Brief Original Article

Higher levels of hepatitis C virus RNA found in blood donors co-infected with HIV as compared to HCV mono-infected donors

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Abstract

Introduction: Hepatitis C virus (HCV) infection and human immunodeficiency virus (HIV) infections are public health problems in sub-Saharan countries such as the Republic of Congo. HIV infection could impact the characteristics of HCV infection in co-infected people. We investigated HCV-HIV co-infection among blood donors in Congo.

Methodology: Ninety-nine HIV-positive and/or HCV-seropositive blood donors were selected during screening and subsequently tested for aminotransferases and HCV RNA.

Results: A total of 29 donors were found positive for HCV RNA (HCV-infected individuals), including 19/60 (31.66%) HIV donors (co-infected) and 10/39 (25.64%) non-HIV donors (mono-infected). Most of the co-infected donors (17/19) displayed a high viral load (> 5 log). The median HCV RNA level was at least 2 logs higher in co-infected people. The levels of alanine aminotransferase (ALT) were also slightly higher in co-infected donors than in HCV mono-infected donors.

Conclusion: This study reports HCV-HIV co-infection among blood donors in Congo and shows that HCV viral load is higher in HIV donors.

Introduction

Hepatitis C virus (HCV) and human immunodeficiency virus (HIV) infections are global concerns. The Republic of Congo-Brazzaville is considered to be a high prevalence area for HCV infection, with an estimated seroprevalence of 5.6% [1]. The reported prevalence of HIV infection in the country is around 2.8% [2]. Sharing routes of transmission of HIV and HCV contributes to a frequent co-infection with both viruses [3]. Currently, antiretroviral drugs from the Global Fund are available for most HIV-infected patients in Congo, while chronically HCV-infected patients can rarely access treatments available in developed countries. It is well known that patients chronically infected with HCV are at a high risk of developing liver cirrhosis and end-stage liver disease (ESLD) [4]. HCV could then be a

threat among HIV-infected patients in Congo, since ESLD was reported as a major cause of death (after AIDS-related complications) among HIV-infected individuals in areas where antiretroviral therapy (ART) is available [5,6]. Indeed, it was reported that HIV infection exacerbates HCV-related liver disease, increasing the likelihood of cirrhosis and HCV-related mortality [3,6]. HIV infection has been associated with persistent HCV viremia and higher HCV viral load [7]. Most studies regarding HCV-HIV co-infection are usually based on hospital cohorts of HIV-infected patients, treated or not. In addition, to the best of our knowledge, little information has been reported about HCV-HIV co-infection in Congo-Brazzaville [8]. Therefore, our aim was to investigate HCV and HIV co-infection among asymptomatic and treatment-naïve blood donors in Pointe-Noire, Republic of Congo.

Methodology

This study was prospectively conducted among blood donors at the blood bank of Pointe-Noire, Congo. The study was carried out in compliance with the local guidelines and laws, and in accordance with the ethical standards of the Declaration of Helsinki. The inclusion criteria were a positive test for anti-HCV and/or anti-HIV antibodies. For routine screening, HIV testing was done by the blood bank using Genscreen ULTRA HIV Ag-Ab (Bio-Rad, Marnes-la-Coquette, France) and Determine HIV-1/2 Ag/Ab (Alere, San Diego, USA) assays, and HCV was tested with Monolisa HCV Ag-Ab ULTRA assay (Bio-Rad, Marnes-la-Coquette, France). After informed consent was obtained, two 5 mL tubes of blood (one clot tube and one EDTA tube) were collected from donors by veinipuncture. Upon inclusion, the levels of alanine aminotransferase (ALT) and aspartate aminotransferase (AST) were determined immediately for all donors, as well as CD4 cell counts for HIV-infected donors. Aliquots of plasma were kept at -80°C and thereafter shipped to the Laboratory of Virology of Lille for the detection and quantification of HCV RNA. RNA extraction and quantitative detection of HCV RNA were performed using the COBAS AmpliPrep/COBAS Taqman HCV version 2.0 test (Roche Diagnostics, Meylan Cedex, France). Briefly, specimen preparation was automated using the COBAS AmpliPrep instrument with amplification and detection automated using the COBAS TaqMan Analyzer. The volume used for the test was 650 μL of EDTA plasma. The limit of detection was 15 IU/mL and the method was linear from 15 HCV RNA IU/mL to 10^8 HCV RNA IU/mL.

Comparisons were done using Fisher's exact test or the non-parametric Mann-Whitney test.

