Oshun et al. *Afr. J. Clin. Exper. Microbiol.* 2023; 24 (3): xxxx https://www.afrjcem.org

African Journal of Clinical and Experimental Microbiology. ISSN 1595-689X Jul 2023; Vol.24 No.3
AJCEM/2266. https://www.ajol.info/index.php/ajcem

Original Article **Open Access**

Prevalence and risk factors for hepatitis C virus infection among HIV positive patients at the Lagos University Teaching Hospital, Nigeria

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Abstract:

Background: Worldwide, an estimated 58 million people have chronic hepatitis C virus (HCV) infection, with about 1.5 million new infections occurring per year. About 2.3 million people living with HIV globally have serological evidence of past or present HCV infection. The aim of this study was to determine the prevalence of active HCV infection and associated risk factors among HIV positive patients attending the HIV clinic, Lagos University Teaching Hospital (LUTH), Idi-Araba, Lagos, Nigeria.
Methodology: A cross sectional study was conducted to determine the prevalence of and risk factors for HCV infection among randomly selected HIV positive patients at the LUTH HIV clinic. Socio-demographic, clinical and laboratory data were collected from the participants using a structured questionnaire. Blood samples were collected and tested for HCV antibodies with an enzyme linked immunosorbent assay (CTK Biotech USA) and HCV RNA was detected using reverse transcriptase polymerase chain reaction assay.
Results: One hundred and ninety-five HIV infected participants were recruited into the study of which 134 (68.7%) were females and 61 (31.3%) were males. The mean age of participants was 40.1±7.8 years. Of the 195 participants, 5 tested positive for antibody to HCV, giving a seroprevalence rate of 2.6% (95% CI = 0.8-5.9%). Of the 5 seropositive participants, HCV RNA was detected in 1 (20.0%), giving a prevalence of 0.5% (1/195) for active HCV infection. The seroprevalence of HCV in males of 4.9% (3/61) and females of 1.5% (2/134) was not significantly different (OR=3.41, 95% CI=0.56-20.98%, p=0.18). The mean $\log_{10}$ HIV viral load was significantly higher among participants seropositive for HCV (5.1±0.9 log copies/ml) than those seronegative (2.7±1.2 log copies/ml) (p < 0.001). The mean duration of antiretroviral therapy was significantly lower among participants seropositive for HCV (2.6±1.3 years) than those seronegative (5.6±3.1 years) (p=0.004). The seroprevalence of HCV was significantly higher in those with CD4 count <350 cells/mm^3 (8.5%) than those with CD4 count >350cells/mm^3 (p=0.02). The seroprevalence of HCV in the HIV-positive participants was significantly associated with sexual partners (p=0.0473), with highest seroprevalence in those with ≥ 3 sexual partners (OR=11.625, 95% CI=1.049-128.83). Other risk factors were not significantly associated with seroprevalence of HCV (p>0.05), while risk factors associated with active HCV infection could not be evaluated with the only one HCV RNA positive participant
Conclusion: Although the prevalence of active HCV infection in HIV infected individuals in this study was apparently low (0.5%), screening with HCV antibody test and confirmation with HCV RNA PCR assay are recommended.

Keywords: Hepatitis C virus; HIV; HCV RNA; prevalence; risk factors

Received Apr 10, 2023; Revised May 9, 2023; Accepted May 10, 2023

Prévalence et facteurs de risque de l'infection par le virus de l'hépatite C chez les patients séropositifs à l'Hôpital Universitaire de Lagos, Nigéria

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Résumé:

