Original Research Article

Detection of Hepatitis B and C Virus Infection Among Students of a Private Tertiary Institution in South-Western Nigeria

Abstract

Background: Hepatitis B virus (HBV) and hepatitis C virus (HCV) infection is a major health problem and account for a substantial proportion of liver diseases worldwide. **Aim:** The aim of this study was to determine the prevalence rate of Hepatitis B and C virus infection among undergraduate students of Babcock University. **Methodology:** The blood samples of 200 participants (96 males and 104 females) were randomly collected and screened using rapid serological methods. HBV markers were determined using a HBV 5 in 1 Panel cassette Supplied by Innovita Biological Technology Co., Ltd., China; while antibody to HCV was detected using anti-HCV test strip supplied by Blue Cross Bio-Medical Co., Ltd., China**.** The demographic and clinical information of the participants were collected using structured questionnaires. **Results:** Out of the 200 participants screened, 3 (1.5%) were positive for HBsAg, 10 (5.0%) were positive for HBsAb, 3 (1.5%) were positive for HBcAb, 2 (1.0%) were positive for HBeAb and none (0%) was positive for HBeAg. 2 (2.1%) of the 96 males screened were positive for HBsAg, while only one (1%) out of the 104 females screened was positive for HBsAg. There was no significant difference (P>0.05) between the number of male and female students positive for HBsAg. On the basis of age distribution, data show that 3 (2.7%) out of the 110 students that were 16-20 years old were positive for HBsAg, while students in the other age groups were negative for HBsAg. Risk factors associated with infection include: tattooing, history of blood transfusion and shared sharp objects. Interestingly, zero prevalence rate (0%) of HCV infection was recorded in this current study. And consequent upon the above, co-infection of Hepatitis B and C Virus was absent in this present study. **Conclusion:** The outcome of this study showed that a low prevalence rate of HBV infection exists among undergraduate students of Babcock University, therefore the on-going public health campaign programme against Hepatitis B and C should be sustained.

Keys: *Liver Disease, Hepatitis, HBsAg, HBsAb, HBcAb, HBeAb, HBeAg, anti-HCV Ab*

1.0 INTRODUCTION

Hepatitis is defined as the inflammation of the liver. It may be caused by exposure to certain chemicals, autoimmune diseases, or by microbial agents such as bacteria, parasites and viruses; majorly the hepatitis viruses [1, 2]. The hepatitis B and C viruses in particular, can cause acute and chronic hepatitis and are the leading causes for hepatic cirrhosis and cancer, thus creating a significant burden to healthcare systems due to the high morbidity/mortality and costs of treatment [3, 4]. The viruses live in the blood and other body fluids and are transmitted from person to person through unprotected sexual intercourse with an infected person and percutaneous exposure to blood or body fluids through injections, needle stick or blood transfusion [2, 3].

The hepatitis B virus (HBV) is 10 times more infectious than hepatitis C virus (HCV) with many carriers not realizing they are infected with the virus, thus referred to as a “silent killer” [5]. The risk of developing a chronic form depends on age at infection: the younger the patient, the higher the risk of developing chronic hepatitis: chronic infection is seen in 90% of infants infected at birth, 30 to 50% of children infected between the age of one to four years, and 1 to 10% of those infected at older age or as adults [3].

Approximately, half of the world's population lives in HBV endemic areas and hepatitis B surface antigen (HBsAg) seroprevalence is more than 8% [6]. HBV infection has been the most significant factor associated with the development of liver cancer, which is one of the most malignant cancers; the second most frequent cause of cancer death in men, and the sixth leading cause of cancer death in women [7]. The incubation period of hepatitis B is four to 12 weeks, followed by the acute infection phase, icteric, or anicteric course, once again with a variable duration of two to 12 weeks [8]. HBV can effectively be prevented by vaccination, here, a safe and effective HBV vaccine has been available since the 1980s and can prevent acute and chronic infection with an estimated 95% success [3].

Most new infections with HCV are subclinical and majority of HCV patients (70–90%) develop chronic hepatitis, many of which are at risk of progressing to chronic active hepatitis and cirrhosis (10–20%). In some countries, like Japan for instance, HCV infection often leads to hepatocellular carcinoma [9]. A large number of people carrying the HCV virus are not aware of being infected due to high proportion of asymptomatic infections [3]. About 25,000 individuals die annually of chronic liver disease and cirrhosis in the United States. HCV appears to be a major contributor to this burden, approximately 40% [9].

According to the World Health Organization, there is no vaccine against HCV infection and a person with HCV can infect others from one to several weeks before symptoms begin to show up [10]. In case of chronic infections, infectivity may persist indefinitely. Relevant measures to reduce transmission are early diagnosis, effective prevention and screening programmes, as well as appropriate treatment [3].

Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections account for a substantial proportion of liver diseases worldwide [11] and Nigeria belongs to the group of countries highly endemic for viral hepatitis [12]. In Nigeria, HBV infection is hyperendemic and may be the highest in sub-saharan Africa [13]. In Nigeria, 18.7% of liver cancer patients carry markers of HCV and it is said that the results of seroprevalence studies of HCV in Nigeria vary depending on the study population and also the geographical setting having higher rates along the eastern borders and some in Northern regions [14].

Patients with dual HBV/HCV infection have a higher risk of progression to cirrhosis and decompensated liver disease, and have an increased risk of hepatocellular cancer (HCC). Co-infected patients represent a diverse group with various patterns of viral replication and great variations of immune profiles [15]. Because the two hepatotropic viruses share same modes of transmission, co-infection with the two viruses is not uncommon, especially in areas with a high prevalence of HBV infection and among people at high risk for parenteral infection. Patients with dual HBV and HCV infection have more severe liver disease, and are at an increased risk for progression to hepatocellular carcinoma [16].

