International Journal of Scientific Research and Engineering Development-– Volume 5 Issue 2, Mar-Apr 2022

Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

Seroprevalence of Hepatitis B and C Viruses Among Young Prospective Blood Donors in Bamidele Olumilua University of Education, Science and Technology (Bouest), Ikere, Ekiti State, Nigeria

Olawale David AJAYI* and Emmanuel Akokhamen OMON*

**University Health Centre, Bamidele Olumilua University of Education, Science and Technology, Ikere, Ekiti State, Nigeria*

Authors' Contributions:

This work was carried out in collaboration among both authors. Both authors read and approved the final manuscript.

Corresponding Author: Emmanuel Akokhamen, OMON

Email: omonemmanuel2005@gmail.com

GSM: +2348036238940

ABSTRACT

Hepatitis B virus (HBV) and/or hepatitis C virus (HCV) infections are public health issues that are endemic in the Sub-Saharan African countries where Nigeria is located.This study was carried out to determine the seroprevalence of hepatitis B and hepatitis C viruses among apparently healthy young prospective blood donors in Bamidele Olumilua University of Education, Science and Technology (BOUEST), Ikere, Ekiti State, Nigeria. In this cross-sectional study, four hundred (400) blood samples were aseptically collected from young prospective blood donors in BOUEST. Participants were screened for hepatitis B surface antigen and anti-HCV antibody using standard laboratory methods. All data generated in this investigation were analyzed for statistical significance using Pearson's Chi square. The result obtained showed that of the 400 samples screened, 33 representing 8.25% were seropositive for hepatitis B surface antigen, while 3 representing 0.75% were seropositive for anti-HCV antibody. The sex related prevalence obtained were 3.75% in males and 4.50% in females for HBV, while HCV recorded 0.25% for males and 0.5% for females. HBV and HCV infections were not significantly ($p>0.05$) associated with the gender of participants. Age related prevalence for HBsAg were 1.5%, 3.0% and 4.75% among the age groups 21-23 years, 24-26 years and 27-30 years respectively, while 0.5% and 0.25% prevalence rates of anti-HCV were observed among the age groups 27-30 and 24-26 years respectively. Risk factors such as unprotected sex accounted for 5.25% and 0.5% of HBV and HCV infections respectively among seropositive prospective blood donors among our study population, while previous blood transfusion, intravenous drug users and scarification marks recorded 0.5%, 0.5% and 0.75% respectively for HBV only. No identified risk factors accounted for 1.25% and 0.25% of HBV and HCV infections respectively. The study concludes that the sero-prevalence of HBV and HCV among young prospective blood donors in Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti was high which demonstrates their endemicity and possibly increasing rate among young prospective blood donors.

Key words: Hepatitis B, Hepatitis C, Prospective blood donors, Sero-prevalence, Ikere-Ekiti

INTRODUCTION

A blood donor is an apparently healthy individual who donates blood to be used in medical treatment for others [1]. A prospective blood donor is someone who fits the blood donation criteria and is eligible to donate [2]. Blood transfusion is an important patient treatment approach in modern medicine, but it comes with some substantial dangers for both the donor and the recipient [2]. Infectious agents such as the hepatitis A virus (HAV), hepatitis B virus (HBV), hepatitis C virus (HCV), HIV, and syphilis are among the most serious hazards to blood safety for transfusion patients [3].

Hepatitis B virus is a double-stranded DNA virus from the Hepadnaviridae family that is thought to be the principal cause of chronic liver illness [4]. Hepatitis B virus (HBV) is highly infectious and resistant to heat inactivation; it is 50-100 times more virulent than HIV and ten times more infectious than hepatitis C. The virus can be found in nearly all of an infected person's bodily fluids (blood, saliva, sperm, vaginal secretion, menstrual blood, and to a lesser extent, perspiration, breast milk, tears, and urine) [5].

Hepatitis C virus (HCV) is an enclosed, positive-ense single-stranded RNA virus of the Flaviviridae family that is tiny (55-65nm in size) [6]. The hepatitis C virus, which has a long incubation period of 2 to 26 weeks, has been linked to non-A, non-B hepatitis. The virus is transmitted through plasma and shares the same routes of transmission as the Hepatitis B virus: sexual contact, exposure to infected blood and blood products, or vertical transmission (from a mother to her foetus or child during the perinatal period) [7].

Over the last two to three decades, there has been a rise in information regarding viral hepatitis, but there is still a significant gap between what is reported in other parts of Africa and what is currently available for healthcare providers in South-South Nigeria on Hepatitis B and C viruses [8]. Furthermore, there is no regional hepatitis surveillance, nor is there any database that connects the sporadic reports to allow for future illness trends to be predicted [9].

