Incidence of Hepatitis C Virus Infection among Students in Public Tertiary Institution in North-Central Nigeria

Shakirat Iyabo Bello[1*] and Patrick Omonua Erah[2]

[1] Department of Clinical Pharmacy and Pharmacy Practice, Faculty of Pharmaceutical Sciences, University of Ilorin, Ilorin, Nigeria
[2] Department of Clinical Pharmacy and Pharmacy Practice, Faculty of Pharmacy, University of Benin, Benin City, Nigeria

ABSTRACT

Hepatitis C Virus (HCV) disease is one of the principal health burden in the developing countries especially sub-Saharan Africa. Prevalence rates of 4.3-20% have been reported in various parts of Nigeria. The main objective of this study was to determine the incidence of HCV infection among students in the North-Central Nigeria with the view to identifying risk behavioral factors associated with the incidence. The sera from each of the 202 students enrolled in the study were tested for the presence of anti-HCV using a rapid visual immunoassay kit. A pre-tested questionnaire was used to obtain information on demographic characteristics and risk factors for the virus infection from the studied subjects. Informed consent was sought from the students and ethical approval granted by the institution. The students (mean age: 18.21± 3.57 years; age range: 17–48 years; and mainly females: 57.4%) had HCV incidence rate of 1.98%. Male has a lower risk of being infected with HCV than female counterparts (1:3). There was no significant association between socio-demographic characteristics and HCV positivity. Of all the behavioral risk factors, only those with tattoo showed significant association with HCV ($p < 0.009$). It is concluded that the incidence of HCV in the study area was low and the use of body tattoo is a major risk factor.

Keywords: Tattoo, Hepatitis C Virus, Incidence, Students, Risk Factors,

INTRODUCTION

Hepatitis C virus (HCV) infection is a severe inflammatory necrotic liver disease that is frequently asymptomatic. The chronic form of HCV causes significant morbidity and mortality with a risk of liver cirrhosis and hepatocellular cancer (Chlibek *et al*., 2017). HCV infection is a major global health problem in the developing countries especially sub-Saharan Africa (Eze *et al*., 2014). In 2015, about 257 million people were living with chronic HCV worldwide (WHO, 2019). Africa has a major share of this burden, accounting for 31.9 million infections of incidence rate of 5.3% compared to America and Europe with less than 2% (Eze *et al*., 2014). In West Africa, Nigeria has been a major contributor to the number of infected people with HCV (Umego *et al*., 2018). The incidence of HCV infection earlier reported in Nigeria was 4.3% in Port Harcourt (Ojule *et al*., 2008), 4.7% in Enugu (Obienu *et al*., 2011), 4.7-5% in Ilorin (Ejiofor *et al*., 2017), 5.4% in Makurdi (Alao *et al*., 2010), 8.4% in Lagos (Ayolabi *et al*., 2006), 11% in Ibadan and 20% in Benin (Ejiofor *et al*., 2017). Though HCV infection is a curable disease, it is frequently unrecognized and undiagnosed in its acute phase. This is because of challenges such as barriers to screening, cost-related factors, inadequate knowledge and awareness of HCV infection. Low detection rate could be one of the reasons for poor treatment uptake and significant morbidity and mortality (Ojule *et al*., 2008). In the World Hepatitis Day 2019, World Health Organization focused on the need to promote hepatitis prevention, testing, and treatment services, to achieve the 2030 elimination targets at local, national and international levels (WHO, 2019). The burden of HCV infection not only affects the patients but also the caregiver, the government and the general public. This is because the economic cost of the infection is high and unaffordable by the patients (Popping *et al*., 2019). Using interferon and ribavirin, the cost of HCV treatment in Nigeria is about USD 5,500.00 to USD 8,500.00. Adding a Direct-Acting Antiviral drugs would increase the cost a hundredfold (Godwin *et al*., 2013). The persistently high cost of treatment for hepatitis C infection is generally attributed to the high cost of innovation (Biotechnological production), lack of commitment by policymakers to treat the infection and the absence of prevention efforts (Henry B, 2018, Suthar and Harries, 2018).
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*Correspondence Author: Email: sibello10@yahoo.com; Tel: +2348035675609

In this background, it is necessary to determine the incidence of HCV infection and associated risk factors among students through an effective screening program.

