Original Research Article

Demographic and Serum Alanine Aminotransferase pattern of primary Health Care Workers positive for Hepatitis B Surface Antigen and Hepatitis C Virus in Cross River North, Nigeria

Abstract

Background: Healthcare workers (HCW) are perceived to be a high-risk group for hepatitis B due to occupational exposure to infected bodily fluids and often poor availability of protective equipment in sub-Saharan Africa. This study was carried out to assess the serums ALT levels of Primary Health Care workers (PHCW) who are reactive to Hepatitis B surface antigen, hepatitis C virus and evaluate their sociodemographic characteristics amongst.

Methods: The study was carried out in the health care centres of five (5) local government areas of Cross River North Senatorial district of Cross River State, Nigeria which includes Bekwarra, Obanliku, Obudu, Ogoja and Yala local government areas. These primary health care centres provide medical services for patients diagnosed with Hepatitis B, Hepatitis C and HIV. Two hundred (200) health workers' samples were analysed in the study.

Result: The result showed that 192 (96%) of the subjects tested negative to hepatitis B Virus while 8 (4%) were positive for the virus. Data also show that 198 (99%) of the subjects tested negative to Hepatitis C Virus while 2 (1%) were positive. Alanine aminotransferase decreased in subjects that tested positive to the Hepatitis B and C Virus.

Conclusion: The prevalence of hepatitis B surface antigen (HBsAg) and Hepatitis C amongst Health Care Workers was significant, and this could be attributed to the knowledge and attitude of the workers towards safety practices as well as vaccination.

Keywords: Hepatitis, Virus, Health, worker, Aminotransferase and vaccinated

1. INTRODUCTION

Hepatitis B is a serious and growing public health problem [1]. Hepatitis B Virus (HBV), a major public health problem worldwide is more prevalent in the developing countries [2]. Hepatitis B virus (HBV) affects approximately 350 million people worldwide and remains a global public health concern [3]. The World Health Organisation (WHO) estimates the prevalence of chronic hepatitis B infection in sub-Saharan Africa is 6.1% [4]. This is a substantial proportion of people at risk of complications including cirrhosis, hepatocellular carcinoma and premature mortality. The WHO have set a target of elimination of viral hepatitis by 2030, and substantial public health effort will be required to reach this laudable aim [5]. Whilst hepatitis B is vaccine-preventable and many countries have introduced vaccinations in the past 20 years, most countries in sub-Saharan Africa have hepatitis B vaccines for infants only without an adult catch up plan and coverage is imperfect± 74% of eligible children in sub-Saharan Africa received three doses of hepatitis B vaccine in 2016 [6-7].

The regions of highest prevalence for HBV infection are Africa, the Pacific region and Asia, where the virus is acquired mainly through perinatal transmission. In China, the prevalence of hepatitis B surface antigen (HBsAg) is high and affects 8.5±10.5% of the adult population [8]. Hepatic diseases account for 7.9% of medical admissions in Nigeria, with primary hepatic cancer and cirrhosis accounting for 44.3% and 20.4%, respectively. HBV is the second main cause of these conditions with the prevalence of 49.4% after alcohol consumption (52.1%) [9]. There is an increasing trend of HBV infection in Nigeria (Schweitzer et al., 2015), so the risk of contracting HBV in Nigeria is substantial not only due to low vaccination rates but also because as many as 75% of the population will be exposed [10]. Worldwide, viral hepatitis caused 1.45 million deaths in 2013, which represents an increased mortality burden by 63% between 1990 and 2013. The leading cause of viral hepatitis in sub-Saharan Africa is hepatitis B [11].

HBV infection, which prevalence is increasing, is a dynamic process, and the development of HBV is affected by the individual's immune response and HBV replication. Disease progression is divided into multiple phases, based on the levels of serum hepatitis B envelope antigen (HBeAg), HBV DNA and alanine aminotransferase (ALT) and on the degree of liver inflammation. The impacts of HBV infection can be life long as the disease can become chronic and develop further into cirrhosis, liver failure and hepatocellular carcinoma (HCC). The number of HBV-associated deaths due to cirrhosis and/or HCC is more than one million per year [11].