Direct contact with blood, transfusion of blood and blood products, intravenous injections, and unprotected intercourse are all ways for HBV and HCV to be transmitted [10]. Due to the lack of routine serological screening for prospective donors in underdeveloped countries, transmission of infection from donors to recipients is becoming more common [1]. The World Health Organization (WHO) has advised routine serological tests for transfusion-transmissible diseases (TTIs), such as HBV and HCV, to limit the transmission of these viruses [11]. The findings of the donors' tests can be used to determine whether or not the blood supply is safe. It is also used to identify the prevalence rate of HBV and HCV among blood donors, which aids health workers in understanding the epidemiology of such infection in the community [12]. This study was therefore carried out to determine the sero-prevalence of hepatitis B and C viruses among young prospective blood donors in Bamidele Olumilua University of Education, Science and Technology, Ikere, Ekiti State, Nigeria.

MATERIALS AND METHODS

Study Area

This study was carried out in Bamidele Olumilua University of Education, Science and Technology (BOUEST), Ikere. Ikere is the second most populous and principal city of Ekiti State, Nigeria. The area lies between latitudes 7^0 30' North of the equator and longitudes 5^0 14' East of the Greenwich meridian. The city has an area of 262 km^2, of which 52.2% of the population are females, while 47.8% are males. Compared to the entire Ekiti as a state and Nigeria as a country, Ikere is densely populated, with a population density of 778.3/km^2. Ikere-Ekiti is essentially an agrarian and mining community. According to 1991 and 2006 census,

the population of was 114,780 and 147,355 respectively [13]. There are three major types of religion in Ikere; Christianity, Islam and traditional religion [14].

Study Design and Population

The study design is a descriptive cross-sectional survey consisting of apparently healthy prospective blood donors in Bamidele Olumilua University of Education, Science and Technology (BOUEST), Ikere-Ekiti. A total of four hundred (400) apparently healthy young prospective blood donors within age range of 17–30 years and of both sexes were recruited for this study.

Ethical Approval and Informed Consent

Ethical approval was obtained from the Health Research and Ethics Committee of Bamidele Olumilua University of Education, Science and Technology (BOUEST), Ikere, Ekiti State. Informed consent was sought from each participant before sample collection.

Inclusion and Exclusion Criteria

Apparently healthy prospective blood donors in Bamidele Olumilua University of Education, Science and Technology (BOUEST), Ikere, Ekiti State who are not known to have any chronic illness or at high risk of developing hepatitis who gave their consent were included in the study. Individuals with underlining health conditions and those who did not give their consent were excluded from the study.

Sample Collection

For each participant, about two (2) ml of blood was collected into plain bottles by veinpuncture. They were labeled and allowed to clot. The serum was separated by centrifugation. The serum was carefully withdrawn into a pre-labeled tube. Specimens not tested immediately were stored at 2^0–8^0 C. The samples were used to screen for both HBsAg and HCV respectively using Solid Rapid Diagnostic Test strips.

Analytical Methods

HBsAg (Using Solid Rapid Diagnostic Test Strips)

Principle

The Hepatitis B Surface Antigen Test (Whole Blood/Serum/Plasma) is a lateral flow chromatographic immunoassay based on the principle of the double antibody-sandwich technique. The membrane is pre-coated with anti-HBs on the test line region of the test. While detecting a positive sample, HBsAg in the specimen (whole blood, serum or plasma) reacts with the particle coated with anti-HBs. The mixture migrates upward on the membrane chromatographically by capillary action to react with anti-HBs on the membrane and generate a colored line. The presence of this colored line in the test region indicates a positive result, while its absence indicates a negative result. To serve as a procedural control, a colored line will always appear in the control line region indicating that the proper volume of specimen has been added and membrane wicking has occurred.

Procedure

The specimen and test components were brought to room temperature. The specimen was mixed well prior to assay once thawed. When ready to test, the pouch at the notch was opened and device removed. The test device was placed on a clean, flat surface. The device was labeled with specimen's ID number. The test strip was immersed into the sample with the arrow end pointing towards the sample. Care was taking not to immerse past the MAX (maximum) line. The strip was taken out after 8-10 seconds and laid flat on a clean dry flat surface. The timer was set up. Result was read in 15 minutes.