Despite the level of public health awareness been created, many are yet to know their Hepatitis B and C virus infection status [17, 18]. Early detection of Hepatitis B and C virus infection can prevent liver diseases, including liver cancer. Howbeit, the percentage occurrence of Hepatitis B and C virus infection among undergraduate students of Babcock University is not known. Besides, there is need to identify factors that pre-dispose young adults in this setting to Hepatitis B and C virus infection. Scarcity of information in this regard, therefore necessitates this study.

2.0 Materials and Methods

2.1 Study area

This cross-sectional institutional based study was carried among undergraduate students of Babcock University, Ilishan-Remo, Ogun State. Babcock University is a First Class Seventh-day Adventist Institution of higher learning, with a student population of about 6000, located in the South-Western region of Nigeria, coordinates: 6.8862^{o}N, 3.7055^{o}E.

2.2 Duration of study

The study was carried between the months of April and June, 2017.

2.3 Study population

Undergraduate students from different Departments of Babcock University were the target population. They consist of young male and female adults within the age range of 16-35 years from different ethnic, religious and cultural background studying different degree program. Currently, the University has a total student population of about six thousand (6000), 100-600 level combined.

2.4 Sample size calculation

The sample size (n) was estimated using the single population proportion formula:

$$N = \frac{(1.96)^2 pq}{D^2}$$

Where;

n = required sample size

p = proportion of the population having hepatitis B and Hepatitis C virus infection from previous study

q =1-p and

d = the degree of precision

For the calculation, a 95% confidence interval, a p value of 0.14, *i.e,* a prevalence rate of 14% from previous study by Pennap *et al*., [19] and margin of error (d) set at 0.05 was used to determine the minimum sample size required. To minimize errors arising from the likelihood of non-compliance, 10% of the sample size was added giving a final sample size of 200.

2.5 Sample size

A total of 200 blood specimens was collected randomly from consenting 200 students (100 males and 100 females) of Babcock University, Ilishan-Remo, Ogun state.

2.6 Eligibility of Subjects

2.6.1 Inclusion Criteria

Consenting male and female undergraduate students of Babcock University were recruited randomly for the study.

2.6.2 Exclusion criteria

Non-consenting undergraduate students, as well as postgraduate students of the University were excluded.

2.8 Data collection

Clinical information was obtained from the participants through administration of prepared questionnaires and personal interviews. Each questionnaire had a unique participant identification number (PIDN). The first part of the questionnaires contained the biodata of the patients e.g. name, sex, age, study level and marital status. Second part included history of HBV and HCV Infection, risk factors, personal hygiene and health care-seeking behaviour. The study population was stratified by sex, age, study level, religion, tribe and marital status. Responses to structured questionnaire administered were used to collect data on epidemiology, demographic trends and causes of vulnerability for both HBV and HCV Infection. For reasons of privacy, all data was kept confidential in accordance with World Medical Association declaration of Helsinki [20] and for each participant, only the PIDN was recorded on the laboratory forms.

2.9 Specimen collection and Storage

A 4 ml of venous blood was aseptically collected from each of the participant by vene -puncture of the median cubital vein and shared into two equal halves. One portion was collected into EDTA bottle for antigen testing, while the second portion was collected into plain bottle for antibody testing. The specimen was transported to the laboratory and processed within 2 hours. Blood in the plain bottles were allowed to clot and centrifuged at 2000 resolution per minutes (rpm) for 5 minutes to separate into serum. Serum was aspirated using Pasteur pipettes and stored in cryogenic vials. Where sera was not processed immediately, they were stored at 2-8^{o}C for up to 3 days. For long term storage, specimens were kept below -20^{o}C. Frozen specimens were completely thawed, brought to room temperature and mixed well prior to testing. Repeated cycle of freezing and thawing of specimens was avoided

2.10 Laboratory analyses

Qualitative detection of HBV markers in serum specimens was determined using a HBV 5 in 1 Panel Supplied by Innovita Biological Technology Co., Ltd, Hebei, China (Figure 1). While antibody to HCV was detected using anti-HCV test strip supplied by Blue Cross Bio-Medical Co., Ltd, Beijing, China (Figure 2) according to the manufacturer's instruction.

Figure 1: Photograph of Innovita HBV 5 in 1 Panel use for the detection of Hepatitis B Virus markers.

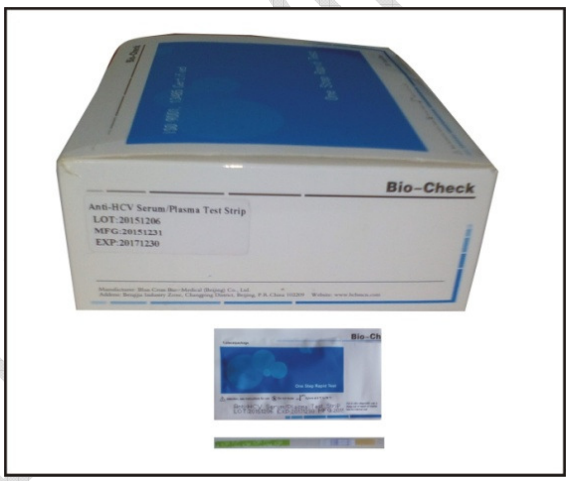

Figure 2: Photograph of Bio-Check Anti-HCV Test Strip used for the detection of antibody to HCV

Interpretation of the results

Interpretation for HBsAg, HBsAb, HBeAg

Positive: In addition to a pink colored control band, a distinct pink colored band will also appear in the test region

Negative: Only one colored band will appear on the control region

Invalid: No band appearing in the control region which could be as a result of procedural error and/or the test reagent has deteriorated. Specimen should be re-tested

Interpretation for HBeAb, HBcAb

Positive: Only one colored band will appear in the control region, no pink colored band will appear in the test

Weak positive: In addition to a pink colored control band, there will be a faint pink band appearing in the test region

Negative: Two colored bands appear in both tests and control region

Invalid: No band appearing in the control region which could be as a result of procedural error and/or the test reagent has deteriorated. Specimen should be re-tested

Interpretation for anti-HCV

Negative: only one colored band appeared on the control region.