The significance of timely prevention of infections among health care workers (HCWs) cannot be overemphasized in a hospital setting where the employees' health is constantly threatened by innumerable infectious hazards, most of which can be avoided by observing standard precautions [12]. At least twenty six different infectious agents have been reported in literature to be transmitted through occupational exposure during sharp injuries [13]. The possibility of transmission of yet to be identified plethora of infectious agents can never really be ruled out. The highest share of exposure to contaminated sharps is shared by the HCWs of the developing countries where approximately 40–60% of the occupational Hepatitis B virus (HBV) infections arise due to the sharp injuries [12]. About 14.4% and 1.4% of HBV and HCV rates have been reported in HCWs with the highest prevalence among dentists, nursing staff, dialysis unit staff, laboratory staff or physicians [14]. A study reports 600,000 to 800,000 cut or puncture injuries amounting to around 30 injuries per 100 beds per year out of which almost half are not registered [15]. As per the World Health Organisation (WHO), the average number of occupational injuries per HCW varied region wise (0.2–4.7 injuries annually) along with the proportion of HCWs in the general population (0.2%–2.5%) [16-17].

In the pre-vaccination era transmission of hepatitis B virus (HBV) in medical settings was a severe public health problem. A high rate of infections of health care workers (HCW) with HBV was observed and 5–10% of the infected subjects usually became chronic HBV carriers. HBV transmission was especially frequent in cases of direct contacts with blood, such as surgery, hemodialysis units, or oncology wards. In contrast to hepatitis C, transmission of HBV from patient to HCW can be prevented by vaccination. Therefore, the number of HBV infections of HCW dropped significantly during the last 20 years [18]. This sustained decline in the incidence of hepatitis B among persons with occupational exposure can be attributed to hepatitis B vaccination of HCW, graduates of medical school, and emergency medical technicians [19]. Introduction of a series of measures to prevent exposure to HBV in addition contributed to the reduction of the rate of HBV infections [20].

As a result, the incidence of HBV infection among HCW is now lower than among the general population. Because more than 95% of vaccines develop protective antibodies, the risk of vaccinated HCW to acquire HBV during their professional activities is minimal. However, not all HCW are vaccinated or are responders to vaccine and, therefore, are at risk to acquire HBV infection. HBV is among one of the important public health challenges with a mortality accounting for almost a million deaths annually [19]. HBV infection, the most important etiology of cancer mortality worldwide, accounts for almost 80% of the cases of primary liver carcinoma [21]. What is more worrisome is that there are no national strategy plan for prevention and control of hepatitis B in Nigeria either among healthcare workers or the general population, and no routine surveillance or sero-surveys of infection [22]. Increasing use of various newer invasive diagnostic or therapeutic modalities makes the exact estimation of the incidence of nosocomial HBV difficult. Moreover in resource constraint countries, where HBV is in high prevalence, the implementation of prevention strategies becomes even more crucial due to the lack of adequate treatment opportunities. Both employees and employers of a health care setting are responsible to take suitable steps to prevent the exposure or transmission of blood-borne pathogens among PHCWs, patients and/or health workers. The aim of this study is to assess the serums alanine aminotransferase levels of Primary Health Care workers who are reactive to Hepatitis B surface antigen, hepatitis C virus and evaluate the sociodemographic characteristics amongst primary health care worker who are reactive to Hepatitis B surface antigen in Cross Rivers North.

2. METHODS

This study was conducted among health care workers at Primary Health Care centres in five local government areas of Cross River North Senatorial district of Cross River State. They include Primary Health Centers in Bekwarra, Obanliku, Obudu, Ogoja and Yala local government areas. These primary health care centers provide medical services for patients diagnosed with Hepatitis B, Hepatitis C and HIV. The population size for this study includes six hundred and thirty two (632) health workers within the study area outlined as follows: Bekwarra (n = 115), Obanliku (n = 117), Obudu (n = 150), Ogoja (n = 120) and Yala (n =130). The study was a multicentre, hospital-based cross-sectional study.