HCV (Using Solid Rapid Diagnostic Test Strips)

Principle

The Hepatitis C Virus Antibody Test (Whole Blood/Serum/Plasma) is a lateral flow chromatographic immunoassay based on the principle of the double antibody-sandwich technique. The membrane is pre-coated with HCV antigen on the test line region of the test. While detecting a positive sample, HCV antibody in the specimen (whole blood, serum or plasma) reacts with the particle coated with HCV antigen. The

mixture migrates upward on the membrane chromatographically by capillary action to react with HCV antigen on the membrane and generate a colored line. The presence of this colored line in the test region indicates a positive result, while its absence indicates a negative result. To serve as a procedural control, a colored line will always appear in the control line region indicating that the proper volume of specimen has been added and membrane wicking has occurred.

Procedure

The specimen and test components were brought to room temperature. The specimen was mixed well prior to assay once thawed. When ready to test, the pouch at the notch was opened and device removed. The test device was placed on a clean, flat surface. The device was labeled with specimen's ID number. The test strip was immersed into the sample with the arrow end pointing towards the sample. Care was taking not to immerse past the MAX (maximum) line. The strip was taken out after 8-10 seconds and laid flat on a clean dry flat surface. The timer was set up. Result was read in 15 minutes.

Statistical Analysis

All results were presented as frequency and simple percentage. Significant difference was done using Chi-square test and Student's t-test using Statistical Package for Social Sciences (SPSS) version 21.0. A p-values <0.05 was considered significant.

RESULTS

Table 1 showed the socio-demographic characteristics of the subjects studied. Four hundred (400) subjects were recruited for this study comprising of 224 (56%) females and 176 (44%) males. The subjects were drawn from different age groups of which age group 21–23 years made up 31.5%, age group 24–26 years made up 33.5% and age group 27–30 years made up 35% of the study population respectively. Similarly, the subjects who were from Bamidele Olumilua University of Education, Science and Technology (BOUEST), Ikere were drawn from different faculty of study which include; Sciences (20%), Education (30.25%), Technology (17.25%), Management Sciences (22.5%) and Social Sciences (10%) respectively. Data on the level of study of participant showed that students from 100, 200, 300 and 400 levels made up 22%, 26.75%, 21.25% and 30% of the study population respectively. Christians made up 90% of the study population, while Muslims made up 10% of the study population.

Table 2 showed the prevalence of HBsAg and HCV among prospective blood donors in Bamidele Olumilua University of Education, Science and Technology (BOUEST), Ikere-Ekiti. The results obtained showed that 33 representing 8.25% of the subjects were sero-positive for HBsAg, while 3 representing 0.75% of the study population tested positive for HCV.

Table 3 showed the prevalence of HBsAg and HCV among prospective blood donors in Bamidele Olumilua University of Education, Science and Technology (BOUEST), Ikere-Ekiti with respect to sex. The results obtained showed that among subjects who tested positive for HBsAg, 15 (3.75%) were males, while 18 (4.5%) were females. Similarly, among subjects who tested positive for HCV, 2 (0.5%) were females and 1 (0.25%) was a male. There was no significant difference ($p>0.05$) in the prevalence of HBsAg and HCV in the study with respect to sex.

Table 4 showed the prevalence of HBsAg and HCV among prospective blood donors in Bamidele Olumilua University of Education, Science and Technology (BOUEST), Ikere-Ekiti in relation to age. The results obtained showed that seropositivity for HBsAg was recorded among group 21–23 years (1.50%), 24–26 years (3.0%) and age group 27–30 years (4.75%) respectively. Similarly, among the subjects who tested positive for HCV, 1 (0.25%) belong to age group 24–26 years, while 2 (0.50%) were in age group 27–30 years. There was no significant difference ($p>0.05$) in the prevalence of HBsAg and HCV in the study population in relation to age.

Table 5 showed the prevalence of HBV and HCV infection by risk factors among the study population. The result obtained showed that more than half (57.5%) of the study population engaged in unprotected sex. Risk factors such as unprotected sex accounted for 5.25% and 0.5% of HBV and HCV infections respectively among sero-positive prospective blood donors in our study population, while previous blood transfusion, intravenous drug users and scarification marks recorded 0.5%, 0.5% and 0.75% respectively for HBV only. No identified risk factors accounted for 1.25% and 0.25% of HBV and HCV infections respectively. Individuals that had previous surgery and use unsafe injection were not sero-positive for both HBV and HCV according to our study.

