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EPSTEIN BARR VIRUS NUCLEAR ANTIGEN AND SOCIODEMOGRAPHICAL CHARACTERISTICS OF HIV-INFECTED INDIVIDUALS IN TWO TERTIARY HEALTH FACILITIES IN RIVERS STATE, NIGERIA

Oketah, E. N.[1] , Cookey, T. I.[1*] , Okonko, B. J.[2] , Adim, C. C.[1] , Onu, E. N.[3] , Frank-Peterside, N.[1] & Okonko, I. O.[1]

[1]Virus & Genomics Research Unit, Department of Microbiology, University of Port Harcourt, Port Harcourt, Nigeria.
[2]Virology & Immunology Unit, Department of Microbiology, Ebonyi State University, Abakaliki, Nigeria.
[3]Department of Medical Microbiology, Faculty of Basic Clinical Medicine, Alex - Ekwueme Federal University Ndufu-Alike, Ikwo Ebonyi State Nigeria.
*Corresponding author's e-mail address: tochi.cookey@uniport.edu.ng;

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ABSTRACT

Epstein-Barr virus (EBV) is one of the opportunistic pathogens that affects HIV infected individuals. Although high prevalence of EBV has been well documented in Africa and some parts of Nigeria, such data are sparse from Rivers State, Nigeria. Thus, this study aimed at determining the Epstein Barr virus nuclear antigens and the sociodemographical characteristics of HIV-infected individuals in two tertiary hospitals in Rivers State, Nigeria. Plasma from 182 HIV-infected individuals attending the Retroviral Clinics of UPTH and RSUTH in Rivers State, Nigeria were tested for antibodies specific for EBNA by IgM ELISA assays. Overall prevalence of IgM antibodies against Epstein Barr Nucleic Acid (EBNA) was 20.9%. The study showed sex-related statistical variances in the seropositivity of anti-IgM (females 23.5% vs. males 16.4%, p<0.05). Higher seropositivity occurred in age range 0-20 years (25.0%) than other age range, divorced and widowed (50.0%) than the married (25.7%) and singles (10.1%), among tertiary education (24.7%) than secondary (20.5%) and primary education (8.3%), Islamic religion (56.3%) than Christian religion (17.5%), and social/healthcare workers (37.5%) than other occupational groups. Summarily, higher seropositivity of anti-IgM antibodies against EBV was observed in HIV-infected individuals in UPTH than their counterparts in RSUTH. Nevertheless, 20.9% of the HIV-infected individuals in this study that were categorized with current/ongoing primary infection, owed to VCA-IgM detection, were positive for EBNA IgM antibodies. In conclusion, this study clearly confirmed that EBV seropositivity considerably increased with age, sex, marital status, educational level, religion, and occupation. Thus, this study verified earlier studies that presented high EBV seroprevalence, touching >50.0%the populace in Nigeria. Future larger and multi-center clinical research are suggested to address some unanswered seroepidemiological questions.

Keywords: Antibodies, EBNA, IgM, HIV, Sociodemographical characteristics

INTRODUCTION

Epstein–Barr Virus (EBV), also known as human herpesvirus 4, are oncogenic viruses with a long latency period in healthy hosts and will reactivate from dormancy when the hosts are immunosuppressed (Adjei et al., 2008). Oncoviruses are a particular type of virus that directly contribute to cell change and tumour development (Suares et al., 2021). EBV is also a lymphotropic herpesvirus and the major cause of the disease called infectious mononucleosis (IM) (CDC, 2016; Smatti et al., 2018).

EBV is a vital global human pathogen in the family of herpes virus (Maeda et al., 2009; Balfour, 2014*)*. It is one of the opportunistic pathogens that affect individuals that their immune system are low especially HIV/AIDS and it is the principal cause of death and cancer in humans (Maeda et al., 2009; Balfour, 2014*)*. It is also one of the 8 human herpesviruses that creates life-long lasting infection in individuals (Tangye et al., 2017; Houen & Trier, 2021).