Positive: In addition to a pink colored control band, a distinct pink colored band will also appear in the test region.

Invalid: A total absence of color in either regions or only one color band appears on the test region which indicates test error and or the test reagent has deteriorated.

2.11 Data Analysis

Data obtained for the antigen and antibody screening was presented using tables and was analyzed with oneway analysis of variance (ANOVA) and Turkey-Kramer Multiple Comparisons Test using SPSS-18.0 (Statistical packages for social Scientists – version 18.0) statistical program. P values<0.05 was considered significant.

3.0 RESULTS AND DISCUSSION

3.1 Results

The present study investigated the prevalence of Hepatitis B and C virus infection amongst undergraduate students of Babcock University, Ilishan-Remo, Ogun State. A total number of 200 students (96 males and 104 females) were screened using rapid serological methods. The prevalence of Hepatitis B Virus Surface antigen (HBsAg) Infection in relation to their social demographic characteristics is presented in Table 1. Out of the 200 participants screened, only 3 (1.5%) were positive for HBsAg, while the remaining 197 (98.5%) were HBsAg negative.

Based on sex distribution, 2 (2.1%) of the 96 males screened were positive for HBsAg, while only one (1%) out of the 104 females screened was positive for HBsAg. There was no significant difference (P>0.05) between the number of male and female students positive for HBsAg. On the basis of age distribution, participants were stratified as follows: 110 (16-20 years), 80 (21-25 years), 6 (26-30 years) and 4 (≥31 Years). Data show that 3 (2.7%) out of the 110 students 16-20 years old screened were positive for HBsAg, while students in the other age groups were negative for HBsAg. With regard to their marital status, study participants were either single or married. And out of the 196 singles screened, 3 (1.5%) of them were found positive for HBsAg; while the 4 married participants were without HBV infection.

Table 1: Prevalence of Hepatitis B Virus Surface antigen in relation to social demographic characteristics of the study participants

Characteristics	Category	Number of serum samples examined	Number positive N (%)	Number negative N (%)
Sex	Male	96	2 (2.1)	94 (97.9)
	Female	104	1 (1.0)	103 (99.0)
	Total	**200**	**3 (1.5)**	**197 (98.5)**

Age Range	16-20 Yrs	110	3 (2.7)	107 (97.3)
	21-25 Yrs	80	0 (0)	80 (100)
	26-30 Yrs	6	0 (0)	6 (100)
	≥31 Yrs	4	0 (0)	4 (100)
	Total	**200**	**3 (1.5)**	**197 (98.5)**
Marital Status	Single	196	3 (1.5)	193 (98.5)
	Married	4	0 (0)	4 (100)
	Total	**200**	**3 (1.5)**	**197 (98.5)**
Study Level	100 Level	38	0 (0)	38 (100)
	200 Level	10	1 (10)	9 (90)
	300 Level	18	0 (0)	18 (100)
	400 Level	72	2 (2.8)	70 (97.2)
	500 Level	62	0 (0)	62 (100)
	Total	**200**	**3 (1.5)**	**197 (98.5)**
Religion	Christianity	190	2 (1.1)	188 (98.9)
	Islam	10	1 (10)	9 (90)
	Traditional	0	0 (0)	0 (0)
	Total	**200**	**3 (1.5)**	**197 (98.5)**
Tribe	Yoruba	108	3 (2.8)	105 (97.2)
	Ibo	48	0 (0)	48 (100)
	Hausa	0	0 (0)	0 (0)
	Others	44	0 (0)	44 (100)
	Total	**200**	**3 (1.5)**	**197 (98.5)**

Based on study level distribution, participants were stratified as follow: 38 (100 Level), 10 (200 Level), 18 (300 Level), 72 (400 Level) and 62 (500 Level). 1 (10%) out of the 10 students in 200 Level was positive for HBsAg; while 2 (2.8%) out of the 72 students in 400 Level were positive for HBsAg. There was no significant difference (P>0.05) between the number of students in 200 Level positive for HBsAg compared to 400 Level. Meanwhile, there was no occurrence of HBV infection (0%) among students of other Levels.

On the basis of religion, participants were either Christians or Muslims, as no student indicated traditional religion. 2 (1.1%) out of the 190 Christian students screened were found to be positive for HBsAg, while only 1 (10%) out of the 10 Muslim students screened was positive for HBsAg. Percentage occurrence of HBsAg with regards to the two religion was not statistically different (P>0.05).

