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Full Length Research

Hepatitis B and C Virus among Health Care Workers in National Institute for Pharmaceutical Research and Development (NIPRD) Abuja, Nigeria

[1]*Ya'aba Y., Mohammed S. B.[1], Olatunji K. T.[1], Abubakar A.[1], Usoroh M.[1], Daniel O. C.[1], and Abdulmumin A. R.[2]

[1]Department of Microbiology and Biotechnology, National Institute for Pharmaceutical Research and Development (NIPRD) Abuja, Nigeria.

[2]Department of Microbiology, Ibrahim Badamasi Babangida University, Lapai, Niger State, Nigeria.

*Corresponding Author's Contact Details: E-mail ✉: yakyabnig@yahoo.com, Phone no ☎: +2348033326544

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Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections in Nigeria have remained a public health challenge. They are major cause of mortality, especially in developing countries. Health care workers (HCWs) are at high risk of having viral hepatitis infections. This study was designed to determine the seroprevalence of HBV and HCV among HCWs at National Institute for Pharmaceutical Research and Development, Abuja, Nigeria. Two hundred and five staff members and staff on training in the employment of the institute as at 31st may, 2018 were given health talk, counselled, referred to the Virology unit laboratory. Data were collected by administering a structured and self-administered pre-test questionnaire to every member of staff that consented to participate in the study. Blood samples were collected and screened for Hepatitis B surface antigen (HBsAg) and anti-HCV antibodies using rapid ELISA kits. Data was analyzed using SPSS version 20.0. Among the 205 HCWs screened for HBV and HCV antibodies, 122 (59.5%) were males while 83 (40.5%) were females. A total of 197 clients were hepatitis infection negative, whereas, 7 (3.5%) were HBV positive and 1 (0.5%) were positive for HCV. No co-infection was observed from the study. Therefore, health talks/education should be encouraged in our health facilities.

Keywords: Hepatitis B Virus, Hepatitis C Virus, Health Care Workers, Administrative staff, Public Health Challenge, ELISA kits.

INTRODUCTION

Healthcare workers (HCWs) are exposed to a lot of hazardous blood-borne pathogens such as hepatitis B virus (HBV) and hepatitis C virus (HCV) in their occupational work environment. HBV and HCV are common causes of occupational diseases transmitted from patients to HCWs and vice versa and also to HCWs' families. These viruses still remain global public health challenges that needs greater efforts for prevention, care, control and managements, thereby causing great consequences in terms of occupational and psychological diseases (Askarian et al., 2011). Liver inflammation are known to be cause by hepatotrophic viruses and it is also proven that only hepatitis B, hepatitis C, and hepatitis

D viruses cause chronic infection (Karoney and Siika, 2013).

HBV can easily be transmitted from one infected individual to another by blood contact or blood products, by unprotected sexual intercourse, from mother to child, or by sharing of eating utensils and other barbershop and beauty salon equipment due to its high level of contagiousness. The main modes of transmission include prenatal infection, skin and mucous membrane infections caused by infected blood/blood products or body fluid, sexual contact, and injection drug abuse (Durro and Qyra, 2011). In addition, tattooing, ear piercing, acupuncture, dialysis, needle prick and even use of a syringe or sharp objects can be the source of this virus infection (Mesfin et al., 2014).

There is high burden of HBV infection in the developing countries like Nigeria and other sub Saharan Africa. World Health Organization (WHO) have estimated that the prevalence of HBV infection in Africa is on average of more than 10%. However, a study conducted in Addis Ababa, Ethiopia, showed that the mean prevalence of HBsAg was 6.1% (Anagaw et al., 2012) and in Nigeria in increasing ranged from 3.9 to 50.7% (Adoga et al., 2010).

It is also estimated that 200 million individuals (about 3.3% of the world population) are having hepatitis C infection worldwide (WHO, 2012). The prevalence of HCV varies from region to region, with highest prevalence of (15 – 20%) found in Egypt and lowest prevalence of (0.01 – 0.1%) in the United Kingdom (Mesfin et al., 2014). It is estimated that about 27% of cirrhotic patients and 25% of patients with hepatocellular carcinoma are caused by HCV (Perz et al., 2006). Worldwide, about two billion people are said to be exposed to viral hepatitis (Udeze et al., 2009) and it is also estimated that 325 million people are said to be carriers of HBV and HCV worldwide in 2015 with 257 million and 71 million having chronic HBV and HCV infections respectively (WHO, 2017).

