Hepatitis C virus and human immunodeficiency virus transmission routes: Differences and similarities

Francesca Cainelli

Francesca Cainelli, Department of Internal Medicine, School of Medicine, Faculty of Health Sciences, University of Botswana, Private Bag 00713, Gaborone, Botswana

Author contributions: Cainelli F wrote the paper.

Correspondence to: Dr. Francesca Cainelli, MD, Department of Internal Medicine, School of Medicine, Faculty of Health Sciences, University of Botswana, 4775 Notwane Rd, Private Bag 00713, Gaborone, Botswana. francescacainelli@yahoo.it

Telephone: +267-35-54563 Fax: +267-31-05979

Received: March 24, 2013 Revised: April 21, 2013
Accepted: May 7, 2013

Abstract

Bouare et al found that hepatitis C virus (HCV) infection in Malian women is mainly transmitted through medical procedures with contaminated supplies, and that human immunodeficiency virus (HIV) transmission is predominantly sexual. The results of this study confirm those of a recent case-control study in New York and Oregon which demonstrated that health-care exposures represent an important source of new HCV infections in United States. HCV seroprevalence was only 0.2% in pregnant, young Malian women, indicating that hygiene improved in healthcare facilities over time. Heterosexual transmission of HCV is exceptional, and can occur, from males to females, in extremely rare occasions in case of vaginal mucosal damage or less rarely through anal intercourse. Transmission by needle-stick injury occurs in 0.9%-2.2% of exposures from HCV-infected subjects and in 0.1%-0.3% of exposures from HIV-infected individuals; therefore HCV is more transmissible through percutaneous exposure.

Core tip: The results of a number of studies have shown that hepatitis C virus (HCV) infection is mainly transmitted through medical procedures with contaminated supplies, whereas human immunodeficiency virus (HIV) transmission is predominantly sexual. Heterosexual transmission of HCV is exceptional and can occur, from males to females, in extremely rare occasions in case of vaginal mucosal damage or less rarely through anal intercourse. Transmission by needle-stick injury occurs in 0.9%-2.2% of exposures from HCV-infected subjects and in 0.1%-0.3% of exposures from HIV-infected individuals; therefore HCV is more transmissible through percutaneous exposure.

© 2013 Baishideng. All rights reserved.

Key words: Hepatitis C virus; Human immunodeficiency virus; Transmission; Sub-Saharan Africa; Pregnant women

COMMENTARY ON HOT TOPICS

Bouare et al, studying 1000 pregnant women in six reference health centers, and 231 older women who attended general practice in two hospitals in Mali, found that hepatitis C virus (HCV) infection is mainly transmitted through medical procedures with contaminated supplies rather than through blood transfusion, whereas human immunodeficiency virus (HIV) transmission is predominantly sexual.

The results of this study confirm those of a very recent case-control study done in three health departments that performed enhanced viral hepatitis surveillance in New York and Oregon and included reported cases of symptomatic acute hepatitis B and hepatitis C...
occurring in persons ≥ 55 years of age from 2006 to 2008; healthcare exposures were found to represent an important source of new HBV and HCV infections in United States[6]. Many other studies also found the same in different countries[7-9]. It is reassuring that HCV seroprevalence was only 0.2% in pregnant (young) Malian women[10], possibly indicating that hygiene improved in healthcare facilities over time. The results also confirm that heterosexual transmission of HCV is exceptional[6,10]. Indeed heterosexual transmission of HCV from males to females can occur in extremely rare occasions in case of vaginal mucosal damage[11,12] or less rarely through anal intercourse[13,14].

What about HIV? The Malian study did not show an association between HIV infection and hospitalization, transfusion, tattoo, dental care. A significant decrease of HIV seroprevalence was detected in young women who used condoms for contraception more than for other purposes, whereas surprisingly HIV seroprevalence was significantly increased in young women using condoms mainly to prevent sexual infections[11]. The authors interpreted these findings as suggestive of awareness of transmission and prevention of HIV infection only after contamination. However knowledge of vaginal sex as an HIV transmission risk and condom use as an HIV prevention strategy were associated with a higher likelihood of HIV infection in Mozambique and elsewhere in sub-Saharan Africa[14], inconsistent condom use was not related to the probability of HIV transmission per coital act in a study of Ugandan HIV discordant couples[15], and condom use was not negatively associated with incident HIV infection in a large study conducted in Benin, Ghana, India, Nigeria, and South Africa[16]. At least the latter of these surprising findings are likely to derive from the inaccuracy of self-reported data[17].

