

A case-control study of hepatitis C virus infection among sexually transmitted disease patients

Pipat Luksamijarulkul*

Porntip Khemnak** Saovaluk Luksamijarulkul***

Luksamijarulkul P, Khemnak P, Luksamijarulkul S. A case-control study of hepatitis C virus infection among sexually transmitted disease patients. Chula Med J 2001 May; 45(5): 413-21

Objective : *To analyze some risk factors for hepatitis C virus (HCV) infection among sexually transmitted disease (STD) patients*

Design : *A case-control study*

Setting : *STD clinics of 3 Venereal Disease and AIDS Centers including Nakhonnayok, Banpong and Ratchaburi*

Subjects/ : *Records including socio-demographic variables, some health behaviors and*

Methods : *medical history of 256 STD patients (68 patients with HCV infection and 188 patients without HCV infection) were analyzed by using Odds Ratio and Chi-square test.*

Results : *It was found that the significant risk factors for HCV infection among studied STD patients were (a) marital status as single or separated (OR = 2.53, $p = 0.0021$), (b) occupation as sex worker (OR = 2.46, $p = 0.0338$), labourer (OR = 2.36, $p = 0.0293$), (c) domicile as central region (OR = 3.02, $p = 0.0243$), north and north-east (OR = 4.41, $p = 0.0059$), (d) tattooing (OR = 6.23, $p < 0.0001$), (e) a history of imprisonment (OR = 4.49, $p = 0.0002$), (f) a history of drug injection (OR = 4.12, $p < 0.0001$), (g) number of extramarital sex relations per month of more than 1 (OR = 4.79, $p < 0.0001$), and (h) anti-HIV positive (OR = 6.23, $p < 0.0001$).*

* Department of Microbiology, Faculty of Public Health, Mahidol University

** Nakhonnayok Provincial Officer, Nakhonnayok Province

*** Faculty of Public Health and Environment, Huachiew Chalermphracheit University, Samutpakan Province

Conclusion : *This study revealed that 3 socio-demographic factors and 5 behavioral factors were significant risk factors for HCV infection among STD patients.*

Key words : *HCV infection, Risk factors, STD patients.*

Reprint request : Luksamijarulkul P, Department of Microbiology, Faculty of Public Health,
Mahidol University, Bangkok 10400, Thailand.

Received for publication. November 15, 2000.

พิพัฒน์ ลักษณะมีจรัสกุล, พรทิพย์ เข็มนาค, เสาวลักษณ์ ลักษณะมีจรัสกุล. การศึกษา Case - Control ของการติดเชื้อไวรัสตับอักเสบ ซี ในผู้ป่วยโรคติดเชื้อทางเพศสัมพันธ์. จุฬาลงกรณ์เวชสาร 2544 พ.ศ; 45(5): 413 - 21

- วัตถุประสงค์** : เพื่อวิเคราะห์ปัจจัยเสี่ยงต่อการติดเชื้อไวรัสตับอักเสบ ซี ในกลุ่มผู้ป่วยโรคติดเชื้อทางเพศสัมพันธ์
- รูปแบบการวิจัย** : การศึกษา Case - Control
- สถานที่** : คลินิกกามโรคและโรคเอดส์ 3 แห่ง ได้แก่ นครนายก บ้านโป่ง และราชบุรี
- ผู้เข้าร่วมการศึกษา/ และวิธีดำเนินการวิจัย** : ข้อมูลบันทึกประวัติของผู้ป่วยโรคติดเชื้อทางเพศสัมพันธ์ จำนวน 256 ราย แบ่งเป็นผู้ป่วยที่มีการติดเชื้อไวรัสตับอักเสบ ซี 68 รายและผู้ป่วยที่ไม่มีการติดเชื้อไวรัสตับอักเสบ ซี 188 ราย นำข้อมูลดังกล่าวมาวิเคราะห์ด้วย Odds Ratio และ Chi-square test
- ผลการศึกษา** : พบว่าปัจจัยเสี่ยงต่อการติดเชื้อไวรัสตับอักเสบ ซี ในผู้ป่วยโรคติดเชื้อทางเพศสัมพันธ์ ได้แก่ (1) สถานภาพสมรสเป็นโสดหรือแยก (OR = 2.53, P = 0.0021), (2) อาชีพบริการทางเพศ (OR = 2.46, p = 0.0338), กรรมกร (OR = 2.36, p = 0.0293) (3) ภูมิภาค:ภาคกลาง (OR = 3.02, p=0.0243, ภาคเหนือหรือตะวันออกเฉียงเหนือ (OR = 4.41, p = 0.0059) (4) การสัก (OR = 6.23, p < 0.0001), (5) ประวัติการจำคุก (OR = 4.49, p = 0.0002), (6) ประวัติการฉีดยาเสพติด (OR = 4.12, p < 0.0001) (7) จำนวนคู่นอนนอกสมรสมากกว่า 1 คน/เดือน (OR = 4.79, < 0.0001) และ (8) การติดเชื้อไวรัสเอดส์ (OR = 6.23, p < 0.0001)
- สรุป** : การศึกษานี้พบปัจจัยด้านสังคม-ประชากร 3 ปัจจัยและปัจจัยด้านพฤติกรรม 5 ปัจจัย เป็นปัจจัยเสี่ยงต่อการติดเชื้อไวรัสตับอักเสบ ซี ในผู้ป่วยโรคติดเชื้อทางเพศสัมพันธ์