Effective and safe vaccine against this virus (HBV) has been developed and made available for over 20 years and its effective in preventing infection, and other serious challenges of viral hepatitis, including liver cirrhosis and cancer, when given before or after exposure (Mesfin et al., 2014) but up to date HCV has no vaccine (WHO, 2012). In 2012, a pentavalent vaccine comprising HBV, tetanus, pertussis, Haemophilus influenza type B and diphtheria was introduced (GAVI, 2015).

It was estimated by the Centers for Disease Control (CDC) that 3.9 million persons (1.8%) are infected with HCV, and 2.7 million of these infections will become chronic (Askarian et al., 2011). In Nigeria, different type of prevalence rate of HCV infection has been reported in different populations, 5.8% prevalence was found among blood donors in Southern Nigeria (Booth, 1998), while states such as Lagos, Osun and Plateau States have recorded anti-HCV antibody prevalence rates of 8.4% (Ayolabi et al., 2006), 9.2% (Ogunro et al., 2007) and 5.7% (Inyama et al., 2005) among blood donors, pregnant women and HIV patients respectively.

There have been several differences in the reported estimates of HBV and HCV infections in terms of incidence, prevalence, and absolute numbers worldwide (Basnayake and Easterbrook, 2016). Sub-Saharan Africa is said to have an approximated prevalence of 6.1% with wide variations between and within countries (WHO, 2017). For instance, the observed prevalence of HBV and HCV infections in Nigeria defers from one location to another, the population studied, and the nature of study design. Systematic meta-analysis of observed prevalence's across the country, Musa and other researchers (2015) documented a pooled prevalence of 13.6% for HBV (Musa et al., 2015).

To the best of our knowledge, there is scarcity or little work that has been done in the area of establishing the prevalence of HBV and HCV infection in different sub-populations especially HCWs work place at various health facilities in Abuja, Nigeria. Therefore, it is of paramount important that studies on this group of HCWs be carried out, so that the status and prevalence rate of the infection among this sub-population can be achieved, thereby informing appropriate health policy makers in the country for effective interventions such as vaccination and awareness creation for standard precautions to prevent transmission be ascertained. Hence, this study was designed to determine the sero-prevalence of antibodies to HBV and HCV among HCWs at National Institute for Pharmaceutical Research and Development (NIPRD) in Abuja, Nigeria.

MATERIALS AND METHODS

Study Area and design

This study was designed as an institutional based cross-sectional, it was conducted from 13th February,

2018 to 9th April, 2018 among HCWs at the National Institute for Pharmaceutical Research and Development (NIPRD), Abuja, Nigeria. Abuja is the developing Federal Capital City of Nigeria lying between latitude 8.25ºN and 9.20ºE of the equator and longitude 6.45ºN and 7.39ºE of Greenwich Meridian. It is located at the centre of the country with a landmass of approximately 7,315 km², of which the actual city occupies 275.3 km². It is situated within the Savannah region with moderate climatic conditions. The territory is located just north of the confluence of the River Niger and Benue River (Henry, 2008). The institute hospital is a referral centre and serving a large population in the heart of Abuja and its environs. NIPRD has about 277 employees in the different profession and cadre (physicians, pharmacist, Staff on training, nurses, administrators/work, and laboratory personnel/ technologist).

Study populations

The study recruited 205 HCWs aged 10 years and above. The study was announced in the institution as part of the activities for the 2016/2017 world hepatitis day. Participation in the study was voluntary and over 74% of the employees was sampled. The Sample size was estimated using the Kish Leslie sample size formula for a cross-sectional study (Kish, 1995). Based on an HBV seroprevalence of 7.9% from a previous study in Nigeria (Ibrahim and Pondei, 2014), a sample size of 103 was calculated to achieve a 5% margin of error in estimating the HBV prevalence at a 95% confidence level in the study population. Using a design effect of 2 the estimated total sample size became 205 to ensure adequacy of the sample size to screen for both HBV and HCV infections, supposing HBV is more prevalent and that a minimal level of co-infection exists among the study population. However, 205 HCWs eventually participated in the study.

Ethical Consideration

Ethical approval for the study was secured from the Institutional Review Board (IRB) of National Institute for Pharmaceutical Research and Development (NIPRD), Abuja in accordance with the code of ethics for biomedical research involving human subjects. The patients were recruited after they were sufficiently counseled on the objectives, risk and importance of the study. Written consents were obtained and all relevant confidentiality was kept throughout and after the study period. Only the principal investigator held the results of blood samples tested. The participants were informed of their HBV and HCV test results as desired and the test results were delivered to individuals in a sealed form. The participant's found reactive or positive were further counseled and linked to care at the institute research clinic (NIPRD).

