International Journal of Scientific Research Updates

Journal homepage: https://orionjournals.com/ijsru/

ISSN: 2783-0160 (Online)

(RESEARCH ARTICLE)

Dual positivity of HIV and anti-HCV in the highly infected population of Rivers State, Nigeria

Iheanyi Omezuruike Okonko *, Tochi Ifeoma Cookey and Hope Chioma Innocent-Adiele

Virus Research Unit, Department of Microbiology, University of Port Harcourt, P.M.B. 5323, Choba, East-West Road, Port Harcourt, Nigeria.

International Journal of Scientific Research Updates, 2022, 04(02), 039–048

Publication history: Received on 03 June 2022; revised on 11 August 2022; accepted on 13 August 2022

Article DOI: https://doi.org/10.53430/ijsru.2022.4.2.0072

Abstract

The study looked to establish dual positivity of human immunodeficiency virus (HIV) and anti-hepatitis C virus (HCV) antibody among HIV-infected individuals in Port Harcourt, Nigeria. Plasma samples from 89 HIV-infected individuals presenting at the Retroviral Clinic of the University of Port Harcourt Teaching Hospital (UPTH), Rivers State, Nigeria, were assayed for anti-HCV-antibody. Seropositivity of anti-HCV-antibody was detected with ELISA kits. Variables tested include sex, age group, educational status, marital status and occupation. Significant variance ($p<0.05$) existed between patients with mono-HIV infection and those with dual infection of HIV and HCV. Of these infections, 20(22.5%) had HIV and HCV dual infection, while 69(77.5%) had HIV mono-infection. Higher seroprevalence of HIV was found in females [65(73.0%)] than males [24(27.0%)]. The highest seroprevalence of HIV was found in the age group 41-60 years [41(46.1%)], and the age-group 20-30 years had the least prevalence [19(21.3%)]. Also, females had higher HIV and HCV dual positivity (23.1%) than males (20.8%). The age group 31-40 years in this study had the highest HIV and HCV dual positivity (34.5%), while the age group 41-60 years had the lowest prevalence (12.2%). Regarding marital status, singles constituted most study participants and had a dual positivity rate of 28.6% for HIV and HCV. This dual positivity was higher than those divorced and married, with 20.0% and 14.3% prevalence, respectively. Patients with tertiary education (27.3%) and those employed (41.2%) had a higher prevalence than others. None of these demographic characteristics was significantly associated with HIV-HCV dual positivity ($p>0.05$) except for occupations ($p=0.04$). Our study further confirms the dual positivity of HIV and anti-HCV in Rivers State, Nigeria. Planned prevention, screening, and treatment are required to reduce further transmission and morbidity.

Keywords: Dual positivity; Human immunodeficiency virus (HIV); Hepatitis C virus (HCV); Nigeria

1 Introduction

Hepatitis is the inflammation of the liver produced by autoimmune disease, alcohol or drug abuse, genetic disorder or microbial infection (1). Viral hepatitis, on the other hand, is a liver infection or inflammation triggered by one of the hepatotropic viruses, namely hepatitis viruses A, B, C, D, E, G, Measles Virus, Epstein-Barr Virus, Human Cytomegalovirus and recently the TT and SEN hepatitis viruses (2-4).

In seroepidemiological studies, commercially available enzyme immunoassays (EIAs) or Enzyme-Linked Immunosorbent assays (ELISA) are used to detect the presence of antibodies specific to the virus in plasma and serum. Second-generation EIAs detect antibodies directed to the structural core (Core) and non-structural (NS3 and NS4) proteins. Third-generation EIAs detect the same antibodies, plus antibodies directed to the NS5 protein with better sensitivity (5).

* Corresponding author: Iheanyi Omezuruike Okonko PhD
Virus Research Unit, Department of Microbiology, University of Port Harcourt, P.M.B. 5323, Choba, East-West Road, Port Harcourt, Nigeria.

