Seroprevalence and Predictors for Hepatitis C Antibodies among Students in Tertiary Educational Institutions of Nigeria

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Abstract

Hepatitis C (Hep.C) virus infection is highly prevalent with elevated undetected cases globally. The goals of this study were to evaluate seroprevalence and potential predictors associated with HepC antibodies among students in two tertiary educational institutions in Kwara State, Nigeria. Cross-sectional research was conducted with structured questionnaires on socio-demographics and potential predictors for HepC infection which were filled by the participants. Three millilitre of blood sample was collected from each participant to screen for anti-Hepatitis C Virus antibodies. In each tertiary educational institution, 166 participants were recruited. Ethical approval and informed consents were obtained. Descriptive and inferential statistics were used. In both institutions, the majority of the participants (263, 79.2%) were within the ages of 21-25 years. One hundred and thirty-two (79.5%) and one hundred and thirty-one (78.9%) were within the ages of 21-25 years in the College of Education, Oro and Kwara State Polytechnic, Ilorin, respectively. Also, ninety-nine (59.6%) in the College of Education and ninety-five (57.2%) in Kwara State Polytechnic were females. Zero (0.0) and 0.6 percent seroprevalence of HepC virus infection were found among participants in the College of Education, Oro and Kwara State Polytechnic, Ilorin respectively. Also, none of the demographic, social and medical variables was significantly associated with the seroprevalence of HepC infection. The seroprevalence rates of HepC virus infection were low in the institutions studied. None of the risk factors was associated with HepC positivity.

Keywords: HepC antibodies, seroprevalence, screening, tertiary institutions, students

Introduction

According to the World Health Organization's global viraemic prevalence estimate in 2015, approximately 71 million individuals were of chronic Hepatitis C (HepC) infection with between 3 and 4 million cases annually. In 2016, up to 399, 000 deaths occurred mainly from hepatocellular carcinoma and cirrhosis (WHO, 2019). The global estimation of

HepC prevalence was 2.5% and 2.9% in Africa (Petruzziello *et al*., 2016). In Sub-Saharan Africa, HepC infection prevalence rates range from 0.1% to 17.5% (Karoney and Siika, 2013). These variations among countries including Ghana had (0.9%) (Pappoe *et al*., 2019), Egypt (4.4%) (MHPE, 2015), Cameroun (6.5%) (Bigna *et al*., 2017) and Burundi (11.3%) (Karoney and Siika, 2013). The variation in seroprevalence

reports could be linked to varied geographical regions, specificity, and sensitivity of serological diagnostic test kits used in different studies, and the heterogeneous populations screened.

Nigeria is one of the developing countries with a high (2.1%) HepC seroprevalence burden as most of the population did not know their status (Jefferies *et al.*, 2018). Previous reports on HepC seroprevalence in other tertiary institutions in Nigeria include that of Jemilohun *et al.* (2014) among students in Ogbomoso (0.4%), Itodo *et al.* (2016) in Abuja (0.7%), Odenigbo *et al.* (2010) in Anambra (2.0%), Jeremiah *et al.* (2008) in Port Harcourt (5.0%), Imarenezor *et al.* (2016) in Wukari (6.0%), Itelima, (2017) in Jos (6.8%), and Omote *et al.* (2018) in Jalingo (13.6%). Furthermore, Okonko *et al.* (2014) noted 0.0% in Port Harcourt. Omolade and Adeyemi (2018) revealed 0.7% in Sango Ota. Also, Udeze *et al.* (2011) and Adesina *et al.* (2016) recorded 8.0% in Ilorin and 1.6% in Ibadan respectively. The study of Eke *et al.* (2016) observed that unscreened blood transfusion was a major route for acquiring the infection in Nigeria.

There is limited published information on seroprevalence and the risk factors for HepC infection among students in North Central Nigeria (Damola *et al.*, 2017). The apparently healthy students could have been infected with HepC but may not know their status due to the asymptomatic nature of the infection, leading to its complications and death. The goals of this study were to evaluate the seroprevalence and potential predictors of HepC antibodies among the students to create awareness and reduce the menace in the tertiary educational institutions in Kwara State, Nigeria.

Materials and Methods
Sites
There are thirteen tertiary institutions in Kwara State including College of Education, Oro and Kwara State Polytechnic, Ilorin. This study was performed among students in the College of Education, Oro situated in the South district and Kwara State Polytechnic, Ilorin in the Central district. The primary ethnic group is Yoruba, whereas Nupe, Bariba and Fulani are minorities (NHDR, 2018).