Table 1: Socio-demographic characteristics of the Subjects Studied

PARAMETERS	NUMBER	PERCENTAGE (%)
Gender		
Males	176	44.00
Females	224	56.00
Age		
21 – 23 years	126	31.50
24 – 26 years	134	33.50
27 – 30 years	140	35.00
Faculty of Study		
Sciences	80	20.00
Education	121	30.25
Technology	69	17.25
Management Sciences	90	22.50
Social Sciences	40	10.00
Level of Study		
100	88	22.00
200	107	26.75
300	85	21.25
400	120	30.00
Religion		
Christians	360	90.00
Muslims	40	10.00
Others	Nil	

Table 2: Prevalence of HBsAg and HCV among prospective blood donors in BOUEST

Parameters	Number Examined	Number Positive	Number Negative
HBV	400	33 (8.25%)	367 (91.75%)
HCV	400	3 (0.75%)	397 (98.5%)

KEYS:
HBsAg = Hepatitis B surface antigen, **HBV** = Hepatitis B virus, **HCV** = Hepatitis C virus, **%** = percentage, $\mathbf{X^2}$ = Chi square

Table 3: Prevalence of HBsAg and HCV among prospective blood donors in BOUEST with respect to sex

Sex	Number of HBV Examined	Number of HBV Positive	Number of HBV Negative	Number of HCV Examined	Number of HCV Positive	Number of HCV Negative
Male	176 (44.00%)	15 (3.75%)	161 (40.25%)	176 (44.00%)	1 (0.25%)	223 (55.75%)
Female	224 (56.00%)	18 (4.50%)	206 (51.50%)	224 (56.00%)	2 (0.50%)	174 (43.50%)
Total	400	33 (8.25%)	367 (91.75%)	400	3 (0.75%)	397 (99.25%)
$\mathbf{X^2}$		**1.356**			**0.986**	
P-value		**0.254**			**0.366**	

KEYS:
HBsAg = Hepatitis B surface antigen, **HBV** = Hepatitis B virus, **HCV** = Hepatitis C virus, **%** = percentage, $\mathbf{X^2}$ = Chi square

Table 4: Prevalence of HBsAg and HCV among prospective blood donors in BOUEST in relation to age

Age (years)	Number of HBV Examined	Number of HBV Positive	Number of HBV Negative	Number of HCV Examined	Number of HCV Positive	Number of HCV Negative
21 – 23	126 (31.50%)	6 (1.50%)	120 (30.00%)	126 (31.50%)	-	126 (31.50%)
24 – 26	134 (33.50%)	12 (3.00%)	122 (30.50%)	134 (33.50%)	1 (0.25%)	133 (33.25%)
27 – 30	140 (35.00%)	15 (4.75%)	125 (31.25%)	140 (35.00%)	2 (0.50%)	138 (34.50%)
Total	**400**	**33 (8.25%)**	**367 (91.75%)**	**400**	**3 (0.75%)**	**397 (99.25%)**
X^2		**1.108**			**1.086**	
P-value		**0.305**			**0.411**	

KEYS:

HBsAg = Hepatitis B surface antigen, **HBV** = Hepatitis B virus, **HCV** = Hepatitis C virus, **%** =percentage, **X^2** = Chi square

Table 5: Prevalence of HBV and HCV Infection by Risk Factors

Risk Factors	Number Examined N = 400	HBV Positive N = 33	HCV Positive N = 3
Unprotected sex	230 (57.5%)	21 (5.25%)	2 (0.50%)
Previous blood transfusion	40 (10.0%)	2 (0.50%)	0 (0.0)
Scarification marks	38 (9.5%)	2 (0.50%)	0 (0.0)
Previous surgery	8 (2.0%)	0 (0.0)	0 (0.0)
Intravenous drug users	32 (8.0%)	3 (0.75%)	0 (0.0)
Unsafe injection	12 (3.0%)	0 (0.0)	0 (0.0)
No identified risk factor	40 (10.0%)	5 (1.25%)	1 (0.25%)

Keys: N = number, % = percentage

DISCUSSION

The discovery of the HBsAg was a watershed moment in the fight against post-transfusion hepatitis. Despite mandated screening for hepatitis B surface antigen (HBsAg), transfusion-associated hepatitis B virus infection remains a substantial problem [15]. Hepatitis C Virus (HCV) is the most common viral infection in humans that causes chronic liver damage. Many people with chronic hepatitis C virus infection are asymptomatic, and the incidence of anti-hepatitis C virus antibodies among blood donors in this region of the world is not well established [16]. This study was carried out to determine the sero-prevalence of hepatitis B and C viruses among young prospective blood donors in Bamidele Olumilua University of Education, Science and Technology (BOUEST), Ikere-Ekiti.

The result obtained in this study (Table 2) revealed an overall sero-prevalence of 8.25% for HBsAg among young prospective blood donors in Bamidele Olumilua University of Education, Science and Technology (BOUEST), Ikere-Ekiti. The findings of this study corroborate the results of various researchers that hepatitis is endemic in developing countries, particularly sub-Saharan countries like Nigeria. The prevalence rate of 8.25% reported in this study is comparable to the 8.0% prevalence of HBsAg reported by [17] among patients who accessed care at the State Specialist Hospital, Ikere-Ekiti, between October and November, 2020 and the 8.3% reported among apparently healthy individuals in Ekpoma, Edo State [18].