Blood contact, mother-to-child and sexual intercourse (both vertical and horizontal transmission) are common transmission routes for both human immunodeficiency virus (HIV) and hepatitis C virus (HCV) (6-8). Infectivity varies according to the identified routes. HCV, however, is more likely to be contacted parenterally (8-10). The possibility of dual positivity has been demonstrated due to similarities in transmission routes. Globally, the burden of infection for Hepatitis C is about 2.3% affecting about 150-200 million people, whereas the value for HIV is about 0.8%, with an estimated 32.2–38.8 million people living with HIV worldwide (8, 11-13).

There is an established relationship between HIV positivity and the progression of HCV infection; dual positivity with HIV influences the clinical outcome of the HCV infection (8, 9, 14, 15). Aside from the influence of HIV in advancing HCV infection, reports suggest an increased occurrence of Highly Active Antiretroviral Therapy (HAART)-associated hepatotoxicity in HCV-HIV dual-positive patients due to HIV treatment with antiretroviral drugs (8, 9, 16). This observation needs to be considered when treating affected patients. However, current research on the impact of HCV on HIV progression is inconclusive (8, 9, 16-18). Thus, the interaction between HIV and HCV sets the tone for this study which sought to ascertain HIV-HCV dual positivity in a high HIV-infected population of Rivers State, Nigeria. The study outcome will facilitate better management of affected patients, especially HAART use.

2 Methods

2.1 Study Area

This was a health-facility-based study. The study was conducted among HIV patients attending the Retroviral clinic of the University of Port Harcourt Teaching Hospital, Rivers State, Nigeria.

2.2 Study Population

After obtaining due permission from the University of Port Harcourt Teaching Hospital (UPTH), informed consent was obtained from HIV-positive patients after thoroughly explaining the study. Structured questionnaires were used to assess patients' demographic variables considered risk factors for contracting HCV. The variables considered included age, gender, educational status, occupation, and marital status (19, 20), while behavioural data such as the number of sexual partners and condom use (20, 21). Overall, blood samples from 89 HIV-positive patients were obtained for the study.

2.3 Ethical Considerations

This study was performed in compliance with regulations concerning human subject research as stipulated by the University of Port Harcourt Research Ethics Committee and the University of Port Harcourt Teaching Hospital (UPTH) Research Ethics Committee (UPH/R&D/REC/04 and UPTH/ADM/90/S.II/VOL.X/653, respectively).

2.4 Samples and Sampling Technique

Eighty-nine (89) serum samples were randomly selected from confirmed HIV-1 positive samples stored at -20^0C. These samples were collected from clients who accessed the hospital for voluntary HIV counselling, testing, or other health needs. The samples were labelled with a serialized code number that could not be linked to individuals.

2.5 Serological Testing

The analysis was performed with SPSS 20.0 for Windows (SPSS Inc., Chicago, IL). Frequency distributions were generated, and univariate analysis using Chi-square analysis was performed to identify factors associated with HCV/HIV dual positivity.

2.6 Statistical analysis

The generated data were presented in descriptive statistics then, subjected to Fisher's Exact Test for comparison of proportions to establish ascertain any possible relationship between prevalence, infection rate and participants' demographic characteristics. The Chi-square test was used to compare the proportion of HIV positive individuals co-infected with HCV and/or HBV (95% confidence level). The analysis was performed with SPSS 20.0 for Windows (SPSS Inc., Chicago, IL).

3 Results

3.1 Socio-demographic Characteristics of study participants

eighty-nine serum samples were analyzed for the presence of HCV antibodies. Participants comprising male and female individuals were tested for anti-HCV antibodies and recorded. Sixty-five (73.0%) were females out of the total number, while twenty-four (27.0%) were males (Table 1). Most of the patients fell within the age bracket 41 - 60 years (46.1%, n=41), followed by the age brackets 31-40 years (32.6%, n=29) and 20 – 30 years (21.3%, n=19) (Table 1). Thirty-five (39.3%) participants were married, 49 (55.1%) were single, and 5 (5.6%) were divorced. Other socio-demographic characteristics of the participants are shown in Table 1.

