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Sero-prevalence Rate of Hepatitis C Virus among Human-Immunodeficiency Virus Patients in Khartoum State (Sudan)

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Abstract

Background: Human-Immunodeficiency Virus (HIV) infection of liver cells other than hepatocytes may play a role in the progression of disease in co-infected patients. Like other macrophages, Kupffer cells can be infected with HIV, although mono-infection with HIV is not associated with significant liver pathology. In HIV/HCV co-infection, on the other hand, it has been postulated that the HIV-infected Kupffer cells shift to the cytokine response, in turn influencing the hepatic stellate cells (HSCs), the major mediators of collagen deposition and fibro-genesis in the liver.

Objective: To detect the prevalence rate of hepatitis C virus (HCV) among HIV infection patients in Khartoum State (Sudan).

Materials and methods: This was a prospective, descriptive, cross-sectional study. It was conducted at Police Teaching Hospital and the National Reference Laboratory (Khartoum) from January to March 2017. 200 blood specimens were collected from HIV patients to determine the prevalence rate of HCV among HIV patients using the rapid immuno-chromatography test (ICT), and the direct enzyme-linked immunosorbent assay (ELISA). The association of gender and age incidence with HCV and HIV infections was also studied.

Results: 200 patients were included in this study; their mean ± SD age incidence was (26.7 ± 23.5) years. 50% of cases were males and 68.5% cases were under treatment. The majority of cases (95%) were within the normal range of CD4 level and no significant association was observed ($p = 0.196$). 7% of HIV cases showed positive HCV by ICT; whereas only 3% of HIV cases showed positive HCV by ELISA. The study found a low prevalence rate of hepatitis C virus among HIV-infected patients. All HCV patients were less than 30 years old. The majority (71%) of HCV positive patients were men.

Conclusion: The prevalence rate of hepatitis C virus was low among HIV-infected patients with no impact of HCV on CD4 levels in Khartoum (Sudan).

Key words: Sero-prevalence rate, Hepatitis C virus, Human immunodeficiency virus.

Introduction

Approximately 34 million people are infected with HIV worldwide; of whom one to two millions have an HIV infection, an epidemic mainly confined to West Africa. In Guinea-Bissau an estimated 170 million people are chronically infected with HCV and more than three millions are infected annually[1].

Based on the RNA sequence homology, HCV has been classified into six major genotypes and several subtypes; genotype 2 has previously been found. HCV shares a route of transmission with HIV, and the greatest risk of transmission occurs with direct pre-cutaneous exposure to infectious blood. HCV may also be transmitted sexually, but the risk is considered relatively low. Although HCV is prevalent in sub-saharan Africa, the predominant modes of transmission are unclear. Active surveillance of HCV is rarely performed due to resource constraints, unreliable serological tests, lack of molecular-based tests, and absence of HCV antiviral therapy[2].

Almost five million people are co-infected with both HIV and HCV in sub-saharan Africa, but the prevalence rate of HIV/HCV co-infection varies geographically. In sub-saharan Africa the prevalence rate of HCV among HIV-infected patients ranges between 0% and 22%.The rate of spontaneous HCV clearance is lower among HIV co-infected patients than among individuals without HIV infection. In regions with increasing availability of antiretroviral treatment (ART), life expectancy for HIV-infected patients is rising. Thus, HCV-related morbidity may become more important. Certainly, HIV/HCV co-infection has been found to be associated with an increased incidence of end-stage liver disease and a poorer survival than for HCV infection alone. This is probably due to a more rapid liver disease progression and liver damage among severely immunosuppressed patients infected with HIV[3].

Furthermore, HCV infection increases the frequency rate of hepato-toxicity of ART and may affect the physicians' choice of ART treatment regimen. The risk factors, demographic conditions, and clinical features of HIV and HCV co-infection in sub-saharan Africa are poorly studied and a better understanding is necessary to develop clinical strategies. In the United States, it is recommended that all HIV infected patients should be screened for HCV on entry into health care. The reasons given for this practice include the fact that many of the patients acquire HIV infection through intravenous drug use which is also associated with a high risk of HCV infection. In addition, knowledge of HCV status in the HIV positive patients on antiretroviral therapy may help in the interpretation of the causes of elevated liver enzymes. It is therefore, recommended that screening should begin with enzyme linked immune sorbent assays (ELISA) for antibodies against HCV[4].

There are various considerations that have to be taken into account before study recommendations are put into practice. One of these is the cost of the testing. If the costs are very high then routine testing becomes difficult to apply. Another issue is the prevalence rate of HCV among HIV positive patients. If it is very low then routine HCV screening may not be cost effective. Risk factors and signs of chronic liver disease associated with HIV/HCV co-infection, may predispose patients to priority of HCV screening[5].

The aim of this study, was to determine the prevalence rate of HCV among HIV by screening HIV specimens for HCV and to determine the gender and age distribution of HCV infection among HIV infected adult patients.

