(RESEARCH ARTICLE)

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Seroprevalence of Epstein Barr IgG antibody among patients presenting at a tertiary hospital in Port Harcourt, Nigeria

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Abstract

Epstein Barr virus (EBV) has become increasingly recognized as one of the causes of cancer in humans and in Nigeria, its seroepidemiology, has not been fully elucidated. EBV vaccination is not a part of the Expanded Programme of Immunization (EPI) therefore, immunization against the virus is non-existent. This study was conducted to assess the seroprevalence of EBNA IgG antibody in patients in Port Harcourt, Nigeria. Demographic data and sera were collected from 80 consenting patients of different gender and ages from the University of Port Harcourt Teaching Hospital, Rivers State. Their sera were screened for EBV IgG antibodies using enzyme linked immunosorbent assay (ELISA) kit (DIA.PRO Diagnostic Bioprobes, Milano). Of the 80 sera evaluated for EBV Immunoglobulin G antibody, 68 (85%) were positive and 12 (15%) were negative. Seropositivity rate was higher in males (89.3%) than in females (82.9%). Patients within 21-25years had the highest prevalence rate of 87.2%. Age and gender were not significantly associated with the seroprevalence of EBNA IgG antibodies. From the result, the immunity gap in the population is significant. Hence, there is need for vaccination of susceptible individuals in order to ensure the control and elimination of Epstein Barr virus in Nigeria.

Keywords: Epstein Barr virus; IgG antibody; Seroprevalence; ELISA

1   Introduction

Epstein Barr virus (EBV) is also called human herpes virus 4 (HHV4). It is a double-stranded DNA virus belonging to family Herpesviridae, subfamily Gamma Herpesvirinea and genus Lymphocriptovirus (Kieff & Rickinson, 2007; Mustapha et al., 2020). It is a virus that is found all over the world and infects nearly all humans by the time they reach adulthood. Consequently, most adult have a serological evidence of past infection (Huang et al., 2013). EBV is associated with several diseases whose incidence differs dramatically in different parts of the world (Kieff & Rickinson, 2007; Kafita et al., 2018).

EBV infection is the primary cause of infectious mononucleosis (IM), a common infection worldwide with a lifetime prevalence of 90% (Fugl & Andersen, 2019). It is also involved in the cause of other diseases like Burkitt lymphoma, Hodgkin lymphoma, nasopharyngeal carcinoma and gastric carcinoma, multiple sclerosis, lymphomatoid granulomatosis and oral hairy leukoplakia (Shi et al., 2022). Primary infection results in transient viremia followed by rapid immune response (Gulley, 2001). The virus later becomes latent and subclinical in the body (Omoseebi, et al.,

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2018). In some cases, the virus may reactivate. This does not always cause symptoms, but people with weakened immune systems are more likely to develop symptoms if EBV reactivates (CDC, 2020).

The course of EBV infection is determined by the virus load and an individuals' immune system state, which in turn is determined by the person's gene composition, other infection history and several environmental factors, which all may influence the immune capacity of a person to various degrees (Houen & Trier 2021). Diagnosing EBV infection can be challenging because the symptoms are similar to other illnesses (CDC, 2020), though, serology is reported to be the simplest way to test for EBV infection and past infection is deduced from the presence of IgG antibodies to EBV antigens.

Most publications on the incidence and prevalence of EBV antibodies in both children and adults have reported high seroprevalence rates of EBV IgG antibodies, especially in HIV infected patients, falling within the range of 60% to about 95%. In China (60.5%) (Huang et al., 2013), Brazil (71%) (Figueira-Silva & Pereira, 2004), India (89.2%) (Patel et al., 2021), Iran 81.4% and 90.4% (Sharifipour & Davoodi, 2020; Abdollahi et al., 2014) and Germany 93.1% (Abrahamyan et al., 2020).

A meta-analysis on the prevalence of EBV among Nigerian patients suffering from various diseases revealed a prevalence of 20.3% (Irekeola et al., 2022). Other studies carried out in Katsina and Abakaliki reported a seroprevalence rate of 32.6% and 95.6% respectively (Mustapha et al., 2020; Okonko et al., 2020).

It is obvious that EBV antibodies are circulating in persons in Nigeria, and yet there is no national program to vaccinate susceptible individuals against the virus. Thus, infections with EBV will still occur among individuals thereby, posing more risk to immunocompromised individuals. This study was carried out to determine the seroprevalence of EBNA IgG antibodies in different gender and age groups of patients attending a tertiary hospital in Port Harcourt, Rivers State, Nigeria.