Table 1 Socio-demographic Characteristics of study participants

Variable	Number Tested	Percentage (%)
Sex		
Male	24	27.0
Female	65	73.0
Marital Status		
Single	49	55.1
Married	35	39.3
Divorced	5	5.6
Age groups (years)		
20-30	19	21.3
31-40	29	32.6
41-60	41	46.1
Level of Education		
Primary	23	25.8
Secondary	33	37.1
Tertiary	33	37.1
Occupation		
Student	7	7.9
Employed	17	19.1
Self Employed	29	32.6
Unemployment	36	40.4
Total	89	100

3.2 HIV and HCV Dual Infections

Of the 89 participants, 20 were positive for HIV/HCV dual infections. The overall prevalence rate recorded by this study was 22.5% (Figure 1). The relationships between the dual positivity of HIV and HCV infection and the patient's demographic characteristics are shown in Figures 2–6. None of these demographic characteristics was significantly associated with HIV-HCV dual positivity ($p>0.05$) except for occupations ($p=0.04$).

3.3 Dual positivity of HIV and HCV in relation to Sex

The sex-related prevalence showed that female participants had a higher prevalence (23.1%) compared to males (20.8%) (Figure 2). Sex was not significantly associated ($X^2=0.051$, df=1, $p=0.82$) with HIV-HCV dual positivity.

