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Assessment of Knowledge and Seroprevalence of Hepatitis B and C Viral Infection among Health Care Personnel in a Rural Teaching Hospital in South-South Nigeria

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ABSTRACT

Background: Hepatitis B and C viral infections are among the most critical occupation related infections in the hospital workplace. Healthcare personnel (HCP) are exposed daily to HBV and HCV infections from blood and body fluids of patients and clients they care for. The study was aimed at assessing the knowledge and seroprevalence of HBV and HCV among HCP in a rural tertiary health facility in South-South, Nigeria.
Methods: A descriptive cross-sectional study design was used in this study and data was collected using quantitative method. Pre-tested, semi-structured interviewer-administered questionnaires were administered to 280 HCP who were also tested for HBsAg and anti-HCV using the rapid diagnostic method (with the Lab Acon Biotest rapid diagnostic strips). Data analysis was carried out using IBM SPSS version 21.0 and the level of significance-alpha (α) was set at 5% (0.05).
Results: Majority of the respondents were aware of HBV (86.4%) and HCV (75.7%). Their source of information was mainly from lectures (57.1%). The composite knowledge score for HBV and HCV were poor with less than half of the respondents demonstrating good knowledge. There was a significant relationship between respondents' composite knowledge and job category (p-value<0.001). More than half (56.7%) of the HCP in clinically related workgroup had good knowledge of HBV and HCV (p-value<0.001). The seroprevalence of HBsAg and anti-HCV were 1.4% and 1.1% respectively. Though the porters had the highest prevalence of HBsAg (5.0%), there was no statistically significant relationship between the different job categories and seroprevalence of HBsAg and anti-HCV in the study.
Conclusion: Despite the high level of awareness of HBV and HCV among the HCP in this study, there was no correspondingly high-level knowledge of HBV and HCV. The non-skilled HCP like the porters had the highest seroprevalence of HBsAg compared to other HCP and there were no coinfection for HBV and HCV in the study.

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Introduction

According to World Health Organization (WHO), there are about 35-40 million healthcare workers providing services to patients worldwide, about 3 million of which are exposed to-percutaneous injury yearly, with over 90% occurring in resource-constrained countries [1,2]. The sub-Saharan African region has the highest Hepatitis B virus (HBV) rates, and healthcare workers are at an increased risk of contracting nosocomial HBV and HCV infections [3]. The Healthcare Personnel (HCP) is frequently exposed to microorganisms which are capable of causing over 20 different blood-borne infections [4]. The more serious and frequently reported ones associated with occupational exposure in healthcare personnel are Human Immunodeficiency Virus (HIV), Hepatitis B virus (HBV) and Hepatitis C virus (HCV) infections. Of these, HBV is 50 to 100 times more infectious than HIV [4,5].

Hepatitis B virus (HBV) is a 42-47 nm DNA virus in the Hepadnaviridae family [6].The virus has a small circular DNA genome that is partially double-stranded. The virus contains numerous antigenic components, including HBsAg, hepatitis B core antigen (HBcAg), and hepatitis B e antigen (HBeAg) [7]. Humans are the only known host of HBV, although

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some nonhuman primates have been infected under laboratory conditions [7]. It is relatively resilient and, in some instances, has been shown to remain infectious on environmental surfaces for up to 7 days at room temperature [7]. On exposure by a susceptible person, the virus is transported by the bloodstream to the hepatic cells, which are the primary site of HBV replication. Infection with HBV can produce either asymptomatic or symptomatic infection. When clinical manifestations of acute disease occur, illness typically begins 2-3 months after HBV exposure (range: 6 weeks-6 months) [8].

The term hepatitis C virus (HCV) was first adopted in 1989 following the identification of an RNA viral genome [9]. The disease was first recognized in a random-primed cDNA library derived from human blood products such as factor VIII and immunoglobulins.9 It was also found that transplanted organs and some health care personnel who had needles-stick injuries have hepatitis C agent [9]. The most affected regions are Africa, Central, and East Asia [10]. Approximately 500,000 people die each year from hepatitis C-related liver diseases [11,12].

Good knowledge regarding HBV risk of infection and adherence to standard and safety precautions are needed to minimize acquired infections among healthcare personnel in healthcare settings [13,14]. Although awareness about HBV among healthcare personnel and the general population may be high, the comprehensive, in-depth knowledge about the biology, mode, and risk of transmission, clinical features, and vaccination has been found to be low among healthcare workers in Nigeria [14,15].

Reports from a multiple-choice hepatitis B knowledge survey completed by 196 attendees at a University-based continuing-medical-education (CME) conference for primary care providers, including nurse practitioners and physician assistants which was presented at the 30th annual meeting of the Society of General Internal Medicine (SGIM) held in Toronto, Canada in 2007, Dulay et al reported that of the respondents, 55% were not able to identify HBsAg as the determinant for chronic HBV infection [16]. It was shown in the study that knowledge about the appropriate use of the HBsAg test was substantially higher among primary care providers who were Asian (68%) than those of other ethnicities (43%), among physicians (56%) than non-physicians (23%), and among providers who had more years of experience or more time spent in the clinic. Forty four percent of the respondents did not know that chronic HBV infection could be controlled with medication, and 25% incorrectly responded that chronic HBV infection is curable [16].

In another study (cross-sectional survey) conducted among 217 members of the New Jersey Academy of Family Physicians, United States, it was found that a higher proportion of family physicians recommended screening for hepatitis B among men who have sex with men (93%), injection drug users-IDUs (95%), and HIV-infected patients (96%) than for immigrants from Southeast Asia (68%) or sub-Saharan Africa (57%) but only 50% of survey participants recommended screening household contacts of persons who had chronic HBV infection—an established high-risk population [17]. Finally, 21% of the New Jersey family physicians did not know what step to take next if a patient tested positive for HBsAg or would refer such a patient to a specialist for follow-up [17].

