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Prevalence and Determinants of Hepatitis C Virus Infection among HIV Infected Subjects in Benin City, Nigeria

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ABSTRACT: Background: Hepatitis C Virus (HCV) infection is common among HIV infected patients and associated with adverse health outcome. **Aim:** This study aimed at determining the prevalence and risk factors for HCV sero-positivity among HIV infected patients in Benin City, Nigeria. **Materials and Methods:** Seven milliliters of whole blood was collected from a total of 613 HIV positive patients (comprising of 480 HAART exposed and 133 HAART naïve patients) and screened for the presence of antibodies to Hepatitis C virus using immuno-chromatographic technique. CD4+ T lymphocyte estimation was done using flow cytometry. Age range of patients was 4-75 years. A questionnaire was used to obtain relevant information from study participant. **Results:** Overall, the prevalence of HCV was 4.1% and was significantly affected by age (P=0.012) of participants A statistically significant association was observed between presence of tribal marks and HCV infection (OR= 2.624; 95% CI = 1.123, 6.130; P = 0.026). Other types of body scarification (tattoo, ear piercing and medical marks) were not observed as risk factors for HCV infection (P > 0.05). The prevalence of HCV was not significantly affected by gender (P = 0.766), history of blood transfusion (P = 0.123), surgery (P = 0.726), and HAART status of HIV infected patients (P = 0.311). HAART naïve patients with CD4 count ≥ 200 cells.mm^3 had an insignificantly (P = 0.142) higher sero-prevalence of HCV, than those with lower count: **Conclusions:** Age and presence of tribal marks were identified as risk factors for acquisition of HCV infection. Prompt intervention is advocated to reduce the prevalence of HCV infection and associated sequalae.

Key words: Hepatitis C Virus, HIV, risk factors, Nigeria

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INTRODUCTION

Hepatitis C Virus (HCV) infection is a public health concern in both developed and developing countries of the world (1). With a prevalence of 5.3% and an estimated 32 million people infected with HCV, Sub-Saharan Africa (SSA) has the highest burden of the disease in the world (2). HCV is a major etiologic agent of chronic hepatitis worldwide (3). Reports indicate that as high as 60% to 80% of patients infected with HCV develop chronic infection, which is associated with increased risk of cirrhosis, end-stage liver disease, and hepatocellular carcinoma (4). Mechanisms of transmission of HCV include transfusion of unscreened blood, injection drug use, unsafe injections, presence of tattoo and delivery by traditional birth attendants (5, 6, 7, 8).

Reports show that of all people living with HIV in the world, 9% reside in Nigeria (9). Infact, no other country in world except South Africa, have more people living with HIV than Nigeria (9, 10). Due to common route of transmission, HCV is common among HIV infected patients (11). While spontaneous clearance of HCV occurs in infected patients, the rate of such clearance is reported to be lower in those co-infected with HIV than HCV mono-infected ones (12). As a result HIV patients co-infected with HCV presents with higher risk for the development of liver related diseases, cirrhosis and hepatocellular carcinoma.

The World Health Organization recommends that all HIV infected patients be tested for HCV. (13) Sadly however, this is not routinely done in most hospitals in Nigeria (14), thereby increasing the likelihood of missed diagnosis HCV infection which over time could progress to other serious medical complications, including death of patient. Regular surveillance of infectious disease is a critical element for the articulation and implementation of intervention strategies. Against this background this study aimed at determining the prevalence and associated risk factors for HCV infection among HIV infected patients in Benin City, Nigeria.

MATERIALS AND METHODS

Study Area

This study was conducted among HIV infected patients at the University of Benin Teaching Hospital (UBTH) located in Benin City, Edo State Nigeria. Edo state lies between longitude 5°35 and 5°.44' East and Latitude 6°44 and 6°.21' North. The Hospital is a tertiary referral hospital located in the South-South geographical region of Nigeria, and serve neighboring States such as Ondo (longitude 4°04 and 6°.00' East and Latitude 5°04 and 8°.01' North) , Delta (longitude 5°00 and 6°.45' East and Latitude 5°00 and 6°.30' North) and Ekiti (longitude 4°45' and 5°.45' East and Latitude 7°15' and 8°.50' North) States.