Subject Selection Criteria; All subjects who are health workers in primary health care centres within the study area and period who gave informed consent were recruited into the study.

Structured questionnaires and interview were used to exclude subjects who were not health workers and did not fit into the inclusion/eligibility criteria. Patients with the following conditions were excluded: co-infection with hepatitis C, antiviral drugs taken 6 months before enrolment, pregnancy or lactation, co-infection with HIV and cirrhosis.

The sample of the population of this study stood at 200 primary health care workers across the five local government areas.

A convenience sampling method was used to cluster five major facilities in the study area and all primary health care workers in those facilities who gave an informed consent were sampled.

Instrument for Data Collection; All primary health care workers who were sampled for this study were screened for hepatitis B surface antigen, hepatitis C virus and retro virus by way of blood test, Alanine aminotransferase levels was also checked on subjects.

A questionnaire was used in the study. The content of this instrument was based on information about hepatitis B and the biodata of participants.

The cubital fossa of each participant was cleaned with alcohol pad, and was gently pricked with lancet. About five millilitres (5 mL) of blood was collected into a plain bottle and transported to the laboratory immediately for analysis. Each sampling bottle was properly labelled for easy identification.

About 1 mL of the whole blood was set aside for use immediately for rapid test, while the remaining 4 mL were allowed to stand at room temperature for 1 hour to effect clotting and then centrifuged at 2500 rpm for 10 min in a vacutainer. The sera were then separated into a plain blood collection container and stored at <20°C until needed [23].

Serology Tests; For each participant, a sealed pouch was opened by tearing along the notch. The test strip was removed from the pouch. A drop of blood was introduced onto the marked "T" point on the test strip, and one drop of the buffer solution was added to the drop of blood on the test strip. This was allowed to mix and react based on the antigen/antibody reaction principle for about 10minutes and then the result was interpreted as follows: Those who were negative to HBsAg, only one colour band appeared on the control region. No apparent band on the test region. This indicated that there was no detectable HBsAg in the serum of such participants. For those who were positive, distinct colour bands appeared on the control and test regions. Both test line and control line indicates that the specimen contains detectable amounts of HBsAg.

Biochemical Tests; Sera were subjected to liver function Reflotron tests in order to determine the level of ALT. It was analysed biochemically using the Reflotron instrument which was switched on and a test strip was removed from the container when the display showed "READY". The desiccant stopper was replaced immediately on the container. The strip was unwrapped with care taken not to bend it. Sample material was drawn using the Reflotron pipette and was applied as a drop to the red application zone with care taken not to touch the application zone with the pipette tip. With the sliding cover or flap open, the test strip was placed on to the guide within 15 sec and was slided forward horizontally until it locked into place. The sliding cover or flap was closed. The instrument displayed GPT to confirm that it has correctly read in the test-specific magnetic code. The display showed the number of seconds left before the result was displayed. GPT activity was calculated automatically from the reading taken using a function and conversion factors that were entered in the instrument via the magnetic strip on the underside of each test strip. The enzyme activity was shown for 37°C in U/L. The used test strip was removed from the Reflotron and disposed of accordingly.

2.1 Statistical Analysis

Data obtained from test results were analysed using IBM SPSS Version 20 statistical software (IBM Corp. Armonk, NY, USA). The relationship between HBV serologic markers and liver

enzymes/compounds abnormalities were evaluated with binary logistic regression, where a p-value of less than 0.05 at 95% confidence interval (CI) was considered statistically significant.

3. RESULTS

Sociodemographic Characteristics of Primary Health Care workers in Cross Rivers North

In this segment, the socio-demographic characteristics of primary health workers in Cross Rivers North were analysed.