Furthermore, on the basis of tribal distribution, participants consist of 108 Yorubas, 48 Ibos and 44 others who were neither Yorubas, Ibos nor Hausa. 3 (2.8%) out of the 108 Yoruba students tested were positive for HBsAg. There was no occurrence of HBV infection among the non-Yorubas. The Hepatitis B Virus profile of the study participants is presented in Figure 3. Out of the 200 study participants, 3 (1.5%) were

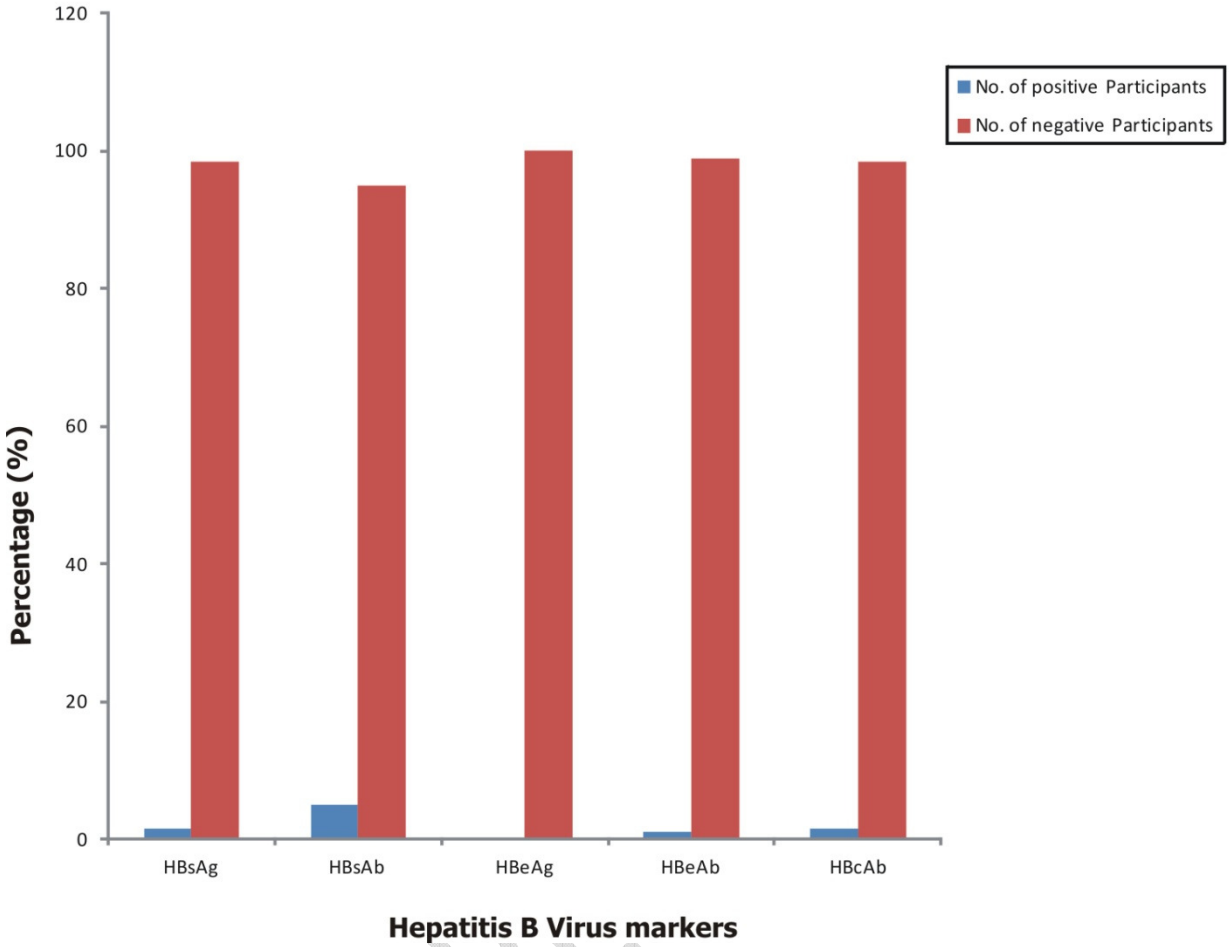

Figure 3: Histogram showing the Hepatitis B Virus Profile of the study participants

Key: ***HBsAg*** *= Hepatitis B surface antigen,* ***HBsAb*** *= Antibody to Hepatitis B surface antigen,* ***HBeAg*** *= Hepatitis B envelope antigen,* ***HBeAb*** *= Antibody to Hepatitis B envelope antigen,* ***HBcAb*** *= Antibody to Hepatitis B core antigen*

positive for HBsAg, 10 (5.0%) were positive for HBsAb, 3 (1.5%) were positive for HBcAb and 2 (1.0%) were positive for HBeAb. Meanwhile, none of the participants (0%) was positive for HBeAg (Figure 4, 5, 6 and 7). Distribution of Hepatitis B Virus Surface antigen (HBsAg) of the study participants in relation to risk factors is presented in Table 2. Two, 2 (1.7%) out of the 116 respondents who indicated knowledge/awareness of Hepatitis B Virus infection, were positive for HBsAg. None of the 10 respondents (0%) who had received Hepatitis B Vaccine was positive for HBsAg, while 3 (1.6%) out of the 190 respondent who had not received Hepatitis B Vaccine were positive for HBsAg. One respondent (0.5%) with history of blood transfusion was positive for HBsAg, while 2 (1.0%) respondents without history of blood transfusion were positive for HBsAg. None of the respondents (0%) with history of organ transplant or dialysis was positive for HBsAg. 2 (3.2%) of the 62 respondents with tattooing/ear piercing was positive for HBsAg, while only 1 (0.7%) without such history was positive for HBsAg. Also, 2 (50.0%) out of the 4 respondents who indicated sharing of sharp objects were positive for HBsAg, while only 1 (0.5%) out of 196 respondents who indicated otherwise was positive for HBsAg. Also, none of the respondents who indicated sharing of tooth brush, smoking of cigarette, drinking of alcohol, use of intravenous drugs, engage in sexual intercourse, use condoms/barriers and change sex partners recently had HBV infection.