Study population

A total of 613 HIV infected patients were recruited for this study. Out of this number 480 were on Highly Active Anti-retroviral Therapy (HAART) and the remaining 133 were HAART naïve. HIV positive patients less than 18 months old were exempted from this study. The study was approval by the Ethical Committee of the University of Benin Teaching Hospital, Nigeria. Protocol number ADM/E 22/A/VOL.VII/1014. Informed consent was obtained from all participating subjects or their parents/guardians in case of minors

Specimen collection and processing

Seven milliliters of blood was collected from all consenting participants for this study, out of which five mililitres was dispensed into Ethylene diamine tetra-acetic acid (EDTA). Sero-diagnosis of HIV infection was done using a previously described protocol. (15) HCV antibodies were detected from participants blood using immune-chromatographic method - Clinotech Anti-HCV (Clinotech Diagnostics, Richmond, Canada), following manufacturer's instructions. The test is based on the sero-detection of HCV antibodies. Briefly, 50ul of sera obtained from patients were applied to test strips and observed for the emergence of two distinct line bands on the strip which was indicative of a positive result. Positive and negative controls were run alongside test. CD4+ T lymphocyte estimation was done using flow cytometry (Partec, GmbH, Germany. Briefly, 20 µl of CD4 PE antibody was placed into a Partec test tube and 20 µl of well-mixed whole EDTA blood was added, and mixed gently and thereafter incubated in the dark for 15min at room temperature. The mixture was agitated during incubation every 5 minutes. Then 800µl of CD4 buffer was added to the mixture of antibody and sample mixed gently. This was then plugged to the counter for counting.

Statistical analysis

The data were analyzed with Chi square (X^2) test or Fischer`s exact test where appropriate using the statistical software INSTAT® (GraphPad Software Inc., La Jolla, CA, USA).

RESULT

The overall prevalence of HCV in this study was 4.1%. Age was observed to significantly affect the sero-prevalence of HCV, with participants within the age group of 50-59 years found to have the highest prevalence of 9.9%. The presence of tribal marks was significantly associated with HCV sero-positivity (Yes vs. No: 6.2% vs. 2.1%; OR= 2.624; 95% CI = 1.123, 6.130; P = 0.026). An insignificantly higher sero-prevalence of HCV was found with presence of tattoo (0.2456), ear piercing (P=0.813) presence of medicinal marks (P=1.000), gender (P=0.766), history of blood transfusion (0.123) and having a history of surgery (P = 0.726). (Table 1)

Although, HAART exposed HIV infected patients were found to have a lower sero-prevalence of HCV infection (HAART exposed vs. HAART naïve: 3.1% vs. 7.5%), the difference between the two groups did not reach statistically significant proportion (P= 0.311). HARRT naïve HIV infected patients with a CD4+ count ≤ 200 cells/mm^3 had a higher risk of acquiring HCV infection (CD4+ ≤ 200 cells/mm^3 vs. CD4+ > 200 cells/mm^3: 11.7% vs 6.1%; OR= 3.241; 95% CI=0.876, 11.989; P= 0.142) (Table 2).

Table 1: Sero-prevalence of HCV among HIV infected subjects

Variable	N	No. HCV Positive (%)	OR	95% CI	P value
Age (yrs)					
0-9	21	0(0.0)			0.012
10-19	23	0 (0.0)			
20-29	50	4(8.0)			
30-39	208	3(1.4)			
40-49	184	6 (3.3)			
50-59	91	9 (9.9)			
≥ 60	36	3 (8.3)			
Gender					
Male	168	8 (4.7)	1.259	0.532, 2.421	0.766
Female	445	17(3.8)			
Blood Transfusion					
Yes	197	12 (6.1)	2.011	0.906, 4.433	0.123
No	416	13 (3.2)			
Tribal marks					
Yes	289	18 (6.2)	2.624	1.123, 6.130	0.026
No	324	7 (2.1)			
Tattoo					
Yes	45	0 (0.0)	0.234	0.014, 3.913	0.246
No	568	25(4.4)			
Ear Piercing					
Yes	471	20 (4.2)	1.215	0.448,3.299	0.813
No	142	5(3.5)			
Medical marks					
Yes	64	2 (3.1)	0.737	0.169, 3.205	1.000
No	549	23 (4.2)			
Surgery					
Yes	189	9 (4.8)	1.275	0.553, 2.940	0.726
No	424	16 (3.8)			

N- number of patients**, OR**-odd ratio, **CI**- confidence interval

Table 2: Sero- prevalence of HCV in relation to HAART status and CD4 count of HIV infected patients

HIV POSITIVE	N	No. HCV Positive (%)	OR	95%CI	P value
HAART STATUS					
Exposed	480	15 (3.1)	0.396	0.128, 0.905	0.311
Naïve	133	10 (7.5)			
HAART NAÏVE					
≤ 200 cells.mm3	34	5 (11.7)	3.241	0.876, 11.989	0.142
> 200 cells/mm3	99	5 (6.1)			

N- number of patients**, OR**-odd ratio, **CI**- confidence interval

DISCUSSION

There is paucity of data on the burden and drivers for HCV infection among HIV infected patients in Benin City, Nigeria. Against this background this study aimed at determining the prevalence and associated risk factors for HCV among HIV infected patients in Benin City, Nigeria.