Table 1; Social-Demographic Variables of Subjects

Factors	Variables	Towns					Total N(%)
		Bekwarra N(%)	Obanliku N(%)	Obudu N(%)	Ogoja N(%)	Yala N(%)	
Gender	**Male**	16 (48)	13 (31)	5 (9)	12(36)	8 (24)	54 (27)
	Female	17 (52)	29 (69)	54 (91)	21 (64)	25 (76)	146 (73)
Age (Years)	**<30**	15 (44)	13 (31)	0 (0)	3 (8)	15 (44)	44 (22)
	31 – 40	5 (16)	13 (31)	9 (16)	8 (24)	3 (12)	40 (20)
	>40	13 (40)	16 (38)	50 (84)	22 (68)	15 (44)	116 (58)
Level of Education	**Primary**	1 (4)	3 (6)	2 (4)	0 (0)	3 (8)	10 (5)
	Secondary	19 (57)	1 (3)	1 (2)	0 (0)	3 (8)	6 (3)
	Tertiary	13 (39)	38 (91)	56 (94)	33 (100)	27 (84)	184 (92)
Duration in Public Service (Years)	**<10**	22 (68)	17 (41)	7 (11)	8 (24)	16 (48)	70 (35)
	11 – 20	0 (0)	10 (25)	17 (29)	1 (4)	8 (23)	36 (18)
	>20 years.	11 (32)	15 (34)	35 (60)	24 (72)	9 (29)	94 (47)

Table 1 shows the socio-demographic parameters of health workers in cross rivers north LGA. It was generally observed that 146 (73%) of the subjects were women. This was consistent from the data collected across the different town within the study area. Most of the health workers, 116 (58%) are observed to be more than 40 years old. Despite this, a high number of Primary Health Workers in Bekwarra and Yala are below the age of 30 years. Distribution in level of education of these subjects show that 184 (92%) of the primary health workers had tertiary education. Data also show that 94 (47%) of the subjects have spent more than 20 years as Primary Health Workers

Table 2; Attitude of subjects toward Hepatitis B and C Virus

Factors	Variables	Towns					Total N(%)
		Bekwarra N(%)	Obanliku N(%)	Obudu N(%)	Ogoja N(%)	Yala N(%)	
Vaccination	**Vaccinated**	4 (12)	1 (3)	10 (16)	4 (12)	0 (0)	18 (9)
	Not vaccinated	21 (64)	32 (75)	22 (38)	12 (36)	24 (72)	110 (55)
	Partially vaccinated	8 (24)	9 (22)	27 (46)	17 (52)	9 (28)	72 (36)
Knowledge on Mode of Transmission	**Aware**	30 (92)	37 (88)	55 (93)	32 (96)	33 (100)	187 (93)
	Not aware	3 (8)	5 (12)	4 (13)	1 (4)	0 (0)	13 (7)
Knowledge on Precautionary Measures	**Aware**	21 64)	35 (84)	42 (71)	33 (100)	24 (72)	155 (78)
	Not Aware	12 (28)	8 (16)	17 (29)	0 (0)	9 (28)	45 (22)
Exposure to accidental needle	**Exposed**	8 (24)	20 (44)	34 (58)	12 (36)	11 (32)	85 (43)
	Not Exposed	25 (76)	22 (53)	25 (42)	21 (64)	22 (68)	115 (57)

The table above (Table 2) shows the attitude of primary health workers in cross rivers north towards the hepatitis B and C Virus. Records show that, across the five different towns within the study area, most of the health workers have not been vaccinated against the Hepatitis B Virus. Generally, 110 (55%) of the total study subjects have not been vaccinated. It was also observed that 187 (93%) have knowledge on the mode of transmission of the hepatitis virus while 13 (7%) do not have knowledge on the transmission of hepatitis B and C virus. Similarly, most of the health workers, 155 (78%) know the precautionary measures in avoiding the contact and transmission of hepatitis B virus. Also, 115 (57%) of the health workers are not exposed to accidental needle while 85 (43%) find themselves exposed to accidental needle.