2 Material and methods

2.1 Study Area

The study was conducted among patients attending the University of Port Harcourt Teaching Hospital, Port Harcourt, and Rivers State, Nigeria. Port Harcourt is the capital of Rivers State located in the South Southern region of Nigeria. The indigenes are predominantly Ikwerre by tribe.

2.2 Study design

A cross-sectional study was conducted, from September through October, 2015, among 80 patients of different sex and ages attending the University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria. Ethical consideration and approval for the study was obtained from the University of Port Harcourt Research Ethics Committee. A structured questionnaire was used to collect demographic data from consenting patients.

2.3 Sample Collection and processing

Three milliliters of blood was aseptically collected by venipuncture from 80 consenting patient and dispensed into appropriately labeled sample tube, screwed-capped and left at room temperature for about 40 minutes, after which it was spun at 3,000rpm for 10 minutes to separate serum from blood. Samples were clearly identified with codes in order to avoid misinterpretation of results. The sera were carefully aspirated into plain bottles and stored at -20°C until analyzed.

2.4 Analysis of blood Samples

Laboratory analysis was carried out at the Virus Research Unit, Department of Microbiology, University of Port Harcourt, Choba, Rivers State. The samples were analyzed for EBNA specific IgG antibodies (qualitative assay of IgG antibodies) by using the commercially available ELISA kit manufactured by Dia.Pro. Diagnostic Bioprobes Srl (Milano) according to manufacturer's instructions. Washing was done automatically using an ELISA washer (ELx50, Biotek, USA). Plates were read using an ELISA plate reader (ELx808i, Biotek, USA) at an absorbance of 450 and 630 nm (Okonko & Egbogon 2022). Samples with a concentration lower than 5 arbU mL^{-1} were considered negative for anti-EBNA IgG antibodies. Samples with a concentration ranging 5-10 arb U mL^{-1} were considered in the grey zone. Samples with a concentration higher than 10 arbU mL^{-1} were considered positive for anti-EBNA IgG antibodies.

2.5 Data Analysis

The data obtained from questionnaires and laboratory analysis were entered into Microsoft Excel, analyzed using Statistical Package for Social Sciences version 21. Pearson Chi-square was calculated at 95% confidence interval and *P*-value < 0.05 was considered significant to determine the association between the presence of the antibodies to the virus and other parameters.

3 Results

3.1 Age and Gender characteristics of the study participants

A total of 80 patients were enrolled in this study. The age of the participants ranged from 15 to 30 years. More than half of the patients enrolled were females (65%) while males were 35%. Most of the patients were in age group 21–25 years (39/80, 48.7%), followed by age group 26–30 years (32/80, 40%) and lastly, age group 15-20 years (9/80, 11.3%). No significant difference was observed in relation to their age and sex. This is as shown in Table 1.

Table 1 Prevalence of EBV IgG Antibody based on Age and Gender of study participants

Variable	Number Tested	Positive %	Negative %	P. value
Sex				
Males	28 (35.0)	25 (89.3)	3 (10.7)	0.43
Females	52 (65.0)	43 (82.7)	9 (17.3)	
Age groups (years)				
15-20	9 (11.3)	7 (77.8)	2 (22.2)	0.77
21-25	39 (48.7)	34 (87.2)	5 (12.8)	
26 -30	32 (40.0)	27 (84.4)	5 (15.6)	
Total	80 (100.0)	68 (85.0)	12 (15.0)	

3.2 Overall Prevalence of EBV

Of the 80 sera samples collected and analyzed for EBNA IgG antibodies, an overall seropositivity rate of 85% (68/80) were positive and 15% (12/80) were negative (Figure 1).
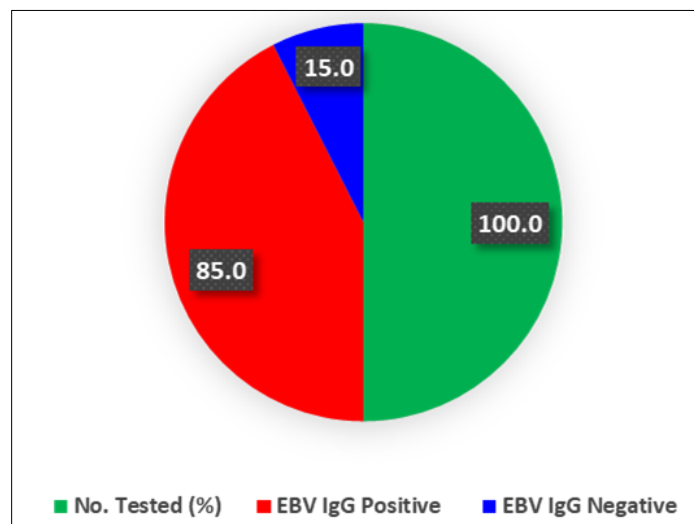