Healthcare personnel's knowledge about hepatitis C appears to be similarly insufficient, although there are few published types of research on this topic [17-19]. There is paucity of local publications on this subject. In a cross-sectional mail survey of 217 members of the New Jersey Academy of Family Physicians carried out in the United States of America, Ferrante found that although 95% of the family physicians would recommend testing of IDUs for HCV infection, only 81% would recommend HCV testing for people who received blood transfusions before 1992, and only 65% would recommend testing of incarcerated persons—all populations that are at high risk for HCV infection that fall within the US national testing guidelines [17]. Of the respondents, 31% did not know what to do next or would refer a patient to a specialist after a positive test for HCV antibody, and 2% incorrectly assured patients that those who tested positive were immune to HCV [17]. Physicians in practice for more than 20 years were found to have the lowest level of knowledge about HCV risk factors, whereas those in practice for 5 years or less had the highest knowledge level [17].

Additional research has examined HCV knowledge among drug-treatment providers. Research conducted on 104 members of the staff of two drug-free and two methadone-maintenance treatment programmes (MMTPs) in the New York metropolitan

area demonstrated that knowledge about hepatitis C was inadequate [18,19]. On the basis of the evidence described above, it was concluded that insufficient provider knowledge leads to critical missed opportunities for providers to educate patients about prevention of hepatitis B and hepatitis C. Also, to identify patients who may be at risk for these infections, and to test for chronic HBV and HCV infection in patients and their sexual, family, and household contacts in the case of hepatitis B and drug-use networks in the case of hepatitis C [20]. To further corroborate the importance of this, the Society for Healthcare Epidemiology of America (SHEA) had advocated for a comprehensive education concerning blood-borne pathogens for all healthcare providers and trainees [21].

The prevalence of HBV is high in the Far East, the Middle East, Africa and parts of South America, with HBsAg rates ranging from 8% to 15%. There is an intermediate prevalence (2-7%) in Japan, parts of South America, Eastern and Southern Europe and parts of Central Asia. The prevalence is lowest (<2%) in Northern Europe, Australia, the southern part of South America, Canada and USA [22]. In the United States of America, the incidence of HBV infection among all healthcare workers is estimated to be 3.5 to 4.6 infections per 1000 workers, which is 2-4 times higher than the level in the general population. Worldwide, 66,000 healthcare workers are infected by HBV each year through sharp injuries with about 261 deaths [23].

In a cross-sectional serosurvey, with ELISA system used to detect anti-HBc, anti-HCV and anti-HIV conducted among 89 doctors and 414 nurses from 16 randomly selected hospitals in West Pomerania, Poland, between January-June 2009, the nature and frequency of sharps injuries and the prevalence of HBV/HCV/HIV infections among doctors and nurses from the same surgical/gynaecological wards were evaluated. Anti-HBc was seen in 16.4% of doctors and 11.2% of nurses, p>0.28; anti-HCV-in 1.1% of doctors against 1.4% of nurses, p>0.79, which was not statistically different. A striking finding was that there was no anti-HCV positive case among the respondents [24].

Hepatitis B virus infection has been demonstrated to be higher among HCWs across many countries in the world. In North-west Turkey between 2002 and 2003, the occupational hazard of exposure to HBV was evaluated among 595 nurses, in total, 18.7% had been exposed to HBV infection and 2.7% were HBsAg positive [25]. In India, an intermediate endemic zone where the estimated prevalence rate of HBV in the healthy general population is around 4.7%, a recent study showed a 5% HBsAg positivity in HCWs [25]. Surveys among sub-Saharan African HCWs have shown a comparable higher prevalence of HBV markers than those of developed countries of the world [26]. In Tanzania, with HBsAg seroprevalence in an adult population of 6%, the prevalence in at-risk HCWs was found to be 7.4% [27]. In Cameroon, the population seroprevalence is estimated at 10.1% whereas the seroprevalence among HCWs in Cameroon is as high as 23.6% for HBV and 16% for HCV [28,29]. In Nigeria, HBsAg adult population seropositivity is estimated to be 13.6% and that of HCWs 17% with a higher rate among surgeons (25.7%) [30-32]. The adult population anti-HCV seroprevalence, on the other hand, is estimated at a range of 4.7-5% in Ilorin, to 5.3-6.6% in Enugu, to 11% in Ibadan and 20% in Benin, whereas, the seroprevalence for HCW estimated at 5.0% [33,34].

It has been established that many people who think they are negative may be infected without them knowing their status as a result of their not undergoing a serological test [14,35]. In a prevalence study carried out in Nnewi, South-East, Nigeria in which four hundred and eighty (480) pregnant women were recruited, 40 tested positive to HBsAg, accounting for 8.3% of the respondents recruited through simple random sampling using a computer-generated number [36]. In another cross-sectional study of HBV markers among 167 surgeons and 193 administrative staff (control group) in Lagos, it was demonstrated that there was high rate (25.7%) of HBV seroprevalence among surgeons in Nigeria [30]. This was higher than the general prevalence of HBsAg seropositivity for a population study of 188 consented health personnel involved in the handling of patients/patients' specimens recorded in a study carried out in Uyo metropolis, South-South, Nigeria with a value of 17.0% [32]. It was found in the study that nurses contributed to the burden of the infection among this group of health personnel accounting for the highest prevalence recorded in the study involving doctors, nurses, medical laboratory scientists/technicians/assistants, pharmacists, and ward assistants [32]. This further shows that HBV infection is of higher prevalence among HCP handling patients and patients' specimens.

In Nigeria, like most West African countries, there

is high endemicity of the disease with HBV surface antigen (HBsAg) prevalence of >8%.5,37 The values recorded in hospitals across the West African countries with high endemicity have similar high prevalence of chronic HCV infection and is due in part to lack of access to preventive measures, such as harm-reduction programmes and lack of access to antiviral treatments in high-risk populations. In a systematic review and meta-analysis study of the prevalence of HBV infection in Nigeria between 2000 and 2013, in which forty-six studies were included (n=34,376 persons) Musa et al. 38 revealed that the pooled prevalence of HBV in Nigeria was 13.6% (95% confidence interval [CI]: 11.5, 15.7%). The pooled prevalence (% [95% CI]) among subgroups was: 14.0% (11.7, 16.3) for blood donors; 14.1% (9.6, 18.6) for pregnant women attending antenatal clinics; 11.5% (6.0, 17.0) for children; 14.0% (11.6, 16.5) among adults; and 16.0% (11.1, 20.9) for studies evaluating adults and children. HBV prevalence in Nigeria varied by the screening method used [% (95% CI)]: 12.3% (10.1, 14.4) by using enzyme-linked immunosorbent assay; 17.5% (12.4, 22.7) by immunochromatography; and 13.6% (11.5, 15.7) by HBV DNA polymerase chain reaction. HBV infection is hyperendemic in Nigeria and may be the highest in sub-Sahara Africa [37,38].

