the screening level, we did not check the viral load of the subjects that were positive. Also we did not consider the CD4 count of the subjects for those who had co infection.

Informed Consent: All subjects gave consent to participate in the study.

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