Prevalence and Risk Factors for Hepatitis C Virus Infection among Young Thai Men

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Abstract. Epidemiologic studies of hepatitis C virus (HCV) infection are unusual in developing countries, especially Thailand. We evaluated the prevalence and risk factors for HCV among military conscripts, including a sample of 5,246 men (1:30 sample), and human immunodeficiency virus (HIV)-1 positive men ($N = 500$) between 2005 and 2008. The HCV prevalence was 2.2% in the sampled group and 8.4% in HIV-1 sero-positives. Among the sampled group, HIV-1 infection, injection drug use (IDU) history, and unsafe injections were associated with HCV infection; adjusted prevalence rate ratios [RRs; 95% confidence intervals (CIs)] were 3.7 (1.04–12.77), 1.9 (1.04–3.54), and 1.8 (1.02–3.11), respectively. Among HIV-1 sero-positives, an IDU history and residence in southern Thailand were associated with HCV prevalence; adjusted RRs (95% CIs) were 3.5 (1.71–7.24) and 2.6 (1.18–5.61), respectively. Public health measures to prevent HCV in Thailand should focus on reducing injection drug use and other exposures to unsafe injections among young Thai men.

INTRODUCTION

Hepatitis C virus (HCV) infection is a major public health problem worldwide. An estimated 170 million persons have been infected with HCV globally. Persistent HCV infection is a leading cause of serious liver disease, including cirrhosis and hepatocellular carcinoma (HCC).^{1–3} The primary risk factor for HCV infection in developed Western countries has been illicit injection drug use (IDU). In developing countries, IDU and contaminated medical and non-medical injections also are important risk factors for infection. However, a wide variety of exposures have been suspected of transmitting HCV in developing countries, including other parenteral exposures (e.g., blood transfusions, immunizations, tattoos, scarifications, body piercing, hemodialysis, etc.) as well as sexual contact.^{4,5} Recently, high rates of HCV have been documented among injection drug users and other risk groups living along drug-trafficking routes, especially among populations in eastern Europe and central Asia.^{6,7} The variation in HCV prevalence could be related to the proportion of injection drug users in the population. One striking example of a large epidemic of HCV spread throughout the general population by contaminated medical injections occurred as a complication of the public health program in Egypt. This program was designed to prevent the transmission of Schistosomiasis by treating humans with parenterally administered antiparasitic drugs in the community.^{8,9} Because the injection equipment was reused repeatedly, HCV infections were transmitted and became a more significant public health problem in these populations than Schistosomiasis had been. An estimated 2–4 million people in developing countries acquire HCV infection from unsafe injections each year.^{10,11} To prevent HCV and reduce the burden of liver diseases and HCC, it was important to reduce the risk of infection among injection drug users and evaluate the contribution of other risky parenteral and non-parenteral exposures, especially in developing countries where the potential for HCV transmission is diverse.¹²

The estimated worldwide HCV prevalence is approximately 2.2–3.0%, and countries in Africa, Asia, and southern Europe have relatively high prevalence.^{3,13,14} In Thailand, up to 85% of those who are anti-HCV positive are injection drug users or human immunodeficiency virus (HIV)-1 sero-positive.¹⁵ HCV prevalence ranged from 1% to 6% among blood donors. Recently, high rates of HCV and HIV-1 had been reported among injection drug users in Thailand.^{12,16–22} However, most studies of HCV in Thailand have been done in high-risk populations, such as injection drug users. Because of the large variety of risk exposures for HCV infection, which are not limited to IDU, it is important to evaluate the prevalence and risk factors for HCV in the general population. Because most patients with acute infection with HCV are asymptomatic, one cannot rely on reports of symptomatic infection to estimate the incidence. Understanding the epidemiology of HCV infection in Thailand is critically needed to formulate an effective public-health program to prevent infection and chronic liver disease morbidity and mortality.

In this study, we evaluated the prevalence and risk factors for HCV infection among a sample of young Thai men who were selected for military service by a random lottery conscription process after they reached 21 years of age. Therefore, the data are applicable to the general population of young men in Thailand. The knowledge of percutaneous and sexual risk factors in this large community-based study can supplement the knowledge of HCV epidemiology and provide baseline information for public-health policy to prevent this important infection and its complications.

