



PATTERN OF SEROPREVALENCE AND SOCIO-DEMOGRAPHIC DISTRIBUTION OF HEPATITIS B VIRUS INFECTION AMONG POTENTIAL BLOOD DONORS ATTENDING AHMADU BELLO UNIVERSITY TEACHING HOSPITAL-ZARIA, NIGERIA

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ABSTRACT

Background: Blood transfusion is an essential medical service that ensures life safety and saves lives in situations like massive blood loss.

Aim: This study aims to provide insight into the seroprevalence and socio-demographic distribution trends of HBV infection among blood donors attending blood donor bay of ABUTH-Zaria, Nigeria, as well as identify the most potential risk factors that contribute to its transmission.

Methodology: This is a cross-sectional comparative study that employed a simple random sampling technique in recruiting 131 potential blood donors (18-57 years of age; 128 males and 3 females) attending the blood donor bay in ABUTH-Zaria, Nigeria. Five milliliter (5 mL) of whole blood was collected from each participant and screened for Hepatitis B surface antigen (HBsAg) using ELISA. Demographic characteristics data were collected and validated using the Epi Info™ 7.2.3 questionnaire database. Ethical clearance was obtained from the HRECs of ABUTH-Zaria and informed consent was obtained before recruitment. The study participants for this research were recruited from November, 2022 to February, 2023. Data were analyzed using GraphPad Prism v6.05.

Results: The 131 recruited study participants had an overall seroprevalence of 8.4%. A Median Interquartile range (IQR) age of 27.5 (22-35) years was observed. The highest HBV prevalence (4.6%) was observed between the age group of 28-37 years. Male gender, Hausa/Fulani tribe, Entrepreneurs, married and secondary school certificate holders had the highest HBV prevalence rate (7.6%, 6.9%, 5.3%, 5.3%, and 5.3% respectively). Known HBV infection risk factors such as sharing clippers, needle stick injuries, local circumcision, and tribal marks had the highest HBV prevalence rate (7.6%, 5.3%, 7.6%, and 4.6% respectively).

Conclusion: Zaria has a high HBV endemicity (8.4%) with youths at highest risk. Effective awareness approaches, including health education, disease surveillance, tighter vaccination policies, and stakeholder involvement, are needed for prevention and control.

Keywords: HBV, Blood, Donors, ABUTH-Zaria, Seroprevalence, Nigeria

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INTRODUCTION

Blood transfusion is one of the most crucial and essential medical services that ensures life-safety and saving especially in situations like massive blood loss due to trauma, burns, or extensive surgery (Jersild and Hafner, 2017). Blood transfusion treatment is usually performed in health-care settings. In these health-care settings (for example, a hospital), the blood transfusion services/unit deals with various aspects of the blood transfusion chain, from potential donor (information and selection of donors, blood collection, blood testing, blood processing, blood storage, blood transportation) to the potential recipient (selection and distribution of appropriate components for transfusion) and should link to the clinical interface and patient follow-up. Blood transfusions remain the leading cause of HBV transmission in Nigeria, thereby threatening safe blood transfusion for saving lives (Ikerionwu, 2018). Available data suggest the sub-Saharan Africa is among the HBV high prevalence population in the world (>8% prevalence) (MacLachlan *et al.*, 2015; Oluyinka *et al.*, 2015), making it a major public health concern in Nigeria.

Hepatitis B virus is a serious health concern globally, with over 257 million people infected, and approximately 887,000 deaths annually (Kim and Kim, 2018). In Nigeria, the prevalence of HBV is high, and studies have shown that it varies across different age groups, genders, occupation, ethnicity, and level of education (Gambo *et al.*, 2012). To develop effective preventive and control measures in Northern Nigeria, it is pertinent to understand the distribution and associated risk factors of HBV.