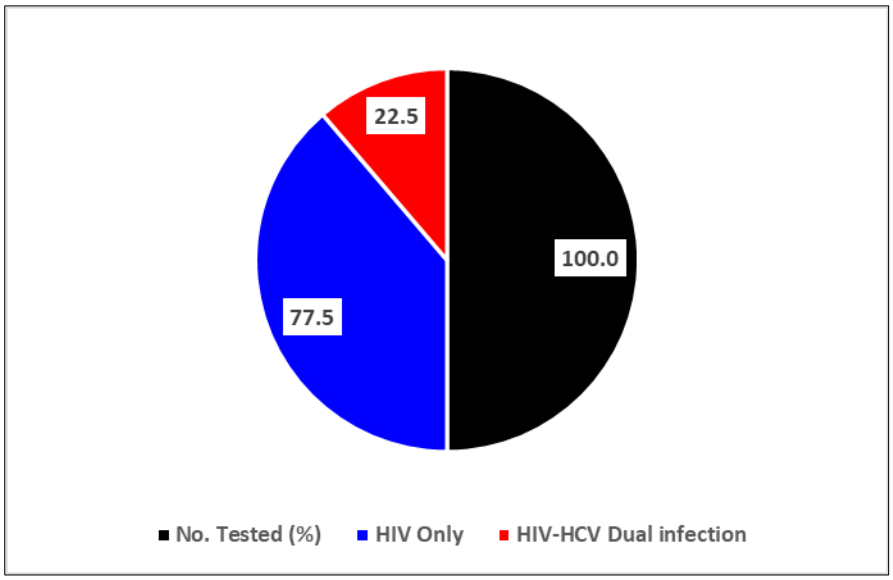

Figure 1 Overall Prevalence of HIV and HCV Dual Infections

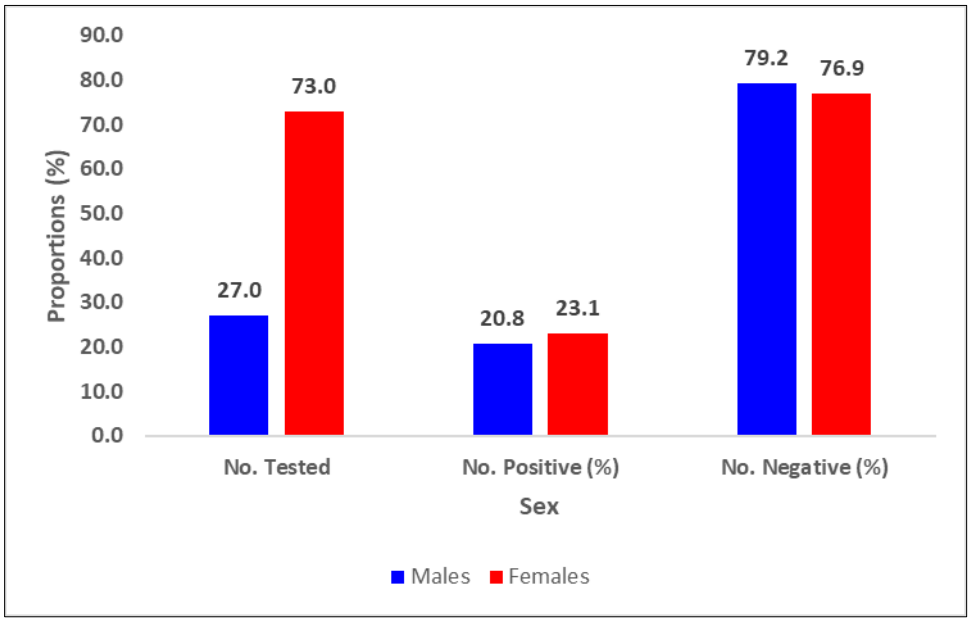

Figure 2 Dual positivity of HIV and HCV in relation to Sex

3.4 Dual positivity of HIV and HCV in relation to Age

As shown in Figure 3, the younger participants had a higher rate of HIV-HCV infections, with those within the age bracket 31 – 40 years bearing the highest rate (34.5%), followed by those in the age bracket 20 – 30 years (26.3%). However, the lowest prevalence rate of 12.2% was recorded in the age bracket of 41 – 60. Age was not significantly associated (X^2=5.048, df=2, p=0.08) with HIV-HCV dual positivity.

3.5 Dual positivity of HIV and HCV in relation to Marital Status

Participants that were single recorded the highest prevalence rate (28.6%), which was followed by those that were divorced (20.0%), and those that were married had the least prevalence (14.3%) (Figure 4). Marital status was insignificantly associated (X^2=2.410, df=2, p=0.30) with HIV-HCV dual positivity.