However, the 8.25% prevalence rate of HBsAg recorded in this study is less than the prevalence rates of 8.9% reported among women of child-bearing age in Lagos, Nigeria [19] and the 10.3% reported in the general population of Uganda [20] respectively. This finding backs up the World Health Organization's [21] classification of Nigeria as a highly endemic country. Endemicity is characterized as having an HBsAg burden of more than 8% in an adult population. The fact that this study was conducted in a student environment where students are likely to engage in indiscriminate sexual behavior, as well as the sub-urban nature of Ikere, where disease prevalence practices that favor transmission such as poor adherence to vaccination schedules, relatively low vaccination coverage, drug misuse, and unprotected sex, among others, may explain part of the high seroprevalence rate recorded in this study.

Furthermore, the reported 8.25 percent prevalence rate of HBV carriage was greater than the sero-prevalence rates of 3.2 percent reported by [22], 4.98 percent by [23], and 6.0 percent by [24]. Reference [22], [23] and [24] each sampled a group that includes an apparently healthy pre-vaccination urban population, prospective blood donors, and medical students, respectively, which differed from the academic community sampled in this study. The reason for the lower prevalence of HBsAg in these areas compared to ours and other Nigerian cities is unknown. These differences could be related to the fact that some of the trials were carried out on low-risk individuals [23-25].

On the other hand, higher HBV sero-prevalence rates of 11.0% in Makurdi [26]; 12.6% in Lagos [27], 12.8% in Minna [28]; 13.2% in a rural settlement in northern Nigeria [29]; 15.1% in Maiduguri [30], and 26.0% in Benin [31] have been reported in Nigeria. Changes in the prevalence of HBV infection documented in different regions could be due to differences in sample size, the sensitivity and reliability of viral test strips, the type of people investigated, the study population's geographical location, and their socio-cultural behaviors [32-33].

Hepatitis C virus sero-prevalence of 0.75 percent was found among young prospective blood donors inBamidele Olumilua University of Education, Science and Technology (BOUEST), Ikere-Ekiti. The report of this finding is lower when compared with studies from Ekpoma, Enugu, Jos and Kaduna with sero-prevalent rates of 3.0%, 14.9%, 5.2% and 11.9% respectively [9, 34-35]. Differences in the prevalence of HCV infection reported in these studies could be due to differences in sample size, sensitivity and reliability of viral test strips, the category of persons, geographical location of the study population, and their socio-cultural habits [9]. The prevalence of HCV infection reported in this study was comparable to the reports of0.1–1.0 percent for the United Kingdom and Scandinavia [36], but lower than the 1.0–1.9 percent [37] for

countries like the United States of America, Australia, Turkey, Spain, Italy, and Japan, and the 15-20 percent reported in Egypt [38]. The prevalence of hepatitis B and C varies by country and is influenced by a complex interplay of behavioral, environmental, and host factors [34]. It is lowest in countries or places where living standards are high and highest in countries or areas where socioeconomic levels are low [9].

The prevalence of HBsAg and HCV was found to be highest among people aged 24 to 30. This is consistent with [9] findings in Ekpoma, where they found a greater prevalence of HBV and HCV in the 30–39 year old age group. Similarly, [30] found that this age group had a greater prevalence of certain viral illnesses (30-39 years). Previous studies have also discovered a link between age and health [20, 22]. Individuals under the age of 40 have the highest rate of HCV infection, according to [39], and the age group of 24-39 years includes people who engage in a lot of sexual activity. It's plausible to believe that sexual intercourse is the predominant mode of transmission in this community, given the age group most impacted in our study. High sexual activity during marriage, premarital sexual activity, sex as a widow/widower, sex owing to customs and tradition, sex for debt settlement, or sex as a commerce [40] or pleasure are all related with this age group.

The prevalence of HBV was found to be higher (4.5 percent) in female subjects than in male subjects in the current study (3.75 percent). Furthermore, female subjects had a prevalence rate of 0.5 percent for HCV infection compared to 0.25 percent recorded by their male counterpart. Predisposition to HBV and HCV infections in women may be related to social, cultural, or biological factors. A woman's risk of developing HBV and HCV during unprotected vaginal intercourse is up to four times higher than a man's, according to [41]. There was no significant difference in the prevalence of HBV and HCV infections between men and women in our research sample ($p>0.05$).In contrast, male subjects are more susceptible to HBV infections than female subjects according to [42]. Reference [17] also reported that the risk of men of any age-bracket getting infected with HBV is twice that of their female counterparts. However, there is no clear explanation for why males are more susceptible to infection than females [18].