The primary infections in immunocompetent host are normally asymptomatic (Adjei et al., 2008). Classically, the main infection is without symptoms occurring during childhood (Smatti et al., 2018). Though, it can manifest with symptoms in adulthood (Santpere et al., 2014). The population of adult human that carries asymptomatic infection of EBV is greater than 90% (Adjei et al., 2008; Kolawole et al., 2017).

EBV is now measured to be aetiologically related with nasopharyngeal carcinoma (NPC), extranodal nasal NK/T-cell lymphoma, endemic Burkitt's lymphoma (BL), and classical Hodgkin's lymphoma (HL) tumors in HIV-infected patients (Thorley-Lawson & Gross, 2004; Adjei et al., 2008; Chen et al., 2015; Smatti et al., 2018).

There are various factors and analysis of risk factors which includes; age, gender, country or region of residence, household educational level, kissing, smoking habit and sexual activity have been connected to the EBV seropositivity (Crawford et al., 2002; Higgins et al., 2007; Anejo-Okopi et al., 2019).

The virus–host imbalance promotes EBV reactivation, which in turn causes lymphoproliferation in immunocompromised patients, such as HIV-positive people (Rickinson, 1996; Fellner et al., 2007). Compared to transplant recipients, the EBV burden in the HIV-positive population has received substantially less research. Similar to transplant recipients, HIV-positive people have experienced numerous reactivations of EBV infection, as evidenced by elevated EBV-specific antibody titers and, more recently, high levels of circulating EBV copies (Rahman et al., 1991; Yao et al., 1996; Dehee et al., 2001; O'Sullivan et al., 2002; Ling et al., 2003). The association between EBV and HIV markers may reflect a significant pathogenic interaction between the two viruses (Telenti et al., 1993).

Most EBV studies concentrate on serological assays (Nystad & Myrmel, 2007; Adjei et al., 2008; Trottier et al., 2012; Dowd et al., 2013; Suntornlohanakul et al., 2015; Smatti et al., 2018), and fewer studies have inspected the EBV viremia among healthy blood donors (Hudnall et al., 2008; Sousa et al., 2011; Polz et al., 2014; Smatti et al., 2017, 2018).Thus, this study was designed to estimate IgM antibodies against EBNA in relation to their sociodemographical features of HIV-infected individuals in two tertiary hospitals in Rivers State, Nigeria.

MATERIALS AND METHODS

Study Area

This study was piloted amongst HIV-infected individuals attending the HIV clinics in University of Port Harcourt Teaching Hospital (UPTH) and Rivers State University Teaching Hospital (RSUTH) both in Rivers State of Nigeria.

Study Design

Across-sectional research study. It was led to examine Epstein Barr Nuclear Antigens (EBNA)in HIV-infected individuals who

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attended retroviral clinic follow-up at University of Port Harcourt Teaching Hospital (UPTH) and Rivers State University Teaching Hospital (RSUTH) both in Port Harcourt, Rivers State, Nigeria.

Study Population

The study population was HIV-infected patients attending University of Port Harcourt Teaching Hospital (UPTH) and Rivers State University Teaching Hospital (RSUTH) both in Rivers State, Nigeria. At most, 182HIV-infected patients were employed while the entire HIV-infected patients in Rivers State, Nigeria were the target populace from which the findings were extrapolated. The demographic details relevant to this study was obtained.

Eligibility criteria

All HIV-infected patients age 4 to 73 years were eligible for the study. HIV-infected individuals with full data in the registration book were included. HIV-infected individuals with incomplete documentation such as age, laboratory test results, and duplicate records were exempted from the study.

Sample Collection, Laboratory Diagnosis and Quality Control

Five millilitres of venous blood were collected aseptically from the participants into sterile ethylene-diamine-tetra-acetate (EDTA) bottles. The collected samples of blood were transported in cold chain to the Virus & Genomics Research Unit of the Department of Microbiology, University of Port Harcourt, Nigeria and centrifuged at 1300 x g for 10min. Plasma were stored in two aliquots at -20^{0}C before carrying out other laboratory procedures to detect the existence of antibodies EBV (ELISA; IgM antibodies to EBNA; Dia.Pro, Milano, Italy), following the manufacturer's inserts. EBV seroreactivity was tested using the EBNA IgM ELISA for the qualitative determination of anti-IgM antibodies to EBNA in human plasma. Using manufacturers' instruction, the laboratory testing was done.