This study aims to provide insight into the prevalence and distribution of HBV among different demographic characteristics distribution in ABUTH-Zaria, Nigeria, as well as identify the potential risk factors that contribute to its transmission. The finding from this study will be useful to policymakers, healthcare providers, and other stakeholders in the fight against the spread of HBV in Nigeria. This will also

provide critical data to optimize and assess the impact of current prevention and control strategies, including disease surveillance and diagnoses, vaccination policies and management for those infected.

MATERIALS AND METHODS

Study Area

This study was conducted at Blood donor bay, Department of Hematology and Transfusion, Ahmadu Bello University Teaching Hospital (ABUTH), Zaria, Nigeria.

Ethical Consideration

Ethical clearance was obtained from Human Research Ethical Committees (HRECs) of the ABUTH, Zaria (ABUTHZ/HREC/H45/2022). Informed consent was also sought and obtained from each participant before recruitment. Information of the participants was encrypted, and their confidentiality was secured. The rights of participants were well spelt out and respected throughout the study.

Study Population

This study was conducted among potential blood donors (Consenting adults, 18-57 years of age) attending ABUTH-Zaria.

Study Design

This is a cross-sectional comparative study.

Sampling Technique

A simple random sampling technique was used to recruit a total of 131 (both male and female) potential blood donors for the study.

Sample Collection, Processing and Analyses

Five milliliter (5mL) of whole blood was collected from each participant using a 5mL plain-vacutainer sample bottle. Firstly, a Hepatitis B surface antigen (HBsAg) Rapid Diagnostic Test (RDT) kit was used to screen for HBV. Later, an anti-HBc (total) ELISA assay was conducted using serum samples extracted from the plain-vacutainer bottle centrifuged at 2000 rpm for 5 minutes. All serum samples were stored at -20°C until analyses. All serological assay techniques were also carried out aseptically.

Data Collection and Management

The demographic characteristics data were collected and validated using Epi info™ 7.2.3 questionnaire database.

The study participants for this research were recruited from November, 2022 to February, 2023.

The data obtained were analyzed using GraphPad Prism v6.05.

RESULTS

Among the one hundred and thirty-one (131) participants recruited for the study, 11 (8.4%) were seropositive for HBV as illustrated by Figure 1.

The Median Interquartile range (IQR) age for this study is 27.5 (22 – 35) years. Figure 2 illustrated 61(46.56%) participants ranging from 18-27 years (37.81-55.48, 95% CI); 53 (40.46%) participants ranging from 28-37 years (31.98-49.38, 95% CI); 15 (11.45%) participants ranging from 38-47 years (6.55-18.18, 95% CI); 2 (1.53%) participants ranging from 48-57 years (0.19-5.41, 95% CI). The highest HBV point prevalence of 4.6% was observed within the age range of 28-37 years whereas 0% was within the older age group of 38-57 years.

In this study, Figure 3 illustrated 128 (97.71%) of participants are males (93.45-99.53, 95% CI) and 3(2.29%) of participants are females (0.47-6.55, 95% CI). The male population demonstrated the highest HBV point prevalence of 7.6%, whereas 0.8% was among the female population.

Figure 4 illustrated 116 (88.55%) participants belonging to the Hausa/Fulani (79.64-98.20, 95% CI), 6 (4.58%) as Yoruba (1.70-9.70, 95% CI), 2 (1.53%) as Igbo (0.19-5.41, 95% CI) and 7 (5.34%) as others (2.18-10.70, 95% CI) tribe of Nigeria. The Hausa/Fulani tribe demonstrated the highest HBV point prevalence at 6.9% and the lowest among the Igbo tribe with none.

Figure 5 illustrated 71 (54.20%) participants are Entrepreneurs (45.27-62.93, 95% CI); 26 (19.85%) participants are artisans (13.39-

27.71, 95% CI); 23 (17.56%) participants are civil servants (10.40-28.86, 95% CI); 11 (8.40%) participants are unemployed (3.38-18.05, 95% CI). The highest HBV point prevalence of 5.3% was observed among entrepreneurs whereas none among the unemployed.