Table 3; Distribution of reaction to hepatitis B virus (HBV) among the study group (n = 152).

Serological Markers	Frequency (N)	Percentage
HBsAg negative	192	96
HBsAg Positive	8	4
HCV negative	198	99
HCV Positive	2	1

Table 3 shows the distribution of Hepatitis B and C Virus among Primary Health Workers in Cross Rivers North. It was observed that 192 (96%) of the subjects tested negative to hepatitis B Virus while 8 (4%) were positive to the virus. Data also show that 198 (99%) of the subjects tested negative to Hepatitis C Virus while 2 (1%) were positive.

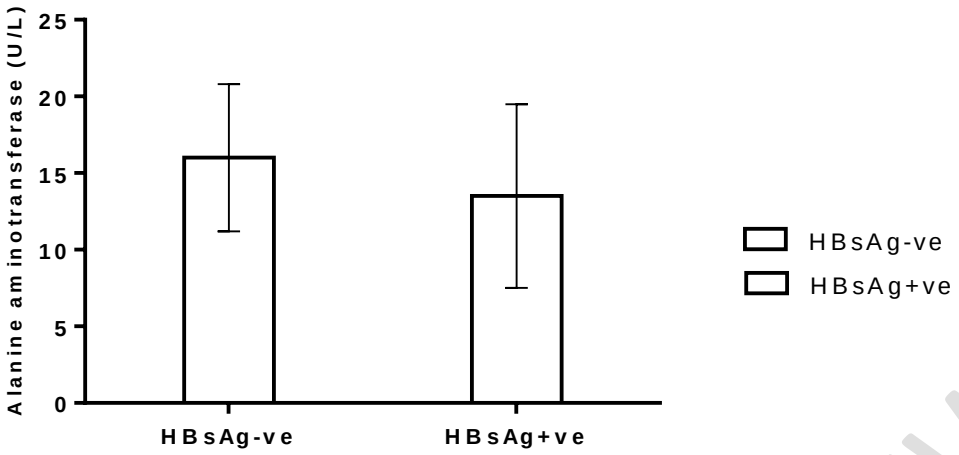

Figure 1; Effect of Hepatitis B Virus (HBV) on Alanine aminotransferase Level

This experiment shows the effect of Hepatitis B Virus on Liver enzyme, alanine aminotransferase. Data show that the alanine aminotransferase decrease in subjects tested positive to the Hepatitis B Virus. The decrease was not statistically significant when compared to the ALT level of subject tested negative to Hepatitis B surface antigen.

Fig 2 shows the Effect of Hepatitis C Virus (HCV) on Alanine aminotransferase Level of Primary Health Care Workers in Cross River north. It was observed that the serum alanine aminotransferase level was significantly reduced ($p<0.05$) in the subjects tested positive for HCV when compared to the alanine aminotransferase of subject who are not infected with HCV.

