

Risk Factors of Hepatitis C Virus Infection in Blood Donors in Thailand: A Multicenter Case-Control Study

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Objective: To investigate the risk of hepatitis C virus (HCV) infection in healthy blood donors in Thailand
Material and Method: We performed a case-control study of 435 HCV-seropositive blood donors and 894 HCV-seronegative blood donors as controls. The study was done with direct interview regarding demographic characteristics and risk factors. Odds ratios (OR) with 95% confidence intervals (CIs) were calculated by using conditional logistic regression.

Results: The final multivariable model included only the following independent HCV risk factors: intravenous drug user (IDU) (OR = 61.5; 95%CI, 26.6-142.5), previous blood or blood products transfusion (OR = 12.3; 95%CI, 7.6-19.9), sharing of razors (OR = 2.3, 95%CI, 1.6-3.2), unsafe injection (OR = 3.3, 95%CI, 1.8-5.9), unused condom (OR = 1.6; 95%CI, 1.1, 2.4). No risk was shown for a history of tattoo, ear piercing, or acupuncture and multiple sexual partners.

Conclusion: The risk factors for HCV infection in healthy blood donors in Thailand are IDU, past history of blood transfusion and unsafe injection.

Keywords: Hepatitis C virus, Blood donor, Blood transfusion, Intravenous drug user

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Hepatitis C virus (HCV) infection is a worldwide disease occurring among persons of all ages, genders, races, and regions of the world⁽¹⁾. HCV has been the major cause of post-transfusion non-A and non-B hepatitis, especially before the introduction of HCV screening among blood donors. Most of the HCV infected people cannot clear the virus and become chronically infected. These patients remain asymptomatic and undetected until development of cirrhosis or hepatocellular carcinoma. The introduction of a

sensitive anti-HCV screening test for blood products has reduced the incidence of post-transfusion HCV infection remarkably, especially when HCV RNA detection assay is applied jointly. However, this test is not available everywhere and new cases of HCV infection continue to occur. Identifying high risk donors may help reduce the incidence of post-transfusion HCV infection. A number of studies have reported high frequencies of anti-HCV positivity in IDU and patients with a history of blood transfusion, intranasal cocaine use, or tattooing⁽²⁻⁶⁾.

In Thailand, the seroprevalence of HCV infection varies from region to region, from about 1% in Bangkok to 5-6% in the north and northeast regions⁽⁷⁻⁹⁾.

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However, there is no study regarding risk factors in blood donors. Therefore, this study was conducted to evaluate potential risk factors of HCV infection in blood donors from different geographical regions of Thailand.

Material and Method

Study population

The study design was that of a cross-sectional case control study. Study subjects were defined as HCV seropositive blood donors determined by second or third generation enzyme-immunoassay done at participating blood transfusion centers. Seropositive blood donors were equally recruited from four blood transfusion centers at Siriraj Hospital, Khon Kaen University, Prince of Songkla University, and Chiang Mai University. Each seropositive subject was matched with two seronegative controls from the same blood transfusion center. An invitation letter was sent to all cases and controls were identified during 1 September 2000 to 31 December 2001. All subjects were negative for hepatitis B and immunodeficiency virus seromarkers. The study protocol and questionnaire were approved by the ethical committees of all these study centers. After obtaining an informed consent, a private and confidential interview was administered by trained nursing staff to cases and controls using a standardized questionnaire. The standardized questionnaire contained information regarding sociodemographic characteristics, history of liver disease, and factors that related to potential exposure to HCV, including a history of IDU, blood transfusion, potential unsafe injection from non-medical personnel, tattooing and body piercing, and sharing of razors or toothbrushes. Sexual preference and sexual practice were optional for participants.

Statistical analysis

To assess the association between HCV status and each risk factor (i.e., univariable analysis), Chi-

square test was applied. Crude odds ratios (OR) and its 95% confidence intervals (CIs) were reported. To determine the effect of all risk factors simultaneously (i.e., multivariable analysis) on HCV status, a conditional logistic model was fitted. Adjusted odds ratios (OR) and 95% CIs obtained from the model were reported.

All statistical data analyses were performed using SPSS version 10.1.