Materials and methods

This was a prospective, descriptive, cross-sectional study. It was conducted at Police Teaching Hospital and the National Reference Laboratory (Khartoum) from January to March 2017. 200 blood specimens were collected from HIV patients to determine the prevalence rate of HCV among HIV patients using the rapid immuno-chromatography test (ICT), and the direct enzyme-linked immunosorbent assay (ELISA). Approval to conduct the study was granted by the Ethical Committee of Al Neelain University. Informed consent was obtained from all patients investigated. Statistical analysis was performed by the Statistical Package for Social Sciences (SPSS) program (version 20). Continuous variables were expressed as mean and standard deviation. In the analytical phase, "t" test was applied to compare averages. P-value < 0.05 was considered significant.

About 5 ml blood specimens were collected by sterile syringes in plain containers and centrifuged at 3000 rpm for 5 minutes. After that, serum was separated and stored at - 20°C.

Procedure: The rapid immunochromatography test used was a colloidal gold enhanced assay for the qualitative detection of antibodies against HCV in human serum. This test was a screening test and all positives were confirmed by ELISA testing.

The HCV ELISA test was used for clinical diagnosis of patients suspected of having a hepatitis C virus infection. The ELISA test involves a two-step incubation procedure in which solid phase, indirect ELISA technique for HCV antibodies was established. In this third generation HCV ELISA test, recombinant, highly immuno-reactive antigens corresponding to the core and non-structural regions of HCV were pre-coated on the polystyrene micro-well strips. In a new sterilized micro-titre plate; first micro-well was left empty as a blank to correct reading, 50 uL of negative control was coated to the second and third micro-wells, 50 uL of positive control was coated to the fourth and fifth micro-wells, and the rest of micro-wells was coated with the samples. All were incubated at 37ºC for 30 minutes, and then washed 4 times with buffer dilution 1:20. A conjugate was added to all wells. 100uL of washing buffer were added to the blank, incubated at 37ºC for 30 minutes, and washed 4 times. Then 50 uL of substrate A and 50 uL of substrate B were added to each well and mixed. The reaction was allowed to continue for 10 minutes and stopped with 50 uL of stop solution. The color intensity was read with the plate reader at wave length 450 nm using an enzyme-linked immuno-sorbent assay reader. The cut-off value was calculated as half of mean summated positive and negative control. Positive samples gave optical density (OD) value of more than 0.5 and the negative value was below 0.3.

Results

Two hundred patients were investigated in this study. Their mean of age was 26.7 years with a standard deviation of 23.5 years. There was no significant age association with HCV (p = 0.837).

As shown in Table (1), 50% of cases were males. This finding showed a strong significant gender association with HCV (p = 0.000). 68.5% of patients were under treatment, while 31.5% were not under treatment. This finding showed a strong significant treatment association among HCV patients (p = 0.000). As regard CD4 level, the majority of cases (95%) were within the normal range, and this finding showed no significant difference (p = 0.196).
Regarding ICT results, 8% of HIV cases were positive for HCV infection; and no significant difference was observed (p = 0.097). On the other hand, by ELISA method 4.5% of HIV cases were positive for HCV infection and also no significant difference was observed (p = 0.098).

Table (1): Frequency rate of HCV positive HIV patients according to gender, medication, CD4 level, and laboratory methods parameters

Parameters		Frequency	Percent	P - value
Gender	Male	100	50%	0.000
	Female	100	50%	
Medications	No treatment	63	31.5%	0.000
	Under treatment	137	68.5%	
CD4	Low	10	5%	0.196
	Normal	190	95%	
ICT	Negative	184	92%	0.097
	Positive	16	8%	
ELISA	Negative	191	95.5%	0.098
	Positive	9	4.5%	

Discussion

HIV/HCV co-infection has been found to be associated with an increased incidence of end-stage liver disease and a poorer survival rate than for HCV infection alone. This is probably due to a more rapid liver disease progression and liver damage among severely immunosuppressed patients infected with HIV. This study findings showed a low prevalence rate of HCV among HIV infected patients.
Age incidence of all HCV infected patients were less than 30 years, and the lowest age was 7 years. The increased seropositivity rate of HCV among patients younger than 30 years old may be due to the sexuality status of this age group.
The majority (71%) of HCV positive patients in this study were men. This gender difference was not associated with HCV infection; in contrast to what reported by Plamondon and his colleagues in Guinea-Bissau[6].
On the other hand, our study did not notice any association between the low CD4 cell count and HCV status. Previous studies assessed the impact of HCV infection on CD4 restoration. Some HCV positive patients had no HCV replication. Other studies reported 15 HCV RNA-positive cases and 24 HIV patients revealing a delay in the CD4 gains in the former group but restored

after one year treatment[7].
In our study the same definition for HCV coinfection was used. However, much larger samples would confirm these findings.
A major limitation of this study was the relatively small number of patients were HCV positive. This decreased the power to detect any characteristics associated with HCV infection and thus the ability to detect the cause and effect. For risk factor analysis, the sample size should ideally be much larger. Furthermore, the prevalence rate of HCV in this study may not reflect the state of the general population in Sudan. Similar studies have been conducted in other West African settings to detect anti-HCV, e.g. Ivory Coast (1.2%)[8], Gambia (1.2%)[9], Senegal (1.6%)[10], Ghana (3.6%)[11] and Nigeria (3.8%)[12].
Conclusion: The prevalence rate of hepatitis C virus was low among HIV-infected patients with no impact of HCV on CD4 levels in Khartoum (Sudan).

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