

Original Articles

The Risk of HIV Infection and Safe Donor Recruitment and Retention Program in Chiangrai

Somporn Khaisuwan, Pathom Sawanpanyalert*, and Hideki Yanai**.

Chiangrai Regional Hospital, Muang, Chiangrai, *Bureau of Medical Technical Development, Department of Medical Services, Ministry of Public Health, Nonthaburi, **TB/HIV Research Project, Chiangrai

Abstract: *The primary function of blood centers is to ensure adequacy and safety of blood supply. The blood safety can be jeopardized by several factors including the risk of transfusion-associated infectious diseases, particularly infection with Human Immunodeficiency Virus (HIV). Despite very highly sensitive tests for anti-HIV antibody, the risk of transfusion-associated HIV infection still remains. Most of the residual risk occurs when transfusion is done during the HIV-seronegative window period. This study is to determine the HIV infection risk in a blood bank in Chiangrai and to describe its safe donor recruitment and retention program as the main measure to reduce the window-period risk of transfusion-associated HIV infection. Ten years of data (1989-1998) from the provincial hospital blood bank were entered and validated. A retrospective cohort of repeat donors was identified and HIV incidence rates were calculated. Program activities were also studied. The window-period risk of HIV infection is about 130.1 per 100,000 donations (95% confidence interval 115.1-146.5). HIV incidence declines steadily as the number of donations increases. Over the study period, it can be shown that the number of sites which were regularly scheduled (i.e. 3 or 4 donation visits in a year) for donation visits increased significantly and was inversely related with the declining prevalence rates. It is likely that the recruitment and retention of safe blood donors has been a major factor in reducing the transfusion-associated HIV infection risk during the seronegative window period.*

Key Words : ● HIV incidence ● Safe donor recruitment and retention ● Chiangrai

Thai J Hematol Transf Med 1999;9:195-202.

Received September 9th, 1999. Accepted September 24th, 1999.

Requests for reprints should be addressed to Ms. Somporn

Khaisuwan, BSc. Blood Bank, Chiangrai Regional Hospital,

Muang, Chiangrai. 57000. Thailand.

The major function of blood banks is to secure adequate and safe blood supply. The safety of blood supply can be compromised in several steps including compatibility testing and laboratory determination of infectious markers in the donated blood. Risk of transfusion-associated infections is of particular concern, especially in epidemic areas of human immunodeficiency virus (HIV). Despite very sensitive antibody test for HIV, the risk of transfusion-associated HIV still remains¹⁻⁴. Transmission of HIV via blood transfusion largely occurs during the so-called "seronegative window period" during which the blood donors are HIV-infected but tested negative for HIV antibody. The risk of the window period donation in an HIV epidemic area can be as high as 130 per 100,000 donations⁵. This risk can be reduced by employment of more and more sensitive (usually more and more expensive as well) tests for evidence of HIV infection and recruitment and retention of safe blood donors. This study was conducted in Chiangrai with a 1998 population of 1.22 million. There are one provincial (regional) hospital and a few private hospitals in the central district and one community hospital in each of the other districts. The provincial hospital has a blood bank that receives about 1,000 donations per month: about half of the donations are done at the hospital and the other half at remote mobile donation sites.

In general, blood donors must be 17-60 years old, weigh >48 kg, have >12 g/dL of hemoglobin, and have blood pressure >100/60 mmHg.

However, the age criterion is usually waived for regular healthy blood donors. All blood units are tested for HIV antibody, VDRL reactivity, and hepatitis B surface antigen (HBsAg) positivity. Antibody testing for hepatitis C virus was not done until early 1998. Blood tested positive to any one of the infectious markers is discarded. Endogenous HIV infection in Thailand has been known to be exclusively HIV-1.