Hepatitis C virus (HCV) infection is one of the emerging infectious diseases in many countries including Thailand. ⁽¹⁻³⁾ The virus had infected approximately 170 million people world-wide by the year 1999. ⁽⁴⁾ Moreover, complications frequently occur, 40 % of patients will develop chronic active hepatitis and gradual progression to liver cirrhosis and liver carcinoma. ^(5,6) The major mode of transmission is via a parenteral route with a minority contacting the virus through sexual contact. ^(4,7) The vertical transmission rate seems lower than that of human immunodeficiency virus (HIV) infection, approximately 10 %. ⁽⁸⁾ However, the vertical transmission rate will be markedly increased in infants who are also vertically infected with HIV. ⁽⁹⁾ In Thailand, the highest risk group is injecting drug users (IDU) with an 83 - 95 % infection rate. ^(3,10) The other major risk group was a female sex worker (FSW) with 9.5 % of infection. ⁽¹¹⁾ Previous studies among patients attending sexually transmitted disease (STD) clinics showed 5.5 - 7.5 % of HCV infection. ^(7,12) The sexual transmission of HCV might be increased among HIV-infected individuals. ⁽⁷⁾ The risk factors for HCV infection among STD risk group should thus be assessed for preventing and controlling HCV transmission. This case-control study attempts to identify the HCV risk factors among STD patients, which will be valuable in developing a health education module for HCV prevention integrated into the HIV/AIDS prevention program.

Materials and Methods

Study design

This study was a case-control study conducted among STD patients registered at STD clinics of 3 Venereal Disease and AIDS Centers including

Nakhonnayok, Banpong, and Ratchaburi, during the year of 1996. There were 68 patients with HCV infection (anti-HCV positive by repeated testing using the second generation enzyme immunoassay, ABBOTT HCV EIA 2.0) and 188 patients without HCV infection (anti-HCV negative) whom were randomly selected into a control group. Before their blood specimens were collected, studied subjects had received the study information and filled the informed consent forms. The recorded data of studied patients including socio-demographic variables, some risk behaviors, types of STDs and results of anti-HIV antibody testing were collected.

Data analysis

The recorded information, including socio-demographic factors, risk behavior factors and results of anti-HIV, between 2 groups were analyzed searching for risk factors for HCV infection by using Odds Ratio (OR), 95 % confidence interval of OR, and the Chi-square test. The statistical significance of risk factors was a p - value less than 0.05.

Results

General characteristics of case and control groups

Almost 65 % of the case group and 55.32 % of the control group were 30 years of age and lower. About 63 % and 50 % of the case group and the control group respectively were male. Approximately 51.47 % of the case group and 72.87 % of the control group were married. About 50 % of cases and controls had an education level only to primary education.