The results of this study also showed that among the risk factors identified in this study, 5.25% of the subjects who were positive for HBsAg engaged in unprotected sex, 0.75% were intravenous drug users, 1.25% had no identified risk, and 0.5% each had history of previous blood transfusion and scarification marks respectively. Similarly, among subjects who were positive for HCV, 0.5% engaged in unprotected sex and 0.25% had no identified risk factor. This finding is in line with CDC report that blood transfusion, previous immunization, unprotected sexual intercourse, family history of hepatitis B, tattooing, intravenous drug use, previous surgery, unsafe injection and contact with body fluids of infected person amongst others are risk factors for hepatitis B and C viruses [43].

Conclusion

The study concludes that the sero-prevalence of HBV and HCV among young prospective blood donors in Bamidele Olumilua University of Education, Science and Technology (BOUEST), Ikere-Ekiti was 8.25% and 0.75% respectively which demonstrates their endemicity and possibly increasing rate among young prospective blood donors, with the possibility of virus transmission to a prospective susceptible host. The study showed that the sero-prevalence of HBV and HCV in young prospective blood donors was higher in females than males and in the age group 24–30 years. The high incidence of HBV and HCV among young prospective blood donors in the study area highlights the need of early diagnosis of disease agents in disease outbreak prevention and control. The author's recommend that that:

1. Blood donors should be screened adequately for HBsAg and HCV before donation.
2. There should be increase sensitization and public enlightenment on the preventive measures for HBV and HCV especially among University students.
3. Young adults should be encouraged to go for routine screening for HBV and HCV for early detection and management.

4. Seropositive donors for HBsAg are strongly recommended for Hepatitis B Panel screening (HBsAg, HBsAb, HBeAg, HBeAb and HBcAb).

Conflict of Interest

The authors declare no conflicts of interest. The authors alone are responsible for the content and writing of this paper.

Acknowledgements

The authors would like to thank Laboratory and Technical staff of the Department of Medical Laboratory Service, University Health Center, Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti for their excellent assistance and Omon Emmanuel Research Institute (OMRI) for providing medical writing support/editorial support in accordance with Good Publication Practice (GPP3) guidelines. The author's did not receive any funding and/or grant from individuals, government or cooperate organizations for this research work.

REFERENCES

[1] H. Zaheer, U. Saeed, Y. Waheed, S. Karimi, and U. Waheed (2014). Prevalence and trends of hepatitis B, hepatitis C and human immunodeficiency viruses among blood donors in Islamabad, Pakistan 2005-2013. *Journal of Blood Disorders & Transfusion,* **217**(5), 222-226.

[2] B. Nwogoh, O. Ikpomwen, O. and E. Isoa (2011). Donor blood procurement and the risk of transfusion transmissible viral infections in a tertiary health facility in South-South Nigeria. *Nigerian Medical Journal,* **5**(2), 227-229.

[3] O. Erhabor, A. Yakubu, I. Usman, A.W. Abubakar, H. Buhari, and A. Okwesili (2015). The risk of transfusion transmissible hepatitis C infection among blood donors in Sokoto, North Western Nigeria. *Asian Journal of Science & Technology,* **6**(2), 1051-1057.

[4] O.O. Oladele, T.B. Adesina, Z.T. Omolola and T.S. Sunday (2013). Prevalence of HBsAg and HIV among blood donors in Osogbo, Osun State, Nigeria. *International Research Journal of Medicine and Medical Sciences*, **1**(3), 68-71.

[5] H.M. Elgouhari, T.I. Tamimi, and W.D. Corey (2008). Hepatitis B virus infection: Understanding its epidemiology, cause and diagnosis. *Cleveland Journal of Medicine*, **75**(7), 881-889.

[6] C.K. Fairley and T.R. Read (2012). Vaccination against sexually transmitted infections. *Current Opinion in Infectious Diseases*, **25** (1), 66–72.

[7] R. Wejstal, S. Hermodsson, S. Iwarson and G. Wokrans (2000). Mother to infant transmission of Hepatitis C virus infection. *Journal of Medical Virology,* **3**(1), 178-182.

[8] I.O. Okonko, P.O. Okerentugba, F.O. Adeniji, and K.C. Anugweje (2012). Detection of hepatitis B surface antigen (HBsAg) among intending apparently healthy blood donors. *National Science Journal,* **10** (4), 69-75.