Data management and analysis

Data on socio-demographic variables and laboratory test results was collected from HIV patients' registration books. Data was then validated for inclusiveness, and entered into SPSS version 20for evaluation. Expressive statistics was done, then the outcomes were shown in tables. Chi square analysis was fit to identify dynamics related to HIV and EBV infections. A P-value ≤ 0.05 was considered to be statistically significant.

Ethical Approval

Ethical considerations and approval were obtained from the University of Port Harcourt Research Ethics Committee in keeping with the ethics for research involving human subjects.

RESULTS

Socio-demographical Features of the Study Participants

One hundred and eighty-two (182) HIV-infected individuals participated in the study, 91 from UPTH and 91 from RSUTH. The age ranges of the study participants were from 4 - 73 years (average age: 37.6 years). For UPTH, the age ranged from 9 – 73 years (average age = 39.2 years) and RSUTH, the age ranged from 4 – 73 years (average age = 36.1 years). The age groups 21 – 40 years constituted the largest populations making up 57.7%, followed by age group 41 – 60 years (30.8%) and 4-20 years (6.6%), while age group 60 – 73 years were the least (4.9%). Majority of the HIV-infected individuals were females (63.2%, n= 115) and males (36.8%, n= 67) as presented in Table 1. Majority were married (57.7%, n = 105) and69 (37.9%) were singles while 8 (4.4 %) were either widowed or divorced (Table 1). Based on educational background, 85 (46.7%), 73(40.1%) and 24 (13.2%) of the study participants obtained tertiary, secondary and primary education, respectively (Table 1). Based on religion, a lower percentage were Islamic (8.8%) while larger percentage of them were mainly Christian (91.2%) as illustrated in Table 1. Based on occupational

status, majority were employed as civil/public servants (18.1%). This was closely followed by students (17.6%), business (14.3%), artisans (12.1%), teachers (6.0%), farmers (5.5%), social/healthcare workers (4.4%), accountants/bankers (3.8%), while hoteliers'/hotel waiters (2.7%) and engineers (2.2%) were the least (Table 1).

Overall Seropositivity of Epstein Barr Nuclear Antigens (EBNA) IgM Antibodies in HIV-Infected Individuals in Rivers State, Nigeria

Of the 182 HIV-infected individuals studied, 38/182 (20.9%) were positive for IgM antibodies against EBNA, UPTH had 24.2% while RSUTH had 17.6%(Table1).

Sex-Related Seropositivity of anti-IgM antibodies against EBNA

The study sex-related statistical variances in the seropositivity of anti-IgM antibodies against EBNA (23.5% vs. 16.4%). Higher seropositivity of anti-IgM antibodies was noted among females (23.5%, n = 27/182) than in their male counterparts (16.4%, n = 11/182) as shown in Figure 1. Regarding respective hospitals, the seropositivity of anti-IgM antibodies against EBNA, higher seropositivity of anti-IgM was found in females (30.5%, n = 18/59) than in males (12.5%, n = 4/32) in UPTH and in males (20.0%, n = 7/35) than males (16.1%, n = 9/56) in RSUTH (Table 1).

Age-Related Seropositivity of anti-IgM antibodies against EBNA

The study also showed age-related statistical variances in the seropositivity of anti- EBNA IgM. Higher seropositivity was obtained amongst age-range 0-20 years (25.0%, n = 3/12) than other age-range 61-73, 21-40 and 41-60 years with 22.2% (n = 2/9), 21.9% (n = 23/105) and 17.9% (n = 10/56), respectively. For respective hospitals, higher seropositivity was documented amongst age-range 0-20 years (33.3%, n = 1/3) than other age-range in UPTH and age-range 60-73 years (25.0%, n = 1/4) than other age-range in RSUTH (Table 1).