The educational status of the participants was illustrated in Figure 6. A total number of 63 (48.09%) participants have a secondary schools certificates status (39.29-56.99, 95% CI); 54 (41.22%) participants with tertiary education status (32.70-50.15, 95% CI); 9 (6.87%) participants with primary school certificate status (3.19-12.64, 95% CI); and 5 (3.82%) participants with Informal education status (1.25-8.68, 95% CI). The highest HBV point prevalence of 5.3% was observed among participants with secondary school certificate whereas none among the informal educational status.

Figure 7 illustrated 68 (51.91%) participants are married (43.01-60.71, 95% CI) and 63 (48.09%) participants are single (39.29-56.99, 95% CI). The married participants showed the highest HBV point prevalence of 5.3% as compared to the 3.1% demonstrated by the single-marital status participants.

Figure 8 illustrated the frequency of some known HBV risk factors among the participants. 115 (24.89%) with local circumcision, 102 (22.08%) with clipper sharing, and 90 (68.70%) with HBV-status prior knowledge with the highest frequency of attributes among the participants at 95% CI range (21.01-29.10); (18.38-26.14) and (60.02-76.52) respectively. The lowest risk factor frequency was 3 (0.65%) participants at a 95% CI range (0.13-1.89). The highest HBV point prevalence was observed among both local circumcision and clipper sharing as 7.6%, and none among alcohol consumption risk factor.

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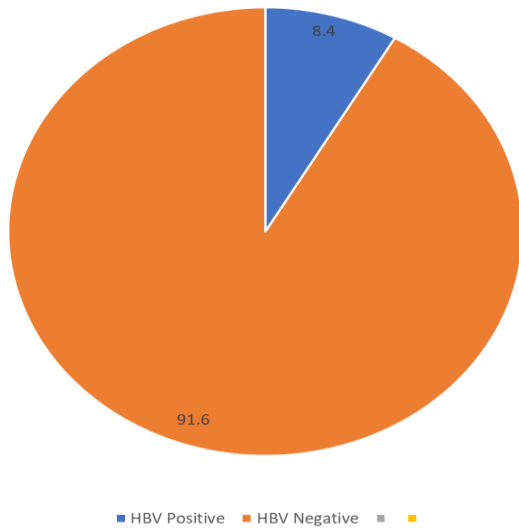


Figure 1: Hepatitis B virus seroprevalence among potential blood donors (n=131) attending ABUTH-Zaria, Nigeria.

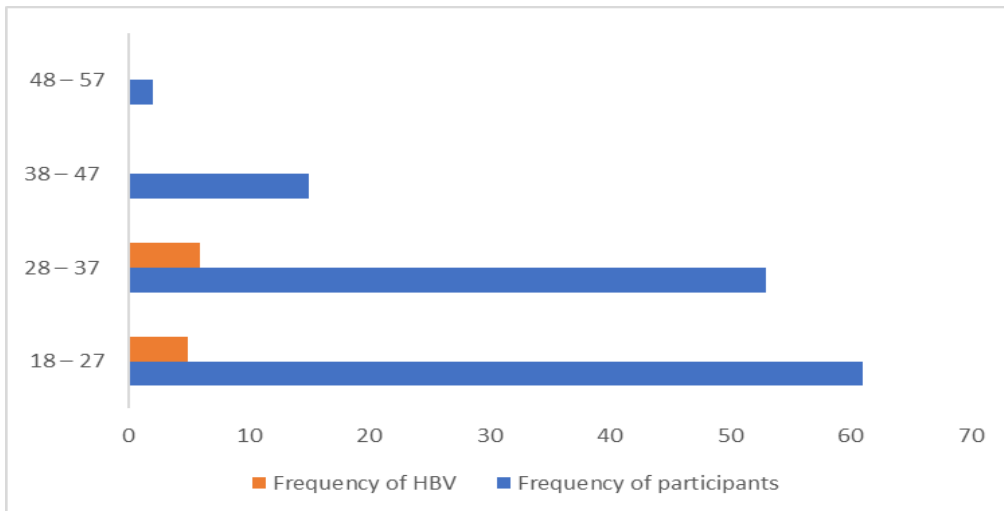


Figure 2: Showing the HBV infection burden across the age groups of the potential blood donors attending ABUTH-Zaria, Nigeria