MATERIALS AND METHODS

Study design

This study was carried out at the Health Centre of the Federal Polytechnic, Offa, located in Offa Local Government Area of Kwara State, Nigeria. The student population consisted majorly of male and female young adults from the North-Central geopolitical zone of Nigeria and a minority from other regions of the country. The institution has over 15,000 students in its care. The average turn-out rate of students per day in the Laboratory Unit of the Health Centre is 14. The sample size of 202 was calculated based on statistical formula of Fisher (Equation 1) as described by Eke *et al*., 2016 using prevalence (p) of HCV infection of 15.6% (Nakhou *et al*., 2018) and degree of accuracy (d) of 0.05.

$n=Z^2pq/d^2$ ……. (1)

where: n=minimum sample size for a statistically significant survey, Z = standard normal deviate set at 1.96 (approx. 2.0), q = 1- p, q = complement of p

Sampling Technique

Sampling was based on convenience as dictated by the inclusion and exclusion criteria and availability of students. Ethical approval to conduct the research was obtained from Ethical Review committee of the Polytechnic. The consented students were enrolled into the study whenever they visited the Health Center for routine screening or clearance into the institution. Included in the study were male and female students who agreed to participate in the study. Those on Direct-Acting Antiviral drugs and on hospital admission were excluded.

Data Collection

A well designed, pre-tested questionnaire was used to capture information on demographic characteristics (age, gender, marital status and tribe) and possible behavioral risk factors for HCV infection (tattoo, blood fights, body piercing, blood transfusion, multiple sex partners, organ transplant, injectable drug use, and medical surgery). Following enrolment, the demographics and behavioral variables of the students were collected. Blood sample (5 ml) was collected from each subject, allowed to clot and the sera recovered using the standard technique. The sera were tested for the presence of anti-HCV using a rapid visual immunoassay kit (Agary, Hamburg, Germany). The strip was immersed into the serum for 10-15 seconds. The result was read after 15 minutes to observe the appearance of the red line. The intensity of the red color on the test line varied depending on the degree of concentration of HCV in each specimen. Any shade of red line in the test (T) and control (C) regions were taken as positive. Red line on the control (C) region and no shades of red color on the test (T) region were noted as negative.

Data analysis

Statistical Package for Social Sciences version 20 software was used in analyzing the data obtained. The outcome variable was HCV status while the independent variables were socio-demographic characteristics and possible behavioral risk factors for hepatitis C. Descriptive statistics were generated for each variable, including frequencies and percentages for categorical variables. Associations between variables were tested with chi-square and logistic regressions were performed to identify risk factors predicting hepatitis C infection. Level of statistical significance was $p < 0.05$ at 95% confidence limit.

RESULTS

Socio-demographic characteristics

The students (mean age: 18.21± 3.57 years; age range: 17–48 years; and mainly females: 57.4%). Most of the students were in the 21-30 years age group. The majority of the students were single 175 (86.6 %), and Yoruba 187 (92.6%) by tribe (Table 1).

Table 1: Demographic characteristics of the students

Variable	Frequency (n)	Percentage
Gender		
Male	86	42.6
Female	116	57.4
Age (Years)		
Less than 21	15	7.4
21-30	173	85.6
31-40	8	4.0
Greater than 40	6	3.0
Marital Status		
Single	175	86.6
Married	27	13.4
Religion		
Islam	110	54.5
Christianity	92	45.5

Regarding the incidence of anti-HCV among the studied students, Table 2 shows that 4 of the 202 student blood samples were reactive for the HCV antibody, giving an incidence rate of 1.98%.

Table 2: Incidence of anti- HCV among the students

Variable	No of positive cases	No of negative cases	No of students screened	% of students infected
HCV Testing	4	198	202	1.98

Association between socio-demographic characteristics and hepatitis C status

Two hundred and two students were involved in the study. The incidence of HCV among patients using socio-demographic characteristics is presented in Table 3. Among those HCV positives, one was a male and three were females, giving a male: female ratio of 1:3. All of the HCV positives were single, one of the HCV infected subjects was less than 21 years old and three were between age of 21 and 30 years. The infected students were Christians and Muslims. There was no significant association between socio-demographic characteristics and HCV positivity.