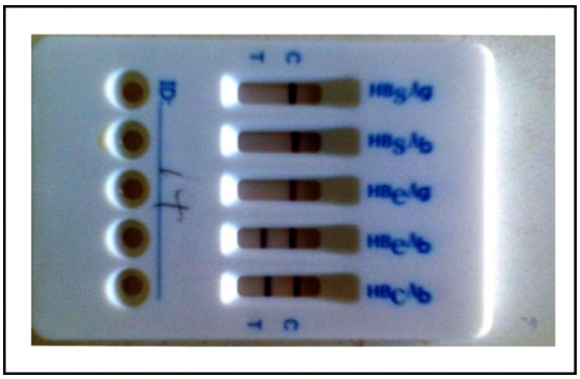

Figure 4: Hepatitis B Virus 5 in 1 Cassette showing a test negative for all the HBV markers

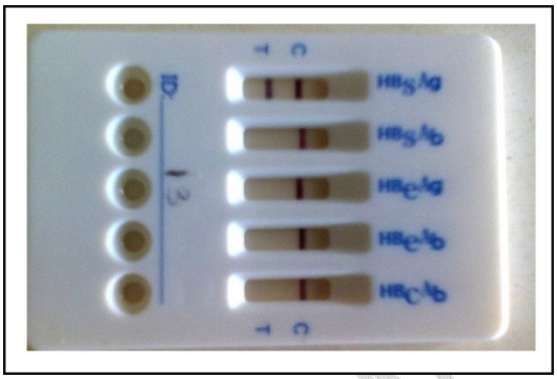

Figure 5: Hepatitis B Virus 5 in 1 Cassette showing a test positive for HBsAg, HBeAb and HBcAb.

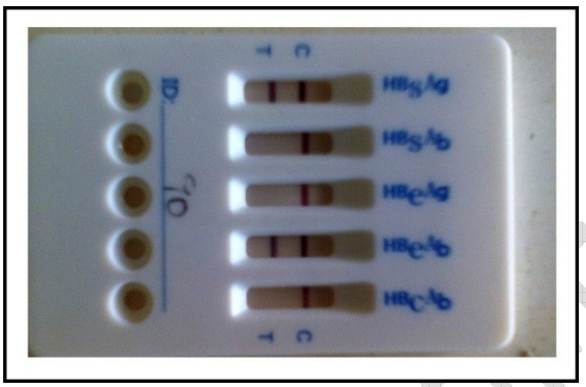

Figure 6: Hepatitis B Virus 5 in 1 Cassette showing a test positive for both HBsAg and HBcAb.

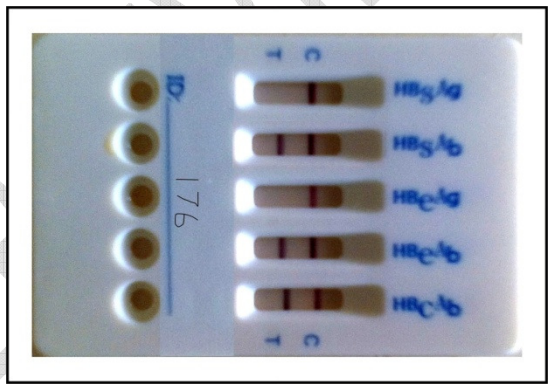

Figure 7: Hepatitis B Virus 5 in 1 Cassette showing a test positive for HBsAb only.

Prevalence of Hepatitis C Virus infection in relation to social demographic characteristics of the study participants is presented in Table 3. Interestingly, zero prevalence rate (0%) of Hepatitis C Virus (HCV) infection was recorded in this current study as none of the study participant, regardless of their demographic characteristic, was positive for antibody to Hepatitis C Virus (anti-HCV). Prevalence of Hepatitis B and C Virus Co-infection in relation to the social demographic characteristics of the study participants is presented in Table 4. Consequent upon the fact that none of the participants were positive for anti-HCV, there was no occurrence of HBV/HCV co-infection in this study.

3.2 Discussion

Hepatitis B virus (HBV) and Hepatitis C virus (HCV) infections account for a substantial proportion of liver diseases worldwide [11]. And Nigeria belongs to the group of countries highly endemic for viral hepatitis [12], with varying seroprevalence depending on the study population and also the geographical setting [14]. The present study investigated the prevalence of Hepatitis B and C virus infection amongst undergraduate students of Babcock University, Ilishan-Remo, Ogun State, south-western Nigeria. A total number of 200 students (96 males and 104 females) were screened using rapid serological methods. Out of the 200 participants screened, only 3 (1.5%) were positive for HBsAg, while the remaining 197 (98.5%) were HBsAg negative.