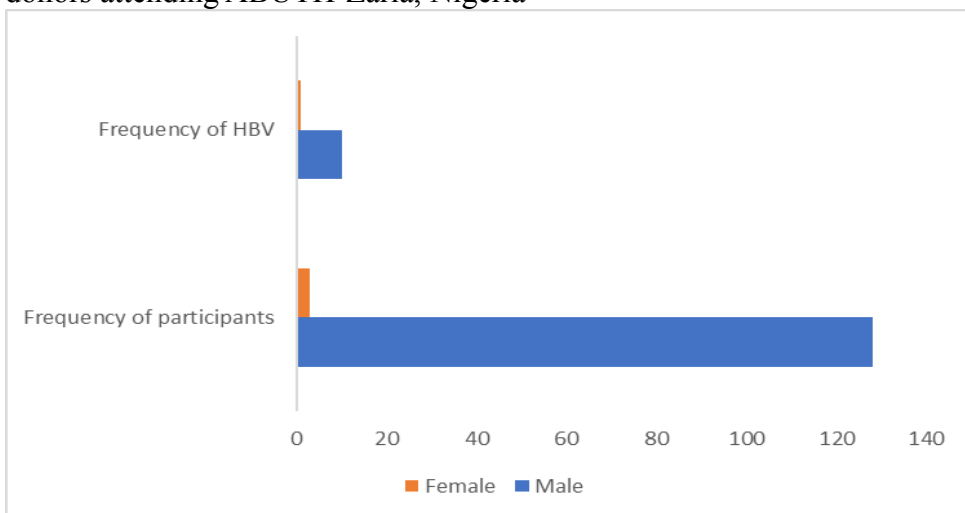


Figure 3: HBV infection burden across the sex groups of the potential blood donors attending ABUTH-Zaria, Nigeria

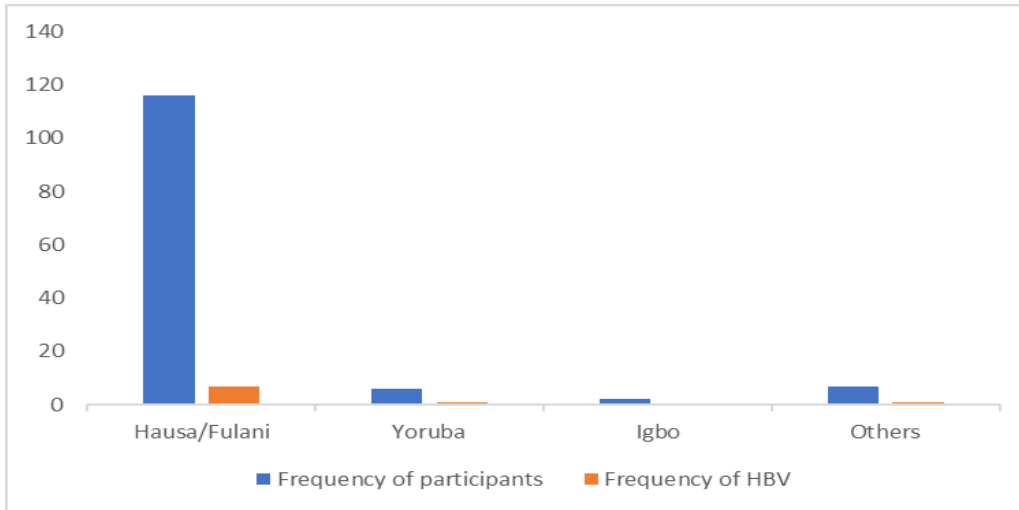


Figure 4: HBV infection burden across tribes of the potential blood donors attending ABUTH-Zaria, Nigeria