MATERIALS AND METHODS

Study population. In Thailand, approximately 60,000 men aged 21 years have been recruited annually in April for military service using a nationwide random lottery sampling system. Unusual exemptions are available for the disabled, individuals who completed a course of military instruction, and individuals who have participated in alternative military service. Individuals with documented or suspected HIV infection are not excluded from participation in the lottery or subsequent service in the military. Sexual orientation and

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drug or substance use also are not grounds for exemption. All new military conscripts are inducted into military service in May and November each year. The newly inducted conscripts have been screened confidentially for HIV-1 antibodies since 1989 as one of the national HIV surveillance populations. The HIV-1 antibody testing and Western blot confirmation of all positive sera were performed at the Army Institute of Pathology in Bangkok. Conscripts who test positive for HIV-1 antibodies were interviewed, counseled, and evaluated for risk factors and medical conditions. HIV-1 sero-positive men remain in the military unless they cannot continue because of medical complications or other reasons.

In this study, we conducted a cross-sectional study to determine HCV sero-prevalence and risk factors for HCV infection. Study populations consisted of two study groups, including a group of 1:30 (1:40 in some rounds) systematic sampling of all the new conscripts and a group of HIV-1 sero-positive men identified from the surveillance system. HIV testing is voluntary. All new conscripts are asked to submit a blood specimen for HIV testing but are permitted to refuse without repercussion. Between November 2005 and May 2008, 176,999 of 180,053 conscripts submitted to HIV testing. In the sampled study population, we identified 5,246 men. Because this study population was a sample drawn from the overall list of the new conscripts, this study population consisted of both HIV-1 positive and negative men. For the second group of the study population, there were 893 HIV-1 sero-positive men identified from the Western blot confirmation of HIV-1 positive test results. Overall, 500 (56%) of these HIV-positive men agreed to participate in the HCV study. Therefore, the two

study groups included a group of 5,246 systematically sampled young men and 500 HIV-1 sero-positive men from six rounds of conscript inductions (Figure 1).

Data collection. A standardized self-administered questionnaire, which was developed from the questionnaire used in the previous HIV-1 risk-factor studies among Thai conscripts from 1991 to 1998,²³⁻²⁵ was used. Additionally, specific questions to identify risk factors for HCV infection²⁶ were added. A pilot test to standardize the questionnaire was performed among the conscripts in Bangkok. The questionnaire was then modified using the pilot test results. The questionnaire covered sociodemographic characteristics, percutaneous risk factors (i.e., a history of blood transfusion, unsafe injections by non-medical practitioners or lay injectors outside a medical-care setting, and IDU), other drug-use history, sexually transmitted diseases (STDs) history, sexual behaviors, and condom use.

During the first 2 weeks of basic military training of the new conscripts from November 2005 to May 2008, we invited conscripts who were selected from systematic sampling to participate in the study. The sampled conscripts were guided through a self-administered questionnaire process. Those conscripts who had difficulties in answering the questionnaires were interviewed by trained study coordinators. The questionnaires were sent to the Data Management Unit, Phramongkutklao College of Medicine in Bangkok, Thailand.

In addition, the second round of data collection for each cohort of the conscripts was performed among the HIV-1 sero-positive group after the availability of the HIV-1 test results. We added the HIV-1 negative subjects in this second round of data collection to avoid stigmatization of the HIV-1 infected

FIGURE 1. The enrollment of the study population from conscripts' induction and HIV-1 sero-surveillance nationwide system from November 2005 to May 2008. Note that the sample group of young men (*A) consisted of both HIV-1 sero-positive and HIV-1 sero-negative men, and 13 participants were excluded (10 HIV-1 sero-negative men with inadequate information and 3 HIV-1 sero-negative men with no sera for HCV testing).

participants. The information from these HIV-1 sero-negative subjects was not included in the analysis. The conscripts who had an HIV-1 sero-positive test result and the other four HIV-1 sero-negative men from the same cohort of induction and serving in the same camp were contacted and invited to join the study before the post-test HIV counseling. The study participants were guided through the self-administered questionnaire process. Post-test HIV counseling was then provided to the HIV-1 positive men according to the standard process among military conscripts by the public health officers of the military hospitals. The study participants also received HCV infection test results and counseling.

