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High hepatitis C virus (HCV) prevalence among men who have sex with men (MSM) in Vietnam and associated risk factors: 2010 Vietnam Integrated Behavioural and Biologic Cross-Sectional Survey

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Abstract

Background—Hepatitis C virus (HCV) is an increasing health issue among key populations such as men who have sex with men (MSM). We sought to assess the burden of and risk factors for HCV among MSM in Vietnam.

Methods—We analysed behavioural and demographic data and stored specimens from MSM surveyed in four provinces through Vietnam's 2009–2010 Integrated Biologic and Behavioural Survey, which used probability-based, respondent-driven sampling. Commercial hepatitis B surface antigen (HBsAg) and HCV/antibody (HCV Ag/Ab) testing were performed on archived sera with follow-up PCR for HCV RNA and genotype determination.

Results—Among the 1588 MSM surveyed, the median (range) frequency, by province, of HCV Ag/Ab detection was 28.4% (13.7%–38.8%); 84.5% (83.1%–100%) among HIV-infected and 21.9% (8.9%–28.2%) among HIV-uninfected. HCV prevalence was higher in northern Hanoi and Hai Phong provinces than in southern Ho Chi Minh City and Chan Tho provinces. Among a convenience sample of 67 HCV Ag/Ab+ MSM, 67.2% were HCV RNA +; of 41 genotyped, 73.2% were genotype 1. HBsAg prevalence varied from 8.5% to 27.4%. In the multivariable

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logistic regression analysis, being HIV-infected (adjusted OR (aOR) 19.0; 7.0–51.9), ever having used injected drugs (aOR 4.4; 1.6–12.4) and age >25 years were significant risk factors for testing HCV Ag/Ab+.

Conclusions—HCV infection in Vietnam appears to be high among MSM, particularly among HIV-infected MSM, with a north–south gradient. Given overlapping risk behaviours and associations between HCV and HIV, integrating HIV and HCV programme services to prevent both HIV and HCV transmission among MSM is indicated.

BACKGROUND

Hepatitis C virus (HCV) infection is a global public health concern; the majority (~75%) of those infected progress to chronic infection.[1] An estimated 130–150 million people worldwide live with chronic HCV infection, resulting in 350 000 deaths annually from HCV-related liver disease (eg, cirrhosis) or cancer.[2] Similar to HIV, HCV is spread via blood, parenteral or percutaneous exposure. Key populations at risk for HCV include primarily people who inject or injected drugs (PWID) and, to a lesser extent, those exposed to contaminated blood products (eg, blood transfusion recipients, exposed to unsafe injections).[3 4] While in many settings HCV transmission is driven largely by past or current injection drug use, some studies indicate rising HCV incidence and prevalence among men who have sex with men (MSM) that may be related to sexual practices.[3 5 6]

In Vietnam, the morbidity and mortality of liver-related disease is significant; liver cancer is now the fourth leading cause of mortality, resulting in >500 000 years of premature years of life lost annually.[7] Much of this burden is attributed to the estimated 8%–12% population prevalence of hepatitis B virus (HBV) and up to 26.7% of liver cancer attributed to HCV infection.[7 8] Higher rates of HCV and HBV infection are reported among PWID and people living with HIV (PLHIV).[7 9] In one study, an estimated 39.6% (95% CI 34.8% to 44.3%) of those PLHIV receiving HIV treatment tested anti-HCV+.[10]

Among a representative sample of male PWID sampled in the Vietnam 2009–2010 Integrated Biologic and Behavioural Survey (IBBS), median prevalence of combination HCV antigen/antibody (HCV Ag/Ab) was 53.8%; both HCV Ag/Ab detection and current HBV infection strongly associated with HIV coinfection.[9] latter findings are particularly important to HIV care and treatment programmes given comorbidity associated with chronic HBV coinfections even in the era of highly effective HIV-suppressive antiretroviral therapy (ART). [11 12] Tenofovir-containing ART may ameliorate some HBV-related morbidity and mortality if accessed early in the course of liver disease, but highly effective, direct-acting antiviral agents to treat HCV are not available in Vietnam and access to costly HCV genotyping to direct therapy remains limited.

Globally, MSM are reported to be at increased risk for HCV and HBV infections, but corresponding data from Vietnam are limited.[13] High rates of behaviours that increase risk for HIV, HCV and HBV infection have been reported Vietnamese MSM, including injection and non-injection drug use, multiple concurrent partners and unprotected anal intercourse.[14 15] To date, no data on the prevalence and profile of HCV or HBV among MSM in Vietnam have been published.

The primary purpose of this analysis address the data gap by determining rates of past or current HCV and HBV infections among MSM in Vietnam and profiling key associated risk factors for these infections. We also sought to obtain preliminary information on rates and genotypes of current HCV infection among MSM exposed to HCV.

METHODS

Survey

Data from the 2009 to 2010 IBBS were used for this analysis. A detailed description of the methodology has been described previously.[9] Briefly, a representative sample of MSM was surveyed during September 2009–February 2010 for HIV infection along with associated risk behaviours (eg, condom use, needle-sharing) and exposure to HIV/AIDS prevention and care services. Specifically, MSM aged ≥16 years were sampled across four provinces (Hanoi, Da Nang, Ho Chi Minh City (HCMC), Can Tho) by using respondent-driven sampling (RDS) as described in previous reports.[16 17] RDS is a modified chain-referral sampling methodology that is designed to sample hard-to-reach or marginalised populations and to approximate probability sampling. RDS employs the use of a limited number of well-networked and representative recruits (‘seeds’) to refer their known peers who in turn refer additional ‘waves’ of known peers until the defined sample size is reached.