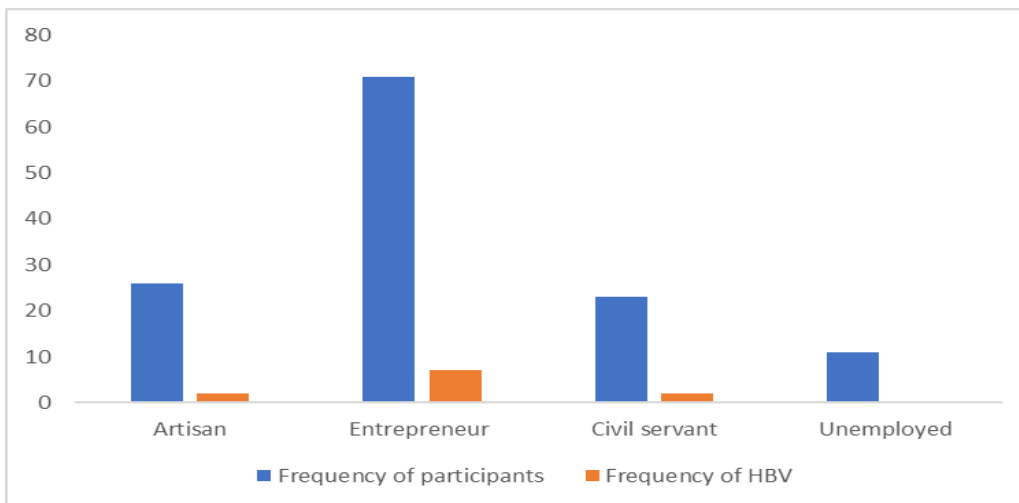


Figure 5: HBV infection burden across various occupation of the potential blood donors attending ABUTH-Zaria, Nigeria

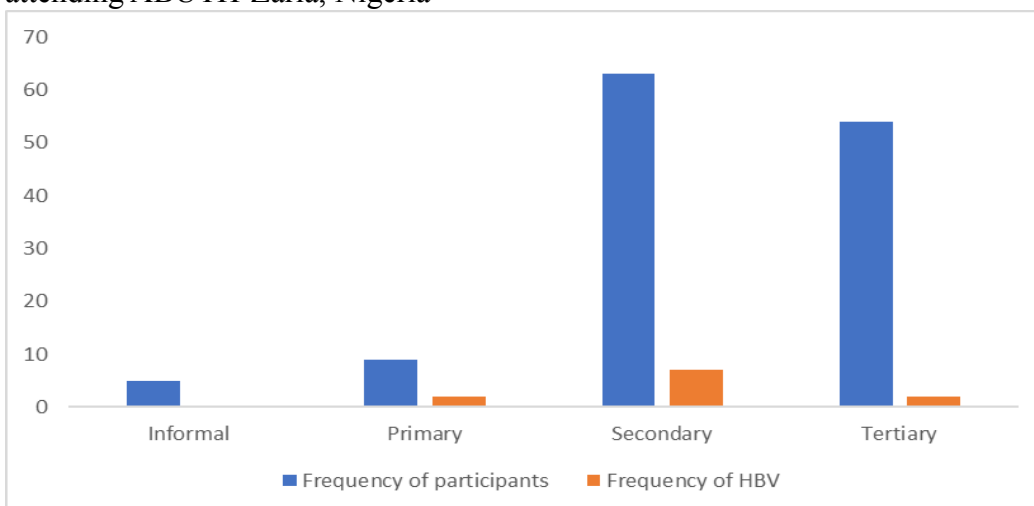


Figure 6: HBV infection burden across the educational status of the potential blood donors attending ABUTH-Zaria, Nigeria