Table 1: EBV IgM Seropositivity according to the sociodemographic characteristics and the respective Clinics

Socio-Demographic Characteristics	Classes	Overall		UPTH		RSUTH	
		No. Tested (%)	No Positive (%)	No Tested (%)	No Positive (%)	No Tested (%)	No Positive (%)
Sex	Males	67 (36.8)	11 (16.4)	32 (47.8)	4 (12.5)	35 (52.2)	7 (20.0)
	Females	115 (63.2)	27 (23.5)	59 (51.3)	18 (30.5)	56 (48.7)	9 (16.1)
Marital Status	Married	105 (57.7)	27 (25.7)	49 (46.7)	15 (30.6)	56 (53.7)	12 (21.4)
	Single	69 (37.9)	7 (10.1)	34 (49.3)	3 (8.8)	35 (50.7)	4 (11.4)
	Others	8 (4.4)	4 (50.0)	8 (100.0)	4 (50.0)	0 (0.0)	0 (0.0)
Age Groups	0 – 20	12 (6.6)	3 (25.0)	3 (25.0)	1 (33.3)	9 (75.0)	2 (22.2)
	21 – 40	105 (57.7)	23 (29.1)	51 (48.6)	13 (25.5)	54 (51.4)	10 (18.5)
	41 – 60	56 (30.8)	10 (17.9)	32 (57.1)	7 (21.9)	24 (42.9)	3 (12.5)
	> 60	9 (4.9)	2 (22.2)	5 (55.6)	1 (20.0)	4 (44.4)	1 (25.0)
Educational Level	Primary	24 (13.2)	2 (8.3)	9 (37.5)	1 (14.3)	15 (62.5)	1 (6.7)
	Secondary	73 (40.1)	15 (20.5)	48 (65.8)	12 (25.0)	25 (34.2)	3 (12.0)
	Tertiary	85 (46.7)	21 (24.7)	34 (40.0)	9 (26.5)	51 (60.0)	12 (23.5)
Religion	Christian	166 (91.2)	29 (17.5)	82 (49.4)	15 (18.3)	84 (50.6)	14 (16.7)
	Islam	16 (8.8)	9 (56.3)	9 (56.3)	7 (77.8)	7 (43.7)	2 (28.6)

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Occupation	Business	26 (14.3)	7 (26.9)	10 (38.5)	4 (40.0)	16 (61.5)	3 (18.8)
	Student	32 (17.6)	5 (15.6)	6 (18.8)	1 (16.7)	26 (81.3)	4 (15.4)
	Artisan	24 (13.2)	5 (4.2)	16 (66.7)	4 (25.0)	8 (33.3)	1 (12.5)
	Teacher	11 (6.0)	4 (36.4)	5 (45.5)	3 (60.0)	6 (54.5)	1 (16.7)
	Civil/Public Servant	33 (18.1)	7 (21.2)	19 (57.6)	5 (26.3)	14 (42.4)	2 (14.3)
	Trader	22 (12.1)	3 (13.6)	14 (63.6)	2 (14.3)	8 (36.3)	1 (12.5)
	Farmer	10 (5.5)	0 (0.0)	6 (60.0)	0 (0.0)	4 (40.0)	0 (0.0)
	Hotelier/ Hotel Waiter	5 (2.7)	1 (20.0)	4 (80.0)	0 (0.0)	1 (20.0)	1 (100.0)
	Engineer	4 (2.2)	1 (25.0)	3 (75.0)	0 (0.0)	1 (25.0)	1 (100.0)
	Accountant/ Banker	7 (3.8)	2 (28.6)	6 (85.7)	1 (16.7)	1 (14.3)	1 (100.0)
	Social/ Health Worker	8 (4.4)	3 (37.5)	2 (25.0)	2 (100.0)	6 (75.0)	1 (16.7)
	TOTAL	**182 (100.0)**	**38 (20.9)**	**91 (50.0)**	**22 (24.2)**	**91 (50.0)**	**16 (17.6)**