MSM were defined as individuals who self-reported having had oral or anal sex with another man during the last 12 months.

Trained staff used structured questionnaires to query individual participants about sexual practices, drug use and exposure to key HIV services. Blood samples were collected for HIV testing and remnant samples were stored at −70°C at the National Institute of Hygiene and Epidemiology (NIHE) for future testing. Participants were provided coupons and encouraged to return to obtain the HIV test results. All participants were compensated for their time and travel expenses with a small monetary award provided for successfully recruiting peers.

Laboratory

Laboratory and diagnostic methods have been described in detail previously.[8] In summary, stored specimens from MSM surveyed underwent HCV Ag/Ab (Murex HCV Ag/Ab Combination, DiaSorin, Italy) and hepatitis B surface antigen (HBsAg) (Murex HBsAg V.3, DiaSorin) testing.[18] A non-random selection of the HCV Ag/Ab+ specimens from MSM and, for comparison, from PWID specimens from the same survey[9] underwent in-house real-time quantitative PCR for HCV RNA followed by 5′ untranslated region (UTR) sequencing of HCV RNA+ specimens. HCV genotyping was performed by amplification of the 5′ UTR fragment (nt 70–300) followed by Sanger sequencing and phylogenetic analysis in the presence of relevant reference strains collected from GenBank.

HIV status was determined using Genscreen HIV Ultra HIV Ag/Ab (Bio-Rad) to screen for antibodies to HIV; HIV-seropositive specimens were confirmed by using Determine HIV ½ (Alere) and Murex HIV Ag/Ab Combination (DiaSorin). Serologic testing was performed at the National Reference Laboratory on HIV at NIHE in Hanoi. HCV and HBV genotyping

and quality assurance testing were performed by the U.S. Centers for Disease Control and Prevention in Atlanta, Georgia.

Classification of HCV and HBV infection status

Specimens testing HCV Ag/Ab+ were reported as cases of past or current HCV infection. Among HCV Ag/Ab+ specimens tested for HCV RNA, those with detectable RNA were classified as current HCV infection. Specimens testing HBsAg+ represented current HBV infection (without discrimination between chronic and acute). Absence of HBsAg with detectable anti-HBc (HBsAg−/anti-HBc+) indicated previous HBV exposure without current infection.

Statistical analysis

For each province, RDS-adjusted point estimates and frequencies with 95% CIs were derived using the RDS Analyst software;[19] the median and range of those provincial point estimates are reported. Provincial MSM network sizes and estimated population sizes were used for weighting the estimates during RDS analysis using the successive sampling estimator.[20] The mid-range estimate of published population sizes was used to generate the estimated population size for each province.[21] For bivariable and multivariable risk factor analysis, data were pooled across provinces and weighted ORs and 95% CI were calculated (STATA V.12.0) (StataCorp, Stata Statistical Software, Release V.12, 2011) by logistic regression to identify factors associated with HCV status. Analysis weights were generated in RDS Analyst for each individual and then exported to STATA for analyses.

All independent variables indicating an association with HCV status ($p \leq 0.20$) in the bivariate analysis were entered into a multivariable logistic regression model using backward stepwise selection and the Wald test after estimation to identify the most parsimonious model (eg, covariate with $p \leq 0.05$).

RESULTS

Population characteristics and risk behaviours

A total of 1588 MSM were included in the 2009–2010 IBBS. The median point estimate for age (range) across provinces was 26.8 (24.5–30.7) years (table 1). With the exception of HCMC, the majority of enrolees in each province had at least a high-school-level education. A median of 67.5% of enrolees self-reported their sexual orientation to that of secretly MSM and outwardly expressing themselves with a masculine, rather than feminine, appearance; 3.7% reported themselves to be ‘openly’ gay; and 28.1% self-identified as a ‘straight’ man. A median of 82.1% (55.9%–88.6%) reported having had sex with a man in the past one month, and 57.2% (51.7%–72.4%) indicated that they used a condom during their last sexual encounter with a casual male partner. The median estimates for having ever used illegal drugs were 19.1% (9.8%–28.3%) and 5.7% (2.4%–6.4%) reported ever injecting drugs overall. The median for reporting having had sexual relations with a female sex worker in the past 12 months was 26.9%. A range of 9.3%–49.0% of MSM reported having had sex with a man for money in the past month. With the exception of HCMC, the

majority of respondents who had been previously tested for HIV reported getting tested at a ‘stand-alone’ voluntary counselling and testing centre.

HCV, HBV and HIV seroprevalence

Among those enrolled in the survey, 1520 (95.7%) were tested for HCV Ag/Ab; 396 tested HCV Ag/Ab+. The median HCV Ag/Ab+ prevalence across the four provinces sampled was 28.4%; prevalence was highest in Hai Phong (38.8%) and lowest in Can Tho (13.7%) (table 2). A median (range) of 12.4% (8.5%–27.4%) tested HBsAg+. Among those testing HBsAg−, a median of 55.1% (49.1%–61.2%) tested anti-HBc+. A median of 14.9% (6.4%–20.2%) of MSM tested positive for HIV infection. Among HIV-infected MSM, a median of 84.5% (83.1%–100%) tested HCV Ag/Ab+; 17.2% (15.2%–48.5%) of HIV-infected MSM also tested HBsAg+. In a subpopulation analysis of HIV-negative, non-injection drug users, the overall HCVAg/Ab+ prevalence was 20.8% (95% CI 16.5% to 25.0%).