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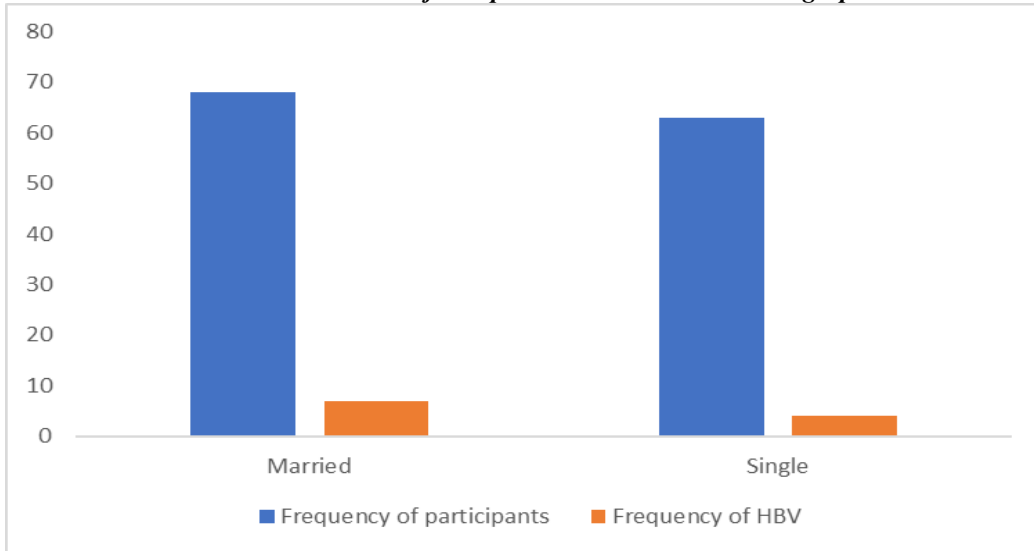


Figure 7: HBV infection burden across marital status of the potential blood donors attending ABUTH-Zaria, Nigeria

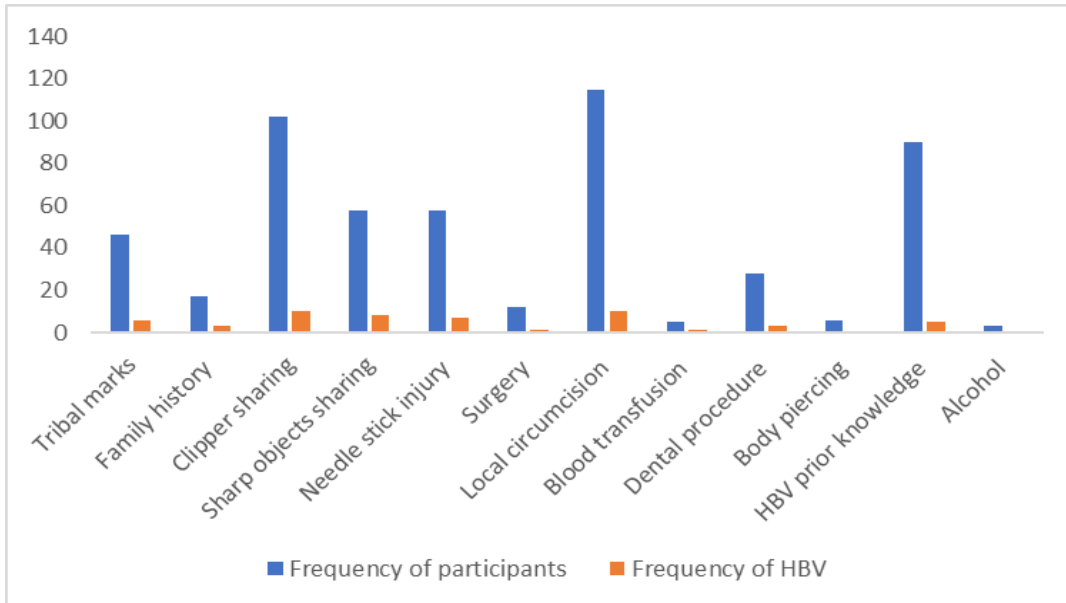


Figure 8: HBV infection burden across the various known risk factors among the potential blood donors attending ABUTH-Zaria, Nigeria