Research Questionnaire

A well-structured self-administered questionnaire was designed to achieve the desire objective of the study and was used to collect information about the socio-demographic characteristics of participants. The questionnaire before the study was pretested on 15 HCWs in our health facility with the necessary modification and corrections made after the pre-test. Trainees (Intern pharmacist and students on industrial training) on attachment in the institute were included into the study while non-employees (securities and cleaners) were excluded.

Samples Collection

Three milliliters (3mLs) of venous blood was collected from each participant into well-labeled sample EDTA bottles for serological analysis for HBV and HCV. The blood samples were collected by trained phlebotomists and processed by trained and experienced laboratory/technology staff. The blood samples were centrifuged at 4,000 revolutions per minutes (rpm) for 10minutes and the recovered plasma was aliquot into the well-labeled cryovials, and kept into -40^{0}C freeze until ready for the screening.

Serological Screening

Serological diagnosis was done using Rapid diagnostic tests (RDTs), for HBV infection the SD BIOLINE (Standard Diagnostic (SD) Inc., Korea) one step HBV test kit was used for detection of HBV infection and HCV antibodies was done using the SD BIOLINE HCV test kit. This is an immunochromatographic rapid test for the qualitative detection of antibodies specific to HCV in blood with a sensitivity of 100% and specificity of 99.4% according to manufacturer's instructions found on the standard operation procedure insert. The seropositive samples of HBsAg and anti-HCV

detected by RDTs screening were further confirmed by Western blot (Trinity Biotech, Bray, Ireland) according to manufacturer's specifications.

Data analysis

The data obtained from the study was analyzed using statistical package for social sciences (SPSS) (version 20.0) descriptive statistics were obtained and presented in Tables. Values obtained were considered statistically significant at $p \leq 0.05$.

RESULTS

Out of the two hundred and five (205) HCWs that participated in the study, fully filled the study questionnaire and blood sample collected, 122 (59.5%) were males while 83 (40.5) are females, 128 (62.4%) were married and 65 (31.7%) are not married. The average age of study participants was 35.0 years (age range was 10 - >60years). The other baseline socio-demographic characteristics are presented in Table 1.

The seropositivity of HBsAg and anti-HCV among the study HCWs participants was 7 (3.5%) and 1 (0.5%) respectively. There was no HCWs participants that were reactive or positive for both HBsAg and anti-HCV co-infection. All HCWs participant's samples screened for HBsAg and anti-HCV that were reactive or positive remains reactive or positive on confirmatory using Western blot. The results showed that HBsAg reactivity or positivity was higher 4 (2.0%) among Administrative staff followed by trainee staff 2 (1.0%) and 1 (0.5%) was among laboratory/technology staff. The 1 (0.5%) HCWs participants found reactive or positive for HCV was among the administrative/work staff. There is no statistically significant difference ($p = 0.153$) between HBV and HCV association in this study as shown in Table 2. The seroprevalence of HBV and HCV was higher among females HCWs participants than males HCWs participants, but these variations were not statistically significant ($p \leq 0.05$). The age distribution, HBsAg and HCV sero-positivity of the studied HCWs participants in NIPRD, Abuja is as shown in Table 3.

DISCUSSION

Serological screening of silent killers like hepatitis B virus (HBV) and hepatitis C virus (HCV) infections would help in resolving challenges faced by these diseases among asymptomatic persons. According to the World Health Organization (WHO) the proportion of health care workers (HCWs) differs greatly from one location to another (0.2 – 2.5%) as does the mean number of occupational work injuries per HCWs; for instance, 0.2 – 4.7 % sharp injuries per worker per year (EPINET, 1999). Although, the annual proportion of HCWs that are exposed to HBV every year is estimated to be 5.9 %, which is corresponding to approximately 66,000 HBV infections among HCWs globally.

Work place exposure caused by HBV infection is a well-proven hazard for HCWs (Singhal et al., 2011). In the developing countries like Nigeria, about 40% - 65% of HBV infections in HCWs may have happened due to per-cutaneous work place exposure (Ayoola and Adelaja, 1986). Meanwhile, in developed countries were exposure rate is less than 10% which might be due to high rates of immunization and availability of post- exposure prophylaxis (PEP). But in this present study where this research was carried out (Abuja, Nigeria) reverse is the case in which HCWs are left on their own to resolve their occupational work place challenges like accident and exposures. Although, most of the challenges caused by HBV infections are primarily related to the extent of contact with contaminated or infected blood and blood products, body fluid in the work place and also to the hepatitis B-e antigen (HBeAg) status of the source individual (Singhal et al., 2011).