Laboratory evaluation. Serum samples remaining after HIV-1 testing were retrieved from the storage at -70°C and tested for HCV antibody using a third-generation enzyme immunoassay EIA 3.0 (Murex anti-HCV version 4.0; Abbott, Kyalami, South Africa) at the Armed Forces Research Institute of Medical Sciences (AFRIMS). All reactive samples were retested in duplicate using the same EIA 3.0 assay. The level of reactivity in the EIA was calculated from two or more of the three test results.^{27,28} The signal to cut-off ratio recommended by the Centers for Disease Control and Prevention (CDC) was used to define a positive HCV EIA test.⁴

Statistical analyses. We evaluated HCV prevalence and risk factors for HCV infection separately among the group of systematically sampled conscripts and the group of HIV-1 sero-positive men. The χ^2 or Fisher's exact test for categorical variables and the Student's *t* test for continuous variables were used to guide interpretation of the results. To estimate the potential effect of various risk factors for HCV infection, we constructed a Poisson regression model with robust variance to obtain unadjusted and adjusted prevalence rate ratios [RRs; 95% confidence intervals (CIs)].^{29,30} Additionally, we tested for interaction and multicollinearity of the variables in the model. The criteria for selection variables into a regression model were a *P* value less than or equal to 0.20 and other biologically relevant variables to control for confounding factors. Stepwise selection was used to guide the selection of potential risk variables with alpha levels of 0.05 for entry and greater than 0.10 for removal. The level of significance was set at *P* value < 0.05. Data analysis was performed using Stata (version 9.0; StataCorp LP, College Station, TX).

Ethical consideration and treatment. The study protocol was reviewed and approved by the Institutional Review Board of the Royal Thai Army (RTA) Medical Department. Written informed consent was obtained from the participants after they read the information sheet and consent form. HIV voluntary counseling and testing (VCT) was given to each cohort of conscripts by trained personnel. HIV-1 and HCV infected men received post-test HIV and HCV counseling at the military hospitals in accordance with the standard of human immunodeficiency virus and acquired immunodeficiency syndrome (HIV/AIDS) treatment in Thailand.

RESULTS

Between November 2005 and May 2008, the sampled population of 5,246 conscripts and 500 HIV-1 sero-positive men participated in the study. The distribution of HCV infection by various characteristics of the study populations and the associations between potential risk factors and HCV infection are shown in Table 1.

In the sampled group, the overall prevalence of HCV infection between November 2005 and May 2008 was 2.21% (95% CI = 1.81–2.61). Additionally, the prevalence of HCV infection among the sampled men who were recruited in 2005, 2006, 2007, and 2008 was 2.81%, 3.80%, 0.89%, and 0.25%, respectively (Figure 2). The subjects were relatively homogeneous in terms of age and socioeconomic status. Their mean age was 21.19 (SD $\pm$ 1.31) years. The conscripts from the northeast had the highest prevalence of HCV infection of 3.24%, whereas men from the eastern part of Thailand had a HCV prevalence of 0.72%. The prevalence of HCV infection among conscripts who had a history of unsafe injections by non-medical practitioners was 3.62%, whereas it was 2.08% for those who did not. The HCV prevalence among those who had a history of IDU was 3.94%, whereas it was 2.10% for those without this history. Finally, the prevalence of HCV infection in sampled men who were HIV-1 positive was 8.70%, whereas it was 2.18% for those who were HIV-1 negative.

In multivariate analysis of the sampled study population (Table 2), we found that a history of unsafe injections by non-medical practitioners (adjusted RR, 95% CI = 1.78, 1.02–3.11), a history of IDU (adjusted RR, 95% CI = 1.92, 1.04–3.54), and HIV-1 infection (adjusted RR, 95% CI = 3.65, 1.04–12.77) were independently associated with HCV infection. In an assessment of multicollinearity, we found that a history of unsafe injections by non-medical practitioners was strongly correlated with a history of residence in the northeast in the 2 years before induction into the military.

We also assessed the effect of risk factors for HCV prevalence among the sampled study population who had resided in the northeast region. We found that, in those young men from the northeast, the independent risk factors for acquiring HCV infection were unsafe injections by non-medical practitioners (adjusted RR, 95% CI = 2.08, 1.03–4.20) and age over 21 years old (adjusted RR, 95% CI = 1.97, 1.07–3.64).

In the HIV-1 sero-positive study population, the overall prevalence of HCV infection was 8.40% (95% CI = 6.12–11.18). The HCV prevalence by year of induction from 2005 to 2008 for HIV-1 sero-positive conscripts was 14.63%, 6.12%, 7.89%, and 7.56%, respectively (Figure 2). Their mean age was 21.75 (SD $\pm$ 1.50) years. The conscripts who were from the south had a prevalence of HCV infection of 15.91%, whereas it was 2.72% for the conscripts from the northeast. Those conscripts who reported a history of IDU had a prevalence of HCV infection of 20.0%, whereas it was 5.69% for those without an IDU history.