Table 3: Association of incidence HCV infection and possible demographic risk factors

Socio-demographic Characteristics	Positive n (%)	Negative n (%)	$\chi 2$	P
Gender				
Male	1 (1.2)	85 (98.8)	0.543	0.461
Female	3 (2.6)	113 (97.4)		
Marital status				
Single	4 (2.3)	171 (97.7)	0.657	0.418
Married	0 (0)	27 (100.0)		
Age				
< 21	1 (6.7)	14 (93.3)	0.707	0.871
21 – 30	3 (1.7)	170 (98.3)		
31 – 40	0 (0)	8(100.0)		
> 40 years	0 (0)	6 (100.0)		
Religion				
Islam	2 (1.8)	108 (98.2)	0.040	0.841
Christianity	2 (2.2)	90 (97.8)		

Association between incidence of HCV and possible behavioral risk factors

There was no statistically significant association between HCV positivity with body piercing ($p > 0.724$), surgery ($p > 0.804$), blood fight ($p > 0.887$), injectable drug use ($p > 0.887$), blood transfusion ($p > 0.702$) and multiple sex partners ($p > 0.527$) (Table 4). However, there was a statistically significant association between HCV positivity and tattoo at a significant level of $p = 0.009$.

Table 4: Association of incidence of HCV infection and possible behavioral risk factors

Risk factors for hepatitis C	HCV Positive n (%)	HCV Negative n (%)	$\chi 2$	P-value
Body Piercing				
No	4 (2.0)	192 (98.0)	0.125	0.724
Yes	0 (0)	6 (100.0)		
Tattoo				
No	3 (1.5)	193 (98.5)	6.872	0.009***
Yes	1 (16.7)	5 (83.3)		
Medical surgery				
No	4 (2.0)	195 (98.0)	0.062	0.804
Yes	0 (0)	3 (100.0)		
Blood Fight				
No	4 (2.0)	197 (98.0)	0.020	0.887
Yes	0 (0)	1 (100.0)		
Injectable drug use				
No	4 (2.0)	197 (98.0)	0.020	0.887
Yes	0 (0)	1 (100.0)		
Blood Transfusion				
No	4 (2.1)	191 (97.9)	0.146	0.702
Yes	0 (0)	7 (100.0)		
Multiple Sex Partners				
No	4 (2.2)	180 (97.8)	0.399	0.527
Yes	0 (0)	18 (100.0)		

***Significant at P<0.05 HCV = Hepatitis C Virus

Logistic regression analysis for predictors of risk factors for HCV positivity

The odds ratio of the risk factors and significant associations with HCV positivity are shown in Table 5. Out of all the risk factors, it is only those with the tattoo that showed significant association at p< 0.05 and were 19 times more likely to be HCV positive than those who did not have a tattoo on their bodies (Odds ratio – 19.48). Male has a lower risk of being infected with HCV than the female counterparts (Odds Ratio – 0.39) but did not show any significant association with HCV positivity.

Table 5: Logistic regression analysis for predictors of risk factors for HCV positivity

Risks factors	Odd ratio	Confidence Interval (95%)	P value
Gender (male)	0.397	0.577-4.882	0.446
Age (<40)	1.000	0.286-3.655	0.999
Tattoo (yes)	1.315	0.421-4.368	0.025**
Body piercing (yes)	1.000	0.213-1.155	0.999
Surgery (yes)	1.000	0.304-1.628	0.999
Blood fight (yes)	0.891	0.622-5.105	1.000
Multiple sex partner (yes)	1.000	0.903-2.464	0.998
Blood transfusion (yes)	1.000	0.491-4.964	0.999