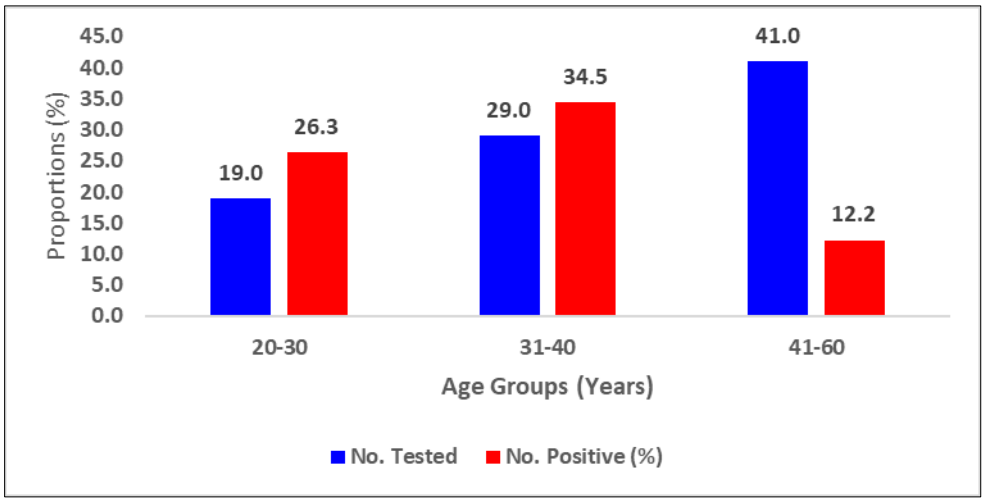

Figure 3 Dual positivity of HIV and HCV in relation to age

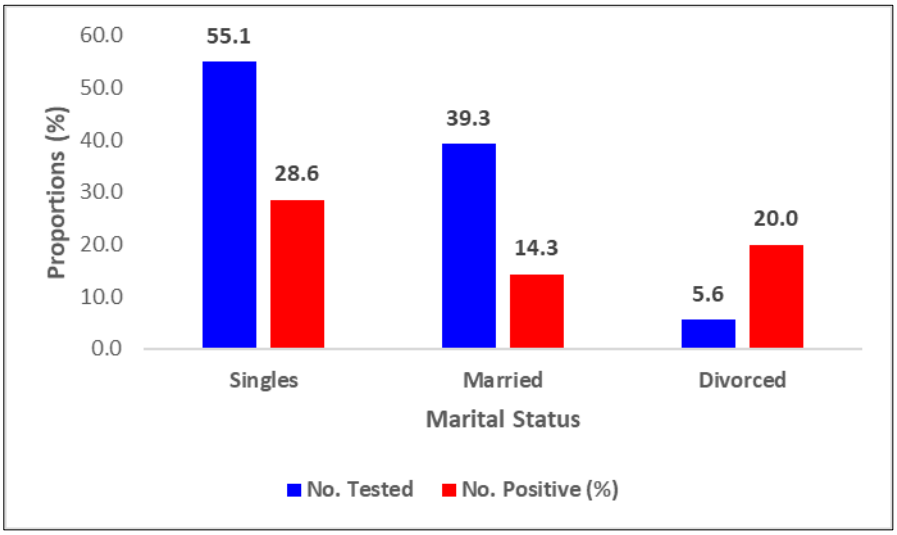

Figure 4 Dual positivity of HIV and HCV in relation to Marital Status

3.6 Dual positivity of HIV and HCV in relation to Level of Education

With respect to the level of education, patients with formal primary education recorded the highest rate of 30.4%. This observation was followed by those with tertiary levels of education (27.3%). The lowest prevalence rate was observed in the secondary level of education, having a prevalence rate of 12.1%, as shown in Figure 5. Level of education was insignificantly associated (X^2=3.303, df=2, p=0.19) with HIV-HCV dual positivity.

3.7 Dual positivity of HIV and HCV in relation to Occupation

Employed patients had the highest dual positivity rate (41.2%), followed by students and the self-employed with 28.6% and 20.7%, respectively. Unemployed patients showed the lowest prevalence of 13.9%, as shown in Figure 6. Significant variance (X^2=0.04, df=3, p=0.04) existed between occupations and HIV-HCV dual positivity.