Eke A.C. et al. [36] he argued that hepatitis B screening in pregnancy should be made routine practice in Nigeria because of the low pick up rate of the infection based only on risk factors for the disease [36]. Therefore, screening HCP for HBV and HCV in African and notably, Nigeria was most appropriate as they are more at risk of the disease. Hepatitis B and C virus infections pose grave financial implication that can negatively affect the economy. One serious blood-borne infection with hepatitis B or C viruses can cost more than a million dollars for medications, follow up laboratory testing, clinical evaluation, lost wages, and disability payments. Although the exact costs of occupational exposures to HBV and HCV infections are not available, it was estimated that the one year cost for these incidents might be as high as $ 400 million [39,40]. The human costs after an exposure are immeasurable. It was stated that the employees may experience anger, depression, fear, anxiety, difficulty with sexual relations, sleep disturbance, poor concentration, and doubts regarding their career choice [41,42]. The emotional effect can be long lasting, even in a low-risk exposure that may not result in infection [41,42].

It has been asserted that knowledge of the seroprevalence of HBV and HCV infections in the region and age-specific groups as well as among high-risk group like HCP is essential for evaluating vaccination programmes and national disease prevention and control efforts particularly in a highly endemic region like Nigeria [43]. Generally, HCP are at high risk for HBV and HCV infections. This study therefore, is aimed at assessing the knowledge, and seroprevalence of HBV and HCV infection among HCP in a tertiary hospital in South-South, Nigeria.

Materials and Methodology

The study was carried out in South-South geopolitical zone of Nigeria. The zone is made up of six States and the region is the oil rich region of the country. The zone is a multi-tribal region with about 35 tribes and it occupies approximately 85,303 square kilometres of land. The region has teaching hospitals distributed across the six states. Some of these teaching hospitals are located in rural areas. They are Irrua Specialist Teaching Hospital, Irrua (ISTH) in Edo State, Delta State University Teaching Hospital, and Niger Delta University Teaching Hospital (NDUTH), Okolobiri, Bayelsa State [44].

A multistage sampling technique was used to select one of the teaching hospitals and finally the participants for study. Irrua Specialist Teaching Hospital, Irrua was selected for the study. The teaching hospital is a 375-beds with ongoing expansion with over 60 additional beds and has 12 wards with a staff strength of over 1596 [45]. Descriptive cross-sectional study design carried out between February and March 2018 among 280 consenting healthcare personnel of the health facility. The sample size of 300 was determined with the formula n=[Z1-α/2 *P(1-P)]/d2 where Z1-α/2 at 95% confidence interval is 1.96 at two-tailed alpha error d is the margin of error allowed for the study which is a measure of desire precision/ degree of accuracy or deviation usually at 5% [46]. A correction factor for a population less than 10,000 and non-response rate of 10% was also considered in the sample size determination [47,48].

The study instruments were both semi-structured self-administered questionnaire used to access information on the respondents' socio-demographic and knowledge of HBV and HCV while the Lab ACON Biotest Rapid Diagnostic strips were used for testing respondents' blood against HBsAg (for HBV infection) and anti-HCV (for HCV infection).

There were 38 questions to ascertain the in-depth knowledge of HBV and HCV infections by the HCP, and each correct answer was scored 1, and incorrect answer(s) scored 0. The maximum score obtainable was 38, and the minimum score obtainable was 0. The scores were converted to percentages and classified thus based on the distribution of the data set [49]. A total score of less than 50% was graded as poor knowledge. A score of 50%-65% graded as fair knowledge, and a score of greater than 65% graded as good knowledge.

The seroprevalence assay materials included bucket centrifuge, disposable gloves, sterile needles and syringes, tourniquet, methylated spirit, cotton wool, Ethylenediaminetetraacetic acid (EDTA) sample bottles, racks for sample bottles, and cold boxes. Others are, timer; disposable dropper or micropipette; and Lab ACON Biotest Rapid Diagnostic Strip for testing for blood against HBsAg (for HBV infection) and anti-HCV (for HCV infection) consisting of atomic absorption spectrophotometer and associated laboratory materials and reagents. The materials for waste management included bio-safety hazard bags and sharps boxes.

The seroprevalence of HBV was determined using the Hepatitis B Surface Antigen (HBsAg) rapid test strip (Serum/Plasma) manufactured by Lab ACONR Hangzhou Biotest Biotech Co., Ltd Ref No. IHBSG-S31, Lot No.:HBSG17030028, RP5110303, manufacturing date: 2017-03 and expiration date 2019-03 (for qualitative detection of HBsAg in serum or plasma) and the seroprevalence of HCV was determined using the Hepatitis C virus rapid test strip (Serum/Plasma) manufactured by Lab ACONR Hangzhou Biotest Biotech Co., Ltd Ref No. IHCV-S31, Lot No.: HCV17030016, RP5110303, manufacturing date: 2017-03 and expiration date 2019-03 (for the qualitative detection of HCV in serum or plasma). The test strips provide accurate, convenient and affordable medical test with a rapid chromatographic immunoassay for the qualitative detection of antibodies to HBV in serum or plasma. The specificity and sensitivity of ACON kits is 99.4% (98.9%-99.7%) and 99.2% (98.3%-99.7%) respectively. While the accuracy is 99.3% (98.9%-99.6%) [CI 95%]. The test strips are for qualitative assessment of the markers of hepatitis B virus infection in human serum/plasma and anti-hepatitis C virus in serum/plasma. The seroprevalence of HBV and HCV was determined by testing the blood of consented participants using the Lab ACONR HBV and HCV rapid test strips. The appearance of two bands (test and control) was interpreted as positive; only control band was interpreted as negative while the strip showing either a single line on the test zone or no line was interpreted as an invalid result.