The blood bank maintains donor registration system with two logbooks. One contains donor identification number, names, address, age, sex, weight, blood group, blood pressure, frequency of donation, and blood type but not laboratory test results on HIV antibody, VDRL, HBsAg, and anti-HCV antibody. The other logbook contains donor identification number which can be linked with the first logbook and the laboratory test results. All data are manually recorded.

Objective

This study is intended to describe the pattern of HIV infection risk in Chiangrai and safe blood donor recruitment and retention program.

Subjects and Methods

Ten years of data (1989-1998) from the first logbook were double-entered into two separate database files, which were later validated against each other for possible typographic, transcription and other errors using Epi Info version 5.01b⁶. After correction of the errors, names and addresses were excluded from the files to

ensure confidentiality of the data. The data from the second logbook were entered into a separate file and later merged with data of the first logbook by use of the unique identification number.

For each donor, the dates of first HIV negative, last HIV negative and first HIV positive tests were identified. A retrospective cohort of repeat blood donors who were initially HIV-negative was formed. HIV seroconverters were defined as blood donors who were initially HIV negative but later turned HIV-positive. HIV incidence is expressed as the number of HIV seroconverters per 100,000 person-years of HIV negative observation. The number of HIV seroconverters is calculated as the cumulative probability of seroconversion between the last negative and the first positive HIV tests, assuming the uniform distribution of the probability. The denominator, the number of person-years of HIV negative observation, is calculated by adding the period between the first negative and the last negative tests to the period between the last negative and the first positive tests, taking into consideration of the probability of HIV seroconversion during the period. The 95% confidence interval (CI) for the incidence rate was calculated using a Poisson approximation method. The risk of donations during the window period among repeat donors was defined by multiplying the incidence rate by an average window period, which is estimated to be 45 days or 45/365.25 years⁸. This method is used extensively to assess the

risk of transfusion transmitted virus (HIV and HCV) infection and named the Incidence/Window Period (IWP) Model⁹⁻¹¹. HIV prevalence rate was defined as the number of HIV-positive blood units divided by the total blood units received in a year.

Serologic test methods

Before early 1998, all tests for infectious markers were done in the hospital laboratory, as described in our previous report⁵. After early 1998, as part of the National Blood Center's policy to standardize laboratory tests in Thai blood banking system, the tests were done in a regional blood center located in a major province located about 183 km apart. Blood specimens are shipped via plane to the center and laboratory results are transmitted via facsimile back .

Results

The HIV prevalence was 0.98% in 1989 and peaked at 3.67% in 1991 before decreasing to 0.83% in 1998, as shown in Fig 1. During the same period, the incidence-window period (IWP) model gave an incidence rate of 1055.8 per 100,000 person-years of HIV seronegative observation (95% CI 934.2-1188.8). This resulted in an estimate of the window-period risk of HIV infection of 130.1 per 100,000 donations (95% CI 115.1-146.5). In Fig 2, HIV incidence rates were 2004, 1195, 742, 619, and 347 per 100,000 person-years for donors with 2, 3, 4, 5, ≥ 6 -time donations, respectively. It is clearly seen that the risk of window-period donations drops

steadily as the number of donation times increases.

Fig 3 shows the number of mobile donation sites for which the blood bank scheduled visits for one, two, three and four times in a year. The height of the column together with the corresponding number represent the number of sites visited for that many time. For example, there were 34 donation sites in 1998. Among these, 12 sites were visited only once in that year, while another 4, 1, and 17 sites were visited twice, three times in the year, respectively. It can be seen that the proportion of sites that are scheduled for three or four times a year, i.e. regularly scheduled, increases steadily over the period and is quite inversely correlated with the HIV prevalence rates shown in Fig 1.

Discussion

The fact that incidence rates vary according to the number of times of donations is ex-

pected and readily understandable. In other words, more frequent donors have lower risks or incidence rates. Since the finding was elicited retrospectively, this information has never been made explicit to the donors at the time of their donations. However, based on this finding, it is appropriate to convey this message to the donors in a prospective manner, i.e. at the time of donation, from now onwards. The main intention is to encourage low-risk repeat donors to stay in the program. By retaining the repeat donors, the blood bank can make a significant impact on both safety and adequacy of blood supply.