Transmission by needle-stick injury occurs in 0.9%-2.2% of exposures from HIV-infected individuals[18,19] and in 0.1%-0.3% of exposures from HIV-infected individuals[20]; therefore HCV is more transmissible through percutaneous exposure. It has not been definitively established why HCV is much less transmissible than HIV by heterosexual contact, and more infectious through parenteral exposure. Although low infectivity of HCV by vaginal intercourse has been related to low titres in genital secretions, titres of free HIV are also low. It may be that as infection of tissue dendritic DC-SIGN(+)-DC cells and localised replication in cervico-vaginal tissues are of fundamental importance for HIV infection of exposed individuals[21], the lack of target cells in the genital tract may prevent infection by HCV through vaginal intercourse.

REFERENCES

1 Bouare N, Gothot A, Delwaide J, Bontems S, Vaira D, Seidel L, Gerard P, Gerard C. Epidemiological profiles of human immunodeficiency virus and hepatitis C virus infections in Malian women: Risk factors and relevance of disparities. World J Hepatol 2013; 5: 196-205 [DOI: 10.4254/wjh.v5.i4.196]

2 Perz JF, Grytdal S, Beck S, Firetaneu AM, Poissant T, Rizzo E, Bornschlegel K, Thomas A, Balter S, Miller J, Klevens RM, Finelli L. Case-control study of hepatitis B and hepatitis C in older adults: Do healthcare exposures contribute to burden of new infections? Hepatology 2013; 57: 917-924 [PMID: 23280786 DOI: 10.1002/hep.26588]

3 Baha W, Foulouis A, Dersi N, They-They TP, Alaoaou KE, Nourichai N, Oukakhe B, Lazzar F, Benjelloun S, Ennaji MM, Elmajki A, Midal H, Bennani A. Prevalence and risk factors of hepatitis B and C virus infections among the general population and blood donors in Morocco. BMC Public Health 2013; 13: 50 [PMID: 23339190 DOI: 10.1186/1471-2458-13-50]

4 Spada E, Mele A, Mariano A, Zuccaro O, Tosti ME. Risk factors for and incidence of acute hepatitis C after the achievement of blood supply safety in Italy: results from the national surveillance system. J Med Virol 2013; 85: 433-440 [PMID: 23280786 DOI: 10.1002/jmv.23485]

5 Flisiak R, Halota W, Horban A, Juszczak J, Pawlowska M, Simon K. Prevalence and risk factors of HCV infection in Poland. Eur J Gastroenterol Hepatol 2011; 23: 1213-1217 [PMID: 22002200 DOI: 10.1097/MEG.0b013e3283d178c]

6 Kim JY, Won JE, Jeong SH, Park SJ, Hwang SG, Kang SK, Bae SH, Kim YS, Lee HC. Acute hepatitis C virus in Korea: different modes of infection, high rate of spontaneous recovery, and low rate of seroconversion. J Med Virol 2011; 83: 1195-1202 [PMID: 21567423 DOI: 10.1002/jmv.22100]

7 Terrault NA, Dodge JL, Murphy EL, Tavis JF, Kiss A, Levin TR, Gish RG, Busch MP, Reingold AL, Alter MJ. Sexual transmission of hepatitis C virus among monogamous heterosexual couples: the HCV partners study. Hepatology 2013; 57: 881-889 [PMID: 23175457 DOI: 10.1002/hep.26164]

8 Ndong-Atome GR, Njoum R, Padilla C, Bisigou U, Makuwa M, Kazanji M. Absence of intrafamilial transmission of hepatitis C virus and low risk for sexual transmission in rural central Africa indicate a cohort effect. J Clin Virol 2009; 45: 349-353 [PMID: 19473878 DOI: 10.1016/j.jcv.2009.04.017]

9 Hajiani E, Masjedianzadeh R, Hashemi J, Azmi M, Rajabi T. Hepatitis C virus transmission and its risk factors within families of patients infected with hepatitis C virus in southern Iran: Khuzestan. World J Gastroenterol 2006; 12: 7052-7058 [PMID: 17109499]

10 Vandelli C, Renzo F, Romano L, Tismanetzky S, De Palma M, Stroffolini T, Ventura E, Zanetti A. Lack of evidence of sexual transmission of hepatitis C virus among monogamous couples: results of a 10-year prospective follow-up study. Am J Gastroenterol 2004; 99: 855-859 [PMID: 15128530 DOI: 10.1111/j.1572-0241.2004.01450.x]

11 Quer J, Murillo P, Esteban J, Martell M, Esteban R, Guardia J. Sexual transmission of hepatitis C virus from a patient with chronic disease to his sex partner after removal of an intrauterine device. Sex Transm Dis 2003; 30: 470-471 [PMID: 12916140]