DISCUSSION

In Africa, Nigeria is ranked as one of the countries that is hyper-endemic for HBV infection (>8%) (Kramvis *et al.*, 2007). A diverse range of factors influences the observed variations in HBV prevalence across Nigeria, with significant inequities in birth dose vaccination, among the most widely recognized. The immunization coverage of birth dose varied widely across

Nigeria, from the highest coverage of 64.9% in South East to the lowest coverage of 14.1% in the North-west (Nigerian National Immunization Coverage Survey, 2017). Multiple barriers have been identified which vary from person-to-person, region-to-region, which further explains the impact of the low birth dose uptake in the North-west region (Ophori *et al.*, 2014).

Additionally, factors such as relative geographical isolation, religious beliefs that fuel vaccine hesitancy, limited antenatal screening for HBV surface antigen, birth occurring outside healthcare facilities, and lack of skilled medical staff to provide birth-dose vaccination (Abba, 2016; Ajuwon *et al.*, 2021).

In this study, HBV prevalence is determined at 8.4% (Figure 1), which however, appears to be declining as compared to the much earlier conducted studies. This could be attributed to the national vaccination policies over the years and ongoing public enlightenment programs. This decline in HBV seroprevalence is consistent with global trends (WHO 2017). Several authors report on the seroprevalence of HBV among sub populations in Nigeria with estimates varying depending on the population studied and methods used (Musa *et al.*, 2014). Earlier research in Nigeria conducted by Bada *et al.* (1996), Hassan *et al.* (2010), Paulyn *et al.* (2011), and Agbesor *et al.* (2015), have also found a higher HBV prevalence of 23.4%, 20%, 17.5%, 9.4% respectively, among the blood donors. However, Studies by Ejele *et al.* (2005), Murktar *et al.*, (2005) Olokoba *et al.* (2008), reported a low HBV seroprevalence of 1.1%, 2.4%, and 4.2% among the blood donors.

Blood donors between the age range of 28 to 37 years demonstrated the highest HBV seroprevalence at 4.6% as compared to the 18 to 27 years age range with 3.8% (Figure 2). However, blood donors between the age range of 37 to 57 years demonstrated 0% HBV seroprevalence. Similar results were obtained by (Alam *et al.*, 2007; Ndams *et al.*, 2008; Jatau and Yabaya. 2009; and Olokoba *et al.*, 2011) all of which reported the highest prevalence rate of infection among this age bracket (27-36 years). The high prevalence rate of HBV among this age group in this study could suggest that most of them might have gotten the infection through sex since members of this age bracket are usually sexually active (Abba, 2016). This study contradicts the earlier report with a high prevalence of HBV in

older subjects 40 years and above than in younger people (Luka *et al.*, 2008 and Lawal *et al.*, 2009).

The male gender demonstrated the highest HBV seroprevalence of 7.6% as compared to 0.8% HBV seroprevalence among female blood donors (Figure 3). This result agrees with the report by Mehmet *et al.* (2005) and Ezeonu *et al.* (2019), who reported higher prevalence rate of 12.7% and 9% respectively in males than 2.1% and 0% respectively in females. This could be as a result of the differences in lifestyle of the male gender as compared to the females. It could also be attributed to demographic location and cultural beliefs that discourage women from donating blood. However, a study by Abioye *et al.* (2022) reported a higher HBV prevalence rate in females than in males.