Figure 1 Overall Prevalence of EBV IgG antibody

3.3 Gender-specific seroprevalence of EBV

Figure 2 shows the prevalence of EBV IgG antibody in relation to sex. The highest prevalence rate of 89.3% occurred in males than females (82.7%).
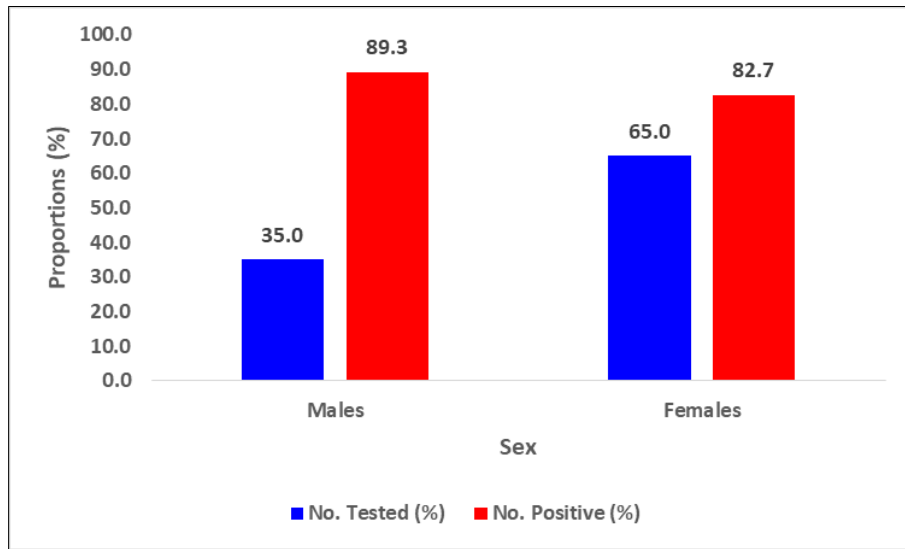

Figure 2 Prevalence of EBV IgG antibody in relation to Sex

3.4 Age-specific seroprevalence of EBV

Figure 3 shows the prevalence of EBV IgG antibody with respect to age groups. The highest prevalence rate (87.2%) was obtained in age group 21-25 years while the lowest (77.8%) was obtained in age group 15-20 years.
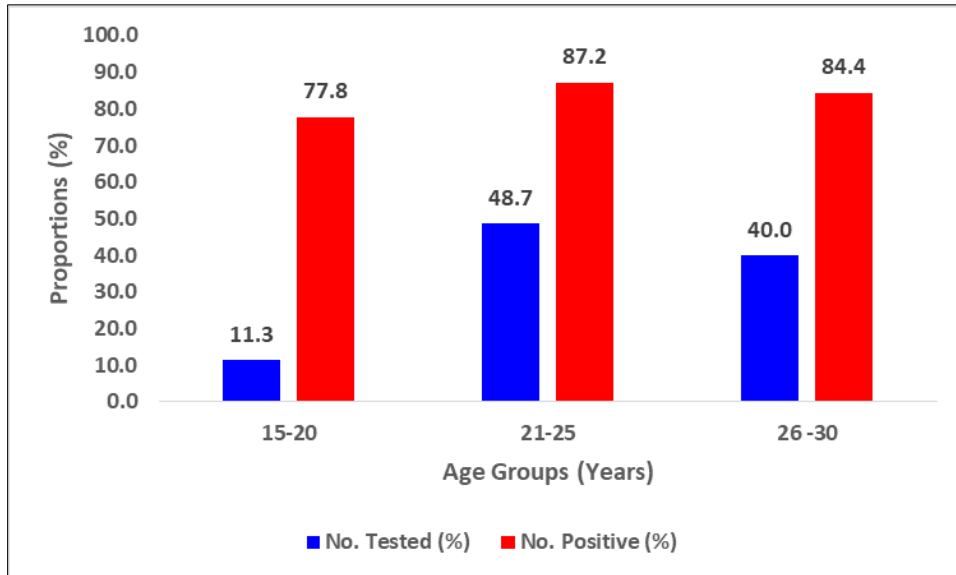