Results

*Others: Akoko-Edo and Isoko 2(.7%) each, Ijaw, Hausa and Bassa-Nge 1(.4%).

The mean (standard deviation) age of respondents was 34.9(±9.46) years with most of the respondents, 112(40.0%) belonging to the age group of 30-39 years. Two hundred and fourteen (76.4%) of the respondents were married while 2(0.7%) were divorced (Table 1).

Table 1. Socio-demographic characteristics of respondents.

Variable	Frequency (n=280)	Percentage (%)
Age (years)		
20-29	40	14.3
30-39	112	40
40-49	82	29.3
50-59	44	15.7
60-69	2	0.7
Mean ± SD	34.90±9.46 years	
Sex		
Male	104	37.1
Female	176	62.9
Marital status		
Married	214	76.4
Single	54	19.3
widowed	7	2.5
Separated	3	1.1
Divorced	2	0.7
Ethnic Status		
Esan	156	55.7
Ibo	38	13.6
Etsako	27	9.6
Benin	23	8.2
Yoruba	11	3.9
Ora	9	3.2

Ika	5	1.8
Urhobo	4	1.4
Others*	7	2.6
Religion		
Christianity	273	97.5
Islam	5	1.8
African Traditional	2	0.7

One hundred and four (37.1%) were nurses, forty-nine (17.5%) were accounting, and administrative staff, 18(6.4%) were health attendants, 14(5%) laboratory scientists/technologists, 65(23.2%) were doctors while 6(2.1%), 20(7.1%) and 4(1.4%) were pharmacists, porters, and scientific officers respectively. Two hundred and thirty-one (82.5%) of the respondents were in clinically related work type while 49 (17.5%) of the respondents were in the non-clinical related work type (Table 2).

Table 2. Work-related characteristics of respondents

Variables	Frequency (n=280)	Percentage (%)
Job category		
Nurses	104	37.1
Medical doctors	65	23.2
Administrative and Account officers	49	17.5
Porters	20	7.1
Health attendants	18	6.4
Laboratory scientist/ technologists	14	5
Pharmacists	6	2.1
Scientific officers	4	1.4
Work type		
Clinical Related	231	82.5
Non-clinical related	49	17.5
Duration of work (years)		
<1	15	5.4
1-5	82	29.3
6-10	103	36.8
11-15	18	6.4
16-35	62	22.1
Mean ± SD	9.64±8.26 years	

Two hundred and forty-two (86.4%) of the respondents were aware of HBV infection. Two hundred and twelve (75.7%) of the respondents were aware of HCV infection. Thirty-eight (13.6%) of the respondents have not heard of HBV infection. Sixty-eight (24.3%) of the respondents have not heard of HCV infection in the past (Figure 1).

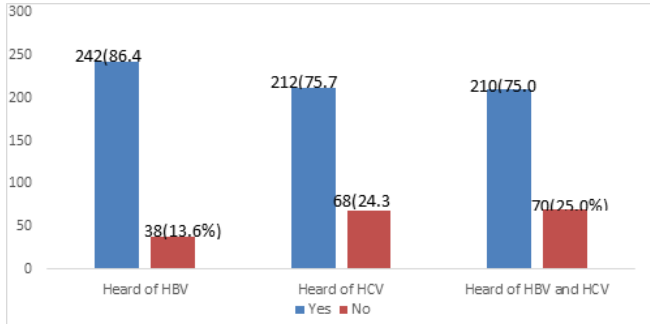


Figure 1. Respondent's awareness of HBV and HCV infections

One hundred and sixty (66.1%) of the respondents got their information on HBV and HCV from public lectures.

The minor sources of information were the internet, hospital seminar and radio/television (Table 3).

Table 3. Source of information on HBV and HCV

Variables	Frequency (n=280)	Percentage (%)
Sources of information (n=242)*		
Lectures	160	66.1
Hospital seminar	119	49.2
Internet	61	25.2
Television or radio	50	20.7
Print media	30	12.4
Friends	26	10.7
Colleagues	3	1.2
*Multiple responses applicable.		

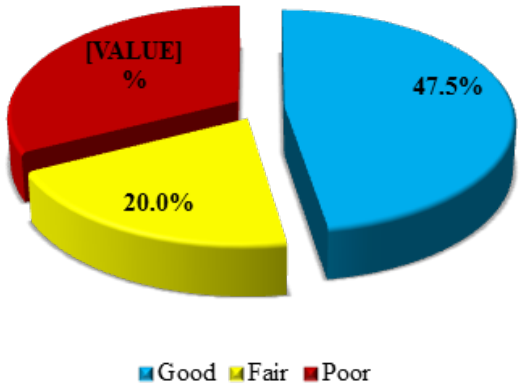
More than four-fifth of the respondents answered the knowledge questions on HCP at risk of HBV and HCV infections, vaccination a method of HBV infection prevention, standard precaution practice a method of HBV infection prevention, HBV or HCV be transmitted by contaminated blood and blood products, and if HBV or HCV can be transmitted to HCP by patients. Lest than one-tenth of the respondents could ascertain that vaccination is not a method of HCV infection prevention (Table 4).