HCV RNA and genotype analysis

Among the 396 MSM who tested HCV Ag/Ab+, a convenience sample of 67 (16.9%) was further analysed for HCV infection status and genotype. The majority (67.2%) were HCV RNA+. The vast majority of the 41 specimens sequenced were genotype (gt) 1 (73.2%) or gt6 (24.4%) (table 3).

The profile of combined MSM and PWID genotypes appeared to vary by geography, with gt1 more common in the southern than the northern provinces (78.8% vs 69.2%); gt3 (6.9% vs 0.0%) and gt6 (23.1% vs 18.8%) were more common in the northern provinces than in the southern provinces. Statistical comparison analyses were not performed because of the non-random sampling for genotyping (see online supplementary table A).

Factors associated with HCV Ag/Ab prevalence

The median provincial HCV Ag/Ab prevalence among HIV-infected MSM (84.5%) was nearly four times that of the HIV-uninfected MSM (21.9%). In the bivariate analysis, being HCV Ag/Ab+ was positively associated with older age (ie, >20 years old), ever being married to a woman (OR 2.1; 95% CI 1.2 to 3.7), ever used (OR 2.0; 95% CI 1.2 to 3.2) or injected (OR 5.0; 95% CI 1.9 to 12.7) illicit drugs, testing HBsAg+ (OR 1.8; 95% CI 1.0 to 3.0) and being infected with HIV (OR 19.9; 95% CI 7.3 to 54.0).

Multivariable analysis of all MSM surveyed (table 4) identified that HIV-infected status was the most significant factor associated with an HCV Ag/Ab+ status; HIV-infected MSM had 19.0 (95% CI 7.0 to 51.9) times greater odds of testing HCV Ag/Ab+ than HIV-uninfected MSM. Also significant was the association between testing HCV Ag/Ab+ and having ever injected drugs (adjusted OR (aOR) 4.4; 95% CI 1.6 to 12.4). Being between 25 and 30 years of age (aOR 6.1; 95% CI 2.5 to 15.1) and >30 years (aOR 2.1; 95% CI 1.0 to 4.7) also had higher odds for testing HCV Ag/Ab+ relative to those <20 years of age. Additionally, MSM in Can Tho appeared to have lower relative odds for testing HCV Ag/Ab+ compared with Hanoi and Hai Phong.

In an univariable analysis of a subpopulation of individuals without self-reported injection drug use history (see online supplementary table B), increasing age, testing HBsAg+ (OR 2.1; 95% CI 1.2 to 3.6), ever married to a women (OR 2.0; 95% CI 1.1 to 3.7) and being infected with HIV (OR 17.2; 95% CI 6.2 to 47.3) were significantly associated with an HCV Ag/Ab+ status.

DISCUSSION

This analysis provides previously unavailable data on HCV burden among MSM in Vietnam and the associated risk factors. The prevalence of HCV Ag/Ab+ among MSM is higher than available estimates among the general population. This appears to be largely associated with being infected with HIV, ever having injected illicit injection drugs and older age. Results from a sample of enrolees testing HCV Ag/Ab+ indicate that the majority of these individuals were currently infected with HCV, increasing the potential for transmission to others and for chronic infection with the associated risk of liver damage, cirrhosis, liver failure and liver cancer. This analysis also highlights that the risk of HCV is not limited to these risk factors given that an estimated one out of five HIV-uninfected, non-injection drug users were HCV Ag/Ab+, which may indicate sexual transmission of HCV in Vietnam that may be supported by the findings that a high proportion of enrolled MSM reported recently having sex with a man for money or with a female sex worker, respectively. High rates of previous or current illicit drug use among these MSM are consistent with recent studies among MSM in select locations in Vietnam.[14 15]

Our findings also indicate that the MSM population surveyed is ‘hidden’ as the vast majority reported to be secretly practising MSM behaviour or identified themselves as a ‘straight’ man. The finding that in the subanalysis of HIV-infected MSM reporting ‘no anal sex in the past 12 months’ was highly associated with a HCV Ag/Ab+ result may indicate a reluctance to accurately report risk behaviours among this specific population. Almost half of those surveyed reported to have had sex with a woman in the past year, even as >80% had sex with a man in the past month. This is likely due to societal pressures to conform to masculine norms and the limited understanding and acceptance of MSM practices in Vietnamese society. This stigmatising context may force MSM to engage in high-risk behaviours (eg, inconsistent condom use, commercial sex) and limit uptake of harm-reduction services, putting them and their sexual partners at increased risk for HCV, HBV and HIV.[22]

There are limited data on HCV prevalence among MSM in the region. In China, estimates from select locations reported an HCV Ag/Ab+ prevalence among MSM to be 1.9%[23] and between 4.0% and 30.4% among HIV-infected MSM.[24] A survey among MSM in Indonesia reported an HCV prevalence of 28.0%.[25] Consistent with other global findings, HCV Ag/Ab+ prevalence was higher among HIV-infected MSM compared with HIV-uninfected MSM in this survey.[5 26] Understanding the overlap between HIV and HCV is important because, compared with those HIV-uninfected, PLHIV coinfected with HCV are more likely to develop chronic HCV infection and related liver disease; in addition, there are often higher HCV viral loads in the semen of HIV-infected individuals, increasing the risk of HCV transmission.[27 28]

This analysis also provides insight into the risk of HCV among HIV-uninfected MSM in Vietnam, which is also substantially higher than that reported among the general Vietnamese population.[7] HCV Ag/Ab detection was strongly associated with reporting illicit and injection drug use. HCV infection among HIV-uninfected MSM was also associated with increasing age, which may be a result of additive risk behaviours over time.