The multivariate analysis of HIV-1 sero-positive study population showed that a history of IDU and residence in the south in the 2 years before the induction into the military service were independently associated with HCV infection (Table 2). The HIV-1 positives who had ever injected illicit drugs were 3.52 times more likely to acquire HCV infection (95% CI = 1.71–7.24) than those who never injected drugs after adjusting for age, residence by region, marital status, and unsafe injections history. In addition, those HIV-1 sero-positive men who had resided in the south were at 2.57 (95% CI = 1.18–5.61) times greater risk of acquiring HCV infection compared with those who came from the other regions of Thailand after adjusting for other confounding factors. The association between unsafe injections by non-medical practitioners and HCV infection in the HIV-1 sero-positive population was not significant during the study period.

TABLE 1

Univariate analysis of risk factors for HCV infection among a group of sampled men and a group of HIV-1 sero-positive men from 2005 to 2008

Characteristics	No. tested	Sampled men (N = 5,246)		No. tested	HIV-1 sero-positive men (N = 500)	
		Anti-HCV positive			Anti-HCV positive	
		n (%)	RR (95% CI)		n (%)	RR (95% CI)
Age (years); mean (±SD)	5,214	21.36 (± 1.45)	1.10 (0.96–1.25)	476	22.09 (±2.04)	1.14 (0.92–1.41)
Age (years)						
17–21	4,199	85 (2.02)	1	254	16 (6.30)	1
> 21	1,015	29 (2.86)	1.41 (0.93–2.14)	222	17 (7.66)	1.22 (0.63–2.35)
Marital status						
Not single	1,496	27 (1.80)	1	117	4 (3.42)	1
Single	3,699	87 (2.35)	1.30 (0.85–1.20)	358	28 (7.82)	2.29 (0.82–6.39)
Residence by region						
East	277	2 (0.72)	1	31	1 (3.23)	1
Lower north	412	7 (1.70)	2.35 (0.49–11.25)	42	3 (7.14)	2.21 (0.24–20.34)
Upper north	490	9 (1.84)	2.54 (0.55–11.69)	49	4 (8.16)	2.53 (0.30–21.66)
Central	678	14 (2.06)	2.86 (0.65–12.50)	52	6 (11.54)	3.57 (0.45–28.40)
South	534	11 (2.06)	2.85 (0.64–12.78)	44	7 (15.91)	4.93 (0.64–38.17)
Bangkok	1,011	12 (1.19)	1.64 (0.37–7.30)	102	6 (5.88)	1.82 (0.23–14.61)
Northeast	1,700	55 (3.24)	4.48 (1.10–18.27)*	147	4 (2.72)	0.84 (0.10–7.31)
Rural residence						
No	1,612	28 (1.74)	1	173	11 (6.36)	1
Yes	3,574	88 (2.46)	1.41 (0.93–2.16)	303	22 (7.25)	1.14 (0.57–2.30)
Occupation before enrollment						
Unemployed and labor	3,323	64 (1.93)	1	289	19 (6.57)	1
Employed/students/others	1,819	45 (2.47)	1.28 (0.88–1.87)	178	13 (7.30)	1.11 (0.56–2.20)
Transfusion						
No	5,037	111 (2.20)	1	446	29 (6.50)	1
Yes	164	4 (2.44)	1.10 (0.41–2.96)	30	4 (13.33)	2.05 (0.77–5.45)
Unsafe injection by non-medical practitioners						
No	4,803	100 (2.08)	1	415	27 (6.51)	1
Yes	387	14 (3.62)	1.74 (1.00–3.01)*	58	6 (10.34)	1.59 (0.69–3.69)
Injection drug use						
Never	4,943	104 (2.10)	1	439	25 (5.69)	1
Ever	279	11 (3.94)	1.87 (1.02–3.45)*	40	8 (20.00)	3.51 (1.70–7.27)*
Non-injection drug use						
Never	3,378	75 (2.22)	1	283	17 (6.01)	1
Ever	1,810	38 (2.10)	0.95 (0.64–1.39)	191	16 (8.38)	1.39 (0.72–2.69)
HIV-1 sero-status						
Negative	5,223	114 (2.18)	1	–	–	–
Positive	23	2 (8.70)	3.98 (1.05–15.17)*	–	–	–
HCV testing	5,246	116 (2.21)	–	500	42 (8.40)	–

RR = prevalence rate ratio.