Risk factors for HCV infection among studied STD patients

Socio-demographic factors

The details of socio-demographic factors in

the case group and the control group were compared and analyzed. It was found that the significant socio-demographic risk factors for HCV infection were: (a) marital status as single or separated, OR = 2.53 ($p = 0.0021$), (b) occupation as sex service, OR = 2.46 ($p = 0.0338$) and labourer, OR = 2.36 ($p = 0.0293$), (c) domicile as central region, OR = 3.02 ($p = 0.0243$) and north and northeast, OR = 4.41 ($p = 0.0059$). These are shown in Table 1

Risk behaviors for HCV infection

The personal behaviors and sexual behaviors among the two studied groups were analyzed searching for significant risk behaviors for HCV infection. We found that the significant risk behaviors were: (a) tattooing, OR = 6.23 ($p < 0.0001$), (b) a history of imprisonment, OR = 4.49 ($p = 0.0002$), (c) a history of drug injection, OR = 4.12 ($p < 0.0001$), (d) number of extramarital sex relations per month of more than 1, OR = 4.79 ($p < 0.0001$), and (e) anti-HIV positive, OR = 6.23 ($p < 0.0001$). Details are shown in Table 2.

Table 1. Risk factors for HCV infection among studied STD patients: Socio-demographic factors.

Socio-demographic factors		Patients with Anti-HCV (N=68)	Patients without Anti-HCV (N=188)	Odds Ratio (95 % CI)	p-value (χ^2 -test)
Age	: ≤ 30 years	44	104	1.48 (0.8-2.74)	0.2302
	: > 30 years	24	84	1.00	
Sex	: Male	43	94	1.72 (0.94-3.17)	0.0830
	: Female	25	94	1.00	
Marital status	: Single or separated	33	51	2.53 (1.37-4.68)	0.0021*
	: Married	35	137	1.00	
Education	: Primary level and lower	36	110	0.80 (0.44-1.45)	0.5143
	: Secondary level and higher	32	78	1.00	
Occupation	: Sex service	23	49	2.46 (1.06-5.72)	0.0338*
	: Labourer	32	71	2.36 (1.08-5.20)	0.0293*
	: Housewife and others	13	68	1.00	
Income/month	: $\leq 5,000$ Baht	39	86	1.60 (0.88-2.90)	0.1337
	: $> 5,000$ Baht	29	102	1.00	
Domicile	: Central part	43	109	3.02 (1.16-9.26)	0.0243*
	: North and North-east	19	33	4.41 (1.47-14.81)	0.0059*
	: Southern part	6	46	1.00	

*Statistical significance at $\alpha = 0.05$

Table 2. Risk behaviors for HCV infection among studied STD patients.

Risk behaviors		STD patients with anti-HCV (N=68)	STD patients without anti-HCV (N=188)	Odds ratio (95% CI)	p-value (χ^2 -test)
History of contact with jaundiced patients	: Yes	8	22	1.01 (0.39-2.54)	0.8366
	No	60	166	1.00	
Sharing used blade	: Yes	6	6	2.94 (0.80-10.75)	0.1216
	No	62	182	1.00	
Tattooing	: Yes	34	26	6.23 (3.17-12.31)	<0.0001*
	No	34	162	1.00	
Ear piercing	: Yes	35	94	1.06 (0.59-1.92)	0.9471
	No	33	94	1.00	
History of imprisonment	: Yes	17	13	4.49 (1.91-10.59)	0.0002*
	No	51	175	1.00	
History of drug injection	: Yes	33	35	4.12 (2.17-7.86)	< 0.0001*
	No	35	153	1.00	
Number of extramarital sex relation per month	: >1 time	45	55	4.79 (2.55-9.04)	< 0.0001*
	Only 1	23	133	1.00	
Type of current STD	: Gonorrhea	22	59	1.22 (0.56-2.63)	0.7178
	Others	19	62	1.00	
	(missing value	27	67)		
Anti-HIV	: Positive	28	19	6.23 (3.01-12.97)	< 0.0001*
	Negative	40	169	1.00	