Although the findings of the genotype testing should be interpreted with caution due to the convenience sampling and small sample size, it provides unique detail on the genotypic profile of HCV among MSM in Vietnam. These data suggest that HCV gt1 and gt6 predominate in key populations, but other genotypes circulate and geographic or risk population differences in genotype distribution may exist. The relatively lower levels of HCV and absence of gt3 among MSM in Can Tho province in southern Vietnam may indicate moderate introduction of that strain to PWID via the northern drug smuggling routes but not yet into the MSM networks in the more southern regions of the country. Improved understanding of HCV gt distribution among different risk groups is critical to developing national treatment strategies to cure and to reduce HCV transmission.

The high HBV prevalence noted among many MSM surveyed, exceeding estimates of the general population prevalence, also highlights the need for HBV testing, prevention and intervention for MSM to reduce liver-related morbidity and mortality.

LIMITATIONS

There are at least several limitations that might impact the validity and generalisability of these findings. First, the cross-sectional design of this survey limits the ability to identify causal relationships between factors reported and HCV infection. Second, in addition to potential biases associated with self-reported behaviours, this survey did not collect in-depth data on sexual behaviours such as type of anal sex (eg, fisting, use of sex toys, HIV status of sexual partner(s)) that might increase risk of HCV and HBV infection and transmission. A third limitation is that the sampling frame for this survey was not designed to be nationally representative, potentially limiting the generalisability of the findings nationally; particularly the results of the genotypic analysis given that the testing was taken from a convenience sample of specimens. These findings may also be affected by the fact that, due to limited specimen availability, no HIV-infected specimens from Hanoi were tested for HCV, which may have resulted in an underestimation of the HCV prevalence there given the apparent positive association between HCV and HIV.

CONCLUSIONS

Over the past decade, increased attention and resources have been allocated to addressing the HIV epidemic in Vietnam with considerably less emphasis on the HCV and HBV response. This analysis provides previously unavailable information about the high burden of HCV (and HBV) among MSM in Vietnam and can be used to advocate for additional focus on the HCV epidemic and its overlap with HIV. An estimated 275 000–375 000 adult males[21] in Vietnam have practised same-sex behaviour in the last year and may be at increased risk for acquiring and transmitting HCV and HBV.

The overlap of HCV and HBV infection and exposure with HIV risk behaviours (eg, injection drug use, unsafe sexual practices) and infection suggests that integrating HCV and HBV surveillance and services into HIV programmes might realise efficiencies and increase overall impact to prevent HIV, HCV and HBV transmission among MSM and reduce morbidity. These findings support the need for HCV and HBV screening and appropriate treatment among MSM, particularly those with HIV or injecting drug use (IDU) behaviour. Prevention interventions to promote safe sex practices (eg, condom use), harm reduction for MSM who use drugs (eg, needle and syringe exchange, opioid substitution therapy) and education related to HCV, HIV and HBV are also indicated.[29] Given that only 26% of MSM in this survey reported having had an HIV test, HIV testing and counselling in MSM-friendly settings, or even self-testing, may offer an opportunity to provide HCV education and screening, particularly for MSM found to be HIV-infected or reporting a history of IDU.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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REFERENCES

1. Mauss S, Berg T, Rockstroh J, et al. The short guide to Hepatitis C. 2013 edn. Flying Publisher, 2013.
2. Lozano R, Naghavi M, Foreman K, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet 2012;380:2095–128. [PubMed: 23245604]
3. Gorgos L Sexual transmission of viral hepatitis. Infect Dis Clin North Am 2013;27:811–36. [PubMed: 24275272]
4. Karch DL, Chen M, Tang T. Evaluation of The National Human Immunodeficiency Virus Surveillance System for the 2011 diagnosis year. J Public Health Manag Pract 2014;20:598–607. [PubMed: 24253405]
5. Urbanus AT, Van De Laar TJ, Geskus R, et al. Trends in hepatitis C virus infections among MSM attending a sexually transmitted infection clinic; 1995–2010. AIDS 2014;28:781–90. [PubMed: 24832014]
6. Vanhommerig JW, Stolte IG, Lambers FA, et al. Stabilizing Incidence of Hepatitis C virus infection among men who have sex with men in Amsterdam. J Acquir Immune Defic Syndr 2014;66:e111–15. [PubMed: 24853305]
7. Sereno L, Mesquita F, Kato M, et al. Epidemiology, responses, and way forward: the silent epidemic of viral hepatitis and HIV coinfection in Vietnam. J Int Assoc Physicians AIDS Care (Chic) 2012;11:311–20. [PubMed: 22828983]