The National Blood Center in Thailand is under the responsibility of the Thai Red Cross Society that is governed by a board chaired by the Royal Family members. At the provincial level, the Red Cross Society is chaired by the governor's first lady. Similar organization is repeated at the district level. The primary re-

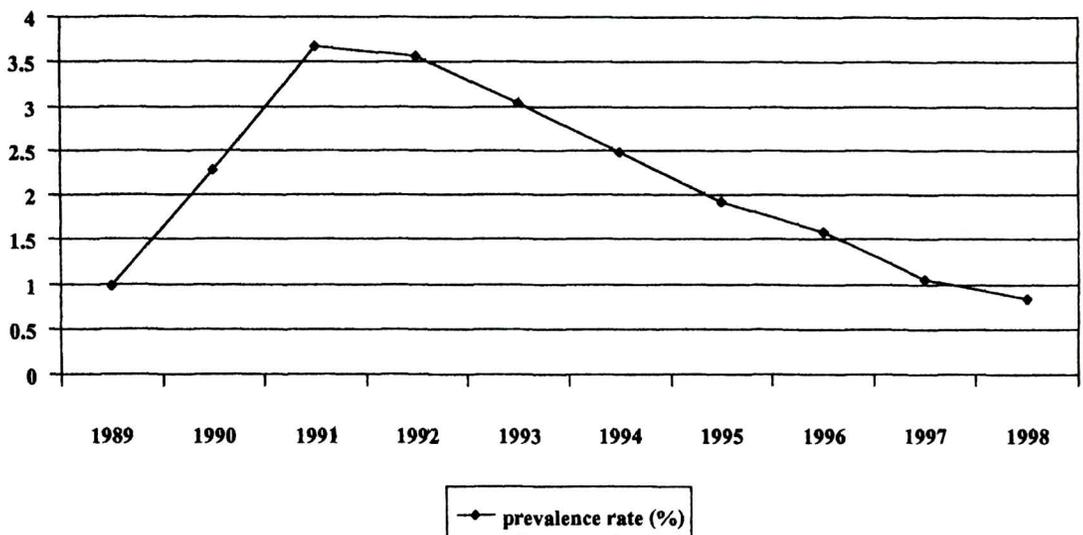


Fig. 1 Prevalence rate of HIV infection among blood donors in Chiangrai, 1989-1998.