Table 4. Responses of the study participants to HBV and HCV knowledge items

Knowledge questions asked (correct answer)	No. of correct answers given by respondents (frequency)	Percentage (%)
Is HBV a DNA virus? (Yes)	77	27.5
Is HCV a RNA virus? (Yes)	78	27.9
Are HCP at risk of HBV and HCV infection? (Yes)	228	81.4
Can HBV or HCV be transmitted by unsafe sex? (Yes)	197	70.4
Can HBV or HCV be transmitted to patients by HCP? (Yes)	204	72.9
Can HBV or HCV be transmitted to HCP by patients? (Yes)	226	80.7
Can HBV or HCV be transmitted by contaminated blood and blood products? (Yes)	226	80.7
Can HBV or HCV be transmitted to new born babies during child birth or breast feeding? (Yes)	186	66.4
Can HBV or HCV remain infectious on environmental surfaces over 7 days at room temperature? (Yes)	106	37.9
Is HBV 50-100 times more infectious than HIV? (Yes)	173	61.8
Is HCV 50-100 times more infectious than HIV? (No)	50	17.9
Is good hygiene practice a method of HBV prevention? (Yes)	211	75.4
Is good hygiene practice a method of HCV prevention? (Yes)	172	61.4
Is standard precaution practice a method of HBV prevention? (Yes)	231	82.5
Is standard precaution practice a method of HCV prevention? (Yes)	176	62.9
Is post-exposure prophylaxis a method of HBV prevention? (Yes)	141	50.4
Is post-exposure prophylaxis a method of HCV prevention? (Yes)	102	36.4
Is vaccination a method of HBV prevention? (Yes)	232	82.7
Is vaccination a method of HCV prevention? (No)	25	8.9
Does drug treatment exist for HBV infection? (Yes)	170	60.7
Does drug treatment for HCV infection? (Yes)	118	42.1

One hundred and thirty-three (47.5%) of the respondents had good knowledge of HBV and HCV infections. Ninety-one (32.5%) of respondents had poor knowledge of HBV and HCV. Fifty-six (20%) of the respondents had a fair knowledge of HBV and HCV infections (Figure 2).

Figure 2. Composite score of respondents' knowledge of HBV and HCV



More than half (56.7%) of healthcare personnel in clinical related areas had good knowledge of HBV and HCV. All the scientific officers demonstrated good knowledge, of those in the clinically related job categories, the majority (80.0%) of the Medical Doctors had good knowledge of HBV and HCV followed by the pharmacists (66.7%) and the nurses (59.6%). All the porters demonstrated poor knowledge of HBV and HCV.

Over half of respondents with work duration of 1-5 years (59.8%) and less than one year (53.3%) had good knowledge of HBV and HCV and 6-10 years (45.6%) with the highest proportion of poor knowledge for HBV and HCV. There were significant statistical relationship between work type, working in the clinically related areas tend to have better knowledge of HBV and HCV than working in the non-clinical related area with higher proportion of poor knowledge of HBV and HCV; Job categories and duration of work with good knowledge with less duration of work and poor knowledge with increasing duration of work up to 6-10 year duration before a decline till 16-35 years duration of respondents' knowledge of HBV and HCV (Table 5).

Table 5. Association between work-related characteristics of respondents and composite knowledge of HBV and HCV

Variables	Knowledge Grade				
	Good (%)	Fair (%)	Poor (%)	χ^2	p-value
Work type	N=133	N=56	N=91		
Clinical Related	131(56.7)	48(20.8)	52(22.5)	64.5	<0.001*
Non-clinical related	2(4.1)	8(16.3)	39(79.6)		
Categories of HCP					
Administrative officers and Accounts	2(4.1)	8(16.3)	39(79.6)	216.86	<0.001*
Health attendants	1(5.6)	3(16.7)	14(77.8)		
Laboratory scientist/ technologist	8(57.1)	0(0.0)	6(42.9)		
Medical doctor	52(80.0)	12(18.5)	1(1.5)		
Nurse	62(59.6)	33(31.7)	9(8.7)		
Pharmacy	4(66.7)	0(0.0)	2(33.3)		
Porter	0(0.0)	0(0.0)	20(100.0)		
Scientific Officer	4(100.0)	0(0.0)	0(0.0%)		
Duration of work (years)					
<1	8(53.3)	2(13.3)	5(33.3)	22.02	0.005*
1-5	49(59.8)	18(22.0)	15(18.3)		
6-10	43(41.7)	13(12.6)	47(45.6)		
11-15	6(33.3)	5(27.8)	7(38.9)		
16-35	27(43.5)	18(29.0)	17(27.4)		

The overall HBsAg seroprevalence was 1.4%, and the seropositivity for HCV was 1.1%. Most of the respondents were seronegative for HBsAg (98.6%) and anti-HCV (98.9%).

There was zero (0.00%) co-existing seropositive HBsAg and anti-HCV (Table 6).

Table 6. Seroprevalence of HBV and HCV

Variables **N=280**	**Frequency**	**Percentage (%)**
Hepatitis B virus surface antigen status	4	1.4
Positive$^{\sigma}$	4	1.4
Negative	276	98.6
Hepatitis C virus antibodies status		
Positive$^{\sigma}$	3	1.1
Negative	277	98.9

$^{\sigma}$No co-existing seropositive HBsAg and anti-HCV.

Healthcare personnel in clinically related work had the same HBV and HCV seroprevalence (1.3%). This was similar to the overall seroprevalence for HBV (1.4%). Those in non-clinical related work were only seropositive for HBV surface antigen (2.0%).

The sero-prevalence of HBsAg among the non-clinical respondents was 2.0%, medical doctors 1.5%, nurses 1.0% while the highest (5.0%) was found among the porters. There was no seropositive distribution of anti-HCV among other HCP groups except for the nurses (1.9%) and medical doctors (1.5%) who had seropositive results. The medical doctors had the same sero-prevalence (1.5%) for both HBsAg and anti-HCV.

HBsAg sero-prevalence was only recorded among healthcare personnel with work durations of 6-10 years and 16-35 years. The anti-HCV seropositivity were recorded for work duration 1-5(1.2%), 6-10(1.0%) and 11-15 (5.6%) (Table 7).