Study Design
The study conducted was a multi-centered, cross-sectional assessment of students that were uncertain of their HepC virus status. The research commenced in May 2019 and continued for two months at the respective health clinics of the two institutions with the use of self-completed structured questionnaires. The target populations were male and female students (> 21 years old) in the two institutions. The students that rejected to be involved in the study were excluded.

Sample Size Determination and Recruitment of Participants
The sample size of the study was computed with the use of the Raosoft Sample Size Calculator as illustrated by Voidăzan *et al.* (2019) at 95% Confidence Interval and an error margin of $\alpha = 5\%$. Based on the earlier survey of HepC infection in Nigeria by Ejiofor *et al.* (2010), the percentage of seroprevalence of the target population was 12.3%. Therefore, the calculated sample minimum size was 166 students in each institution. The minimum sample size obtained (166) was distributed over a study period of two months. Hence, three students per day that attended the laboratory units of the institutions were randomly recruited into

the study after given oral and written informed consent. This was to ensure that the study sample was representative of the population.

Research Instruments
A self-completed questionnaire used for the study contained twenty questions that were structured in line with relevant questionnaires from the previous research works. The questionnaires were initially pre-tested for validity, efficiency, inclusiveness and reliability. Some slight corrections were made on the questionnaires after the pre-tested study, for a few questions that were not well understood by the students before the final study was conducted. A descriptive letter promising secrecy was attached to the questionnaires. The questionnaires showed no information confirming the identity of the participants. The privacy of information was stated at the beginning of the questionnaires. The participants were allowed to complete the questionnaires according to the information supplied. There was a 100% response rate from the students and attrition was not encountered in any of the institutions.

Blood Collection and HepC Antibodies Screening Procedures
Trained laboratory technicians used the structured questionnaires to record the socio-demographic variables, clinical, and behavioural features from the participants. They thereafter collected three millilitres of aseptically blood samples after verbal and written permission from the participants to screen for anti-Hepatitis C virus antibodies using Micro Point Diagnostic Rapid Testing Kit (Nantong, China). The blood was allowed to clot at a room temperature of 27°C and then spun with centrifuge for five minutes at 3,000 revolutions per minute to separate the

serum following instructions of the manufacturer's manual. The resulting serum was labelled and stored at a temperature of -20°C until it was ready for testing. The serological assays were used in identifying a particular antibody to the HepC virus (anti-HepC) in the serum.

The results of the tests were read within 15 minutes. For a participant that tested positive, two red lines appeared one in the test area and the other in the control area. For a negative sample, a line at the control area was observed (WHO, 2019).

The validity of the testing kit used was performed by screening three positive and three negative confirmed samples of hepatitis C virus antibodies in the laboratory units of the studied institutions. The results obtained with the Micro Point kit were comparable with the negative and positive results in the control samples. According to the manufacturer's manual, the sensitivity of the diagnostic test kit is 99.9% (99.3% -100.0%) and a specificity of 99.9% (99.7% -100.0%).

Ethical Clearance
Ethical approvals to conduct the studies at the institutional clinics were sought from the management of the institutions. Oral and informed consent of the students were obtained before recruitment into the study.

Statistical Analysis
The seroprevalence of HepC virus infection was obtained by dividing the number of those participants that tested positive to HepC virus by the total number of participants enrolled in the study. The raw data were inputted into a coded database (Microsoft Excel) to disallow unauthorized access to the database. The data were evaluated for normality by exploring box plots. STATA Version 12.0 for Windows

(Stata Corp, TX, USA) was applied to analyse the results. Categorical variables were expressed with percentages and frequencies. Descriptive and inferential statistics were used to assess the statistical differences between variables. The socio-demographic characteristics were transformed into categorical variables. To determine the predictors for HepC antibody positivity, variables that correlated with HepC antibody positivity were concurrently added to the logistic regression model at a significance level of the p-value of less than 0.05 with a 95% confidence interval.

Results
As revealed in Table 1, most of the participants were within the ages of 21-25 years in the College of Education, Oro and Kwara State Polytechnic, Ilorin. Also, in both institutions, more than one half were females and single. Almost all the participants were Yoruba by tribe in the institutions studied. In the College of Education, Oro the Christians dominated the study while the majority practices Islamic religion in Kwara State Polytechnic, Ilorin.