* Statistical significance at $\alpha = 0.05$

Discussion

HCV antibody testing by the second generation EIA is considered useful for screening HCV infection due to the high sensitivity and specificity of the test.⁽¹³⁾ The virus had infected approximately 170 million people world-wide by the year 1999⁽⁴⁾ and the trend of infection seems to be increasing. Known risks for acquiring HCV infection, such as injecting drug use, multiple blood transfusion and the presence of anti-HIV have been previously reported.^(1,4,7,14) This case-

control study showed that 3 socio-demographic factors including marital status, occupation and domicile and 5 risk behaviors including tattooing, a history of drug injection, a history of imprisonment, number of extramarital sex relations per month and the presence of anti-HIV were significant risk factors for HCV infection among studied STD patients. The single or separated STD patient was at risk of HCV infection with OR = 2.53 ($p = 0.0021$). Perhaps single or separated individuals had a higher opportunity for

non-monogamous sex relations than the married individuals.

In Thailand, a group of commercial sex workers was found to be a high risk group for HIV, and HCV infections.^(11,15) This study supported this evidence that sex work was a risk factor for the infection as well as the labourer group. The domicile factor, which was an indirect risk factor for infection, might depend on the prevalence of HCV infection and health behaviors in the various parts of Thailand. A previous study of HCV infection rate among blood donors in the North-eastern Thailand found anti-HCV prevalence was higher than other parts of Thailand.⁽¹⁶⁾ Two risk behaviors found in this study (injecting drug use and the presence of anti-HIV) supported that injecting drug use is a major risk factor for HCV infection and the presence of anti-HIV was a predictor of HCV infection, as reported by Strydom, et al 1992.⁽⁷⁾ Another study in infants infected with HCV has shown that infants who were HIV-infected were at least 8 times more likely than HIV-uninfected infants to be vertically infected with HCV.⁽⁹⁾

A tattoo, which is an important risk factor for blood-borne infections like HBV infection⁽¹⁷⁾ and HIV/AIDS,⁽¹⁸⁾ was a significant risk factor for HCV infection among studied STD patients (OR = 6.23, $p < 0.0001$). Another risk factor was a history of imprisonment (OR = 4.49, $p = 0.0002$) which was an indirect risk behavior for infection because most individuals with a history of imprisonment had a history of drug injection and were more prone to have extramarital sex relations. There is no doubt that sexual activity is an important risk factor for the transmission of HBV and HIV but it seems to be of minor importance in the spread of HCV.^(2,7) However, this case - control study

found that a significant risk factor for HCV infection was the number of extramarital sex relations per month being more than 1 (OR = 4.79, $p < 0.0001$).

To reduce the sexual transmission of HCV as well as HIV infection, an intensive 100 per cent condom use policy should be emphasized and information for preventing infection should be integrated into the HIV/AIDS prevention program. The use of life skill education for avoiding or delaying of premarital or extramarital sex relation should be emphasized also because some practical problems have been reported from a 100 per cent condom use policy.⁽¹⁹⁾ To reduce the parenteral transmission of HCV as well as HIV infection, the retention of a methadone maintenance program for injecting drug users and health education for changing injecting and tattooing behaviors should be emphasized. Moreover, life skill education for avoiding drug injection should be integrated also.⁽²⁰⁾

Acknowledgements

The authors gratefully acknowledge the Directors and staff of the studied Venereal Disease and AIDS Centers for the kind help and friendly assistance provided during the period of data collection, and all participants.

References

1. Nishioka K. Hepatitis C virus infection in Japan. *Gastroenterol Japonica* 1991 Jul; 26 (Suppl 3): 152-5
2. Hershov RC, Kalish LA, Sha B, Till M, Cohen M. Hepatitis C virus infection in Chicago women with or at risk for HIV infection : evidence for sexual transmission. *Sex Transm Dis* 1998 Nov; 25(10): 527 - 32