Results

During the study period, there were 435 cases and 894 controls eligible for evaluation. For HCV seropositive cases, there were more males than females (82.3% and 17.7%, respectively) with a mean age of 34 years. Except for educational levels, which were significantly high in the controls, both cases and controls had similar distributions of age, income, and occupations.

There was no statistical significance in risk factors among blood donors from the four different geographical regions of Thailand. Univariable analysis of potential risk factors showed that history of blood transfusion, IDU, potential unsafe injection from non-medical personnel, tattooing and body piercing, sharing of razors, multiple sex partners, homosexuality and unsafe sexual practice were significantly associated with HCV seropositivities (Table 1). Multivariable analysis showed that history of blood transfusion, IDU, potential unsafe injection from non-medical personnel, sharing of razors and unsafe sexual practice were among the independent risk factors for HCV infection as shown in Table 2. Among these five risk factors, history of IDU is the most important risk factor (OR = 61.5, 95%CI 26.1, 142.5), as indicated by 95% of participants who reported histories of IDU and were positive for HCV. History of blood transfusion was the second most important risk factor, with a mean interval of transfusion 11 years before entering the study.

Table 1. Univariable analysis of risk factors associated with HCV infection in blood donors

	Case No (%)	Control No (%)	p-value	Odds ratio (95%CI)
History of blood transfusion (N = 1,305)	93 (22.5)	26 (2.9)	0.001	9.2 (5.8, 14.4)
History of IDU (N = 1,327)	131 (30.3)	6 (0.7)	0.001	64.2 (28, 147)
Potential unsafe injection (N = 1,318)	77 (18.1)	27 (3.0)	0.001	6.9 (4.4, 10.9)
Tattooing and body piercing (N = 1,325)	171 (39.7)	277 (31.0)	0.02	1.5 (1.2, 1.9)
Sharing of razors (N = 1,284)	123 (30.6)	119 (13.5)	0.001	2.6 (1.9, 3.4)
Multiple sex partners (N = 930)	138 (39.2)	183 (31.7)	0.023	1.9 (1.4, 2.5)
Homosexuality (N = 929)	32 (9.1)	36 (6.3)	0.014	2.1 (1.3, 3.3)
Unsafe sex (N = 930)	101 (23.6)	105 (11.8)	0.001	2.3 (1.7, 3.1)

Table 2. Odds ratio of risk factors associated with HCV infection in blood donors

Risks factors	Odds ratio (95%CI) Univariable	Odds ratio (95%CI) Multivariable
History of blood transfusion	9.2 (5.8, 14.4)	12.3 (7.6, 19.9)
History of IDU	64.2 (28, 147)	61.5 (26.6, 142.5)
Potential unsafe injection	6.9 (4.4, 10.9)	3.3 (1.8, 5.9)
Sharing of razors	2.6 (1.9, 3.4)	2.3 (1.6, 3.2)
Unsafe sex	2.3 (1.7, 3.1)	1.6 (1.1, 2.4)

Discussion

The prevalence of HCV seropositivity in Thailand varies from region to region with a prevalence of about 1% in the central region and 6% in the north^(7,8). In this multi-center case control study, we found no difference in this potential risk factors for HCV infection among these regions. The use of two controls from the same region may have reduced any possible bias. However, there were some potential sources of bias since not all cases and controls accepted the invitation to participate in the study and the risk factors were assessed retrospectively by direct interview. Furthermore, risks in the remote past may not have been recalled by the participants and patients' awareness of their HCV status may have influenced their responses to the interview. Lastly, direct interview may have influenced the pattern of response, especially when confidential and personal data were questioned. However, we thought that direct interview might have been the best way to collect data, because the relatively low educational level of participants might have limited their ability to complete a self-answered questionnaire.

This study identified that a history of IDU, blood transfusion, potential unsafe injection from non medical personnel, sharing of razors and unsafe sexual practice were independent risk factors for HCV seropositivity. A history of IDU was the single most important risk for HCV. This result was consistent with previous reports from Australia, England, and the United States where 50-90% of IDU's were infected with HCV^(3,10,11). Thus, it is necessary to exclude blood from donors with a history of IDU, especially when a sensitive HCV screening test is not available in some areas of the world.