Table 1: Demographic Information of Participants in Two Kwara State Tertiary Educational Institutions on Hepatitis C Virus Testing

Variables	College of Education, Oro n = 166 (%)	Kwara State Polytechnics, Ilorin n = 166 (%)
Age (Years)		
21-25	132 (79.5)	131 (78.9)
26-30	21 (12.7)	13 (7.8)
31-35	9 (5.4)	15 (9.1)
36-40	3 (1.8)	4 (2.4)
41-45	1 (0.6)	3 (1.8)
Gender		
Male	67 (40.4)	71 (42.8)
Female	99 (59.6)	95 (57.2)
Marital Status		
Unmarried	153 (92.2)	163 (98.2)
Married	13 (7.8)	3 (1.8)
Tribe		
Yoruba	157 (94.6)	156 (94.0)
Igbo	2 (1.2)	7 (4.2)
Hausa	5 (3.0)	1 (0.6)
Nupe	2 (1.2)	1 (0.6)
Others	0 (0.0)	1 (0.6)
Religion		
Islam	72 (43.4)	86 (51.8)
Christianity	94 (56.6)	79 (47.6)
Others	0 (0.0)	1 (0.6)

Regarding the seroprevalence of HepC virus infection among the institutions studied, only one participant tested positive in Kwara State Polytechnics, Ilorin, giving a seroprevalence rate of 0.6% while none of the participants was infected with the virus in College of Education, Oro, showing 0% seroprevalence (Table 2).

Table 2: Seroprevalence of Hepatitis C virus infection among participants attending two Kwara State tertiary educational institutions

Testing of the Hepatitis C virus	College of Education, Oro n=166 (%)	Kwara State Polytechnics, Ilorin n=166 (%)
Hepatitis C (positive)	0 (0.0)	1 (0.6)
Hepatitis C (negative)	166 (0.0)	165 (99.4)
Seroprevalence rate of Hepatitis C	0.0	0.6

As depicted in Table 3, participants in the College of Education were more involved in risk behaviours that made them prone to HepC virus infection than Kwara State Polytechnic. There were few cigarette smokers among the participants in both educational institutions. Seventeen participants (10.2%) were in the College of Education, Oro while three (5.0%) were in Kwara State Polytechnic, Ilorin. Also, less than one-fifth of the participants were alcohol drinkers; twenty-three (13.9%) were in the College of Education and fifteen (9.0%) in Kwara State Polytechnic. Furthermore, the minority of the participants had a tattoo on their bodies; ten (6.0%) in the College of Education and four (2.4%) in Kwara State Polytechnic. More than one half (65.7%) of the participants in the College of Education pierced their ear or body while forty- seven (28.3%) were found in Kwara State Polytechnic. Few participants of thirty-one (18.7%) in the College of Education had multiple sexual partners as compared to forty-seven (28.3%) in Kwara State Polytechnic. Only five participants (3.0%) chose to share toothbrushes among one another in Kwara State Polytechnic whereas eighteen (10.8%) were for the College of Education. About one-third of the participants, fifty-eight (35.0%) used other people's utensils in the College of Education and sixty-two (37.3%) in Kwara State Polytechnic. Also, twenty-four (14.5%), and nine (5.4%) shared sharp objects in the College of Education and Kwara State Polytechnic, Ilorin, respectively (Table 3).

Table 3: Social information of participants screened for Hepatitis C virus infection in two Kwara State tertiary educational institutions

Variables		College of Education, Oro n = 166 (%)	Kwara State Polytechnics, Ilorin n = 166 (%)
Cigarette Smoking	Yes	17 (10.2)	5 (3.0)
Alcohol Drinking	Yes	23 (13.9)	15 (9.0)
Body Tattoo	Yes	10 (6.0)	4 (2.4)
Ear or body piercing	Yes	109 (65.7)	47 (28.3)
Multiple sexual partners	Yes	31 (18.7)	47 (28.3)
Sharing of Toothbrushes	Yes	18 (10.8)	5 (3.0)
Use of Utensil	Yes	58 (35.0)	62 (37.3)
Sharing of sharp objects	Yes	24 (14.5)	9 (5.4)

Table 4 reveals the medical information of participants screened for HepC virus infection in the two educational institutions. While one fifth, forty (24.1%) participants were injecting drugs of abuse in the College of Education, twelve (7.3%) were involved in Kwara State Polytechnic. Only fourteen participants (8.4%) had undergone blood transfusion in their lifetime whereas four (2.4%) were recorded in Kwara State Polytechnic. Very few participants had ever worked in the medical field and were exposed to blood during students' industrial work experience postings in secondary healthcare hospitals in the state with 6(3.6%) recorded in the College of Education and 5(3%) in Kwara State Polytechnic. The majority of the participants were unaware of HepC virus infection in both institutions. Twelve of the participants (7.2%) heard about the infection in the College of Education and ten (6.0 %) in Kwara Polytechnic (Table 4).