Results

During the six-month study period, 7,785 blood donations were recorded. Among donors, 392 (5%) were HIV positive, while the anti-HCV antibody was detected in 366 subjects (4.7%). Thirty individuals were found positive for both anti-HIV and anti-HCV antibodies, which represented 0.4% of all blood donors (and 7.6% of HIV-infected donors) at screening. Among donors who gave their consent, 99 subjects were consecutively selected for investigation. The mean age was 34.66 years (range of 18 to 54 years) and the male-female sex ratio was 4.5. This population included 39 HCV-seropositive donors, 40 HIV-positive donors, and 20 individuals who were both HIV positive and HCV seropositive. HCV RNA was detected in 29 individuals (HCV-infected) including 13/20 HIV-positive and HCV-seropositive donors, 10/39 HIV-negative and HCV-seropositive donors, and 6/40 HIV-positive and HCV-seronegative donors. A total of 19/60 (31.66%) HIV-positive subjects were considered to be co-infected with HCV, and 10/39 (25.64%) non-HIV donors were mono-infected. High levels of HCV RNA (> 5 log) were observed in 89.47% (17/19) of HIV and HCV co-infected donors, and in only 20% (2/10) of HCV mono-infected donors (p = 0.0004). The median HCV RNA level in co-infected patients (5.91 log [IQR, 5.68 to 6.18 log]) was at least 2 log higher than in HCV mono-infected donors (3.45 log [IQR, 3.26 to 5.40 log]; p = 0.02). The characteristics of co-infected and HCV mono-infected donors are summarized in Table 1. The median ALT levels in co-infected patients (95 U/mL) were higher than in HCV mono-infected patients (38 U/mL) (p = 0.03). The analysis of risk factors did not show a particular profile for co-infected donors. Similar patterns were observed in terms of injecting drug use, history of blood transfusion,

Table 1. Characteristics of HCV-infected and co-infected donors

Characteristics	Groups		
	Co-infected (n = 19)	HCV infection (n = 10)	p value
Median AST (U/mL) [IQR]	74 [24-88]	31.5 [26.25-68]	0.3
Median ALT (U/mL) [IQR]	95 [28-111]	38 [23.25-57.75]	**0.04**
HCV RNA > 5 log (%)	89.47	20	**0.0004**
Median HCV viral load (log) [IQR]	5.91 [5.66-6.18]	3.45 [3.26-5.40]	**0.02**
Injecting drug use [number (%)]	0 (0)	0 (0)	1
Blood transfusion [number (%)]	5 (26.32)	0 (0)	0.13
Scarification, a piercing or a tattoo [number (%)]	6 (31.56)	2 (20)	0.67
Multiple sex partners [number (%)]	9 (47.37)	2 (20)	0.23

IQR: interquartile range, ALT: alanine aminotransferase, AST: aspartate aminotransferase

presence of scarification, a piercing, or a tattoo, and the number of sex partners. The median CD4 count was 401 (IQR, 309 to 463.5) cells/mm3 in co-infected donors and 396 (IQR, 327 to 413) cells/mm3 in HIV mono-infected donors, showing a similar status in these two groups.

Discussion

This is the first report on HCV and HIV co-infection among blood donors in Congo-Brazzaville. HCV infection is relatively common in HIV-infected people, and its management is especially difficult in resource-limited areas such as sub-Saharan African countries [9]. The reported prevalence of HCV-HIV co-infection in this part of the continent is highly variable [10-14] and is probably underestimated because it is often based on serology. Indeed, HCV RNA was detected in six HIV-infected donors who were HCV seronegative at screening. This raises questions about the performance of assays used in these low-resource settings for HCV diagnosis, and especially in critical situations such as blood donation. The negative impact of HIV on HCV infection has been well described [3,6]. In our study, newly discovered and asymptomatic co-infected patients already had relatively higher liver enzymes than HCV or HIV mono-infected patients. The level of HCV RNA in this study was higher in co-infected donors than in mono-infected donors, in agreement with previous findings [3]. However, high levels of HCV RNA did not seem to be the major factor leading to a faster progression of liver disease [7]. Moreover, co-infected patients who resolve the HCV infection (positive anti-HCV antibody and negative HCV RNA) have been shown to have a higher risk of liver-related death compared to HIV-infected patients [7]. It has been hypothesized that higher HCV RNA levels seen in co-infected people are in part related to a decline in CD4 and CD8 T-cell response to HCV infection [3]. In our study, the CD4 T-cell counts in co-infected patients were similar to those of the other HIV-infected patients. Nevertheless, HIV infection can induce an impairment of CD4 function, which may lead to an insufficient immune response to control HCV infection. It was also previously reported that the increased HCV viral load in HIV-infected individuals was not related to HCV genotype [7]. HCV genotype 4 has been reported to be the most common in Republic of Congo [1]. Further studies are needed in this country to assess the impact of HCV genotype in co-infected people. It was reported that a successful response to ART among HIV-HCV patients was associated with a better control of HCV infection, encompassing a long-term reduction in HCV RNA levels [3]. Although early initiation of ART can reduce the rate of liver disease progression, HCV eradication by optimal HCV treatment remains the most effective strategy in decreasing HCV-related deaths in co-infected individuals [6].