A history of previous transfusion of blood and blood products was also significantly associated with HCV infection. The result of the odd ratio 12.3 (95% CI, 7.6-19.9) was higher than reports from England⁽¹²⁾ (OR 3.6, 95%CI, 1.5-8.3) and the United States⁽¹³⁾ (OR 4.6, 95%CI 3.2-6.4). The introduction of routine anti-

HCV screening of blood products would reduce new cases of HCV infection that has already been documented in the United States⁽¹⁴⁾.

Studies from many countries have shown that unsafe injections both from health-care related procedure and non-medical personnel is another problem and this may result in a continued increase in new cases of HCV infection in some countries⁽¹⁵⁾. With this practice, infection may occur because of inadequately sterilized equipment and unsafe practices (including re-use of contaminated glass syringes, re-use of needles, administration at home by nonprofessionals, and sharing instruments among family members). This practice is an important risk factor in many developing countries. Sharing of personal items, for example razors and toothbrushes, may be a problem in poorly educated individual with a low socioeconomic status. Adequate health education and counseling may reduce the risk of new infection by these means.

Unsafe sex was another risk factor for HCV infection, although the odd ratio was only 1.6 by multivariable analysis. It seemed that sexual practice may increase the risk but was not per se an important risk factor for HCV transmission. Our study found that homosexuality was a risk factor. Studies from the United States and elsewhere have confirmed that the risk associated with homosexuality was minimal and occurred in those with multiple sex partners, failure to use a condom and sexual practices involving trauma⁽¹⁶⁾.

Body piercing and tattooing were significant risk factors by univariable analysis but the significance could not be demonstrated by multivariable analysis. This finding was in contrast to studies from the west when body piercing/tattooing was analyzed as a risk factor for HCV infection^(11,17,18). It was a fact that most body piercing in this study was ear piercing where a safe technique has been used.

In conclusion, this multicenter study of potential risk factors for HCV infection showed that IDU and history of blood transfusion were among the two most

important factors in blood donors from different geographical regions of the country. Implementation of these two factors in the exclusion criteria for blood donor screening would reduce the potential incidence of post-transfusion HCV infection.

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ปัจจัยเสี่ยงในการติดเชื้อไวรัสตับอักเสบบีในผู้บริจาคโลหิตในประเทศไทย: การศึกษาแบบ case-control หลายสถาบัน

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วัตถุประสงค์: เพื่อศึกษาปัจจัยเสี่ยงในการติดเชื้อไวรัสตับอักเสบบี ในผู้บริจาคโลหิตในประเทศไทย

วัสดุและวิธีการ: คณะผู้วิจัยได้ศึกษาผู้บริจาคโลหิตที่มีผล Anti-HCV บวก 435 ราย โดยเปรียบเทียบกับกลุ่มควบคุมที่มีผล anti-HCV ลบ 894 ราย โดยการสัมภาษณ์โดยตรงเกี่ยวกับข้อมูลพื้นฐานและปัจจัยเสี่ยง การประเมินจะใช้ Odds ratios (OR) ที่ 95% confidence intervals (CIs) โดยการคำนวณด้วย conditional logistic regression

ผลการศึกษา: ในการวิเคราะห์ แบบ multivariable พบว่าปัจจัยเสี่ยงในการติดเชื้อไวรัสตับอักเสบบี คือ การติดยาเสพติด ชนิดฉีด (IDU) (OR = 61.5; 95%CI, 26.6-142.5), ประวัติได้รับเลือดหรือส่วนประกอบของเลือดมาก่อน (OR = 12.3; 95%CI, 7.6 -19.9), การใช้มีดโกนร่วมกัน (OR = 2.3, 95%CI, 1.6-3.2), การฉีดยาโดยบุคลากรอื่นที่ไม่ใช่แพทย์หรือพยาบาล (OR = 3.3, 95%CI, 1.8-5.9), ไม่ใช้ถุงยางอนามัย (OR = 1.6; 95%CI, 1.1, 2.4) ในขณะที่ไม่พบความเสี่ยงเพิ่มขึ้นในผู้ที่สักตามร่างกาย เจาะหู ฟังเข็ม และการมีคู่นอนหลายคน

สรุป: ปัจจัยเสี่ยงในการติดเชื้อไวรัสตับอักเสบบีในประเทศไทยคือ การติดยาเสพติดชนิดฉีด เคยได้รับเลือดหรือส่วนประกอบของเลือดในอดีตและการฉีดยาที่ไม่ปลอดภัย