Table 4: Medical information of participants screened for viral Hepatitis C infection in two Kwara State tertiary educational institutions

Variables		The College of Education, Oro n =166 (%)	Kwara State Polytechnics, Ilorin n =166 (%)
Injectable Drug Abuse	Yes	40 (24.1)	12 (7.3)
History of Blood Transfusion	Yes	14 (8.4)	4 (2.4)
Ever worked in the medical field and have a blood exposure	Yes	6 (3.6)	5 (3.0)
Awareness of Hepatitis C virus infection	Yes	12 (7.2)	10 (6.0)

In both educational institutions, none of the demographic, social, and medical variables was significantly associated with the seroprevalence of HepC virus infection as risk factors.

Discussion

In the current study, low seroprevalence rates of HepC virus infection were obtained in both educational institutions which were consistent with some previous studies in Nigeria. Okonko *et al*. (2014) at the University of Port Harcourt, Nigeria reported a seroprevalence rate of 0.0% and Jemilohun *et al*. (2014) amongst students in Ogbomoso (0.4%). Omolade and Adeyemi (2018) also revealed a seroprevalence of 0.7% among participants at Babcock University in South-West Nigeria while Itodo *et al*. (2016) observed 0.7% in Abuja in the North Central. Other low seroprevalence rates in Africa were shown by Pappoe *et al*. (2019) in Ghana (0.9%). Nonetheless, the global seroprevalence rate was 3% (Chlibek *et al*., 2017).

In Nigeria, a remarkable higher seroprevalence rate has also been observed by Karoney and Siika (2013) with a rate of 2.1% and Achinge *et al*. (2013) with (2.8%) in Makurdi. Ejiofor *et al*. (2010) with 4.7-5% in Wukari, 6.8% was recorded in the study of Itelima (2017), Jos and Udeze *et al*. (2011) reported (8.0%) among students in the University of Ilorin. Furthermore, a seroprevalence of 18.5% was observed in Enugu (Ezeilo *et al*., 2018). The variation in seroprevalence reports could be linked to varied geographical regions, specificity and sensitivity of serological diagnostic test kits used in different studies and the heterogeneous populations screened.

Multivariate analysis showed several potential predictors for HepC antibody seropositivity such as alcohol consumption, smoking cigarette, having body tattooing, injecting drug of abuse, having multiple sexual partners, sharing of toothbrushes and utensils, involved in blood exposure in a medical facility and having a history of blood transfusion. However, none of the expected and potential predictors were found in both institutions. This finding was not in line with that of Enitan *et al*. (2019) who conducted research among participants in a Nigeria tertiary institution and reported some risks of exposure associated with HepC infection which include: tattooing, history of blood transfusion and shared sharp objects, though zero seroprevalence rate of HepC infection was recorded. Globally, several studies had reported sexually related vices as major predictors for HepC infection (Karoney and Siika, 2013). These observed discrepancies could be the geographic variations, diagnostic techniques applied and control strategies adopted in their studies. Similarly, in both institutions, none of the demographic risk factors was considerably associated with the seroprevalence of HepC infection. Comparable to this result was the study of Onyekwere *et al*. (2016) that seroprevalence of the HepC antibody was not appreciably associated with age, sex, educational level, or marital status. Nevertheless, this was not in tandem with the research of Adesina *et al*. (2016) where age showed substantial association with HepC infection.

It was observed in both educational institutions that none of the social and health information risk factors was distinctly associated with seroprevalence of HepC infection among the participants. Contrarily, Ogefere *et al*. (2016) reported a seroprevalence rate of the HepC virus antibody of 1.4% and that alcohol consumption, smoking, and skin piercing were potential risk factors in contracting HepC affliction amongst students at the University of Benin, Benin City, Nigeria. Also, previous authors reported that having multiple sexual partners was identified as a

remarkable risk factor for HepC infection (Onyekwere *et al*., 2016) while Eke *et al*. (2016) observed traditional scarification as the predominant associated risk factor for HepC infection among students. Another study elsewhere in Nigeria by Umumararungu *et al*. (2017) discovered that exposure to injection from traditional practitioners was detected as a significant risk factor of HepC infection.

Due to aforementioned, the national guidelines for screening infectious diseases of blood-born including the HepC virus should be adhered to before blood transfusion. The perceived public challenge to contract the virus through transfusion of blood can be a danger signal for the National Blood Banks. Thus, there is a need for vivid verification of the appropriate diagnostic kits required for testing HepC antibodies before blood storage in the banks.

The results of this study showed low seroprevalence rates of contracting HepC infection among participants in the study areas. Also, none of the demographics, social and health information risk factors were significantly associated with seroprevalence of HepC infection among the participants.

Acknowledgments

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