Contexte: Dans le monde, environ 58 millions de personnes sont infectées par le virus de l'hépatite C (VHC) chronique, avec environ 1,5 million de nouvelles infections par an. Environ 2,3 millions de personnes vivant avec le VIH dans le monde ont des preuves sérologiques d'une infection passée ou présente par le VHC. Le but de cette étude était de déterminer la prévalence de l'infection active par le VHC et les facteurs de risque associés chez les patients séropositifs fréquentant la clinique du VIH, Hôpital Universitaire de Lagos (LUTH), Idi-Araba, Lagos, Nigeria.
Méthodologie: Une étude transversale a été menée pour déterminer la prévalence et les facteurs de risque de l'infection par le VHC chez des patients séropositifs sélectionnés au hasard à la clinique LUTH HIV. Des données socio-démographiques, cliniques et de laboratoire ont été recueillies auprès des participants à l'aide d'un questionnaire structuré. Des échantillons de sang ont été prélevés et testés pour les anticorps anti-VHC avec un test immuno-enzymatique (CTK Biotech USA) et l'ARN du VHC a été détecté à l'aide d'un test de réaction en chaîne par polymérase par transcriptase inverse.
Résultats: Cent quatre-vingt-quinze participants infectés par le VIH ont été recrutés pour l'étude, dont 134 (68,7%) étaient des femmes et 61 (31,3%) étaient des hommes. L'âge moyen des participants était de 40,1±7,8 ans. Sur les 195 participants, 5 ont été testés positifs pour les anticorps anti-VHC, ce qui donne un taux de séroprévalence de 2,6% (IC à 95%=0,8-5,9%). Sur les 5 participants séropositifs, l'ARN du VHC a été détecté chez 1 (20.0%), ce qui donne une prévalence de 0,5% (1/195) pour l'infection active par le VHC. La séroprévalence du VHC chez les hommes de 4,9% (3/61) et les femmes de 1,5% (2/134) n'était pas significativement différente (OR = 3,41, IC à 95%=0,56-20,98%, p=0,18). La charge virale VIH moyenne log10 était significativement plus élevée chez les participants séropositifs pour le VHC (5,1±0,9 log copies/ml) que chez les séronégatifs (2,7±1,2 log copies/ml) (p<0,001). La durée moyenne du traitement antirétroviral était significativement plus faible chez les participants séropositifs pour le VHC (2,6±1,3 ans) que chez ceux séronégatifs (5,6±3,1 ans) (p=0,004). La séroprévalence du VHC était significativement plus élevée chez les personnes ayant un nombre de CD4 < 350 cellules/mm^3 (8,5%) que chez celles ayant un nombre de CD4 > 350 cellules/mm^3 (p=0,02). La séroprévalence du VHC chez les participants séropositifs était significativement associée aux partenaires sexuels (p=0,0473), la séroprévalence la plus élevée chez ceux ayant ≥ 3 partenaires sexuels (OR=11,625, IC à 95%=1,049-128,83). Les autres facteurs de risque n'étaient pas associés de manière significative à la séroprévalence du VHC (p>0,05), tandis que les facteurs de risque associés à l'infection active par le VHC n'ont pas pu être évalués avec le seul participant positif à l'ARN du VHC.
Conclusion: Bien que la prévalence de l'infection active par le VHC chez les personnes infectées par le VIH dans cette étude soit apparemment faible (0,5%), le dépistage avec le test d'anticorps anti-VHC et la confirmation avec le test PCR de l'ARN du VHC sont recommandés.

Mots clés: Virus de l'hépatite C; VIH; ARN du VHC; prévalence; facteurs de risqué

Introduction:

Hepatitis C virus (HCV) infection is a major public health problem and a leading cause of liver related morbidity and mortality. Worldwide, an estimated 58 million people have chronic HCV infection, with about 1.5 million new infections occurring per year (1). Of the 58 million persons living with HCV infection globally in 2019, an estimated 15.2 million (21%) knew their diagnosis, and of those diagnosed with chronic HCV infection, around 9.4 million (62%) had been treated with direct acting antivirals by the end of 2019 (1). The World Health Organisation (WHO) estimated that in 2019, approximately 290,000 people died from HCV infection, mostly from cirrhosis and hepatocellular carcinoma (1).

According to recent global estimates in 2021, 38.4 million people were living with the human immunodeficiency virus (HIV), with 1.5 million new infections, and 650,000 people died of AIDS related illness (2). About 85% of people living with HIV knew their HIV status in 2021 and 28.7 million were accessing antiretroviral therapy (2). The prevalence of HIV in Nigeria is 1.4% with 1.9 million people living with HIV. In 2020, there were 86,000 new infections and 49,000 AIDS related deaths (3).

Both HCV and HIV share common routes of transmission which makes the risk of co-infection common. About 2.3 million people (6.2%) of those living with HIV globally have serological evidence of past or present HCV infection (1). In Nigeria, the prevalence of HIV/HCV co-infection among people living with HIV age 15-64years was 1.1%; 1.2% among females and 0.8% among males (3).