The overall prevalence of HBV infection in this present study among HCWs was 3.5% at the study location (Abuja) indicating intermediate endemicity (2 - 7%) of the threat according to the World Health Organization (WHO) classification of the prevalence of HBV infection (European Centre for Disease Prevention and Control) (WHO, 2012; Zampino et al., 2015), despite high (60%) prevalence observed of having ever been exposed to blood/blood products or body fluid by means of splashing into the eyes and/or mouth or needle stick injury or sharps.

It is surprising to find that the prevalence of HBV among HCWs observed in this study was lower than that observed in general population. We predict that this may be affiliated to certain factors such as high level knowledge about modes of transmission and prevention and control of HBV among this group of occupational exposure workers (HCWs), several training on infection control and access to preventive measures (Vaccination) they had learnt and

Table 1: Socio-demographic characteristic of health care workers in NIPRD, Abuja.

Variable	Number (n = 205)	Percentage (%)
Sex		
Male	122	59.5
Female	83	40.5
Age brackets		
10-19	15	7.3
20-29	68	33.1
30-39	35	17.1
40-49	62	30.2
50-59	19	9.3
>60	3	1.5
Marital status		
Married	128	62.4
Unmarried (single)	65	31.7
Divorced	8	3.9
Widowed	4	2.0
Education		
Primary	3	1.5
Secondary	9	4.4
Tertiary	193	94.1
Residence		
Urban	67	32.7
Rural	138	67.3
Blood transfusion		
Yes	13	6.3
No	192	93.7
Needle stick injury		
Yes	3	1.5
No	202	98.5
*HBsAg test		
Yes	37	18.0
No	168	89.8
**HCV test		
Yes	21	10.2
No	184	89.8
Tribal marks		
Yes	9	4.4
No	196	95.6

* HBsAg: Hepatitis B surface antigen screening.
**HCV: Hepatitis C Virus screening.

received. Although, it is proven that prevention of any disease is directly proportional to knowledge, attitude and practice and therefore negligence during the handling of infected blood and blood products, sharps and body fluid is lower with good and effective knowledge as may be the case in this study. It is, however, possible that prevalence rates of HBV may differ across societies or communities in Nigeria

Table 2: HBsAg and HCV sero-positive distribution by profession/Department among health care workers in NIPRD, Abuja.

Profession/Department	Total No. HCWs	No. positive (HBsAg)	No. positive (HCV)	Percentage positive (HBsAg)	Percentage positive (HCV)
Physicians	4	0	0	0	0
Pharmacy	3	0	0	0	0
Laboratory/Technology	32	1	0	0.5	0
Nursing	5	0	0	0	0
Administrative/work	92	4	1	2.0	0.5
*Training staff	69	2	0	1	0

*Training staff: industrial attachment and intern pharmacy students on training with the institute.

because of occupational exposure risks differences. Standard precautions and positive attitude towards standard precautions may have contributed to the lower value obtained from this study.

The 3.5% prevalence of HBV infection observed in this study was similar to the prevalence of 4.4% observed among HCWs in Khartoum, Sudan (Abdalwhab and Nafi, 2014), and the prevalence of 2.9% observed among HCWs of a tertiary hospital in Rwanda (Kateera et al., 2015) and the 4.2% prevalence observed among medicine and health science students of Wollo University, Northeast Ethiopia (Demsiss et al., 2018), but was closely related to prevalence of 5.5% observed in the study carried out by Martins and colleagues (Martin et al., 1982). Nevertheless, the observed prevalence (3.5%) was lower than the prevalence of 6.7%, 7.3%, 8.7%, 8.1% and 7.0% observed among HCWs of a specialist hospital in Ondo State, Nigeria, Bule Hora Woreda, Southern Ethiopia, Najran region, South western Saudi Arabia, tertiary hospital in Uganda and tertiary hospital in Tanzania respectively (Ziraba et al., 2010; Geberemicheal et al., 2013; Alqabtani et al., 2014; Muller et al., 2015; Olorunfemi et al., 2017). Although, at the other hand, the prevalence 3.5% was found to be higher than the 1.0% and 0.4% prevalence observed among HCWs of a tertiary care hospital in India (Pazhaniaandi et al., 2009; Singhal et al., 2011). These differences could be as a result in their regional characteristic, level of knowledge of HBV and standard precautions and attitude and practice of standard precautions and occupational work place exposure.