Marital Status-Related Seropositivity of anti-IgM antibodies against EBNA

Table 1 shows marital status-specific seropositivity of anti-IgM antibodies against EBNA. Higher seropositivity of anti-IgM antibodies against EBNA was documented among divorced and widowed category (50.0%) than the married (25.7%) and singles (10.1%). These variances were associated significantly. Regarding respective hospitals, the same trend was noted in UPTH where higher seropositivity of anti- EBNA IgM antibodies was also observed among divorced and widowed category (50.0%) than the married (30.6%) and singles (8.8%). However, higher seropositivity was observed among the married (21.4%) than the singles (11.4%) while others (divorced and widowed) category had zero seropositivity among HIV-infected individuals in RSUTH (Table 1).

Education- Specific Seropositivity of anti-IgM antibodies against EBV

Table 1 shows educational level- specific seropositivity of anti-IgM antibodies against EBV. Education levels had significant relationship with the seropositivity of anti-IgM antibodies against EBV. A similar trend was also noted as higher seropositivity of IgM antibodies against EBV was noticed among HIV-infected individuals with tertiary education (24.7%, n = 21/85) likened to those having secondary education (20.5%, n = 15/73) and primary education (8.3%, n = 2/24) as shown in Table 1. Also, the same trend was noticed amongst respective hospitals. Higher seropositivity of anti-EBNA IgM was recorded among those with tertiary education (26.5%) than those with secondary (25.0%) and primary education (11.1%) in UPTH (Table 1). In RSUTH, higher prevalence was also observed among those with tertiary education (23.5%) than those with secondary education (12.0%) and primary (6.7%) as shown in Table 1.

Seropositivity of anti-IgM antibodies against EBV Major Immunodominant Antigens as relates to Religion

Table 1 shows the seropositivity of anti-IgM antibodies against EBV as relates to religion. Higher seropositivity was seen amongst Islamic religion (56.3%, n= 9/16) compared to Christian religion (17.5%, n = 29/166). Statistically, there was significant relationship between religion and the seropositivity of anti-IgM antibodies against EBV (Table 1). The same trend was observed from the perspectives of respective hospital.

Statistically, significant variance existed in the seropositivity of anti-IgM in UPTH and RSUTH. In UPTH, results indicated that the seropositivity of IgM was higher among those in Islamic religion (77.8%) than Christians (18.3%). While in RSUTH, seropositivity was also higher among those in Islamic religion (25.6%) than Christians (16.7%) (Table 1).

Seropositivity of anti-IgM antibodies against EBNA as relates to Occupational Status

Table 1 shows the seropositivity of anti-IgM antibodies against EBV as relates to occupation. Higher EBV IgM prevalence existed among social/healthcare workers (37.5%, n= 3/8) than other occupations. Traders (13.6%) had the least and farmers had a zero prevalence. There was significant relationship between occupation and the EBV IgM seropositivity (Table 1). In respective hospitals studied, significant difference existed in the anti-EBV IgM seropositivity in UPTH and RSUTH. In UPTH, IgM seropositivity was highest among social/healthcare workers (100.0%). Students and accountants/bankers (16.5%) had the least seropositivity while farmers, engineers and hoteliers/hotel waiters had zero seropositivity. In RSUTH, IgM seropositivity was highest among accountants/bankers, engineers and hoteliers/hotel waiters (100.0%), while artisans and traders had the least seropositivity (12.5%) and farmers had zero seropositivity (Table 1).

DISCUSSION OF FINDINGS

This study aimed at evaluating anti-IgM antibodies against Epstein Barr nuclear antigens (EBNA) among HIV-infected individuals in Rivers State, Nigeria. The current study showed an overall seropositivity of 20.9% (38/182) for anti-EBNA IgM antibodies. Consequently, the manifestation of anti-EBV IgM antibodies in a patient sample could be a signal of history of current or ongoing EBV infection and replication which confirms that they are just exposed to the virus. The seropositivity rate obtained in this study is high. This could be linked to the immunocompromised state of the individuals affected (Okonko et al., 2020, 2023; Cookey et al., 2023).