Table 2: Distribution of Hepatitis B Virus Surface antigen of the study participants in relation to risk factors

Characteristics	Responses	No. of participants N (%)	No. positive N (%)	No. negative N (%)
Knowledge/Awareness of	Yes	116 (58)	2 (1.7)	114 (98.3)
Hepatitis B Virus Infection	No	84 (42)	1 (1.2)	83 (98.8)
Received Hepatitis B vaccine	Yes	10 (5)	0 (0)	10 (100.0)
	No	190 (95)	3 (1.6)	187 (98.4)
History of blood transfusion	Yes	1 (0.5)	1 (100.0)	0 (0)
	No	199 (99.5)	2 (1.0)	197 (99.0)
History of organ transplant	Yes	4 (2.0)	0 (0)	4 (100.0)
	No	196 (98.0)	3 (1.5)	193 (98.5)
History of dialysis	Yes	44 (22.0)	0 (0)	44 (100.0)
	No	156 (78.0)	3 (1.9)	153 (98.1)
Tattooing/ear piercing	Yes	62 (31.0)	2 (3.2)	60 (96.8)
	No	138 (69)	1 (0.7)	137 (99.3)
Share sharp objects	Yes	4 (2.0)	2 (50.0)	2 (50.0)
	No	196 (98.0)	1 (0.5)	195 (99.5)
Share tooth brush	Yes	10 (5.0)	0 (0)	10 (100.0)
	No	190 (95.0)	3 (1.6)	187 (98.4)
Smoke cigarette	Yes	56 (28.0)	0 (0)	56 (100.0)
	No	144 (72.0)	3 (2.1)	141 (97.9)
Drink alcohol	Yes	46 (23.0)	0 (0)	46 (100.0)
	No	154 (77.0)	3 (2.0)	151 (98.0)
Use intravenous drugs	Yes	54 (27.0)	0 (0)	54 (100.0)
	No	146 (73.0)	3 (2.1)	143 (97.9
Engage in sexual intercourse	Yes	37 (18.5)	0 (0)	37 (100.0)
before	No	163 (81.5)	3 (1.8)	160 (98.2)
Use condom/barriers	Yes	4 (2.0)	0 (0)	4 (100.0)
	No	196 (98.0)	3 (1.5)	193 (98.5)
Change Sex Partner recently	Yes	44 (22.0)	0 (0)	44 (100.0)
	No	156 (78.0)	3 (1.9)	153 (98.1)
Number of Sex Partner	None	181 (90.5)	3 (1.7)	178 (98.3)
	1	4 (2.0)	0 (0)	4 (100.0)
	2	3 (1.5)	0 (0)	3 (100.0)
	3	8 (4.0)	0 (0)	8 (100.0)
	>3	4 (2.0)	0 (0)	4 (100.0)

The 1.5% HBsAg prevalence rate obtained in this present study was lower than those reported by previous works. For instance, Eyong *et al.* [18], reported a prevalence of 5.7% and 7.5% among pregnant women in the Limbe and Muyuka Health Districts of the South-western region of Cameroon, respectively. Hebo *et al.* [21] reported a prevalence of 2.5% among Health Workers in a University Medical Center, South-west Ethiopia. Ojiegbe *et al.* [17] and Alquatani *et al.* [22] both reported a prevalence of 1.7% among pregnant women in south-eastern region of Nigeria, as well as among Health Students and Health care workers in the Najran region, South-west Saudi Arabia, respectively. In 2015, a prevalence rate as high as 31.5% was reported by Tula and Iyoha [23], among Students of Federal Polytechnic Mubi, Adamawa State, North-east Nigeria. Mboto and Edet [24] reported a prevalence rate of 4.7% among the undergraduate Students of University of Uyo, Akwa-Ibom, South-South Nigeria; while, Jeremiah and Tony-Enwin [25], reported a prevalence rate of 2.1% in a study of Seroepidemiology of Transfusion Transmissible Viral Infection among University Fresh Students in Port Harcourt, south-south Nigeria.

277 **Table 3:** Prevalence of antibody to Hepatitis C Virus in relation to social demographic characteristics of
278 the study participants

Characteristics	Category	Number of serum samples examined	Number positive N (%)	Number negative N (%)
Sex	Male	96	0 (0)	96 (100)
	Female	104	0 (0)	104 (100)
	Total	**200**	**0 (0)**	**200** (100)
Age Range	16-20 Yrs	110	0 (0)	110 (100)
	21-25 Yrs	80	0 (0)	80 (100)
	26-30 Yrs	6	0 (0)	6 (100)
	≥31 Yrs	4	0 (0)	4 (100)
	Total	**200**	**0 (0)**	**200** (100)
Marital Status	Single	196	0 (0)	196 (100)
	Married	4	0 (0)	4 (100)
	Total	**200**	**0 (0)**	**200** (100)
Study Level	100 Level	38	0 (0)	38 (100)
	200 Level	10	0 (0)	10 (100)
	300 Level	18	0 (0)	18 (100)
	400 Level	72	0 (0)	72 (100)
	500 Level	62	0 (0)	62 (100)
	Total	**200**	**0 (0)**	**200** (100)
Religion	Christianity	190	0 (0)	190 (100)
	Islam	10	0 (0)	10 (100)
	Traditional	0	0 (0)	0 (0)
	Total	**200**	**0(0)**	**200**
Tribe	Yoruba	108	0 (0)	108 (100)
	Ibo	48	0 (0)	48 (100)
	Hausa	0	0 (0)	0 (0)
	Others	44	0 (0)	44 (100)
	Total	**200**	**0 (0)**	**200** (100)

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280 The relatively low prevalence seen in this study conducted in an HBV endemic area may be attributable
281 to the low risk nature of the study population. On the basis of sex distribution, the present data show that
282 the prevalence of HBV was 2.1% among the males and 1% among the females. This agrees with the
283 results of previous studies which clearly indicated that HBV is more prevalent among male subjects than
284 their female counterparts.