In this study, the overall prevalence of HCV was 4.1% and is lower than 4.4% reported by an earlier study conducted in Benin City, Nigeria over 10 years ago (16). Other Nigerian studies have reported lower values (17, 18) to ours, although another documented a higher figure (19). It is important to note that the studies (17, 18) and (19) were conducted in North-Western and Middle belt regions of Nigeria respectively, in contrast to ours which was carried out in Mid-western Nigeria. The prevalence of a disease is known to differ from place to place and even within the same location over time (20). This may explain the pattern of results obtained.

Age was identified as a risk factor for HCV infection in this study. This is agreement with findings from another study (21). Patients within the age bracket of 50-59 years had a significantly higher prevalence of HCV than those in other age groups. It is worthy of note that no HCV infection was found in participants less than 19 years old in this study. Previous Nigerian studies (22, 23) have reported a high burden of HCV sero-positivity among elderly patients. Patients at older age at time of infection have an increased risk of developing chronic HCV infection (24). Re-use of sharps without sterilization is rife in developing countries of the world and implicated for high transmission of HBV and other blood borne viruses in the region (25). Thus, the pattern of result obtained may be as a result of a combination of factors ranging from generally weakened immune status of older patients to greater cumulative exposure to HCV over the years.

Males had a higher risk of being HCV seropositive. One Nigerian study (23) has reported similar findings while others conducted outside Nigeria (26, 27), reported the contrary. After initial HCV infection, women are more likely to clear the virus spontaneously (28). This may be related to hormonal differences as there is a body of evidence which suggest that certain female hormones e.g physiological estradiol, 17-beta estradiol inhibits HCV replication in vitro (29). However as reported by other studies (22, 23), gender was not a risk factor for HCV sero-positivity in this study.

An association was found to exist between HCV seropositivty and previous receipt of blood transfusion. Indeed, those with a history of blood transfusion were observed to have twice as much risk of acquiring HCV infection than those without such history. A similar report was documented in an Ethiopian study (30) and a contrary report from a Ugandan one (31). In Nigeria, the blood for transfusion purposes are principally sourced from commercial donors who may carry high risk for HCV and other blood borne viral infections. Again, unlike in developed countries of the world were screening of blood is done with sensitive molecular techniques, screening of blood in Nigeria is mostly done using serological diagnostic methods which have the capacity to give high false negative results. This may explain the higher prevalence of HCV in cohort of HIV patients with history of blood transfusion. However, in this study, receipt of blood transfusion was not found to be a risk factor for HCV sero-positivity.

In Nigeria, body scarification is done for identification, medicinal, adornment purposes among others. With respect to type of marks, only tribal marks were observed to significantly affect the sero-prevalence HCV infection among study population. Facial scarification is a cultural practice in Africa,

especially in Nigeria (32). It is usually done with sharps. Although now becoming unpopular in the last decade, tribal markings were often inscribed on faces of people by elders of families who had no knowledge of the prevention of blood transmitted infections and may have repeatedly used cutting instruments on several persons without sterilization. This may explain the high prevalence of HCV associated with this group of subjects. The risk of transmission of viral hepatitis through medical procedures such as surgery is well documented in literature. The finding of a higher prevalence of HCV infection among cohort of participants with history of surgery in this study has been previously documented in Nigeria (33). One African study however recorded a contrasting finding (34). The risk of contracting viral hepatitis infection varies with type of surgery (35). Thus, differences in the type and number of surgeries performed may account for the contrasting findings. Generally, history of surgery was not identified as a risk factor for HCV infection among study participants.

An insignificantly lower prevalence of HCV was recorded among HIV infected patients on HAART in this study. Although there is no known drug for HCV, the use of HAART may have led to immune restoration among the cohort of patients and facilitated spontaneous clearance of the virus leading to the pattern of result observed. Lending credence to this is the finding that HAART naïve patients with a CD4 count ≤ 200 cells.mm^3, had a three times higher risk of acquiring HCV infection than those with higher count. This re-enforces the benefit of early HAART enrollment of HIV infected patients with HCV infection. The gold standard for diagnosis of HCV infection is the detection of HCV viral nucleic acid in serum. In this study however, diagnosis of HCV infection was based on the detection of anti-HCV antibodies in serum of HIV positive patients, due to the unavailability of molecular testing facilities at our center. This is a perceived limitation to this study. The molecular component of this work has been submitted somewhere for consideration.

In conclusion, the prevalence of HCV was high and found to be significantly affected by age and presence of tribal marks among study population. Prompt intervention measures are advocated to curb the spread of infection and associated sequalae.

LIMITATIONS OF THE STUDY

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Data Availability

The raw data of this study will be made available on reasonable request.

Conflicting interests: None

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