Figure 2 Prevalence of EBV IgG antibody in relation to Age

4 Discussion

The detection of IgG antibodies in sera has been a useful and standard method in determining the incidence and prevalence of EBV infection and the level of immunity in a population (Sharifipour & Davoodi, 2020). In this study, the seroprevalence of EBV IgG antibodies in individuals in Port Harcourt was found to be 85%. This finding corroborates with reports from other countries such as London (85.3%) (Kuri et al., 2020) Bahrain (86%) (Farid & Al-Biltagi, 2017),

India (89.2%) (Patel et al., 2021), Malawi (89%) (Westmoreland et al., 2016) and Iran (81.4%) (Sharifipour & Davoodi, 2020).

Comparatively, several investigators have earlier reported low prevalence rate of IgG in other countries such as: China 58% (Yan et al., 2018), Ghana 20% (Adjei et al., 2008), Kenya 73% (Slyker et al., 2013) and Nigeria, where 20.3% was reported from a systematic review and meta-analysis of EBV infection (Irekeola et al., 2022). Also, 32.6% was reported in HIV patients in Katsina (Mustapha et al., 2020). However, the result in this study was lower than that earlier observed among tertiary students in Port Harcourt (Okonko & Egbogon, 2022).

The variation in prevalence rates in these studies may be due to laboratory methods, differences in geographical location, socio-economic status, crowding (Balfour et al., 2013), poor hygienic practices (Mustapha et al., 2020) and possibly, lack of immunization.

The age-based prevalence of IgG antibodies against EBV among the patients within 21- 25 years revealed the highest prevalence of 87.2%. It was observed that a combination of the 21-25 years and 26-30 years age bracket constituted 88.75% of the patients sampled in this study. This is suggestive, showing that the IgG antibodies are more prevalent in young adults i.e. between 21 to 30 years of age. This finding fits the global burden of EBV infection in adults (Wong et al., 2022). It is also consistent with a research conducted in Port Harcourt where a high prevalence rate was recorded among university students (Okonko & Egbogon, 2022) and in Iran, where seroprevalence was as high as >80% in adults from 20years and above when compared to primary school children with 70% seroprevalence (Abdollahi et al., 2014). Some studies however, in other populations have demonstrated a decline in age-adjusted seroprevalence of EBV (Balfour et al., 2013, Fourcade et al., 2017). Moreover, the consistently higher EBV IgG seroprevalence among all age groups may reflect a genuine increase in seroprevalence in the study area, differences in population sampling, or different sensitivity and specificity of the assays used (Kuri et al., 2020).

A higher prevalence rate of IgG antibodies against EBV was obtained in males (89.3%) than in females (82.7%). This corroborates with the result obtained in Korea, Kuwait and Tehran, Iran (Keun & Mee, 2011); Al-Temaimi el., 2015, Abdollahi et al., 2014) and negates the findings reported in Abakaliki (Okonko et al., 2020). It is not certain why the seroprevalence is high in males when there is a general notion that females mount more vigorous antibody and cellular responses to infection or vaccination than males (Okonko & Egbogon, 2022). Though it has been suggested that the high prevalence of EBV antibodies in males may be due to homosexual relationships (Abdollahi et al., 2014). However, the seroprevalence of EBV IgG antibodies in these patients based on gender was not statistically significant.

5   Conclusion

From this study, there is evidence of high seroprevalence of IgG antibodies against Epstein Barr virus in patients in Port Harcourt tagging along with it a significant proportion of immunity gap among the residents. Therefore, there is a need to vaccinate susceptible individuals in order to ensure the control and elimination of Epstein Barr virus in the study area.

Compliance with ethical standards

Disclosure of conflict of interest

Authors have declared that no competing interests exist.

Statement of ethical approval

All authors hereby declare that all experiments have been examined and approved by the University of Port Harcourt Research Ethics committee and have, therefore, been performed following the ethical standards laid down in the 1964 Declaration of Helsinki.

Statement of informed consent

All authors declare that informed consent was obtained from all individual participants included in the study.

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