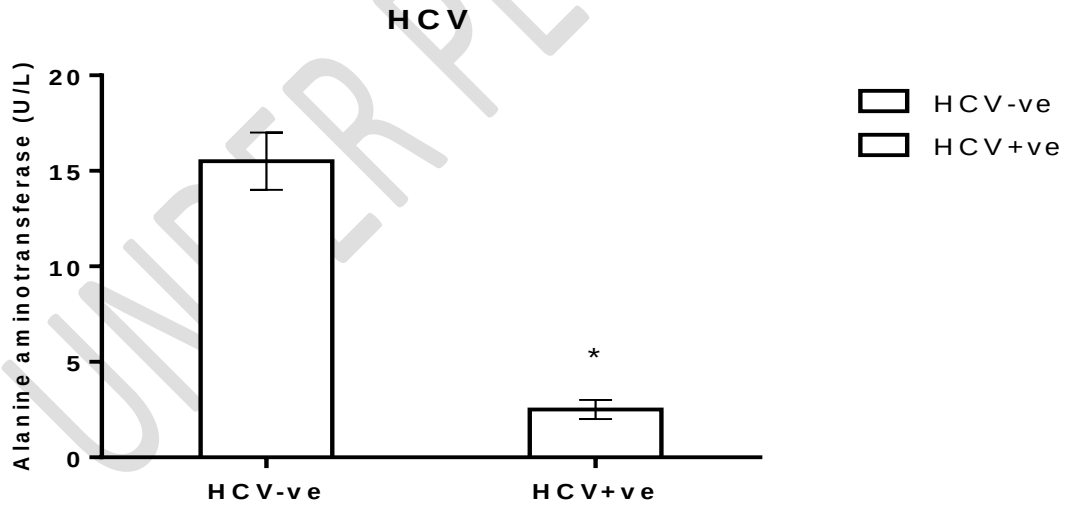

Figure 2; Effect of Hepatitis C Virus (HCV) on Alanine aminotransferase Level

4. DISCUSSION

Hepatitis B caused by infection with hepatitis B virus is a major global health burden. This infection affects the liver and is the most common cause of chronic hepatitis, liver cirrhosis and hepato-cellular carcinoma [4]. It is estimated that in Nigeria about 12% of the total population are chronic

carriers of HBsAg. Hepatitis B virus is an important occupational hazard for health workers. It is preventable with a safe and effective vaccine. It is easy to generally assume that health workers by virtue of their proximity to the health facility should have adequate knowledge about diseases and other health conditions.

The current study was sought to evaluate the serum alanine aminotransferase level of Primary Health Care workers who are reactive to Hepatitis B surface antigen in Cross Rivers North. A vaccine against hepatitis B infection has been available since 1982. Hepatitis B vaccine is 95% effective in preventing HBV infection and its chronic consequences, and it is the first vaccine against a major human cancer. Vaccination rates however have been found to be low among health care providers who paradoxically, given their level of exposure are supposed to have higher vaccine coverage rates. In this study, many of the respondents had a negative attitude towards the hepatitis B infection and vaccine, only 9% of them have been vaccinated and 55% were not vaccinated against Hepatitis B Virus. According to this study, only 36% of study participants were partially vaccinated for hepatitis B. This means that they took less than the recommended three doses. Furthermore, findings from Sofola et al. [24] and Adebamowo [25] in their studies done among health workers in which only 37.9 and 18.1% of their respondents respectively were reported to be fully vaccinated against Hepatitis B infection.

This study revealed that 93% have knowledge on the mode of transmission of the hepatitis virus while 7% do not have knowledge on the transmission of hepatitis B and C virus. Findings in the study are higher than the reports from a study among health workers in southern Nigeria where 68.5% knew viral hepatitis B can be transmitted through non sexual means and 37% knew it can be transmitted through sexual intercourse [26]. High risk groups comprise blood transfusions, health care and laboratory personnel, homosexuals, prostitutes, percutaneous drug abusers, infants of HBV carrier mothers and mothers who are immuno-compromised [27]. Despite the low compliance to hepatitis B vaccination among Health Care workers in Cross Rivers North, most of the health workers, 78% know the precautionary measures in avoiding the contact and transmission of hepatitis B virus. Also, 57% of the health workers are not exposed to accidental needle prick.

Data from the study show that 4% of Health Care Workers in Cross Rivers North tested positive to hepatitis B Virus while 1% tested positive to Hepatitis C Virus. The finding that only 4% of the respondents were positive for HBsAg is within range to lower than the findings of 25.7% among surgeons in a study carried out in Lagos [28] but is within range to the findings of 2.18% and 2.4% from the studies conducted in Peshawar, Pakistan [29] and Korea [30] respectively. The low prevalence of HBsAg in this study may be attributed to the increased awareness of viral Hepatitis B infection and high prevalence of prior vaccination in the subjects. Furthermore, since screening for HBSAg is done before any vaccination is commenced; those who were seropositive might have been transferred to administrative units in the state ministry of health. Prevalence of HCV recorded in this study is in accordance with other reports of HCV prevalence for Health Care Workers in other parts of Nigeria. Imoru et al. [31] reported 0.4% in Kano, Odenigbo et al. [32] reported 2.0% for Anambra, Jeremiah et al. [33] gave 5.0% for Port-Harcourt.