Table 7. Distribution of HBV and HCV seroprevalence by respondents' work-related characteristics

Variables	**N=280**	**HBsAg(%)**	**Anti-HCV(%)**
Work type			
Clinical Related	231	3(1.3)	3(1.3)
Non-clinical related	49	1(2.0)	0(0.0)
Categories of HCP			
Administrative officers and Accounts	49	1(2.0)	0(0.0)
Health attendants	18	0(0.0)	0(0.0)
Laboratory scientist/ technologist	14	0(0.0)	0(0.0)
Medical doctor	65	1(1.5)	1(1.5)
Nurse	104	1(1.0)	2(1.9)
Pharmacy	6	0(0.0)	0(0.0)
Porter	20	1(5.0)	0(0.0)
Scientific Officer	4	0(0.0)	0(0.0)
Duration of work (years)			
<1	15	0(0.0)	0(0.0)
1-5	82	0(0.0)	1(1.2)
6-10	103	2(1.9)	1(1.0)
11-15	18	0(0.0)	1(5.6)
16-35	62	2(3.2)	0(0.0)

Respondents working in clinically related areas had HBV sero-prevalence of 1.3%, and those in non-clinical related areas had a higher prevalence of 2.0% for HBV surface antigen. There was no statistically significant relationship between the respondents' work type and HBV surface antigen sero-prevalence.

Respondents whose duration of work were 6-10 years and 16-35 years had sero-prevalence for HBV surface antigen of 1.9% and 3.2% respectively with other work duration groups of no seropositivity. There was no statistically significant relationship between HBV surface antigen sero-prevalence and duration of work of respondents.

All the three groups of respondents' composite score of knowledge had seropositivity for HBV surface antigen with those with good knowledge (1.5%), Fair (1.8%) and poor (1.1%). There was no statistically significant relationship between the composite knowledge score of respondents and HBV surface antigen sero-prevalence.

There was no statistically significant relationship between the different HCP job categories and their sero-prevalence for HBsAg (Table 8).

Table 8. Association between some selected characteristics and sero-prevalence of HBV surface antigen

Variables	**HBV surface antigen**			
N=280	**Positive (%)**	**Negative (%)**	**χ^2**	**p-value**
Work type				
Clinical Related	3(1.3)	228(98.7)	0.158	†0.539
Non-clinical related	1(2.0)	48(98.0)		
Duration of work (years)				
<1	0(0.0)	15(100.0)	4.533	0.339
1-5	0(0.0)	82(100.0)		
6-10	2(1.9)	101(98.1)		
11-15	0(0.0)	18(100.0)		
16-35	2(3.2)	60(96.8)		
Knowledge of HBV and HCV				
Good	2(1.5)	131(98.5)	0.129	0.938
Fair	1(1.8)	55(98.2)		
Poor	1(1.1)	90(98.9)		
Categories of HCP				
Administrative officers and Accounts	1(2.0)	48(98.0)	2.717	0.091
Health attendants	0(0.0)	18(100.0)		
Laboratory scientist/ technologist	0(0.0)	14(100.0)		
Medical doctor	1(1.5)	64(98.5)		
Nurse	1(1.0)	103(99.0)		
Pharmacy	0(0.0)	6(100.0)		
Porter	1(5.0)	19(95.0)		
Scientific Officer	0(0.0)	4(100.0)		

Respondents working in clinically related areas had HCV sero-prevalence of 1.3%, and those in non-clinical related areas had nil sero-prevalence for HCV antibodies. There was no statistically significant relationship between the respondents' work type and HCV antibodies.

Respondents whose duration of work of 11-15 years had the highest positive sero-prevalence of 5.6% followed by those of 1-5 years (1.2%) and 6-10 years (1.0%). There were no HCV antibodies seropositive for those with work duration of less than 1 and 16-35 years. There was no statistically significant relationship between HCV antibodies and duration of work of respondents.

Respondents with good HBV/HCV composite knowledge score had sero-positivity for HCV antibodies was 2.3%. No HCV sero-positivity for those with inadequate knowledge. There was no statistically significant relationship between the composite knowledge score of respondents and HBV surface antigen sero-prevalence.

There was no statistically significant relationship between the different HCP job categories and HCP's anti-HCV sero-prevalence (Table 9).

Table 9. Association between some selected characteristics and sero-prevalence of HCV antibodies

Variables	**HBV surface antigen**		
Clinical Related	**3(1.3)**	**228(98.7)**	**0.643**
Non-clinical related	0(0.0)	49(100.0)	
Duration of work (years)			
<1	0(0.0)	15(100.0)	3.4
1-5	1(1.2)	81(98.8)	
6-10	1(1.0)	102(99.0)	
11-15	1(5.6)	17(94.4)	
16-35	0(0.0)	62(100.0)	
Knowledge of HBV and HCV			
Good	3(2.3)	130(97.7)	4.503
Fair	0(0.0)	56(100.0)	
Poor	0(0.0)	91(100.0)	
Categories of HCP			
Administrative officers and Accounts	0(0.0)	49(100.0)	2.048
Health attendants	0(0.0)	18(100.0)	
Laboratory scientist/ technologist	0(0.0)	14(100.0)	
Medical doctor	1(1.5)	64(98.5)	
Nurse	2(1.9)	102(98.1)	
Pharmacy	0(0.0)	4(100.0)	
Porter	0(0.0)	20(100.0)	
Scientific Officer	0(0.0)	4(100.0)	
Porter	1(5.0)	19(95.0)	
Scientific Officer	0(0.0)	4(100.0)	

Discussion

Substantial proportion of respondents interviewed in this survey was in the age range of 30-39 years, followed by the age group 40-49 years. These age groups represent the bulk of the economically productive section of the Nigerian population. In a similar study carried out at Usmanu Dan fodiyo University Teaching Hospital (UDUTH), Sokoto, North-West Nigeria, the researchers reported that a higher proportion of respondents were in the younger age groups. Also in another study carried out in Uyo Metropolis, South-South, Nigeria, the predominant respondents were in the older age group [50,32]. This finding might be due to the non-recruitment of new healthcare personnel (HCP) in the Nigeria public healthcare in recent times or may also be due to chance. However, in the current study, the mean age of the HCP interviewed was 34.90 ±9.46 years similar to the findings in the UDUTH Sokoto, Nigeria study [50]. The presence of this age group 30-39 years in large number in the health sector could mean having these HCP trained would be of great benefit to the health care system as they still have a long time to put their services in the system. On the other hand, if this set of HCP is left untrained without concerted effort towards behaviour communication change, infection of these HCP may have sufficient time to result in chronic HCV and HBV.