Co-infection with HIV has an impact on the natural course of HCV infection. There is increased HCV viral load in patients who are co-infected with HIV compared with those with HCV alone. In addition, there is accelerated progression of liver disease, liver fibrosis, cirrhosis, liver failure and rapid progression to hepatocellular carcinoma (4). This is more pronounced in those with CD4 count less than 200cells/mm^3 (5). This accelerated progression can be delayed with the use of antiretroviral therapy such that co-infected patients with negligible HIV viral load take longer to develop cirrhosis than those with high HIV viral load (6).

Screening for HCV is done using a serological test for antibodies to HCV. Once an individual acquires HCV infection, the antibodies persist for life even though the body may have spontaneously cleared the virus (7). If the test is positive for anti-HCV antibodies, a nucleic acid test for HCV ribonucleic acid

(RNA), which is the is the 'gold standard' test for the diagnosis of chronic HCV infection (8) is needed to confirm chronic infection and the need for treatment. This test is important because about 30% of people infected with HCV spontaneously clear the infection by a strong immune response without the need for treatment (1). Antiviral medicines can cure more than 95% of persons with hepatitis C infection, but access to diagnosis and treatment is low. At present, there is no licensed effective vaccine against HCV. Prevention is mainly by reducing the risk of exposure to the virus and this will depend on the route of transmission of HCV.

In many HIV clinics in Nigeria, only screening tests for HCV antibody are performed and PCR for the detection of HCV RNA is not done routinely because they are expensive and not readily available. Most studies on hepatitis c virus infection in Nigeria have been limited to using HCV antibody test to determine prevalence with very few studies able to confirm active or chronic HCV infection using HCV RNA. This study aims to assess the prevalence and risk factors for active HCV infection in HIV positive patients using RT-PCR to detect HCV RNA.

Materials and method:

Study location and population:

This study was conducted at the Lagos University Teaching Hospital (LUTH) HIV clinic. This clinic has been operational since 2004. It implements free treatment of HIV/AIDS with antiretroviral drugs with support from the President's Emergency Plan for AIDS Relief (PEPFAR) in accordance with national guidelines. There is on-site HIV screening, counselling, provision of medication, follow-up, monitoring and evaluation of all patient activities. Over 20,000 adults and 1,200 children had been enrolled into the treatment programme. The HIV clinic has a dedicated laboratory that determines HIV viral load and $CD4^+$ cell count.

The study population consisted adult HIV-positive patients attending the HIV clinic. The inclusion criteria were HIV infected patients ≥18 years of age, who gave informed consent to participate in the study. Those who were not willing to participate were excluded.

Study design and participant selection:

This was a cross-sectional study to determine prevalence of HCV infection in HIV positive patients. Participants were chosen by simple random sampling on each clinic day. A list of all patients who had clinic appointment on each day was compiled and a simple random sample of 5 patients were chosen using a computer-generated list of random numbers with Microsoft Excel software. Active HCV infection was defined as positive anti-HCV antibody test and positive HCV RNA by reverse transcriptase polymerase chain reaction (RT-PCR) assay.

Ethical approval:

Ethical approval was obtained from the Health Research and Ethics committee of Lagos University Teaching Hospital (LUTH). Informed consent form was signed by those who agreed to participate in the study.

Data collection

Socio-demographic, clinical and laboratory data were collected from the participants using a structured questionnaire. Data on the risk factors such as blood transfusion, multiple sexual partners, smoking, alcohol use, sexual orientation, use of condoms, intravenous drug use, CD4 count, HIV viral loads, antiretroviral therapy and were retrieved from the case notes of the patients.

Sample collection and HCV antibody testing:

Five millilitres of blood were collected into an EDTA bottle. Blood was then spun in a centrifuge for 20 minutes at 2000 revolutions per minute. A sterile pipette was used to transfer plasma into a plain sterile cryo-tube. Plasma was stored at -70^{o}C until testing. Processing of specimen was performed at the virology laboratory of the central research laboratory, College of Medicine, University of Lagos. Plasma was tested for the qualitative detection of IgG antibodies to HCV using a solid phase enzyme linked immunosorbent assay (CTK Biotech USA) according to manufacturers' instruction.