The value 20.9% reported for anti-IgM antibodies in this particular study is in comparison with that of previous studies. For IgM antibodies, previous studies have reported that over 50.0% of adolescents are EBV-seropositive in USA and Europe (Kangro et al., 1994; Cohen, 2000; Dowd et al., 2013; Anejo-Okopi et al., 2019). Also, previous studies in Africa (Nigeria and Ethiopia) and Asia (Taiwan) have reported 6.0%, and 11% -17% seropositivity (Chen et al., 2015; Bishop and Adegoke, 2016; Kolawole et al., 2017; Ibrahim et al., 2018; Anejo-Okopi et al., 2019), but no comprehensive data on EBV among HIV-infected individuals in Nigeria.

The observed 20.9% seropositivity of anti-IgM antibodies against EBNA in this study is higher than previous studies done in Nigeria and outside Nigeria. The 20.9% reported in this study is greater than the 6.53% reported by Anejo-Okopi et al. (2019) in Jos, Nigeria. And higher than the 1.8% reported by Smatti et al. (2017) in Qatar, the 11.1% reported byMishra et al. (2004) in India, 4.4% reported by Elansary et al. (2016) in Cairo, Egypt, the 8.7% as reported by Norzuriza et al. (2008) in Malaysia, the 4.0% reported by Kolawole et al. (2017) in Ogbomoso, Nigeria, the 6.6% reported by Bishop and Adegoke (2016) in Zaira, North Nigeria, the 0.15% reported by Cui et al. (2018) in Beijing, and the 2.5% and 0.0% reported by Xuan et al. (2020) in patients and healthy control, respectively, in Xiamen, China. However, this 20.9% reported for IgM antibodies is much lower than the 97.9% reported by Binnicker et al. (2008) in the USA and the 94.4% reported by Färber et al. (2001) in Germany. It is a little lower than the 22.2% reported by Okonko et al. (2020) in Abakaliki, Nigeria and comparable to the 20.0% reported by Adjei et al. (2008) in Ghana.

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An integral amount of risk factors, including age (Dowd et al., 2013; Chen et al., 2015; Anejo-Okopi et al., 2019), gender (Crawford et al., 2002; Higgins et al., 2007; Dowd et al., 2013; Chen et al., 2015; Anejo-Okopi et al., 2019), ethnicity (Balfour et al., 2013a; Dowd et al., 2013; Chen et al., 2015), country or region of residence (Higgins et al., 2007; Anejo-Okopi et al., 2019), and educational level (Levine et al., 2012; Dowd et al., 2013; Chen et al., 2015; Anejo-Okopi et al., 2019), have been connected to the EBV seropositive rate (Chen et al., 2015). The investigation of possibility factors for the achievement of EBV infection is helpful in categorizing vulnerable populaces (Chen et al., 2015).

This study also showed sex-related statistical differences (23.5% vs. 16.4%) in the seropositivity of anti-IgM antibodies against EBNA. This study noted that female gender had higher IgM prevalence than males (Sumaya et al., 1975; Biggar et al., 1981; Wagner et al., 1994; Haque et al., 1996; Chen et al., 2015). In sex distribution, significant variance existed in anti-IgM reactivity of Epstein–Barr virus. This is in disagreement with Elansary et al. (2016) in Cairo, Egypt. Miller (2002) reported no sex-association with EBV antibodies. There was no discernible variation in EBV seropositivity between males and females, according to a study by Norzuriza et al. (2008). The sex-associated anti-IgM prevalence reported in this study is also in disagreement with other previous studies (Wagner et al., 1994; Adjei et al., 2008) who showed no sex-significance. It also disagrees with that of Smatti et al. (2017) who reported no significant association in Qatar. This may be probably due to difference in size of the samples used. Although emphasized mechanisms relating high EBV antibodies in females remain uncertain, but the reason possibly will be owed to closer contacts with the children than men (Smatti et al., 2017).