Conclusions

This study displays, for the first time, HCV-HIV co-infection among blood donors in Republic of Congo and the impact of HIV on HCV viral load in newly discovered and asymptomatic co-infected patients. The outcome of HCV infection in HIV-positive individuals should be further investigated in Congo.

References
1. Cantaloube JF, Gallian P, Bokilo A, Jordier F, Biagini P, Attoui H, Chiaroni J, de Micco P (2010) Analysis of hepatitis C virus strains circulating in Republic of the Congo. J Med Virol 82 Suppl 4: 562-567.
2. UNAIDS. HIV and AIDS estimates (2012). Available: http://www.unaids.org/en/regions countries/countries/congo/. Accessed 25 January 2014.
3. Hernandez MD, Sherman KE (2011) HIV/hepatitis C coinfection natural history and disease progression. Curr Opin HIV AIDS 6: 478-482.
4. Lavanchy D (2009) The global burden of hepatitis C. Liver Int 29 Suppl 1: 74-81.
5. Zeremski M, Martinez AD, Talal AH (2014) Management of Hepatitis C Virus in HIV-Infected Patients in the Era of Direct-Acting Antivirals. Clin Infect Dis [Epub ahead of print].
6. Taylor LE, Swan T, Mayer KH (2012) HIV coinfection with hepatitis C virus: evolving epidemiology and treatment paradigms. Clin Infect Dis 55 Suppl 1: S33-42.
7. Rockstroh JK, Peters L, Grint D, Soriano V, Reiss P, Monforte Ad, Beniowski M, Losso MH, Kirk O, Kupfer B, Mocroft A (2013) Does hepatitis C viremia or genotype predict the risk of mortality in individuals co-infected with HIV? J Hepatol 59 Suppl 2: 213-220.
8. Bossali F, Taty-taty R, Houssissa P, N'suele W, Lingouala LG, Ontsira-Obengui EN (2012) Seroprevalence of co-infections: HBV-HCV-HIV in women delivering at the Adolphe Sicé maternity in 2010. J Afr Hépatol Gastroentérol 6: 315-319.
9. Ocama P, Seremba E (2011) Management of HIV and hepatitis C virus infections in resource-limited settings. Curr Opin HIV AIDS 6 Suppl 6: 539-545.

10. Ladep NG, Agaba PA, Agbaji O, Muazu A, Ugoagwu P, Imade G, Cooke G, McCormack S, Taylor-Robinson SD, Idoko J, Kanki P (2013) Rates and impact of hepatitis on human immunodeficiency virus infection in a large African cohort. World J Gastroenterol 19 Suppl 10: 1602-1610.

11. Sagoe KW, Agyei AA, Ziga F, Lartey M, Adiku TK, Seshi M, Arens MQ, Mingle JA (2012) Prevalence and impact of hepatitis B and C virus co-infections in antiretroviral treatment naïve patients with HIV infection at a major treatment center in Ghana. J Med Virol 84 Suppl 1: 6-10.

12. Zeba Zeba MT, Karou SD, Sagna T, Djigma F, Bisseye C, Ouermi D, Pietra V, Pignatelli S, Gnoula C, Sia JD, Moret R, Nikiema JB,Simpore J (2011) HCV prevalence and co-infection with HIV among pregnant women in Saint Camille Medical Centre, Ouagadougou. Trop Med Int Health 16 Suppl 11: 1392-1396.

13. Jobarteh M, Malfroy M, Peterson I, Jeng A, Sarge-Njie R, Alabi A, Peterson K, Cotten M, Hall A, Rowland-Jones S, Whittle H, Tedder R, Jaye A, Mendy M (2010) Seroprevalence of hepatitis B and C virus in HIV-1 and HIV-2 infected Gambians. Virol J 7: 230.

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