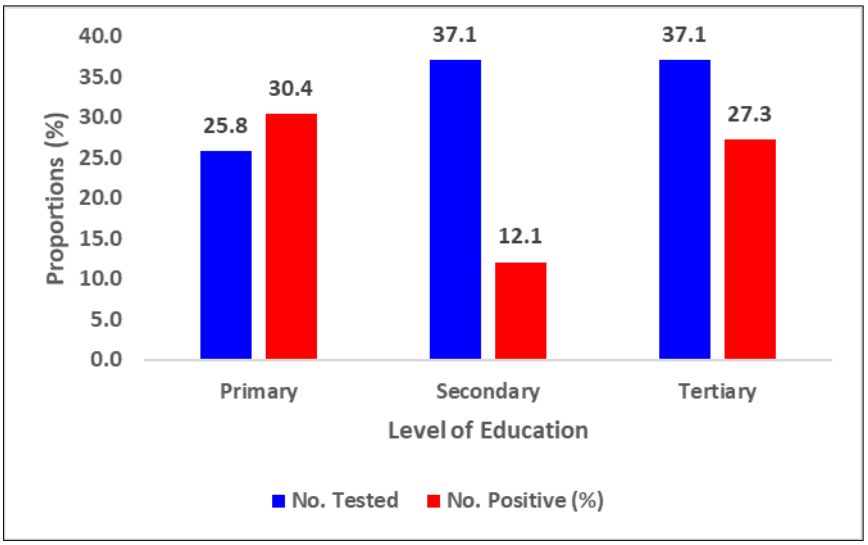

Figure 5 Prevalence of HCV in HIV patients according to the level of education

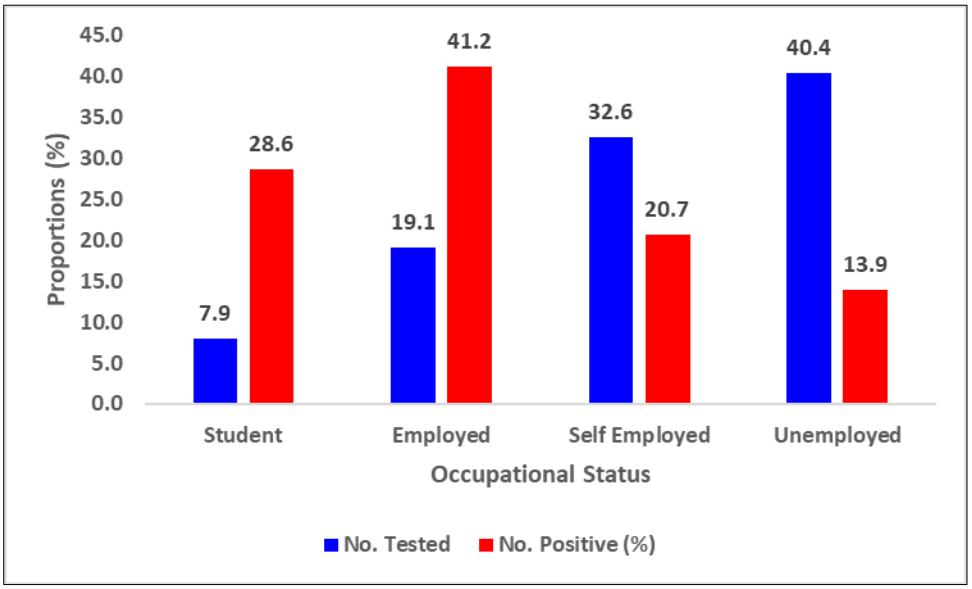

Figure 6 Dual positivity of HIV and HCV in relation to Occupational Status

4 Discussion

Several studies have found that HIV can accelerate the natural progression of chronic hepatitis C and/or hepatitis B (22). However, the influence of HCV and HBV on HIV infection is less clear (22-25). Multiple infections with Hepatitis viruses and HIV have significantly exacerbated mortality and morbidity issues in HIV/AIDS patients (22-25). Dual infections are thus a growing problem, particularly in Nigeria, which has a high burden of HIV infection. As such, it necessitates careful monitoring owing to its adverse effects on HIV treatment response (26). Defining prevalence levels of dual HIV/HCV infections become pertinent, especially among groups at high risk of dual or triple infections.

Of the 89 HIV-infected subjects used in this study, many (77.5%) had HIV mono-infection, while 22.5% had HIV/HCV dual infections. A previous study in Nigeria by Forbi et al. (26) reported an overall HIV/HCV prevalence of 7.2%. In other countries, the prevalence of dual infection was 19.1% in China and 10.4% in Myanmar (22). In their study, Agarwal et al. (27) reported the prevalence of HIV/HCV dual infections to be 1.83%. Furthermore, various studies have reported that dual or triple infections of HIV-infected patients with hepatitis viruses, especially HCV or/and HBV, are prevalent. However, the ratios of dual or triple infections vary depending on geographic regions, risk groups, and the type of exposure involved (22, 28-30).

HIV/HCV dual infection of 22.5% obtained in this study is consistent with an earlier study by Ojo et al. (31) in Ogun State, Nigeria, which reported a 23.5% prevalence of HIV and HCV. On the contrary, Balogun et al. (32) reported a prevalence of 14.7% in Lagos, Nigeria. Agwale et al. (33) discovered a lower HCV seroprevalence rate of 8.2% among HIV-infected Nigerians. There is a clear indication of increased HCV infection in HIV-infected individuals in Nigeria (34). However, Okonkwo et al. (35) observed a 0% HCV seroprevalence among fresh undergraduates.

HCV infection is estimated to affect about 3.0 - 7.0% of HIV-infected people in Sub-Saharan Africa (12,36). This value lies far below the 22.5% observed in our study. The 22.5% prevalence rate in this study is also higher than that obtained in similar studies in Africa: Senegal in West Africa (1.6%), Kenya in East Africa (10.0%), South Africa (13.4%), and Tanzania in another Eastern Africa State (18.1%) (37-40). The difference in prevalence could be from disparities in the social behaviour of the individuals involved in this study and the population size of the individual countries (41).