A large proportion of the respondents had a work duration of 6-10 years. Majority of the respondents were females which were accounted for in the study population, by the high proportional allocation to the nursing profession that is dominated by the females. This finding was consistent with the other studies where nurses were part of the healthcare personnel surveyed in similar studies [32,50,51]. Almost all the respondents in the study were Christians. This observation might be due to the location of the study area in South-South geopolitical zone of Nigeria where the majority of the people are Christians unlike the findings in North West, Nigeria where the majority are Moslems [50]. About three-quarter of the respondents were married. Over half of the respondents were Esan by tribe with distribution across other ethnic groups in the country below one-tenth except for the Ibos who were relatively more than one-tenth. This finding might be as a result of the fact that the hospital is located in a rural setting that lack social amenities that could have attracted healthcare personnel from other ethnic groups across the length and breadth of Nigeria. Also, the fact that many healthcare professionals may be afraid to seek employment in the centre that is known for the highly specialized management of viral haemorrhagic fever disease (Lassa fever) thereby receiving referrals from all over the entire country. To the best of the researcher's knowledge, there are no established linked nor association between religion, marital status, and ethnic group with risk of exposure or seroprevalence of HBV and HCV infections.

Regarding the two broad groups of healthcare personnel examined, the clinical and none-clinical group, the clinically related workgroup expectedly had a higher level of knowledge of HBV and HCV compared to the non-clinical related workgroup, and the difference is statistically significant. This is likely to be because the clinically related workgroup was made up of core-health professionals who probably had their training on infection prevention and control in their schools/colleges. Of note is the fact that all the scientific officers had good knowledge of HBV and HCV. This finding may be because the scientific officers who primarily work in the Institute of Lassa Fever Research and Control of ISTH, Irrua, have repeatedly undergone training and retraining in infection prevention and control given the nature of their job which often involves handling of infectious materials and body fluids. Majority of the medical doctors in the study had good knowledge of HBV and HCV followed by the pharmacist and the laboratory scientists.

Also significantly related to the knowledge of HBV and HCV was the duration of work as HCP. Over half of those whose duration of work was between one and five years as well as less than one year were observed to have good knowledge of HBV and HCV. The highest group with inadequate knowledge of HBV and HCV were those with duration of between six and ten years. This finding seems similar to the report from the survey of the academy of family physicians where it was reported that physicians in practice for more than 20 years were found to have the lowest level of knowledge about HCV risk factors, whereas those in practice for 5 years or less had the highest level of knowledge [17]. This may be because newly employed HCP tend to show up for hospital seminars were training on infectious diseases, and other health-related issues are discussed They are thus more likely remember existing and new information on health subjects. Secondly, the seniors

(with longer duration of service) are usually the ones engaged in the training of others. It may be the reasons why their contemporaries may not pay attention to training and may not even show up at opportunities for continuing medical education probably with the wrong notion that nothing new will be learned.

Regarding the seroprevalence of HBV (HBsAg) and HCV (anti-HCV), the overall seroprevalence for HBV (HBsAg) and HCV (anti-HCV) in this study was 1.4% and 1.1% respectively. This finding is consistent with the study carried out in Ekiti; south Western Nigeria where the seroprevalence of HBsAg was reported to be 1.1% and even lower for the study done in Tertiary Hospital in Rwanda [52,53]. However, this finding did not agree with the results from other surveys as this observed prevalence was found to be far lower than reports from countries with intermediate population HBV seroprevalence: India with 5% HBsAg positivity among HCWs and Tanzania with adult population HBsAg seroprevalence of 6% and among HCWs as 7.4% [27,25]. This finding was also much lower when compared with findings from regions with high HBV and HCV endemicity like Cameroon, the population seroprevalence is estimated at 10.1% and HCWs' seroprevalence of 23.6% for HBV and 16% for HCV [28,29], Nigeria with HBsAg adult population seropositivity of about 13.6% and that of HCWs at about 17% with higher rate among surgeons (25.7%) [30,49,32].

The observed lower seroprevalence in the study may be because the study population is likely to be more exposed to health information than the general population which in turn may positively influence their lifestyle and habits, given that HBV and HCV can also be acquired outside the occupational environment. Also, for fear of stigmatization despite assurances from the research team, some persons who already knew their seropositive status might have opted out of the study and the fact that there are differently reported seroprevalences depending on the method of assay. For instance, findings from a systematic review and meta-analysis study of prevalence of HBV infection in Nigeria between 2000 and 2013, it was revealed that the pooled prevalence of HBV in Nigeria was 13.6% (95% confidence interval [CI]: 11.5, 15.7%) and that HBV prevalence in Nigeria varied by screening method [% (95% CI)]: 12.3% (10.1, 14.4) by using enzyme-linked immunosorbent assay; 17.5% (12.4, 22.7) by immunochromatography; and 13.6% (11.5, 15.7) by HBV DNA polymerase chain reaction [38].

Despite the generally low seroprevalence rate obtained in this study, a comparison between the clinical and non-clinical related group revealed a relatively lower seroprevalence for HBV (HBsAg) among the clinically related group of 1.3%. The seroprevalence for HCV (anti-HCV) among the clinically related group was also 1.3%. The non-clinical related group had zero seropositive HCV though with a relatively higher prevalence for HBV (2.0%). Although the pooled prevalence of adult population HBV in Nigeria is as high as 13.6%, this also varies from one region to another. To the knowledge of the researcher, there is no population study to determine the real population seroprevalence of HBV and HCV in the study location as it might be as low as 2.0% as represented by the non-clinical group in this study. However, determining population seroprevalence was not within the scope of this study.