285 For instance, Wasa and Maigana [26] reported a prevalence rate of 20% and 5%, respectively among
286 male and female undergraduate Students of Gombe State University. In a study conducted among Staff
287 and Students of University of Jos, Plateau State, Nigeria, Solomon *et al.* [27], reported a prevalence rate
288 of 9.9% among males and 3.79% among females. Tula and Iyoha [23] also, reported a prevalence of 43%
289 among male Students of Federal Polytechnic Mubi, Adamawa State, Nigeria and a prevalence of 27%
290 among their female counterparts. Meanwhile, in a study carried out among Students of Federal University
291 Wukari, Taraba State, Nigeria; Imarenazor *et al.* [28], reported a prevalence rate of 6% among male
292 participants and zero (0%) prevalence among female participants.

Table 4: Prevalence of Hepatitis B and C Virus Co-infection in relation to socialdemographic characteristics of the study participants

Characteristics	Category	Number of serum samples examined	Number positive N (%)	Number negative N (%)
Sex	Male	9;86	0 (0)	96 (100)
	Female	104	0 (0)	104 (100)
	Total	**200**	**0 (0)**	**200** (100)
Age Range	16-20 Yrs	110	0 (0)	110 (100)
	21-25 Yrs	80	0 (0)	80 (100)
	26-30 Yrs	6	0 (0)	6 (100)
	≥31 Yrs	4	0 (0)	4 (100)
	Total	**200**	**0 (0)**	**200** (100)
Marital Status	Single	196	0 (0)	196 (100)
	Married	4	0 (0)	4 (100)
	Total	**200**	**0 (0)**	**200** (100)
Study Level	100 Level	38	0 (0)	38 (100)
	200 Level	10	0 (0)	10 (100)
	300 Level	18	0 (0)	18 (100)
	400 Level	72	0 (0)	72 (100)
	500 Level	862	0 (0)	62 (100)
	Total	**200**	**0 (0)**	**200** (100)
Religion	Christianity	190	0 (0)	190 (100)
	Islam	10	0 (0)	10 (100)
	Traditional	0	0 (0)	0 (0)
	Total	**200**	**0(0)**	**200**
Tribe	Yoruba	108	0 (0)	108 (100)
	Ibo	48	0 (0)	48 (100)
	Hausa	0	0 (0)	0 (0)
	Others	44	0 (0)	44 (100)
	Total	**200**	**0 (0)**	**200** (100)

Higher prevalence of HBV infection among male individuals has been linked to some risk factors such as tattooing, intravenous drug use and changing of sexual partners among several others. This however, contradicts earlier report by Babatope *et al.* [29], who observed a prevalence rate of 2.3% among females and 0.7% among males. According to them, socio-economic, cultural and biological factors may be responsible for the female gender's vulnerability to HBV infection.

On the basis of age distribution, data show that 3 (2.7%) out of the 110 students, 16-20 years old were positive for HBV, while students in the other age groups were negative for HBV. Although a 1.5% prevalence rate was recorded in this current study, previous works have shown that HBV is common among young adults, who are less than 30 years old. For instance, a higher prevalence rate of 18.2% was reported by Wasa and Maigana [26], among 16-25 years old undergraduate Students of Gombe State University, Gombe State, Nigeria. Meanwhile, Isa [30] reported a prevalence rate of 16% among 16-20 years old undergraduate Students of Ahmadu Bello University (ABU), Zaria, Kaduna State, Nigeria. These findings put together, shows a high prevalence of HBV among the young ones compared to the

older ones, this could be associated with increased sexual activity and intravenous drug use among young adults in their mid-twenties.

With regard to the marital status of the study participants, out of the 196 singles screened, 3 (1.5%) of them were found positive for HBsAg; while the 4 married participants were without HBV infection. This result differs from the work of Pennap *et al.* [31] who reported a prevalence of 27.2% for the singles and 21.3% among the married ones. According to them, the singles are more at risk to having the infection because of their loose lifestyle.

Furthermore, this present study did not observe any significant difference ($P>0.05$) between the number of students positive for HBsAg based on their study level and religion. And with regard to their tribal status, 3 (2.8%) out of the 108 Yoruba students tested were positive for HBsAg; meanwhile, there was no occurrence of HBV infection among the non-Yorubas. To the best of our knowledge, no previous studies have considered the prevalence of HBV infection in relation to the study level, religion and tribe of the study population.

The Hepatitis B Virus profile of the study participants as shown in Figure 3 shows that out of the 200 study participants tested, 3 (1.5%) were positive for HBsAg, 10 (5.0%) were positive for HBsAb, 3 (1.5%) were positive for HBcAb and 2 (1.0%) were positive for HBeAb. Meanwhile, none of the participants (0%) was positive for HBeAg. The prevalence of HBV markers as observed in this current study differ from those of Ojiegbe *et al.* [17] who reported a prevalence of 1.7% for HBsAg and none (0%) for HBeAg among pregnant women in south-eastern region of Nigeria. It was also found to be far lower than those reported by Ndako *et al.* [32], among 200 school Children in Riyom Local Government Area (LGA), Plateau state, Nigeria: HBsAg (25%), HBsAb (17.5%), HBcAb (13.5%), HBeAb (15.0%) and HBeAg (4.0%).

Clinically, HBsAg, HBsAb, HBcAb, HBeAb and HBeAg are the important markers in the diagnosis of HBV infection. HBsAg is the first marker to appear in the blood and it presence indicates current infection which might be acute or chronic. Simultaneous with or shortly after the disappearance of HBsAg, antibody to HBsAg (HBsAb) is found in the blood. Its appearance heralds completely recovery. Meanwhile, it presence following vaccination with HBV vaccine provides lifelong immunity.