[9] I.O. Babatope, N.J. Inyang, K. Imhanrenezor, and A. Aghahowa (2015). Seroprevalence of Hepatitis B and C viruses among apparently healthy adults in Ekpoma, Edo State, Nigeria. *Special Viral Pathogens Journal*, **1** (1), 15-20.

[10] A.F. Andrade, M. Oliveira-Silva, S.G. Silva, I.J. Motta, and C.R. Bonvicino (2006). Seroprevalence of hepatitis B and C virus markers among blood donors in Rio de Janeiro, Brazil, 1998-2005. *Brazilian Journal of Medicine,* **101**(6), 673-679.

[11] C.J. Uneke, O. Ogbu, P.U. Inyama, G.I. Anyanwu, M.O. Njoku, and J.H. Idoko (2015). Prevalence of hepatitis-B surface antigen among blood donors and human immunodeficiency virus-infected patients in Jos, Nigeria. *Nigerian Medical Journal,* **100**(1), 13-16.

[12] D.M. Flichman, J.L. Blejer, B.I. Livellara, V.E. Re, S. Bartoli, and J.A. Busto (2014). Prevalence and trends of markers of hepatitis B virus, hepatitis C virus and human Immunodeficiency virus in Argentine blood donors. *British Medical Council of Infectious Disease,* **14**(3), 218-222.

[13] World Gazzetter Nigeria (2007). Largest cities and towns statistics populations, 2007. https://www.worldgazzetter.com Accessed 10/04/21

[14] D. Duze (2005). Ekiti: the land of genius. Hope and Faith Press, Ado-Ekiti, pp. 44-46.

[15] V. Lavanya, T. Viswanathan, M. Arul-Sheeba, A. Malarvizhi, and K. Moorthy (2012). Prevalence of hepatitis B virus infection among blood donors with antibodies to hepatitis B core antigen. *International Journal of Medicine and Medical Sciences*, **4**(6), 128-137.

[16] E.F. Chukwurah, S.O. Ogbodo, and G.O. Obi (2015). Seroprevalence of Hepatitis C Virus (HCV) infection among blood donors in a South-Eastern State of Nigeria. *Biomedical Research*, **16** (2), 133-135.

[17] G.O. Daramola, B.E., Olofu, H.A. Edogun, A.O. Ojerinde, O.D. Ajayi, A. Fatoki, A. Egebbi, O.O. Jegede, and O.O. Ogunfolakan (2021). Prevalence of HBV and its Associated Risks Factors among Patients Accessing Care at a Secondary Health Facility in Ekiti State, Southwest, Nigeria. *Journal of Advances in Microbiology,***21**(11), 98-104

[18] I.O. Babatope, N.J. Inyang, K. Imhanrenezor and A. Aghahowa (2015). Seroprevalence of Hepatitis B and C viruses among apparently healthy adults in Ekpoma, Edo State, Nigeria. *Special Viral Pathogens Journal*, **1** (1), 15-20.

[19] O.M. Aganga-Williams, A.S. Akanmu and I. Akinsete, I. (1999). Prevalence of hepatitis B surface antigen among women of childbearing age in Lagos State. *African Journal of Reproductive Health,* **3**(1), 45-50.

[20] J.B. Bwogi, F. Makumbi, I. Mishra, V. Bakamutumatio, B. Nanyunja, M. Opio, A. Downing, R. Biryahwaho and B.R.F. Lewis (2009). Hepatitis B infection is highly endemic in Uganda: findings from a National sero-survey. *African Health Sciences,* **9**(1), 98-108.

[21] World Health Organization (2013). Hepatitis B, WHO, Geneva, Switzerland.

[22] O.O. Odusanya, F.P. Meurice, and B. Hoet (2007). Nigerian Medical students are at risk for hepatitis B infection. *Transition Research in Tropical Medicine,* **10**(1), 465-468.

[23] Q.A. Ejele and A.C. Ojule (2004). The prevalence of Hepatitis B surface antigen (HBsAg) among prospective blood donors and patients in Port-Harcourt, Nigeria. *Nigerian Journal of Medicine,* **13**(7), 336-338.

[24] M.P. Adoga, S.D. Gyar, S. Pechulano, O.D. Bashayi, S.E. Emiasegen, T. Zungwe, O.H. Iperepolu, C. Agupugo and S.M. Agwale, S.M. (2010). Hepatitis B. virus infections in apparently healthy urban Nigerians: data from pre-vaccination tests. *Journal of Infections in Developing Countries,* **4**(6), 397-400.