Polymerase chain reaction (PCR) assay for HCV RNA detection:

HCV RNA was extracted from blood samples of all participants using the QIAamp1 Viral RNA Kit (QIAGEN, Valencia, CA), following the manufacturer's instructions. The 5'NC region of the HCV genome was cDNA amplified by a nested reverse transcriptase polymerase chain reaction (RT-PCR), using QIAGEN® One Step RT-PCR (QIAGEN, Valencia, CA), according to the manufacturer's instruction.

The primer sequences, *ACTGTCTTCA CGCAGAAAGCGTCTAGCCAT* as the outer forward primer, *CGAGACCTCCCGGGGCACTCGC AAGCACCC* as the outer reverse primer, *ACG CAGAAAGCGTCTAGCCATGGCGTTAGT* as the inner forward primer; and *TCCCGGGGCACTC GCAAGCACCCTATCAGG* as the inner reverse primer were used for detection of 5' NC region of HCV genome with nested RT-PCR (9). For the first round, the reaction mixture containing 5 µl 5× PCR buffer with $MgCl_2$ (Qiagen), 1 µl dNTP mix (0.4 mM), 1.5 µl of outer forward and reverse primers, 1µl Qiagen one step RT-PCR enzyme mix, 5 µl of template and RNAse free water up to 20 µl. The cycling conditions were as follows; 50^{o}C for 30 mins,

then 95°C for 15 mins, followed by 35 cycles of 94°C for 30 seconds, 58°C for 30 seconds, 72°C for 60 seconds and final extension at 72°C for 10 mins. The second round was carried out like the first round with the inner set of primers and the cycling conditions were as follows; 94°C for 5 minutes, followed by 40 cycles of 94°C for 30 seconds, 60°C for 45 seconds, 72°C for 30 seconds, and final extension at 72°C for 5 minutes.

The PCR products were electrophoresed on 1.5% agarose gel, stained with SYBR green. The gel was visualized in ultraviolet (UV) transilluminator and photographed using a camera. The expected PCR product size was 251 bp for the inner primer set.

Data analysis:

Prevalence data and 95% confidence intervals were calculated. Categorical variables were compared using the Chi-square or Fisher's exact test while continuous variables were compared using the Students' *t*-test to evaluate the association between the prevalence of HIV/HCV co-infection and associated risk factors. P value < 0.05 was considered to be statistically significant.

Results:

Socio-demographic and clinical characteristics of the study participants:

One hundred and ninety-five HIV infected participants were recruited into the study, of which 134 (68.7%) were females and 61 (31.3%) were males. The age of the participants ranged from 21-69years, with a mean age of 40.1±7.8 years, and median age of 39 years. The mean age of the female participants was 38.4±7.9 years while the mean age of the males was 44.1±9.4 years. Majority of the participants were in the age group 31-40 (45.3%) and most of the participants were married (70.8%, 138/195), while 19% were single. About 42.8% of them had secondary level education, while 41.7% had tertiary level education (Table 1).

The mean age of participants at first sexual intercourse was 20.6±4.0 years. Most of the participants (71.9%, 138/195) had one sexual partner and only 2.6% had three or more sexual partners. The predominant sexual orientation of the participants was heterosexual (99.4%). Majority of the participants (63.5%) used condoms, did not smoke cigarettes (93.8%), did not drink alcohol (89.7%) and did not abuse intravenous drug (95.8%). History of blood transfusion was reported in 18.9% of the participants (Table 1). The use of antiretroviral therapy was reported by 89.5% of the participants, with mean duration of antiretroviral therapy being 5.5±3.1 years. The median $CD4^+$ count was 491 cells/mm^3 (IQR: 334 - 696, range: 98 - 1363), and the mean log_{10}HIV viral load was 2.7 ± 1.3 log copies/ml.

Prevalence of Hepatitis C in HIV infected participants:

Of the 195 HIV infected participants, 5 tested positive for antibody to hepatitis C virus with a seroprevalence rate of 2.6% (95% CI=0.8-5.9%). Of these 5, HCV RNA was detected in 1 (20.0%), giving a prevalence of 0.5% (1/195) for active HCV infection among the study participants. The seroprevalence of HCV in males was 3/61 [4.9% (95% CI=1.0-13.7%)] and in females, it was 2/134 [1.5% (95% CI= 0.2-5.3%)], but the difference was not statistically significant (OR=3.41, 95% CI =0.56-20.98, p=0.18). The median CD4 count was 261 cells/mm^3 (IQR: 236-630) and mean log_{10}HIV viral load was 5.1±0.9 log copies/ml.