Furthermore, HBcAg itself does not circulate freely in the serum of such infected persons, rather antibody to HBcAg (HBcAb) appear shortly after HBsAg, roughly at the time serum ALT begin to rise and also remains elevated for life. Its presence indicates an exposure, which could be current or recent infection, as well as chronic HBV infection. The presence of both HBsAb and HBcAb indicates immunity due to natural infection [33, 34].

On the other hand, HBeAg is an indicator of active intra-hepatic viral replication and increased infectivity and therefore its presence in blood means that the person is highly infectious. Lack of HBeAg shows that there is no increased infectivity among the positive participants. HBeAb is usually present in the serum in the convalescent stage, often in chronic hepatitis and its carrier state denotes low infectivity. It appears shortly after the disappearance of the antigen and is detectable for up to 2 years or more after resolution of the hepatitis.

Presence of HBsAg, HBcAb and HBeAb or HBeAg has been associated with Hepatitis B carrier state. Meanwhile; absent of the 5 HBV markers (HBsAg, HBsAb, HBcAb, HBeAg and HBeAb) denotes absence of HBV infection and that the individual is susceptible to infection [33, 34].

From the data obtained, risk factors associated with occurrence of HBV infection among the study population include: sharing of sharp objects, history of blood transfusion and tattooing/ear piercing among others. This is consistent with the earlier report by Uleanya and Obidike [35]. On the other hand, history of organ transplant/dialysis, sharing of tooth brush, smoking, intravenous drug use and sexual intercourse appear to be unconnected with the 1.5% HBV prevalence recorded in this study.

Furthermore, while 58% of the participants in this study indicated to have knowledge and awareness of HBV infection; 95% of students of University of Sindh, Pakistan and Nursing College Students of Central India indicated to have knowledge and awareness of HBV infection as reported by Ghouri *et al.* [36] and Mahore *et al.* [37], respectively.

With regard to HCV infection, a zero (0%) prevalence rate was recorded in this current study as none of the participants were positive for antibody to Hepatitis C Virus (anti-HCV). This agrees with the work of Muhibi *et al.* [38] and Alquatani *et al.* [22], who both reported zero (0%) prevalence of anti-HCV antibody among undergraduate students of Achievers University, Owo in south-west Nigeria, as well as among Health Students in the Najran region of South-Western Saudi Arabia, respectively. The outcome of this study however differ slightly from the work of Hebo *et al.* [21] who reported a prevalence of 0.42% among Health Workers of University Medical Center, Southwest Ethiopia, as well as that of Jemilohun *et al.* [39] who reported a prevalence rate of 0.40% among undergraduate Student of Ladoke Akintola University of Technology (LAUTECH), Ogbomosho, Oyo State, south-west Nigeria. The study further differs from the work of Udeze *et al.* [40] who reported a prevalence rate of 8.0% among first year Students of University of Ilorin, Kwara State, Nigeria. In a recent study by Tula *et al.* [41], a much higher prevalence rate of 11.5% was recorded among Students of Federal Polytechnic Mubi, Adamawa; majority of whom had history of blood transfusion, medical surgery and circumcision. The on-going public health awareness campaign against HCV might have impacted positively on this outcome. Thus routine screening for HCV and sustained awareness creation activities to eradicate HCV and its attendant consequences from our society is of paramount importance.

HBV/ HCV co-infection wasn't recorded in this study. On one hand, this agrees with the study carried out by Tula *et al.* [41], among Students of Federal Polytechnic Mubi, Adamawa State, Nigeria; as well as Imarenazor *et al.* [28], among Students of Federal University Wukari, Taraba State, Nigeria, who both recorded a zero (0%) prevalence of HBV/HCV co-infection. On the other hand, it differs from the work of Esan *et al.* [42], who reported a prevalence of 0.15% HBV/HCV co-infection among pregnant women attending antenatal clinic of the Federal Medical Centre, Ido-Ekiti, Ekiti State, Nigeria and that of Yari *et al.* [43], who reported a prevalence of 1.88% among patients in Mashhad, Iran.

CONCLUSION

The outcome of this study shows that HBV infection is present among students of Babcock University with a low prevalence rate of 1.5%, whereas there was no record of HCV, as well as HBV/HCV co-infection among the study population. Following the outcome of this screening, we recommend the following: (1) detection of HBV/HCV-DNA and determination of Viral Load should be attempted by future Researchers, (2) Where grants/funding is available, sensitive methods such as Enzyme Immuno Assay, Recombinant immunoblot assay (RIBA) and polymerase chain reaction (PCR) should be used to screen and confirm the HBV and HCV status of the study population, (3) The serum liver enzymes (AST and ALT) and albumin levels should be determined for the positive individuals in other to determine hepatic involvement and the severity of damage to the liver, (4) Public health awareness with regard to HBV and HCV infection should be intensified and sustained by relevant stake holders, (6) HBV Vaccination should also be ensured and carried among students of higher institution, and (7) Positive individuals should visit the hospital for appropriate treatment.

Disclaimer: - This manuscript was presented in a Conference.

Conference name: World Congress on Virology, Microbiology and Microbiologists

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Available link: - https://www.scitechnol.com/conference-abstracts-files/2324-8955-C2-009-006.pdf

CONSENT

All authors declare that 'written' informed consent was obtained from the participants with assurance of anonymity and confidentiality before the commencement of the study.

ETHICAL APPROVAL

Ethical approval for the study was obtained from the Babcock University Health Research Ethics Committee (BUHREC) with ethical approval registration number: BUHREC215/17.

COMPETING INTERESTS

Authors have declared that no competing interests exist

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