8. Institute for Health Metrics and Evaluation. Global Burden of Disease Profile: VIETNAM. 2010. http://www.healthdata.org/sites/default/files/files/country_profiles/GBD/ihme_gbd_country_report_vietnam.pdf
9. Nadol P, O'Connor S, Duong H, et al. Findings from Integrated Behavioral and Biologic Survey among Males Who Inject Drugs (MWID)—Vietnam, 2009–2010: evidence of the need for an integrated response to HIV, Hepatitis B virus, and Hepatitis C virus. PLoS ONE 2015;10:e0118304.
10. Nguyen NB, Do NT, Shiraishi RW, et al. Outcomes of Antiretroviral Therapy in Vietnam: results from a national evaluation. PLoS ONE 2013;8:e55750.
11. Wandeler G, Gsponer T, Bihl F, et al. Hepatitis B virus infection is associated with impaired immunological recovery during antiretroviral therapy in the Swiss HIV cohort study. J Infect Dis 2013;208:1454–8. [PubMed: 23901088]
12. Chun HM, Mesner O, Thio CL, et al. HIV outcomes in Hepatitis B virus coinfected individuals on HAART. J Acquir Immune Defic Syndr 2014;66:197–205. [PubMed: 24694929]
13. Nelson PK, Mathers BM, Cowie B, et al. Global epidemiology of hepatitis B and hepatitis C in people who inject drugs: results of systematic reviews. Lancet 2011;378:571–83. [PubMed: 21802134]
14. Yu G, Clatts MC, Goldsamt LA, et al. Substance use among Male sex workers in Vietnam: prevalence, onset, and interactions with sexual risk. Int J Drug Policy 2015;26:516–21. [PubMed: 25488636]
15. Pham QD, Nguyen TV, Nguyen PD, et al. Men who have sex with men in southern Vietnam report high levels of substance use and sexual risk behaviours but underutilise HIV testing services: a cross-sectional study. Sex Transm Infect 2015;91:178–82. [PubMed: 25182158]
16. Vietnam Ministry of Health. Integrated Biological and Behavioral Surveillance (IBBS) in Vietnam-Round II 2009, 2011.
17. Heckathorn DD. Respondent-driven sampling: a new approach to the study of hidden populations. Soc Probl 1997;44:174–99.
18. DiaSorin S.p.A. Technical Assay Details and Performance summary: Murex HBsAg v.3. 2013.
19. Handcock M, Fellows I, Giles K. Deducer RDSAnalyst: Graphical User Interface to the RDS package for Respondent-Driven Sampling. Version 0.1, 2012. http://hpmrg.org
20. Gile KJ, Handcock MS. Respondent-driven sampling: an assessment of current methodology. Sociol Methodol 2010;40:285–327. [PubMed: 22969167]
21. Vietnam Ministry of Health (MOH). Vietnam HIV/AIDS Estimates and Projections. 2012.
22. García MC, Meyer SB, Ward P. Elevated HIV prevalence and risk behaviours among men who have sex with men (MSM) in Vietnam: a systematic review. BMJ Open 2012;2:e001511.
23. An M, Han X, Liu J, et al. [Study on the rates of infection and spontaneous clearance on HCV among HIV-infected men who have sex with men in China]. Zhonghua Liu Xing Bing Xue Za Zhi 2013;34:15–18. [PubMed: 23648242]
24. Hagan H, Neurer J, Jordan AE, et al. . Hepatitis C virus infection among HIV-positive men who have sex with men: protocol for a systematic review and meta-analysis. Syst Rev 2014;3:31. [PubMed: 24669911]
25. Prasetyo AA, Ariapramuda R, Kindi EA, et al. Men having sex with men in Surakarta, Indonesia: demographics, behavioral characteristics and prevalence of blood borne pathogens. Southeast Asian J Trop Med Public Health 2014;45:1032–47. [PubMed: 25417504]
26. Jin F, Prestage GP, Matthews G, et al. Prevalence, incidence and risk factors for hepatitis C in homosexual men: data from two cohorts of HIV-negative and HIV-positive men in Sydney, Australia. Sex Transm Infect 2010;86:25–8. [PubMed: 19841001]
27. Lee M-H, Yang H-I, Yuan Y, L'Italien G, Chen C-J. Epidemiology and natural history of hepatitis C virus infection. World J. Gastroenterol 2014;20:9270–80. [PubMed: 25071320]
28. Joshi D, O'Grady J, Dieterich D, et al. Increasing burden of liver disease in patients with HIV infection. Lancet 2011;377:1198–209. [PubMed: 21459211]
29. World Health Organization. Guidelines for the screening, care and treatment of persons with hepatitis C infection. 2014:124.

Key messages

- The prevalence (28.4%; range 13.7%–38.8%) of hepatitis C virus (HCV) among men who have sex with men (MSM) appears to be higher than the general population in Vietnam.
- The majority of MSM infected with HIV (median: 84.5%) tested positive for current or previous HCV infection.
- Current or previous infection with HCV was associated with being infected with HIV, a reported history of injecting drug use and older age.

Table 1

Demographic characteristics and key risk behaviours of men who have sex with men (MSM) in select provinces in Vietnam, 2009–2010