Blood donors belonging to the Hausa/Fulani tribe demonstrated the highest HBV seroprevalence of 6.9% as compared to the other two (2) major languages (Yoruba, 0.8%; Igbo, 0%) (Figure 4). The Hausa/Fulani tribe are the predominantly indigenes/residents of the North-western region of Nigeria, where Zaria happen to be situated. And as such, are expected to represent a larger population of participants. The result is also supported by the Nigerian National Immunization Coverage Survey (2017) that reported the lowest birth dose immunization coverage in the North-west (14.1%) as compared to the highest coverage in the South-East (64.9%). A study by Olokoba *et al.* (2008) however, contradicts this study by reporting low (2.4%) HBV seroprevalence among blood donors in the Northern region of Nigeria.

This study also reports a higher HBV prevalence rate of 5.3% in individuals that identified as Entrepreneurs as a means of occupation as well as Secondary schools certificate holders (Figure 5). This could be as a result of entrepreneurs and secondary school as highest educational status representing the larger population of the research participants (Figure 6).

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This could also be as a result of their particular lifestyle that mostly involves moving about in search of business opportunities and customer servicing with regards to business and high unemployment rate and socio-economic status for occupation and education respectively. This result is supported by a study by Ezeonu *et al.* (2019) that reported a high HBV prevalence of 10.3% among blood donors that identified with business as a means of occupation. However, a report by Musa *et al.* (2015) did not agree with our study, thus refuting any significant effect of educational background and occupation with HBV infection.

This study also found a higher HBV prevalence rate of 5.3% among married individuals among blood donors as compared to those with Single status (Figure 7). The study by Ezeonu *et al.* (2019), Emeribe *et al.*, (2019) and Ahmad *et al.*, (2019) supports our finding by stating a higher HBV prevalence among married individuals than in singles.

This study also did not find any significant difference between those that have prior knowledge of their HBV status, Family history of HBV infection with those that did not (Figure 8). This could be as a result of the target population being potential blood donors and for those that know their status as positive will not turn up for potential donation. A study by Abioye *et al.* (2022) supports this possibility by reporting a significantly high HBV prevalence (13.06%) among those did not have any prior knowledge of their HBV status. Therefore, health education to increase awareness of HBV transmission and prevention could reduce infection among the future donor population (Musa *et al.*, 2015).

This study also found a high HBV prevalence among blood donors that share sharp objects such as clippers, 7.6%; needle stick injuries, 5.3%; and local circumcision, 7.6% (Figure 8). This is supported by Musa *et al.* (2014) in a study that reported an increased risk of HBV infection in the North, possibly because of cultural practices

of mass childhood circumcision in rural areas using unsterilized local utensils. Similarly, there is also the usage of local unsterilized blades for commercial barbing services and the use of unsterilized tools for facial marks (Musa *et al.* 2014). However, Olayinka *et al.* (2016) reported in a study in Nigeria that public barbing salon clipper cuts, manicure and pedicure cuts, and scarification were not significantly associated with HBV infection.

This study shows a very low to no HBV prevalence of 0.8% and 0% among potential blood donors that have had blood transfusion previously and alcohol consumption respectively (Figure 8). This could be as a result of Islamic injunctions that prohibit alcohol consumption in some parts of the North-west and North-east, which is the predominantly Muslim dominated populace. As a matter of common knowledge, it is only expected that individuals that have been previously transfused with blood know that as part of the criteria for safe blood donation, prior blood transfused individuals are discouraged from blood donation to ensure safety.

CONCLUSION

This study found a downtrend in HBV seroprevalence in ABUTH-Zaria, Nigeria, which is in line with the Nigerian National Immunization Coverage Survey, 2017. However, Zaria remains a high endemic zone for HBV (8.4%), with youths being the most infected and carrying the most risk burden. There is still a need for more effective awareness approaches through health education and prevention/control strategies, such as disease surveillance and diagnosis, robust vaccination policies and management by the policymakers, healthcare providers, and stakeholders.

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