Considering various categories of HCWs from this study, it was also observed that a higher prevalence of HBV was among the administrative staff 2% (4 of 92), followed by the training staff 1% (2 of 69) and least prevalence was found among the laboratory/technology staff 0.5% (1 of 32) while no prevalence was found among Physician, Pharmacy and Nursing staff 0% (0 of 12). This may be linked to non-exposure of this group to contaminated or infected blood and blood products or accidental needle stick injury. Although it was reported, that the most usual way or factor for those are from regular contact with patients' blood (Gibas et al., 1992). In another study carried out in Lagos, Nigeria among surgeons, it was observed that the prevalence of HBV among this group of HCWs was 25.7% (Bello, 2000). However, this was in contrast to 17.8% HBV prevalence observed among hospital workers in Senegal which does not agrees with the findings obtained in this present study (WHO, 2014). The finding was also lower than a similar study carried out among HCWs in Uganda in which prevalence of 9.0% was obtained for HBV recent infection (Braka et al., 2006). These variations among the different group of HCWs may be due to the different levels of exposure to a hazardous work environment where they usually perform the work.

This present study interestingly revealed a low burden of HCV infection which was previously observed among HCWs in the country. The prevalence of HCV prevalence in this study was 0.5%, this was comparable to the 0%, 1.3% and 0.7% prevalence observed among HCWs of the Najran region, South western Saudi Arabia, tertiary hospital in Rwanda and medicine and health science students of Wollo University, Northeast Ethiopia respectively (Alqabtani et al., 2014; Kateera et al., 2015; Demsiss

Table 3: Age distribution of HBsAg and HCV sero-positivity and sero-negativity (n=205).

Age group	Total No. of HCWs	No. of Positive HBsAg	No. of Negative HBsAg	No. of Positive HCV	No. of Negative HCV	Total Positivity HBsAg/HCV
10 – 19	15	2	13	0	15	2
20 – 29	68	2	66	0	68	2
30 – 39	35	0	35	1	34	1
40 – 49	65	3	62	0	65	3
50 – 59	19	0	19	0	19	0
>60	3	0	3	0	3	0
Total	205	7	198	1	204	8

p values were 0.00 showing that there was no statistical significant difference in HBsAg and HCV infections in this study.

et al., 2018). This could be as a result of students and HCWs having a comparable level of knowledge and practice of standard precautions and, hence, they might have comparable infection due to similar work place exposure. The finding from this study was not comparable to 8.1% reported among HCWs in a specialist hospital in Ondo State, Nigeria (Olorunfemi et al., 2017). This may be attributed to variation in geographic location, despite wide range covering reports by researchers, that the country (Nigeria) is having high burden of viral hepatitis (Adoga et al., 2010).

The sero-positivity of HCV (0.5%) among this group of HCWs was lower than that of HBV (3.5%), therefore, HBV might be more common than imagined but for the possible enough information on HBV in Nigeria and sub–Sahara Africa. This finding was contrary to other studies from some part of the country (Oje et al., 2012) and the African continent (Iles et al., 2013; Guimarães - Nebenzahl et al., 2013). This variation may be due to the type of population studied, socioeconomic status, geographic location, regional difference in risk factors and cultural practices which predate employment as HCWs that are independent of occupational work status. It is reported and documented that marked variations affects sero-epidemiological studies of different populations (Esan et al., 2014).

The distribution of HBV and HCV markers according to HCWs groups was also studied. Laboratory/Technologist, administrative/work and training staff were the work places found to have HBV related infections. Also, administrative/work staff work place was found to have low prevalence of HCV infected HCWs. This finding is not in agreement with of Ziraba and co-researchers (2010), who concluded in their study that laboratory technician are more likely to be more exposed to HBV, but in this present study, the prevalence of exposure was markedly low (0.5%) among laboratory/technologist staff. There was no co-infection prevalence of the two viruses observed at administrative/work staff work place.

CONCLUSION

This study has determined the prevalence of HBV and HCV infections among health care workers and found intermediate endemicity of HBV infection and non-negligible prevalence of HCV at NIPRD, Abuja, Nigeria which is relatively low compared to what was observed from other parts of the country. Concerted efforts should be adapted to strengthened routine immunization, effective health education on standard precautions, and periodic screening for HBV and HCV in the country with the aim of preventing transmission of HBV and HCV infections, providing regular treatment to those already infected.

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CONFLICT OF INTEREST

The authors declared no conflict of interest.

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