[25] J.L. Dienstang and K.J. Isselbacher (1998). Acute Viral Hepatitis. In: Fauci, A.S.,Braunwald, E., Isselbacher, K.J., Wilson, J.D., Martin, J.B., Kasper, D.L., Hauser, S.L., Long, D.L., editors. Harrison's principles of Internal Medicine. NY: Mc Graw Hill, Pp. 1677-1692.

[26] S.M. Agwale, L. Temina and O. Womack (2004). Prevalence of HCV co-infection in HIV-Infected individuals in Nigeria and characterization of HCV genotypes. *Journal of Clinical Virology,* **3**(1), 3-6.

[27] F. Fasola, T.R. Kotila and J.O. Akinyemi (2008). Trends in transfusion transmitted viral infections from 2001 to 2006 in Ibadan, Nigeria. *Intervirology,* **51**(8), 427-431.

[28] D.Z. Egah, E.B. Banwat, E.S. Audu, D. Iya, B.M. Mandong, A.A. Anele and N.E. Gomwalk (2007). Hepatitis B surface antigen, Hepatitis C and HIV antibodies in a low-risk blood donor group in Nigeria. *East Mediterranean Health Journal,***13**(4), 961-966.

[29] G.I. Jombo, D.Z. Egah and E.B. Banwat (2005). Hepatitis B virus infection in a rural settlement of Northern Nigeria. *Nigerian Journal of Medicine,* **14**(4), 425-428.

[30] M.M. Baba, W. Gashau and A.W. Hassan (1998). Detection of Hepatitis B surface antigenaemia in patients with and without the manifestation of Acquired Immunodeficiency syndrome in Maiduguri, Nigeria. *Nigerian Postgraduate Medical Journal,* **5**(1), 125-128.

[31] N.K.D. Halim, E. Offor & O.I. Ajayi (1992). Epidemiology study of the sero-prevalence of hepatitis B surface antigen (HBsAg) and HIV-1 in blood donors. *Nigerian Journal of Clinical Practice,* **2**(1), 42-45.

[32] O.A. Lesi, M.O. Kehinde, D.N. Oguh and C.O. Amira (2007). Hepatitis B and C virus infections in Nigerian patients with HIV/AIDS: *Nigerian Postgraduate Medicine Journal,* **14**(4), 129-133.

[33] World Health Organization (2014). Hepatitis B fact sheet. Available: http://www.who.int/mediacentre/factsheets/Fs204/en/

[34] J.C. Ebie and O.A. Pela (2006). Some socio-Cultural aspects of the problem of drug abuse in Nigeria. *Drug and Alcohol Dependence,* **8**(1), 301-306.

[35] G.T. Strickland (2002). HCV in developing countries. *Postgraduate Document,* **2**(4), 18-20.

[36] Global Burden of Disease (2004). Global burden of disease (GBD) for hepatitis C. *Journal of Clinical Pharmacology,* **4**(4), 20-29.

[37] C.W. Shepard, I. Finelli, A.E. Fiore and B.P. Bell (2005). Epidemiology of hepatitis B and hepatitis C infections in United States children *Pediatric Infectious Disease Journal,* **5**(1), 755- 760.

[38] C. Frank, M.K. Mohammed, G.T. Strickland, D. Lavanchy, R.R. Arthur, L.S. Madgher, T. El-Khoby, W.Y. Abdel, E.S. Aly-Ohn, S. Anwar and I. Sallam (2002). The role of antischistosomal therapy in the spread of hepatitis C virus in Egypt. *Lancet*, **35**(5), 887-891.

[39] O.O. Adewole, E. Andeyi, Z. Ajuwon and I. Wada (2009). Sero-prevalence of hepatitis B and C viruses co-infection in Nigerian patients with HIV infection. *Journal of Infections in Developing Countries,* **6**(5), 369-375.

[40] E. Agwu, V. Pazos, J.C. Ihongbe, J.C. and J. Ssengendo, J. (2011). Appraisal of the inherent socio-demographic dynamics of HIV/AIDS epidemic in four districts of South-Western Uganda. *Journal of Social Aspects of HIV/AIDS*, **8**(3), 150-155.

[41] R.A. Royce, A. Sena, W. Cates and M.S. Cohen (1997). Sexual transmission of HIV. *New England Journal of Medicine,* **336**(15), 1072-1078.

[42] G.R. Pennap, A. Yakubu, O. Oyige and J. Forbi (2010). Prevalence of hepatitis B and C infections among people of a local community in Keffi, Nigeria. *African Journal of Microbiology Research,* **4** (4), 274-278.

[43] S. Alwright, F. Bradley and J. Long (1997). Prevalence of antibodies to HBsAg and risk factors in Irish hospitals in England. *Public Health*, **321** (78), 82-86.