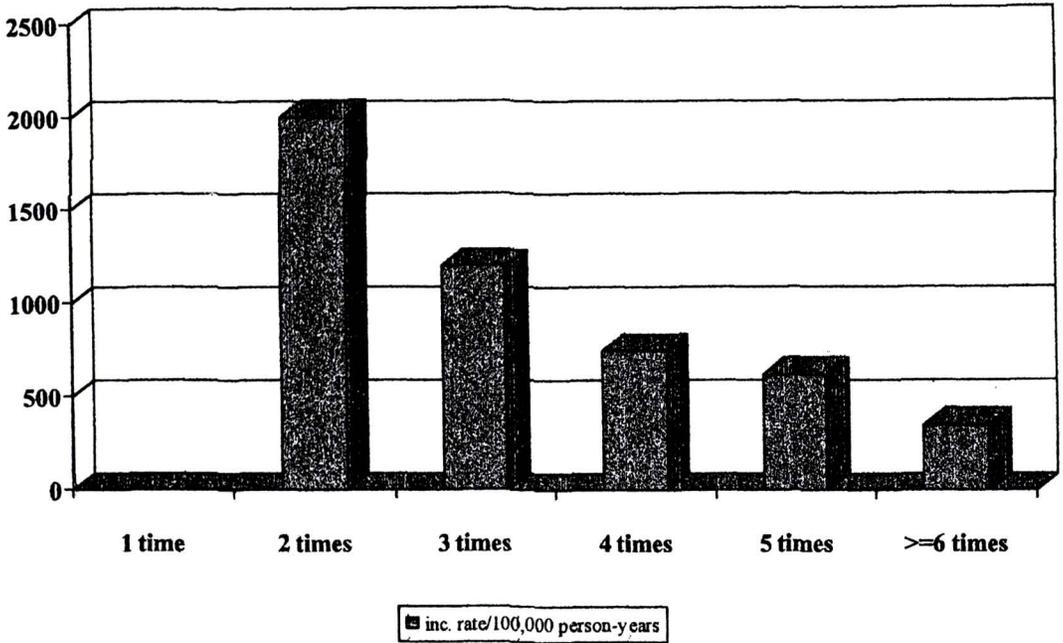


Fig. 2 HIV incidence rate by donation times in Chiangrai, 1989-1998.

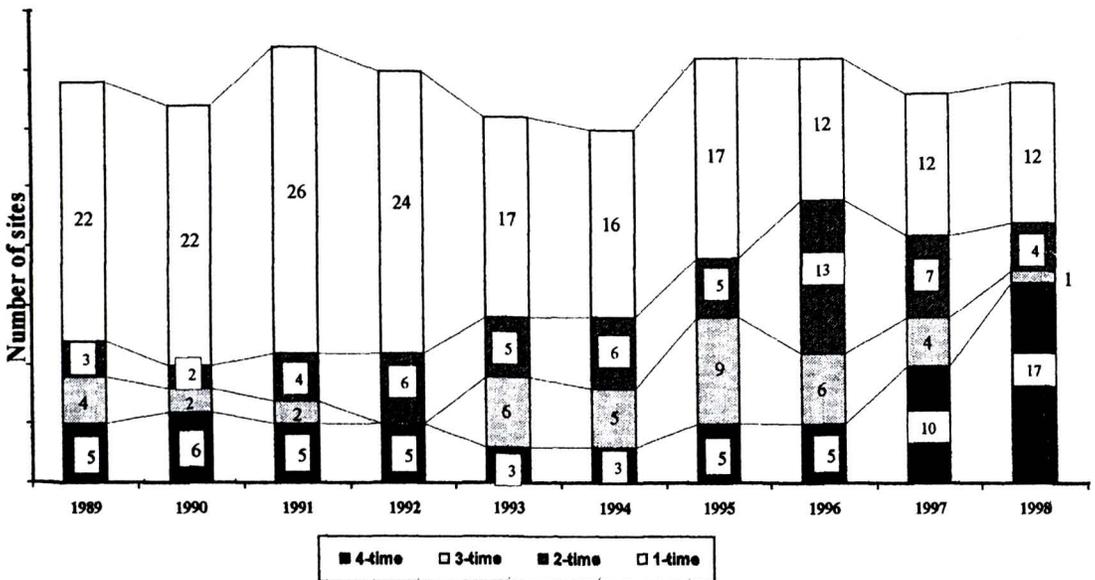


Fig. 3 Proportion of 1-, 2-, 3-, and 4-time-a-year donation sites in Chiangrai, 1989-1998.

sponsibility of the National Blood Center and its provincial and district red cross societies is to secure adequate and safe blood supply. This goal is achieved mainly through recruitment

and retention of low-risk donors through various efforts. This report demonstrates the efforts of the blood bank, the Provincial Red Cross Society and the district officers to recruit and