12 Healey CJ, Smith DB, Walker JL, Holmes EC, Fleming KA, Chapman RW, Simmonds P. Acute hepatitis C infection after sexual exposure. Gut 1995; 36: 148-150 [PMID: 7690221 DOI: 10.1136/gut.36.1.148]

13 Halfon P, Riflet H, Renou C, Quentin Y, Cacoub P. Molecular evidence of male-to-female sexual transmission of hepatitis C virus after vaginal and anal intercourse. J Clin Microbiol 2001; 39: 1204-1206 [PMID: 11230462 DOI: 10.1128/JCM.39.3.1204-1206.2001]

14 Brewer DD. Knowledge of blood-borne transmission risk is inversely associated with HIV infection in sub-Saharan Africa. J Infect Dis 2011; 5: 182-198 [PMID: 21444987 DOI: 10.3855/jidc.1308]

15 Waver MJ, Gray RH, Sewankambo NK, Serwadda D, Li X, Laeyendecker O, Kiwanuka N, Kigozi G, Kiddugavu M, Lutalo T, Naugada F, Waawire-Mangen F, Meehan MP, Quinn TC. Rates of HIV-1 transmission per coital act, by different modes of infection, high rate of spontaneous recovery, and low rate of seroconversion.

16 Healey CJ, Smith DB, Walker JL, Holmes EC, Fleming KA, Chapman RW, Simmonds P. Acute hepatitis C infection after sexual exposure. Gut 1995; 36: 148-150 [PMID: 7690221 DOI: 10.1136/gut.36.1.148]

17 Halfon P, Riflet H, Renou C, Quentin Y, Cacoub P. Molecular evidence of male-to-female sexual transmission of hepatitis C virus after vaginal and anal intercourse. J Clin Microbiol 2001; 39: 1204-1206 [PMID: 11230462DOI: 10.1128/JCM.39.3.1204-1206.2001]

18 Brewer DD. Knowledge of blood-borne transmission risk is inversely associated with HIV infection in sub-Saharan Africa. J Infect Dis 2011; 5: 182-198 [PMID: 21444987 DOI: 10.3855/jidc.1308]

19 Waver MJ, Gray RH, Sewankambo NK, Serwadda D, Li X, Laeyendecker O, Kiwanuka N, Kigozi G, Kiddugavu M, Lutalo T, Naugada F, Waawire-Mangen F, Meehan MP, Quinn TC. Rates of HIV-1 transmission per coital act, by stage of HIV-1 infection, in Rakai, Uganda. J Infect Dis 2005; 191: 1403-1409 [PMID: 15809897 DOI: 10.1086/429411]
Feldblum PJ, Lie CC, Weaver MA, Van Damme L, Halpern V, Adeiga A, Bakare R, Schwartz J, Becker M, Solomon S. Baseline factors associated with incident HIV and STI in four microbicide trials. Sex Transm Dis 2010; 37: 594-601 [PMID: 20879087 DOI: 10.1097/OLQ.0b013e3181e156b]

Turner AN, De Kock AE, Meehan-Ritter A, Blanchard K, Sebola MH, Hoosen AA, Coetzee N, Ellertson C. Many vaginal microbicide trial participants acknowledged they had misreported sensitive sexual behavior in face-to-face interviews. J Clin Epidemiol 2009; 62: 759-765 [PMID: 19013762]

Ryoo SM, Kim WY, Kim W, Lim KS, Lee CC, Woo JH. Transmission of hepatitis C virus by occupational percutaneous injuries in South Korea. J Formos Med Assoc 2012; 111: 113-117 [PMID: 22370291 DOI: 10.1016/j.jfma.2011.05.005]

Tomkins SE, Elford J, Nichols T, Aston J, Cliffe SJ, Roy K, Grime P, Ncube FM. Occupational transmission of hepatitis C in healthcare workers and factors associated with seroconversion: UK surveillance data. J Viral Hepat 2012; 19: 199-204 [PMID: 22329374 DOI: 10.1111/j.1365-2890.2011.01543.x]

Ippolito G, Puro V, De Carli G. The risk of occupational human immunodeficiency virus infection in health care workers. Italian Multicenter Study. The Italian Study Group on Occupational Risk of HIV infection. Arch Intern Med 1993; 153: 1451-1458 [PMID: 8512436 DOI: 10.1001/archinte.1993]

van den Berg LM, Geijtenbeek TB. Antiviral immune responses by human langerhans cells and dendritic cells in HIV-1 infection. Adv Exp Med Biol 2013; 762: 45-70 [PMID: 22975871 DOI: 10.1007/978-1-4614-4433-6_2]