**Significant at P<0.05

DISCUSSION

In this study population, four students tested positive for HCV giving an incidence rate of 1.98%. There was inconsistency in the reports of earlier researchers in Nigeria. The report that agreed with present study was that of Olabowale and Adebayo, (2018) revealing 2.1% HCV prevalent rate among the University students. Conversely, those rate higher that the current study in Nigeria were 8.0% by Udeze *et al*. (2011) in Ilorin, 4.5% in Benin City, (Nwannadi *et al*., 2012), 5.4% in Makurdi (Alao *et al*., 2010). Those with lower rate than the present study were 1.30% in Kano Azeez-Akande *et al*. (2010), Jemilohun *et al*. (2014), (1.3%) in Ogbomoso, and no infections (0.0%) in Port Harcourt, as observed by Okonko *et al.* (2014). Other studies conducted elsewhere showed lower prevalence rates of 0.6% in Ethiopia (Zenebe *et al*., 2015) and 0.9% in India (Coppola et al., 2019). However, the result is higher with 28% in India (Issar *et al*., 2015), 6.5% in Pakistan (Petruzziello *et al*., 2016) and 3.2% in China (Liu *et al*., 2019) but comparable with 2.0% in Indonesia (Coppola *et al*., 2019). The variation in prevalence rates between the present study and previous studies may be attributed to the age category of subjects, methods used in screening and cultural practices in some localities that could increase exposure to HCV. Also, this study showed a slightly higher incidence among the females than the males, although not statistically significant. This is similar to previous studies conducted in Ilorin which had a higher preponderance of HCV among the female participants (Udeze *et al*., 2011). This finding is contrary to a higher prevalence of HCV among male subjects in the studies conducted by Eze *et al*. (2014) in Nigeria and also in Port Harcourt where both genders exhibited zero prevalence (Okonko *et al*., 2014). There was no significant association between socio-demographic characteristics and HCV positivity. Also, there was no statistically significant association between HCV positivity with body piercing, medical surgery, blood fight, injectable drug use, blood transfusion, and multiple sex partners. However, there was a significant association between HCV positivity with a tattoo. Unlike the present study, Mahajan *et al*. (2018) identified the history of dental treatment and therapeutic injections with reusable syringes and needles as risk factors for HCV infection. Furthermore, Fattahi *et al*. (2015) in Iran discovered the significant association between blood transfusion and HCV infection. Transfusion-associated HCV infection was a predominant worldwide risk before HCV testing became available. It has been virtually eliminated in those countries that implemented routine HCV testing of donors but in others, receipt of blood transfusion remains an important source of infection. Some countries continue to use commercial donors to supplement their blood supplies (WHO, 2018). In Nigeria, the low risk of transmission through blood transfusion may be related to the fact that Nigeria is successfully implementing a national blood safety program led by Safe Blood for Africa Foundation to fight the spread of the HCV (Obienu *et al*., 2011). Meanwhile, among the expected risk factors, only tattooing had significant risk factor, indicating that students with tattoo were more likely to be HCV positive than those without it. Similar to this result was that of Umumararungu *et al.* (2017) in Rwanda who reported that exposure to injection from traditional practitioners was identified as a significant factor for HCV. Eke *et al.* (2016) in Nigeria also observed that traditional tattoos was the risk factor observed to be significantly associated with HCV positivity. This may be a reason for high-risk behaviors and practices which are prevalent among the youths in African societies. This study proved that risk behaviors have been shown to play some roles in HCV transmission. The tattoo is usually carried out by traditional healers in very unhygienic environments without any consideration for infection control (Makuza *et al*., 2019).

CONCLUSION

The incidence of HCV in the study area was low and the tattoo was the only identifiable risk factor for HCV positivity. Future evaluations should be focused on the Polymerase Chain Reaction method for the detection of HCV. The promotion of behavioral changes among undergraduate students on the practice of tattoos should be encouraged in Nigeria tertiary institutions.

ACKNOWLEDGMENT

The authors would like to appreciate the Management of Federal Polytechnic, Offa, the Rector, Chief Medical Director and the technical staff of Federal Polytechnic's Health Services. The authors also appreciate all the students who gave informed consent that led to their participation in this study.

Financial support and sponsorship

No external funding was received toward the conduct of this research.

Conflict of interest

There was no conflict of interest.

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