HCV RNA was detected in only 1 of the 5 participants who were seropositive for HCV. The prevalence of active HCV infection was therefore 0.5% (95% CI=0.01-2.82%). This patient was a 30-year-old male with 3 or more sexual partners, who had been on antiretroviral therapy for 5 years, had previous history of blood transfusion, did not smoke, drink alcohol or use IV drugs. His $CD4^+$ cell count was 333 cells/mm^3 and HIV viral load was 4.3 log_{10}copies/ml.

Risk factors for hepatitis C infection in HIV positive patients:

The 5 participants who were seropositive for HCV were compared to those seronegative for HCV using a bivariate analysis (Table 2). The mean log_{10} HIV viral load was significantly higher among participants seropositive for HCV (5.1±0.9 log copies/ml) than those seronegative (2.7±1.2 log copies/ml) (p<0.001). The mean duration of antiretroviral therapy was significantly lower among participants seropositive for HCV (2.6 ± 1.3 years) than those seronegative (5.6 ± 3.1 years) (p=0.004). The seroprevalence of HCV was significantly higher in those with $CD4^+$ cell count < 350 cells/mm^3 (8.5%) compared to those with $CD4^+$ cell count <350 cells/mm^3 (p=0.02).

The seroprevalence of HCV in the HIV-positive participants was significantly associated with sexual partners (p=0.0473), with highest seroprevalence in those with ≥ 3 sexual partners (OR=11.625, 95% CI=1.049-128.83). The participants seropositive for HCV were younger than those seronegative (34.8± 6.6 years vs 40.3±8.8 years), but the difference was not statistically significant (p=0.17). The seroprevalence of HCV was highest in the age group 21-30 years (9.1%), followed by age group 31-40 years (2.3%) and age group 41-50 years (1.6%). However, this difference was not statistically significant (p=0.34). Since there was only one HIV infected patient

Table 1: Socio-demographic characteristics of HIV infected participants attending the HIV clinic of the Lagos University Teaching Hospital, Idi-Araba, Nigeria

Characteristic	Frequency	Percentage (%)
Gender		
Male	61	31.3
Female	134	68.7
Age group (years)		
21 – 30	22	11.5
31 – 40	87	45.3
41 – 50	61	31.8
51 – 60	16	8.3
61-70	6	3.1
Marital status		
Single	37	19.0
Married	138	70.8
Widowed	17	8.7
Divorced	2	1.0
Separated	1	0.5
Education level		
None	5	2.6
Primary education	25	12.9
Secondary education	83	42.8
Tertiary education	81	41.7
Number of sexual partners		
None	39	20.3
One partner	138	71.9
Two partners	10	5.2
Three or more partners	5	2.6
Sexual orientation		
Heterosexual	163	99.4
Homosexual	1	0.6
Condom use		
Yes	115	63.5
No	66	36.5
Smoking		
Yes	12	6,2
No	182	95.8
Alcohol intake		
Yes	20	10.3
No	174	89.7
Blood transfusion		
Yes	36	18.8
No	155	81.2
IV Drug abuse		
Yes	7	4.2
No	159	95.8
Antiretroviral therapy		
Yes	170	89.5
No	20	10.5
CD4 (cells/mm^3) count categories		
<350	47	26.3
350 – 500	45	25.1
>500	87	48.6
Median CD4 count (cells/mm^3)	491 (IQR: 334 – 696)	
Mean age (years)	40.1 ± 8.7	
Mean age sexual intercourse (years)	20.6 ± 4.0	
Mean duration of ART (years)	2.6±1.3	
Mean log$_{10}$ HIV viral load (copies/ml)	2.7±1.3	

with active HCV infection (HCV RNA positive), analysis of the risk factors for active HCV infection could not be performed.