According to this study, females were more likely to be affected (23.1%) with dual HIV/HCV infection than males (20.8%). This result could be due to the many female participants in the study, as females are more vulnerable to HIV infection than males in developing countries, especially in Sub-Saharan Africa (42). Furthermore, because HIV and HCV have similar modes of transmission, women are more likely to become infected with HCV. This observation from this study agrees with the findings of Alli et al. (43) who showed that females (18.7%) were more likely to be affected than males (15.6%). However, this disagrees with previous reports in Northern Nigeria (44, 45) and elsewhere (46, 47).

This study showed that the dual positivity of HIV and HCV occurred more in younger patients aged 31-40 years (34.5%) and 20-30 (26.31%), while the older patients (41-60 years) had the lowest (12.2%). This observation is in line with the findings of Alli and colleagues (43), who, however, recorded lower figures in their study. Their work showed the dual positivity of HIV and HCV to be highest in those aged 31-40 years (13.4%). This result is probably due to these ages falling under youths and unmarried people. This observation agrees with previous reports in Nigeria (44, 45) and elsewhere (46).

Regarding marital status, singles comprised most study participants and had a dual positivity rate of 28.6%, higher than divorced and married people (20.0 % and 14.3%, respectively). Single participants may have had more exposure to multiple sexual partners than married and divorced participants, explaining their high dual positivity. This finding contrasts with Imarengiaye et al. (48), who discovered a higher prevalence of HCV in divorced patients.

Furthermore, this study showed that the dual positivity of HIV and HCV occurred higher in patients with secondary (12.1%) and tertiary (27.3%) education than in patients with primary (30.4%) education. This observation could be due to higher education providing more health and sexual awareness exposure. In comparison, other studies disagree (49). Patients who were employed (41.2%), students (28.6%) and self-employed (20.7%) had a higher occurrence of dual positivity of HIV and HCV compared to those that were unemployed (13.9%). However, this association was significant (p=0.04), and it can be deduced that all categories were at risk of HIV-HCV dual coinfection.

5 Conclusion

The presence of hepatitis C infection in HIV patients in Port Harcourt, Rivers State, Nigeria, was confirmed in this study. It showed an HCV seroprevalence of 22.5% among HIV patients receiving HAART at the University of Port Harcourt Teaching Hospital. None of these demographic characteristics was significantly associated with HIV-HCV dual positivity except for occupations. Various studies have revealed that HCV infections are common among Nigerians (7, 20). The vast disparities in HCV infection rates observed in Nigeria and across Africa could be explained by differences in location, sample sizes, demographics, culture and timeframe of the study. Access to healthcare, immunization practices, and laboratory test reagents may also be contributing factors. Compared to figures from similar studies in Nigeria and Sub-Saharan Africa, the 22.5% prevalence of HCV among HIV-infected participants in this study is disturbing. Planned prevention, screening, and treatment are required to reduce further transmission and morbidity.

Compliance with ethical standards

Acknowledgments

The authors would like to acknowledge the support obtained from the management and staff of University of Port Harcourt Teaching Hospital (UPTH), Nigeria during the enrollment and collection of samples used in this study. The authors sincerely acknowledge the participants for their consent, cooperation participation and support.

Disclosure of conflict of interest

The authors have declared that no competing interests exist.

Authors' Contributions

Author IOO designed the study, performed the statistical analysis and wrote the protocol. Author TIC managed the analyses of the study. Author IOO, Author TIC and Author HCI managed the literature searches and wrote the first draft of the manuscript. All authors read and approved the final manuscript.

Statement of ethical approval

All authors hereby declare that all experiments have been examined and approved by the Research Ethics committees of University of Port Harcourt and have, therefore, been performed following the ethical standards laid down in the 1964 Declaration of Helsinki.

Statement of informed consent

All authors declare that written informed consent was obtained from the patient (or other approved parties) for publication of this study. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal.

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