Province	**Hanoi**	**Hai Phong**	**HCMC**	**Can Tho**	**Median**
Province population (n)	6 844 100	1 904 100	7 681 700	1 214 100	2 028 900
Estimated MSM population size (n)	51 036	7321	57 646	4654	29 179
Sampled MSM (n)	398	399	397	394	
	% (95% CI)	**% (95% CI)**	**% (95% CI)**	**% (95% CI)**	
Age (years) Mean (SD)	25.9 (7.8)	30.7 (8.3)	27.6 (7.8)	24.5 (7.7)	26.8
Education (% (95% CI))					
No formal education	0.7 (0.0 to 1.8)	1 (0 to 2.9)	2.5 (1.2 to 3.9)	1.7 (0 to 3.7)	1.4
Primary	1.9 (0.6 to 3.1)	7.5 (3.9 to 11.0)	18.3 (13.0 to 23.6)	8.9 (1.2 to 16.7)	8.2
Secondary	33 (25.7 to 40.3)	34.9 (28.9 to 40.9)	43.1 (35.6 to 50.5)	28.2 (22.5 to 33.8)	34.0
High school	53.4 (46.6 to 60.2)	32.9 (27.2 to 38.6)	28.8 (22.0 to 35.5)	23.6 (16.2 to 31.0)	30.9
College/university	11 (6.5 to 15.5)	23.7 (18.0 to 29.4)	7.3 (3.4 to 11.2)	37.7 (30.3 to 45.0)	17.4
Ever married to a woman	18.4 (12.7 to 24.0)	20.5 (15.5 to 25.5)	11.4 (6.8 to 16.1)	13.4 (6.3 to 20.6)	15.9
Current living arrangement *					
Alone	20.4 (14.9 to 25.8)	16.9 (11.3 to 22.4)	19.9 (13.7 to 26.0)	13.7 (8.1 to 19.3)	18.4
Male partner	8.4 (4.9 to 12.0)	3.8 (1.3 to 6.2)	4.2 (1.2 to 7.3)	2.4 (1.1 to 3.6)	4.0
With friends	16 (9.6 to 22.3)	14.6 (9.4 to 19.8)	15.1 (9.6 to 20.7)	16.3 (10.7 to 21.9)	15.6
With wife/girlfriend	8.1 (3.3 to 13.0)	4.9 (2.6 to 7.2)	3.4 (1.3 to 5.5)	7 (3.0 to 10.9)	6.0
With family	45 (37.2 to 52.7)	56.8 (50.2 to 63.4)	57.3 (49.6 to 65.0)	59.3 (52.6 to 65.9)	57.1
No fixed address	2.1 (0 to 4.6)	3.1 (0.5 to 5.6)	0.03 (0.00 to 2.5)	0.1 (0 to 0.4)	1.1
Sexual archetype (self-reported) *					
Bong lo’ (openly MSM, feminine appearance)	2.3 (0.0 to 4.8)	6.1 (2.0 to 10.1)	2.2 (0.6 to 3.8)	5 (0.1 to 9.8)	3.7
Bong kin’ (secretly MSM, masculine appearance)	86.3 (81.5 to 91.1)	67.4 (60.9 to 74.0)	67.6 (59.9 to 75.3)	51.1 (43.8 to 58.5)	67.5
Straight man	10.8 (6.9 to 14.8)	25.9 (19.3 to 32.4)	30.2 (22.5 to 37.8)	43.4 (43.4 to 33.7)	28.1
Sexual orientation (self-reported)					
Prefers women to men as partners	14.2 (9.6 to 18.8)	2.1 (0 to 4.2)	21.6 (15.0 to 28.3)	38.6 (31.3 to 45.8)	17.9
Prefers men equally as women	15.1 (10.0 to 20.2)	16.1 (11.0 to 21.1)	15.8 (10.4 to 21.2)	14 (9.8 to 18.2)	15.5
Prefers men to women as partners	70.7 (64.7 to 76.7)	81.8 (76.3 to 87.3)	62.6 (54.8 to 70.4)	47.4 (39.8 to 55.1)	66.7

Province	Hanoi	Hai Phong	HCMC	Can Tho	Median
Had sex with a woman in the past 12 months	47.8 (40.7 to 54.9)	22.3 (17.1 to 27.5)	47.6 (39.9 to 55.3)	50.6 (42 to 59.2)	47.7
Had sex with a man in the past one month	88.6 (83.5 to 93.7)	76.6 (70.5 to 82.7)	87.6 (82.7 to 92.5)	55.9 (49.2 to 62.5)	82.1
Number (median, IQR) of male partners in the past one month (among those sexually active)	2 (1 to 4)	1 (1 to 2)	1 (1 to 2)	2 (1 to 3)	1.5
Sexual position when having sex with another man (past 12 months)					
Primarily or exclusively a giver	19.1 (13.4 to 24.9)	26.6 (21.5 to 31.6)	28.1 (21.6 to 34.6)	34 (27.7 to 40.2)	27.4
Half giver-half receptive	57.2 (49.8 to 64.7)	66.2 (59.9 to 72.5)	36.4 (29.3 to 43.5)	23.2 (18.1 to 28.4)	46.8
Primarily or exclusively receptive	8.6 (3.2 to 14.0)	66.2 (59.9 to 72.5)	14.8 (9.5 to 20.1)	19 (14.1 to 23.9)	16.9
No anal sex	15 (11.8 to 18.2)	1.1 (0.2 to 1.9)	20.7 (29.3 to 43.5)	23.9 (18.0 to 29.7)	17.9
Used condom during *last sex* with MSM casual					
Yes	72.4 (65.8 to 78.9)	51.7 (46.2 to 57.3)	54.7 (46.7 to 62.7)	59.6 (51.3 to 67.9)	57.2
No	27.6 (21.1 to 34.2)	46.3 (40.9 to 51.9)	45.3 (37.3 to 53.3)	39.7 (31.4 to 48.0)	42.5
Don’t remember	–	1.9 (0.4 to 3.4)	–	0.7 (0.0 to 2.2)	1.3
Used condom during *last month* with MSM casual partner (among those responding)					
Always	45.7 (34.6 to 56.7)	53.7 (46.7 to 60.8)	26.7 (15.8 to 37.7)	48.4 (34.1 to 62.6)	47.1
Most of the time	18.2 (8.5 to 28.0)	19.7 (14.2 to 25.3)	5.4 (2.3 to 8.5)	10.6 (7.1 to 14.2)	14.4
Sometimes	15.2 (8.5 to 21.9)	21.2 (15.7 to 26.8)	14.7 (8.1 to 21.4)	12 (4.2 to 19.8)	15.0
Never	20.9 (11.5 to 30.3)	5.3 (2.6 to 8.0)	53.1 (40.4 to 65.9)	29.1 (14.8 to 43.3)	25.0
Had sex with a man in the past one month for money (%)	39.5 (32.5 to 46.6)	9.3 (5.5 to 13.2)	49 (41.2 to 56.8)	23.8 (18.3 to 29.2)	31.7
Paid for anal sex with a man in the past one month for money (%)	4.5 (2.2 to 6.7)	2.1 (0.7 to 3.5)	2.8 (0.5 to 5.0)	2.1 (0.9 to 3.3)	2.5
Ever used illegal drugs	28.3 (22.5 to 34.1)	19.4 (14.1 to 24.6)	18.8 (13.2 to 24.4)	9.8 (5.7 to 13.9)	19.1
Ever *injected* illegal drugs	5.1 (1.5 to 8.7)	2.4 (0.2 to 4.7)	6.3 (2.6 to 10.0)	6.4 (3.4 to 9.5)	5.7
Injected drugs in the last one month	2 (0 to 4.1)	1.8 (0 to 4.0)	2.1 (0.6 to 3.6)	3.8 (1.4 to 6.1)	
Ever shared needles/syringes	4.9 (0 to 12.7 (n=125))	0 ((n=10))	45.1 (16.6 to 73.6 (n=32))	47.7 (21.8 to 71.6 (n=25))	
Had sex with a female sex worker in the past 12 months	26.9 (17.9 to 35.8)	26.8 (14.5 to 39.2)	26.7 (18.2 to 35.2)	37.2 (27.2 to 47.1)	26.9
Had sore, ulcer or unusual discharge in genital area in the past 12 months	5.6 (2.7 to 8.6)	4 (2.2 to 5.7)	7.4 (3.4 to 11.4)	5.6 (3.1 to 8.2)	5.6
Had sore, ulcer or unusual discharge in anal area in the past 12 months	3.4 (0.1 to 6.7)	4.2 (1.4 to 7.1)	3.6 (1.2 to 6.1)	5.3 (2.5 to 8.1)	3.9
Visited STI clinic in the past 12 months	5.8 (2.7 to 8.9)	8.3 (5.6 to 11.0)	24.3 (18.3 to 30.3)	10.6 (6.7 to 14.5)	9.5
Ever tested for HIV, % (95% CI)	29.7 (23.5 to 35.9)	23 (18.0 to 8.0)	18.5 (13.3 to 23.7)	28.7 (21.4 to 36.0)	25.9
HIV testing location					
Preventive medicine centre	1.7 (0 to 4.4)	1.7 (0.7 to 2.7)	17.9 (9.2 to 26.5)	–	1.7