Of the different job categories of HCP studied, HCV seropositivity was only found among the doctors and nurses with a proportion of 1.5% and 1.9% respectively. As observed from the current study, the seroprevalence result agrees with the findings of a cross-sectional serosurvey, with Enzyme-Linked Immuno-sorbent Assay (ELISA) system used to detect anti-HBc, anti-HCV and anti-HIV conducted among 89 doctors and 414 nurses from 16 randomly selected hospitals in West Pomerania, Poland, in which the anti-HCV of 1.1% of doctors versus 1.4% of nurses were recorded [24]. However, the HBsAg seroprevalence in this study had a distribution of 2.0% in the non-clinical workgroup while doctors and nurses were 1.5% and 1.0% respectively. This finding was consistent with the findings among the doctors in Uyo, South-South, Nigeria with a subgroup prevalence of 1.6% [32]. In the same study, the prevalence among nurses was higher similar to the Poland findings for HBsAg [24,32]. Of note is the high prevalence of serum HBsAg (5%) among porters. This is similar to findings in HBsAg seroprevalence survey among HCWs carried out in a tertiary hospital in Nigeria where ward attendants were reported to have accounted for 50% of the total seropositive HBsAg in the study population [54]. Also, in another study carried out in eastern Libya, the nursing aides reported had the highest prevalence of HBsAg and anti-HCV [55]. However, this relatively

high prevalence may also be a reflection of the stratified sampling and thus the relatively small representation of porters in the study population. Although, this group also scored zero percent (0%) on knowledge assessment indicating their abysmal knowledge of HBV and HCV. It is not unusual that in the health sector when training is organized for HCP, this group tend to be forgotten maybe because of the lowly nature of their tasks and the fact that they do not usually belong to any healthcare professional group.

There was a statistically significant relationship between the duration of work and distribution of HBV and HCV infections among respondents. Higher seroprevalence was found in the groups with 6-10 and 16-35 years of practice duration. This was found to be consistent with findings from others studies suggesting that the longer the duration of work or practice as a health care personnel, the higher the prevalence of HBV [56-58]. On the contrary, the finding in this research was not consistent with findings from the study carried out in eastern Libya were HCW with below or above 5 years duration of work had no association with the distribution of HBV and HCV among the HCW studied [55]. Interestingly, in this study, the 6-10 year work duration group also demonstrated the largest proportion of those with inadequate knowledge of HBV and HCV. Thus, this may be the reason for the higher prevalence for HBsAg whereas the other groups: less than 1, 1-5 years, and 11-15 years had zero prevalence. This could represent a possible healthy group of the general population with minimal HBV infection and further buttresses the fact that timely and effective implementation of hepatitis B vaccination and other infection prevention and control strategies among all healthcare workers would go a long way in curbing the spread of hepatitis B infection among health care personnel. The distribution of HCV among this characteristics (durations of work) was about same for 1-5 and 6-10 years of practice whereas, a higher proportion was noticed for the 11-15 years duration of practice as healthcare personnel. Generally, there was no statistically significant relationship between the work type, job categories, duration of practice, knowledge of HBV and HCV with the HBsAg/anti-HCV sero-prevalence of respondents.

Definitions of terms as applied in the study

Bloodborne pathogens

Pathogenic microorganisms that may be present in human blood and can cause disease in humans [59].

Healthcare facility

A workplace as well as a place for receiving and giving health care services.

Healthcare personnel (HCP)-A broader term for all categories of paid and unpaid workers, students or volunteers in the hospital or healthcare setting whose job may or may not involve direct exposure to patients and/or patients' body fluid but have the potential to get themselves exposed to patients and infectious materials such as contaminated medical supplies, equipment, environmental surfaces and air [59].

Healthcare professional

Persons who maintain health in humans through the application of the principles and procedures of evidence-based medicine and care. They have discrete/unique areas of competence and also conduct research and improve or develop concepts, theories, and operational methods to advance evidence-based healthcare.

Healthcare worker (HCW)

A person, who works in a hospital or health centre, promotes and preserves health, diagnose and treat disease, health management, and support workers [59].

Hepatitis B surface antibody (anti-HBs)-Immunoglobin molecule with specific amino acid sequence reacting specifically with the HBV antigen and its presence is generally interpreted as indicating recovery and immunity from hepatitis B virus infection.

Hepatitis B surface antigen (HBsAg)

A protein on the surface of hepatitis B virus and can be detected in high levels in serum during chronic or acute hepatitis B virus infection and indicates that an individual is infectious

Seroprevalence

Overall occurrence of a disease within a defined population at one time, as measured by blood tests.

Conclusion

This study has shown that healthcare personnel generally have a high level of awareness regarding

Hepatitis B and Hepatitis C. However this did not translate to an equally high level of knowledge of HBV and HCV. The poor knowledge of HBV and HCV was demonstrated by the less skilled HCP and the non-clinically related set of healthcare personnel.

The seroprevalence of HBsAg and anti-HCV were relatively lower than the prevalence in the national

Population and comparison with areas of high endemic HBV zone. The non-clinical group had a relatively higher prevalence of HBV than the clinical group. There was no statistically significant difference in the distribution of the HBV and HCV among the different categories of HCP except for the porters who had the highest prevalence compared to any other category of HCP in the study.

We would therefore recommend that as part of the hospital responsibility to her members of staff, the hospital should conduct HBV and HCV screening for all staff of the hospital for a baseline sero-prevalence status. Those who end up to be seropositive should be counseled on how to handle the situation effectively. Those who are seronegative are counselled on how to remain negative and vaccinated against HBV.

Declarations

This article was part of a Fellowship thesis carried out for the award of Fellow of West African College of Physician in Community Health.

Ethical considerations

Approval for the study was obtained from the Health Research and Ethical Committee (HREC) of Irrua Specialist Teaching Hospital, Irrua. Informed written consent was obtained from each study subject after a thorough explanation of the objectives and procedures of the study. The benefit of this study was explained to the study population that the concerned body could utilize the results in improving occupational health safety and service. Confidentiality was ensured by making the questionnaire anonymous and avoiding personal identification

Consent for publication

Not applicable

Availability of data and material

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

EFO and SOA conceived the study and developed the protocol. All authors were involved in data collection, analysis, and writing the manuscript.

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