* *P* value < 0.05.

Education level, rural residence, income, blood transfusion, history of non-injection illicit drug use, reported history of STDs in the past 5 years, age of first sexual relationship, a history of sex with another man, and regular versus irregular condom use were not associated with HCV infection in either the sampled or HIV-1 sero-positive study population.

Between 2005 and 2008, the proportion of IDU increased significantly in the sampled population (χ^2 for trend = 15.87, *P* value < 0.001) and the HIV-1 sero-positive group (χ^2 for trend = 6.50, *P* value = 0.011). In contrast, the proportion of unsafe injections by non-medical practitioners between 2005 and 2008 decreased significantly among both the sampled study population (χ^2 for trend = 18.13, *P* value < 0.001) and the HIV-1 sero-positive men (χ^2 for trend = 3.98, *P* value < 0.046) (Figure 2).

DISCUSSION

Our study describes the prevalence and risk factors of HCV infection in a sample drawn from the total population of randomly selected 21-year-old male military conscripts and all participating HIV-1 positive men identified from this population between November 2005 and May 2008 in Thailand. We found a prevalence of HCV infection of 2.21% among

the sampled population of these generally healthy young Thai men and 8.40% among HIV-1 sero-positive young Thai men. The HCV prevalence was similar in the sampled HIV-1 sero-positive young men compared with that among all HIV-1 sero-positive men (8.70% versus 8.40%). The prevalence of HCV infection from the sampled population was comparable with other previous studies in Thailand that found a prevalence of HCV infection of 2.20% in 1996 and 2.15% in 2004.^{26,31} The highest prevalence of HCV infection (3.24%) was found among the men who resided in the northeastern region of the country before their induction, whereas among the HIV-1 positive men, the highest HCV prevalence (15.91%) was among those from the southern region of Thailand. The study populations of young Thai men were newly inducted conscripts who were randomly recruited using a lottery system. Therefore, the data reflected their history of risk factors and HCV infection before their conscriptions when they had been residing in the community.

During the study period, the prevalence of HCV declined in both sampled and HIV-1 positive men. Because the predominant route of transmission of HCV is parenteral, HCV seroprevalence can be a useful surrogate marker for IDU risk behavior in the area with high prevalence of the virus.^{1,18}

FIGURE 2. Proportion of anti-HCV positive and percutaneous risk factors among the sampled men (A) and HIV-1 sero-positive men (B) by year of induction from 2005 to 2008. UNSI = unsafe injections by non-medical practitioners or lay injectors; IDU = injection drug use; HCV+ = anti-HCV positive; HIV+ = anti-HIV-1 sero-positive.

Therefore, the decline of HCV prevalence observed between 2005 and 2008 possibly may be related, in part, to a decrease in the frequency of high-risk injection of illicit drugs. In addition, the decline may be because of the less frequent unsafe injections by non-medical practitioners or lay injectors, especially between May and November 2007 and May 2008. Changes in other risk factors, such as body piercing, tattooing, or other parenteral exposures and vertical transmission, also may have

occurred during the time when this study was done, but they were not evaluated.

Our data suggest trends for an increasing frequency of a history of IDU and a decreasing proportion of unsafe injections between 2005 and 2008 in Thailand. However, we were not able to identify important risk factors for HCV infection among the majority of HCV infected men in our study. We observed a paradoxical decreasing prevalence of HCV

TABLE 2

Multivariate analyses of potential risk factors for HCV infection among a group of sampled men and HIV-1 sero-positive men from 2005 to 2008

Risk factors	Sampled men (N = 5,246)	HIV-1 sero-positive men (N = 500)
	Adjusted RR (95% CI)	Adjusted RR (95% CI)
Age > 21 years	1.48 (0.98–2.24)	1.12 (0.59–2.15)
Resided in the south	NA	2.57 (1.18–5.61)*
Had unsafe injections	1.78 (1.02–3.11)*	–
Ever injection drug use	1.92 (1.04–3.54)*	3.52 (1.71–7.24)*
HIV-1 infection (yes)	3.65 (1.04–12.77)*	NA

RR = prevalence rate ratio; NA = not available in the model.