Province	Hanoi	Hai Phong	HCMC	Can Tho	Median
VCT centre	70.7 (59.6 to 81.9)	78.6 (67.7 to 89.9)	23.2 (9.9 to 36.5)	75.1 (62.9 to 87.4)	72.9
Provincial/district hospital	15.4 (7.5 to 23.3)	2.1 (0 to 4.9)	40.1 (21.7 to 58.6)	6 (1.6 to 10.4)	10.7
Drug treatment centre	1.9 (0 to 5.9)	–	2 (0 to 4.0)	–	2.0
Provincial AIDS centre	0.1 (0.1 to 0.1)	1 (0 to 2.6)	–	4.8 (2.6 to 7.0)	1.0
Other	10.2 (1.5 to 18.8)	16.6 (16.6 to 6.4)	17 (3.5 to 30.4)	14.1 (2.9 to 25.3)	15.4

* Values may not sum to 100% as the remainder of responses were listed as ‘other’.

HCMC, Ho Chi Minh City; STI, sexually transmitted infection; VCT, voluntary counselling and testing.

Table 2

Hepatitis C virus (HCV) and hepatitis B virus prevalence among men who have sex with men (MSM) in select provinces in Vietn

	Hanoi*	Hai Phong	HCMC	Can Tho	
Province	**398**	**399**	**397**	**394**	
sampled MSM (n)	**% (95% CI)**	**% (95% CI)**	**% (95% CI)**	**% (95% CI)**	**Median**
HCV Ag/Ab+	25.4 (16.8 to 34.0) (n=330)	38.8 (31.4 to 46.3)	31.4 (24.0 to 38.9)	13.7 (8.2 to 19.1)	28.4
HIV+	*	100 (–)	83.1 (64.2 to 100)	84.5 (66.6 to 100)	84.5
HIV−	25.4 (17.7 to 33.1)	28.3 (21.6 to 35.1)	18.3 (11.7 to 20.0)	8.9 (4.6 to 13.2)	21.9
HBsAg+	27.4 (21.6 to 33.2)	12 (7.7 to 16.3)	12.7 (8.1 to 17.3)	8.5 (4.9 to 12.2)	12.4
HIV+	48.5 (30.9 to 66.2)	16.6 (4.3 to 28.8)	17.7 (4.1 to 31.3)	15.2 (0 to 40.8)	17.2
HIV−	23.6 (17.7 to 29.5)	11.2 (6.7 to 15.8)	11.4 (6.4 to 16.4)	8.1 (5.0 to 11.2)	11.3
Anti-HBc+ (among those HBsAg−)	61.2 (51.7 to 70.8 (n=203))	50.1 (42.5 to 57.6 (n=349))	60 (52.3 to 67.7 (n=349))	49.1 (42.3 to 55.8)	55.1
HIV+	78.6 (55.1 to 100)	79.7 (65.0 to 94.4)	82.6 (70.8 to 94.5)	72.3 (50.1 to 94.5)	79.2
HIV−	57.9 (46.8 to 69.0)	45.4 (36.7 to 54.2)	54.7 (46.0 to 63.4)	47.7 (40.4 to 55.0)	51.2
HIV	15.2 (9.7 to 20.8)	14.6 (10.4 to 18.8)	20.2 (13.4 to 26.9)	6.4 (3.0 to 9.7)	14.9

*No HIV+ specimens were tested for HCV due to insufficient quantity of specimen.