3. Luksamijarulkul P, Plucktaweesak S. High hepatitis C seroprevalence in some Thai intravenous drug abusers and qualitative risk analysis. *Southeast Asian J Trop Med Public Health* 1996 Dec; 27(4): 654 - 8
4. Cohen J. The scientific challenge of hepatitis C. *Science* 1999 Jul 2; 285(5424): 26 - 30
5. Hadziyannis SJ, Giannoulis G, Hadziyannis E, Kaklamani E, Alexopoulou A, Dourakis S, Trichopoulos D. Hepatitis C virus infection in Greece and its role in chronic liver disease and hepatocellular carcinoma. *J Hepatol* 1993; 17(Suppl 3): 572 - 7
6. Tanikawa K. Relationship between hepatitis C and alcoholic liver disease. *Asian Med J* 1994; 37(3): 165 - 70
7. Sary A, Kopp W, Hofmann H, Heller-Vitouch C, Kunz C. Sero-epidemiologic study of hepatitis C virus in sexually transmitted disease risk groups. *Sex Transm Dis* 1992 Sep - Oct; 19(5): 252 - 8
8. Giacchinno R, Picciotto A, Tasso L, Timitill A, Sinelli N. Vertical transmission of hepatitis C. *Lancet* 1995 Apr 29; 345(8957): 1122 - 3
9. Papaevangelou V, Pollack H, Rochford G, Kokka R, Hou Z, Chernoff D, Hanra B, Krasinski K, Borkowsky W. Increased transmission of vertical hepatitis C virus (HCV) infection to human immunodeficiency virus (HIV)-infected infants of HIV- and HCV- coinfected women. *J Infect Dis* 1998 Oct; 178(4): 1047 - 52
10. Louisirirochanakul S, Thongput A, Wasi C, Thongcharoen P. Comparison of six anti-HCV second generation assays. *Asian Pac J Allergy Immunol* 1992; 10 (Suppl) : POM-105
11. Luksamijarulkul P, Daengbubpha A. Hepatitis C antibody prevalence and risk factors of some female sex workers in Thailand. *Southeast Asian J Trop Med Public Health* 1997 Sep; 28(3): 507-12
12. Luksamijarulkul P, Khemnak P, Pacheun O. Human immunodeficiency virus and hepatitis C virus infections among patients attending sexually transmitted disease clinics, Regional 2, Thailand. (In pressed in *Asia Pac J Public Health*).
13. Poovorawan Y, Theamboonlers A, Chumderpadetsuk S, Thong CP. Comparative results in detection of HCV antibodies by using a rapid HCV test, ELISA and immunoblot. *Southeast Asian J Trop Med Public Health* 1994 Dec; 25(4): 647-9
14. Donahue JG, Nelson KE, Munoz A, Viahov D, Rennie LL, Taylor EL, Saah AJ, Cohn S, Odaka NJ, Farzadegan H. Antibody to hepatitis c virus among cardiac surgery patients, homosexual men, an intravenous drug users in Baltimore, Maryland. *Am J Epidemiol* 1991 Nov 15; 134(10): 1206 - 11
15. Natpratan P, Apichaartplyakul C, Bordwansin S, Natpratan C, Fain J. Prevalence of HIV and HCV antibodies among commercial sex workers in Chiangmai, Thailand in 1996. ABSTRACTS, The 7 th Scientific Annual Meeting. The Virological Association Thailand. 15 Dec 1997, Bangkok, Thailand 1997; C(P): 126-60
16. Songsivilai S, Jinathongthai S, Wongsena W, Tiangpitayakorn C, Dharakul T. High prevalence of hepatitis C infection among

- blood donors in Northeastern Thailand. *Am J Trop Med Hyg* 1997 Jul; 57(1): 66 - 9
17. Limentani AE, Elliott LM, Noah ND, Lamborn JR. An outbreak of hepatitis B from tattooing. *Lancet* 1979 Jul 14; 2(8133): 86 - 8
18. Luksamijarulkul P, Chompoonuch, Isaranurug S. Antibody to human immuno-deficiency virus, P24 antigen and risk behaviors among some groups of female sex workers. *Chula Med J* 1998 Aug; 42(8): 599 - 607
19. Luksamijarulkul P, Daengbubpha A. Insufficient condom use among some groups of female sex workers: Quantitative and qualitative study. *Thai J Epidemiol* 1999; 7(2): 76 - 83
20. World Health Organization. Life skills education for children and adolescents in schools. Programme on Mental Health, Geneva : World Health Organization, 1997: 1 - 17