Discussion:

The seroprevalence of HCV infection in HIV infected patients was estimated in a population of adults consisting predominantly of females. The seroprevalence of HCV in HIV positive patients in this study was 2.6%. This relatively low prevalence may be explained by the low frequency of documented high-risk behavior in this cohort of HIV-infected patients. However, this seroprevalence is higher than the 1.1% national prevalence of HCV in HIV/HCV co-infected patients reported in the National AIDS Indicator Survey (NAIIS) (3), but the rate is similar and consistent with findings from Abuja where HCV seroprevalence of 2.3% was reported in HIV infected patients (10,11). Nevertheless, the seroprevalence is lower than the HIV/HCV prevalence reported in many studies such as 13.5% from Nasarawa, 11.3% from Jos, 4.8% from Ibadan, 5.8% from Lagos, 5.7% from Rwanda and 11.3% from Cameroun (12-17). The difference in sample size, socio-demographic

Table 2: Bivariate analysis of risk factors for hepatitis C virus seroprevalence in selected HIV positive patients at the HIV clinic, Lagos University Teaching Hospital, Idi-Araba, Nigeria

Variable	Number anti-HCV negative (%) (n=190)	Number anti-HCV positive (%) (n=5)	P value
Gender			
Male	58 (95.1)	3 (4.9)	0.18
Female	132 (98.5)	2 (1.5)	
Age group (years)			
21 – 30	20 (90.9)	2 (9.1)	0.34
31 – 40	85 (97.7)	2 (2.3)	
41 – 50	60 (98.4)	1 (1.6)	
51 – 60	16 (100.0)	0	
61 – 70	6 (100.0)	0	
Marital status			
Single	35 (94.6)	2 (5.4)	0.77
Married	135 (97.8)	3 (2.2)	
Widowed	17 (100.0)	0	
Divorced	2 (100.0)	0	
Separated	1 (100.0)	0	
Educational status			
None	5 (100.0)	0	0.76
Primary education	25 (100.0)	0	
Secondary education	80 (96.4)	3 (3.6)	
Tertiary education	79 (97.5)	2 (2.5)	
Sexual partners			
None	37 (94.9)	2 (5.1)	0.047*
1	136 (98.6)	2 (1.4)	
2	10 (100.0)	0	
3 or more	4 (80.0)	1 (20.0)	
Sexual orientation			
Heterosexual	158 (96.9)	5 (3.1)	0.85
Homosexual	1 (100.0)	0 (0)	
Condom use			
Yes	112 (97.4)	3 (2.6)	1.0
No	65 (98.5)	1 (1.5)	
Smoking			
Yes	12 (100.0)	0	0.77
No	177 (96.3)	5 (2.7)	
Alcohol			
Yes	20 (100.0)	0	1.0
No	169 (97.1)	5 (2.9)	
Blood transfusion			
Yes	34 (94.4)	2 (5.6)	0.24
No	152 (98.1)	3 (1.9)	
IV Drug abuse			
Yes	7 (100.0)	0 (0)	1.0
No	156 (98.1)	3 (1.9)	
Antiretroviral therapy			
Yes	165 (97.1)	5 (2.9)	1.0
No	20 (100.0)	0	
CD4 (cells/mm^3) count categories			
<350	43 (91.5)	4 (8.5)	0.02*
350–500	45 (100.0)	0	
>500	86 (98.8)	1 (1.2)	
Mean age ± SD (years)	40.3±8.8	34.8±6.6	0.17
Mean age at first sexual intercourse	20.5±4.0	22.5±4.9	0.33
Mean duration of ART	5.6±3.1	2.6±1.3	0.004*
Mean $\log_{10}$ HIV viral load (copies/ml)	2.7±1.2	5.1±0.9	<0.0001*

* = statistically significant; SD = Standard deviation

factors, risk behaviours and types of exposure may account for the variation in the prevalence rates in the Nigerian studies. In comparison with this study, the vast majority of other studies in Nigeria which showed a higher seroprevalence of HCV in HIV infected patients predate this study, which may suggest improvement in preventive measures on HCV such as improvement in sexual education, screening of blood for transfusion, and injection safety, which are the main routes of transmission of HCV in Nigeria.

All patients in this study were tested for HCV-RNA using RT-PCR assay and only one patient tested positive. The patient also tested positive for HCV antibody, giving HCV-RNA detection rate of 20% of those who tested positive for antibodies to HCV, and low prevalence of active HCV infection of 0.5% among the entire participants in this study. Very few studies in Nigeria have reported prevalence of active HCV infection by HCV RNA detection in HIV infected patients. The difference between the HCV seroprevalence rates using ELISA and active infection by RT-PCR reported in this study may be due to clearance of the HCV in some patients (past HCV infection) or false positive antibody result or fluctuation of HCV viraemia in those with chronic HCV infection.