Ag/Ab, antigen/antibody; HBsAg, hepatitis B surface antigen; HCMC, Ho Chi Minh City.

Table 3

Hepatitis C virus (HCV) genotypes for sample* of HCV antigen/antibody-positive participants by key population

	PWID	MSM	Total
HCV genotype	n (%)	n (%)	N (%)
1	127 (73.0)	30 (73.2)	157 (73.0)
2	2 (1.2)	1 (2.4)	3 (1.3)
3	9 (5.1)	0 (0)	9 (4.0)
6	36 (20.7)	10 (24.4)	46 (21.4)
Total	174	41	215

*Given the convenience sampling, results are unweighted.

MSM, men who have sex with men; PWID, people who inject or injected drugs.

Table 4

Associations between hepatitis C virus antigen/antibody-positive prevalence (outcome) and select factors among men who have sex with men (MSM) in Vietnam

			4.1: univariate analysis				4.2: multivariable analysis			
Independent predictor	**Total**	**%**	**OR**	**95% CI**		**p Value**	**OR**	**95% CI**		**p Value**
Total	1588									
Province										
Can Tho	394	25.9	1.0							
Ho Chi Minh City	397	26.1	2.9	1.7	4.9	0.000	1.3	0.7	2.7	0.394
Hanoi	330	21.7	2.1	1.2	3.7	0.006	1.4	0.6	3.5	0.452
Hai Phong	399	26.3	4.0	2.4	6.6	0.000	2.9	1.4	5.7	0.003
Age category (years)										
<20	341	22.5	1.0							
20–25	441	29.1	2.3	1.1	4.9	0.025	1.2	0.5	2.6	0.687
25–30	300	19.8	6.6	3.2	13.6	0.000	6.1	2.5	15.1	0.000
≥30	434	28.6	3.5	1.7	7.1	0.001	2.3	0.9	5.8	0.077
Ever married to a woman										
No	1277	85.5	1.0							
Yes	235	15.5	2.1	1.2	3.7	0.013				
Sexual archetype (self-reported)										
Bong lo’ (openly MSM, feminine appearance)	70	4.6	1.0							
Bong kin’ (secretly MSM, masculine appearance)	1053	69.4	0.5	0.1	1.7	0.253				
Straight man or other	395	26	1.0	0.3	3.5	0.974				
Sexual orientation (self-reported)										
Prefers women to men as partners	262	17.2	1.0							
Prefers men equally as women	231	15.2	0.6	0.3	1.4	0.259				
Prefers men to women as partners	1027	67.6	0.8	0.4	1.5	0.459				
No. of male sex partners in the past month										
≤1	495	40.6	1.0							
1–5	474	38.9	0.8	0.5	1.2	0.282				
5–10	174	14.3	0.5	0.3	1.0	0.039				

			4.1: univariate analysis				4.2: multivariable analysis			
Independent predictor	**Total**	**%**	**OR**	**95% CI**		**p Value**	**OR**	**95% CI**		**p Value**
≥10	76	6.2	0.8	0.2	2.5	0.675				
Used condom during last sex with MSM casual partner										
No	318	40.7	1.0							
Yes	457	58.4	0.9	0.5	1.7	0.767				
Dont'remember, no response	7	0.9	0.8	0.1	7.0	0.819				
Used condom during last month with MSM casual partner										
Always	326	20.5	1							
Most of the time	122	7.7	1.0	0.4	2.3	0.925				
Sometimes	176	11.1	0.7	0.3	1.6	0.406				
Never	157	9.9	1.1	0.5	2.5	0.729				
Dont'remember, no response	807	50.8	0.8	0.5	1.3	0.298				
Had sex with a man in the past one month for money (ie, sold sex)										
No	1018		1							
Yes	502	33.2	0.8	0.5	1.2	0.272				
Paid for anal sex with a man in the past one month for money										
No	1448	95.3	1.0							
Yes	72	4.7	0.8	0.3	2.1	0.617				
Ever used illegal drugs										
No	1192	78.4	1.0							
Yes	328	21.6	2.0	1.2	3.2	0.005	2.7	1.3	5.6	0.011
Ever injected illegal drugs										
No	1440	95.7	1.0							
Yes	80	5.3	5.0	1.9	12.7	0.001	3.0	0.8	11.0	0.091
Injected drugs in the last one month										
No	1484	97.6	1.0							
Yes	36	2.4	2.2	0.6	7.5	0.220				
Had sexual relations with a female sex worker in the past 12 months										
No	446	69.8	1.0							
Yes	193	30.2	1.0	0.6	1.8	0.983				
Ever tested for HIV, % (95% CI)										

			4.1: univariate analysis				4.2: multivariable analysis			
Independent predictor	**Total**	**%**	**OR**	**95% CI**		**p Value**	**OR**	**95% CI**		**p Value**
No	1068	70.3	1							
Yes	452	29.7	1.1	0.7	1.8	0.727				
HBsAg										
Negative	1302	86.7								
Positive	218	14.3	1.8	1.0	3.0	0.034	0.026	0.002	0.3	0.002
Anti-HBc										
Negative	571	46.7	1.0							
Positive	653	53.4	1.5	0.9	2.6	0.143				
HIV status										
Negative	1375	90.5	1.0							
Positive	145	9.5	19.9	7.3	54.0	0.000	26.4	8.5	81.8	0.000

HBsAg, hepatitis B surface antigen.