Data from the present show that the alanine aminotransferase in subjects tested positive to the Hepatitis B Virus was within similar range of subjects tested negative, and this was not statistically significant. This was in contrast to findings of Liaw et al. [34] showing that elevated ALT was

considered to be associated with the histological grading and staging of the disease. Similarly, Lok and McMahon, [35] also showed that higher rate of hepatitis B virus e-antigen (HBeAg) seroconversion is associated with increased ALT. Furthermore, the similarities in ALT level between subjects testing negative and positive to Hepatitis B Virus can be explained by findings from Dore et al. [36] which showed that up to 40–50% of all HBeAg-positive patients may have normal ALT levels for prolonged periods.

It was also observed that the serum alanine aminotransferase level significantly ($p<0.05$) reduced in the subjects tested positive for HCV when compared to the alanine aminotransferase of subject who are not infected with HCV. This decrease could be attributed to the extremely low prevalence (1%) of HCV in this study. The prevalence rate of 1% obtained from this study is less than the World Health Organization global prevalence rate of 3% [37]. Previous studies in different population subgroups in Nigeria, some African and Middle -Eastern countries have recorded varying prevalence rates of HCV [33]. Just like the prevalence of 1% obtained in this study, low HCV prevalence rates were recorded in some studies conducted among blood donors in Kano, Nigeria (0.40%), Namibia (0.90%), Sudan (1.90%), Senegal (0.80%), and Ghana (0.90%) [31,33]. However, higher prevalence rates were found in studies previously conducted in Nigeria; 4.50%, among sickle cell disease patients with regular blood transfusion in Benin, 5.70%, among HIV patients in Jos, 8%, among university undergraduates in Ilorin, 5%, and 12.30%, in Port-Harcourt and Benin respectively [38-40]. High prevalence rates have also been found in different parts of Africa and the Middle -East. For instance prevalence rates of 5.20%, 5.70%, 19.20% were reported among blood donors in Ghana, Saudi Arabia and Egypt respectively [33, 41]. These prevalence rates disparities could result from different reasons. First, it could be a true reflection of the worldwide regional variation in the prevalence of HCV as a result of the prevailing unwholesome health practices in such regions [42] or because of the high risk of exposure in the particular population subgroup studied e.g. Sickle cell disease patients, HIV/AIDS patients, commercial blood donors etc. Second, it could be as a result of the disparities in the diagnostic techniques and accuracies of the different assays used in conducting the studies. Third, it could be a reflection of birth cohort-effect on disease prevalence i.e. it may be a reflection of the impact of the recent general improvement in health practices on disease prevalence [42].

5. CONCLUSION

Conclusively, there was a low prevalence of Health Care Workers testing positive to hepatitis B surface antigen (HBsAg). This study has shown that a fair proportion of the Health Care Workers have been vaccinated. Most of these workers have knowledge on the mode of transmission of the virus and precautionary measures, and they are not exposed to accidental needle pricks. Encouragingly the liver enzymes of these workers were not adversely affected as the ALT level was within normal range.

CONSENT

Informed consent both verbal and written was obtained from every subject.

ETHICAL CONSIDERATION

Ethical approval was sought and then obtained from the University of Nigeria College of Medicine through the research and ethical committee and from Cross River State Ministry of Health through

the Health Research Ethical Committee (CRSMOH-HREC), with REC No. CRSMOH/RP/REC/2017/901. Informed consent of each participant was obtained prior to sample collection by the issuance of a consent form.

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