The prevalence of active HCV infection in this study is lower than the prevalence of 8.2% reported by Agwale et al., (18) who

tested 146 HIV positive patients in Northern Nigeria for HCV RNA and HCV genotype and a prevalence of 6% reported in Jos (19). In the study by Agbaji et al., (19), 79 of 262 (30.2%) patients who tested positive to HCV antibody had HCV viraemia. These findings highlight the importance of HCV-RNA confirmatory testing to determine those who have active HCV infection among those who are HCV seropositive. Studies comparing HCV antibody tests to HCV-RNA suggest that false positive antibody tests may be common in Africa (20). However, due to limited capacity for molecular virology, the tests are expensive and mostly not available. Therefore, routine confirmation of seropositive HCV infection by RT-PCR is not done.

The risk factors for active HCV infection in HIV positive patients could not be determined in this study because only one patient had HCV viraemia. Therefore, risk factors were assessed for only those seropositive for HCV. The only patient who had HCV viraemia was a 30-year-old male, who had 3 or more sexual partners, had been on antiretroviral therapy for 5 years, and had previous history of blood transfusion, but no history of smoking, alcohol consumption or IV drug abuse. The $CD4^+$ count of this patient was 333 cells/mm^3 and his HIV viral load was 4.33 log copies/ml.

The HIV infected patients seropositive for HCV in the study had lower $CD4^+$ counts than those seronegative, and those with $CD4^+$ count <350/mm^3 had the highest HCV seropositive rate. This implies that HCV infection is associated with immune suppression in HIV positive patients. Some authors have shown a decline in $CD4^+$ cell count associated with HIV/HCV infection (13,14,21). The mean log_{10} HIV viral load was significantly higher among patients seropositive for HCV (5.1±0.9 copies/ml) than those seronegative (2.7±1.2copies/ml), which suggests that HIV disease tend to progress in those who have HIV/HCV co-infections. There are very few studies in Nigeria that have assessed the association between HCV infection and viral load in HIV positive patients. In a study of 17,882 patients in Jos by Ladep et al., (13), there was a significantly higher HIV viral loads in patients with HIV/HCV co-infection compared to those with HIV mono-infection. It has been demonstrated that there is more rapid HIV disease progression in HIV/HCV co-infected patients compared to those who were HIV-infected mono-infected (22).

More than 80% of the HIV positive patients in this study were on antiretroviral therapy but the mean duration of antiretroviral therapy was significantly lower among patients seropositive for HCV (2.6±1.3 yrs) than those seronegative for HCV (5.6±3.1 years). Suppression of HIV disease progression with antiretroviral therapy may lead to possible recovery of $CD4^+$ cells and decrease viral load, which can delay the progression of HCV liver disease (23).

The limitations of the study include the low number of patients who tested positive for the HCV antibody and HCV RNA. A future study involving large number of patients with positive HCV antibody and HCV RNA test should be conducted to determine the true prevalence and risk factors of active HCV infection in HIV positive patients.

Conclusion:

In conclusion, the seroprevalence of HCV in this study was 2.6% while the prevalence of active HCV infection was 0.5%, and only one in five (20.0%) of those seropositive for HCV had active HCV infection. This implies that the other four patients (80.0%) may have had past infection or false positive antibody test. The HIV viral load was significantly higher while the $CD4^+$ count was significantly lower in those seropositive for HCV. The mean duration of antiretroviral therapy was significantly lower among participants seropositive for HCV. However, the risk factors of active HCV infection could not be assessed since only one patient was HCV RNA positive. Nevertheless, the findings of this study underscores the need for screening of HIV positive patients with HCV antibody and confirmation by detection of HCV RNA.

Acknowledgements:

The kind assistance of Mercy Remilekun Orenolu and Maryam Abiodun Abdullah in the laboratory testing is acknowledged with thanks.

Contributions of authors:

OPO conceptualized the study, developed study methodology, collected data, performed data analysis and wrote the manuscript; SOB and OSA supervised the study. All authors approved the manuscript submitted.

Source of funding:

No funding was received for the study.

Conflict of interest:

Author declares no conflict of interest

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