This study also showed statistical differences in age-related seropositivity of anti-EBV IgM. Unlike anti-IgG (a measure of past EBV infection), EBV IgM (a measure of acute EBV infection) was 25.0% in 0-20years age group which was higher than other age groups 61-73 (22.2%), 21-40 (21.9%) and 41-60 (17.9%) years. This was much higher than the 12.2% reported by Cui et al. (2018) in 0–10-year-old in Beijing and the 1.6%-2.7% reported by Xiong et al. (2014) in 1–10-year-old in Taiwan. This also disagrees with Okonko et al. (2020) who shows that the seropositivity of EBV IgM antibodies in HIV-infected individuals based on age were not significant. About98.0% of Chinese patients became infected with EBV before age 30 (Cui et al., 2018). This might be likened to the finding of this present study which reported highest seropositivity of EBV IgM in 0-20 years. Other values reported by Cui et al. (2018) corroborated with what was obtained in this study. Cui et al. (2018) reported the seropositivity of EBV VCA-IgM to be 14.6% in patients aged under 5 years, 10.2% in 6-10 years, 10.4% in 11-20 years, 6.3% in 21-30 years and 3.1% in 31-40 years, and decreased to 2.0%-3.0% in older patients in Beijing.

This study also disagrees with that of Anejo-Okopi et al. (2019) who reported a higher seropositivity of EBV IgM (5.81%) in age group 31-40 years in a similar study in Jos, Nigeria. It also deviated from earlier reported studies (Chakraborty et al., 2010; Abdollahi et al., 2014) which reported higher seropositivity in age groups 21-40 and 30 $\leq$ 40 years, respectively. Additionally, a recent study conducted in the United Kingdom in 2020 found that the adolescent age group had an overall higher EBV seroprevalence (Kuri et al., 2020). Conversely, a related study by Winter et al. (2020) suggested that EBV seroprevalence typically rises until about the age of 24 and then stays stable. These differences may be as a consequence of sexual activities, networking assayed antibody type and geographical location.

More so, cases of inactive EBV contamination could result in re-triggering via the lowering down of the host's internal defence network through contamination by HIV. Age-specific EBV antibody prevalence showed that white children take their vaccines

as late as 12 years, whereas non-whites need to be vaccinated earlier that, before they are 6 years old (Balfour et al., 2013b). However, this study revealed a significant association between IgM antibodies marital status as higher prevalence was also observed among divorced and widowed category (50.0%) than married (25.7%) and singles (10.1%).

This study also stated that higher level of education is associated to the EBV seropositivity in Rivers State, Nigeria. Education level of the study participants also had significant connection with the seropositivity of IgM antibodies against EBNA as tertiary education (24.7%) had higher prevalence than secondary education (20.5%) and primary education (8.3%). In a study by Chen et al. (2015), it was revealed that 46.0% of seronegative individuals had EBV seroconversion for the period when they were in college. However, there was significant relationship between religion and seropositivity of anti-IgM antibodies as higher seropositivity existed among Islamic religion (56.3%) than Christian religion (17.5%).

In terms of occupational level, a higher seropositivity existed among social/healthcare workers (37.5%) than other occupational groups [teachers (36.4%), accountants/bankers (28.6%), and engineers (25.0%)] among others, with traders (13.6%) as the least and farmers had a zero seropositivity. Those findings were not the same with those found by Figueira-Silva and Pereira (2004) in Brazil. Their overall seropositivity of anti-EBV antibodies in different governorates matched well with that which was reported worldwide.

CONCLUSION

This study showed a high rate of anti-EBV IgM antibodies (20.9%) against Epstein Barr nuclear antigens (EBNA)in HIV-infected individuals in two tertiary hospitals in Rivers State, Nigeria. Thus, this study verified earlier studies that presented high EBV seroprevalence, touching>50.0% the populace in Nigeria. Future larger and multi-center clinical research are suggested to address some unanswered seroepidemiological questions.

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