* P value < 0.05.

while the prevalence of a history of IDU among the men was increasing between May and November 2007 and May 2008. The HCV prevalence in sampled men without an IDU history declined from 0.68% in May and November 2007 to 0.14% in May 2008 (data not shown). In addition, sampled men, including those with an IDU history who were studied in May 2008, were younger than those in the combined group for 2007. These young injectors who have relative shorter exposure periods may have had lower risks for HCV infection compared with those older, long-term injection drug users from other studies.^{17,32,33} However, the HCV prevalence among the HIV-1 positive men with an IDU history increased. When we evaluated the geographical region of origin among the sampled population, we found that the highest proportion of injection drug users was among those young men who were from the east (7.55%) and south (6.97%). However, among the subpopulation of anti-HCV positives, the highest proportion (18.8%) among the sampled population who were injection drug users was in the men from southern Thailand. Additionally, a history of IDU was significantly associated with HCV infection in the sampled population. Subsequently, using anti-HCV positive as a proxy indicator for a history of IDU^{1,18} in the HIV-1 sero-positive study population, we found that the proportion of anti-HCV positive was greater in those men who were from the south than from the other regions (15.91% versus 5.90%). These data suggest that injection-drug behavior may be a problem among young men, especially in the southern region.

Besides the well-known risk factors of injection illicit drug use for HCV infection, we also found another significant effect of unsafe injections by non-medical practitioners or lay injectors. It was an independent risk factor for acquiring HCV infection, particularly in sampled young men from the northeast region. The overall proportion of the population who reported a history of unsafe injections by non-medical practitioners was 7.45%, whereas the highest proportion (9.67%) for lifetime unsafe injections practices was found among men from the northeastern region of the country. It is somewhat likely that this exposure has been underreported by these men, because this practice is common, especially among rural populations in Thailand. We postulate that unsterile injections by non-medical or lay injectors may be an important means of transmission of HCV, especially in lower socioeconomic, rural areas in northeastern Thailand. Injection by lay injector outside a medical-center setting has been common, especially in the northeast. A study of blood donors in 2000 and 2001 found that unsafe injections were an important risk factor for HCV infection in Thailand.³⁴ This risk factor for HCV infection has also been reported from other developing countries, including

Egypt and Pakistan.^{8,11,35,36} The sample of young men who had resided in a rural area were at 1.4-fold greater risk of HCV infection than those from urban areas; however, this difference was not statistically significant. In Thailand, there has been an improvement in the quality and safety of medical care as well as an extension of medical care to rural areas in recent years. Some of this improvement may have been related to concerns about the inadvertent transmission of HIV. Therefore, the risk of HCV infection among young men in Thailand may continue to decrease in the future if they do not inject illicit drugs.

There were several limitations in this study. First, the temporal sequence for causal inference for HCV infection could not be established because of the cross-sectional study design. In addition, our findings might underestimate the overall HCV prevalence because of the low response rate among HIV-1 infected conscripts (56%). A fraction of HIV-1 infected young men who did not participate in the study might be those young men who were injection drug users. There was a possibility that some injection drug users might leave the military service, and those men might have had a greater HCV prevalence. However, it should be noted that a history of IDU per se is not grounds for automatic discharge from the military, unless drug use continues while in the military. Furthermore, our study was done soon after the men were conscripted, and so, we had an opportunity to include most soldiers who might later be discharged. Another limitation of the study was the possibility of misclassification of the reported history of IDU. Drug users might not report their IDU status because of the stigmatization and illegal nature of such behavior. However, the rate of reported IDU history by these men is similar to other estimates of the prevalence of this behavior among young men in Thailand. Another concern might be false positive anti-HCV results. However, the CDC's recommendation for a diagnosis of HCV infection using a high signal to cut-off ratio and a sequential testing algorithm for confirmation was used in our study to decrease the risk of false positive test results.⁴

Our study suggests that HCV infections are a potentially important health problem among young men in Thailand, especially those with a history of the injection of illicit drugs. However, the prevalence of HCV infection among men without an IDU history seems to have declined recently. Nevertheless, it will be important for clinical and public health specialists to continue to monitor HCV prevalence and provide expanded treatment and health services for HCV infected Thai citizens who are in need in the future. Also, the prevention of injection drug use and high-risk injection practices among persons who inject illicit drugs is an important component of the public health agenda to prevent HCV infections in Thailand.

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