retain regular (repeat) donors by scheduling regular visits to the mobile donation sites that give high yield of donation. Typically, the Provincial Red Cross Society office will set a schedule for blood donation in a district and district officers fix donation sites in the district. Messages to increase awareness and attract attention of potential donors are sent to the society via several media channels, e.g. advertisement poster, radio, newspapers, and television. The community of potential donors is also informed of qualification of potential donors and donors' benefits, which include, in addition to good feeling of merit-making, free health check and blood testing. Certain misconceptions are also clarified, e.g. needles and bags are never reused, and blood test results will be kept confidential. Places such as schools and temples are prime targets to recruit potentially low-risk donors. Mobile donation units are sent to collect blood from these sites. Other potential sites for the mobile donation include private companies, banks, government offices, and factories. Donation yields of these sites are reviewed periodically and places with low number of donors are subsequently dropped. Previous donors are regularly reminded via a letter or other means of their next donation visit. The reminders to the donors are made possible because of well-maintained donor registry at provincial and district levels and they are further made easy by introduction of use of computers in donor registry maintenance. Special campaigns to motivate blood donation are held regu-

larly on several occasions, e.g. birthday of the Royal Family members, the King's reigning occasion. On the donation day, potential blood donors will be separated by their *tambon* (sub-district) of residence and the tambon leaders together with district officers and red cross personnel will motivate their people to donate. In addition, the district officers and the tambon leaders also donate their blood on the occasion to set examples for their men. The tambon with highest number of donations in a year receives special award from the Provincial Red Cross Society.

On a typical donation visit to a hospital blood bank, the donor will be given with pre-donation counseling and post-donation counseling by well-trained and good-mannered blood bank staff. Efforts are also made to improve blood collection rooms a friendly and relaxing atmosphere. Blood collection process is carried out in a professional manner. At the conclusion of the donation, the blood donor will be served milk as refreshment. For both on-site and mobile donations, number of donations is recorded and regular blood donors will be decorated or receive special recognition by the Thai Red Cross Society, e.g. decoration pins. The regular donors also receive benefits of reduced medical treatment fees in government hospitals. Those who have donated 24 times or more will get free medical treatments, when needed, in government hospitals. Those with fewer times of donation also receive partial supports, e.g. 16-time donors pay only 50% of the medical

treatment fees. The Thai Red Cross Society also holds an annual thank-you banquet for long-time regular donors and others who have contributed physically and/or financially to the Society activities. The banquet is a high-profile privileged event presided over by one or several of the Royal Family members. Collectively, the afore-mentioned activities contribute substantially to the success of the Thai Red Cross Society in general and this Provincial Red Cross Society and the provincial hospital blood bank in particular in ensuring adequacy and safety of the blood supply through recruitment and retention of low-risk donors¹². This study confirms the relationship between HIV infection risk and efforts in safe donor recruitment and retention program in Chiangrai. It is also clearly seen that repeat donors have a lower risk of HIV infection. The more times they donate, the lower HIV risk they have. This is the kind of program that should be encouraged and strengthened on a wider scale to ensure adequacy and safety of blood supply.

Acknowledgement

The authors would like to acknowledge Dr Renu Srismith, the director of Chiangrai Hospital, for her kind permission to analyze this data set and Mr Pollawat Thongsuk for his valuable comments. The authors are grateful to Chiangrai Hospital Blood Bank staff and Thai Red Cross Chiangrai for their cooperation, and Dr Yutaka Yasui for statistical assistance. The authors also thank Mr Sackson Radchakom, Ms Uthum-

porn Tubtimchai, and Ms Oranuch Nampaisan for their data manager efforts. This study was supported by the Ministry of Health and Welfare of Japan through the grant to the Research Institute of Tuberculosis and the Japanese Foundation for AIDS Prevention

References

1. Chiewsilp P, Isarangkura P, Tanprasert S, et al. Risk of transfusion associated AIDS by seronegative blood in Thailand: a multicenter report. *Southeast Asian J Trop Med Public Health*. 1993;24:139-40.
2. Isarangkura P, Chiewsilp P, Tanprasert S, Nuchprayoon C. Transmission of HIV infection by seronegative blood in Thailand. *J Med Assoc Thai* 1993;76:106-13.
3. Isarangkura P, Mahaphan W, Chiewsilp P, Chuansumrit A, Hathirat P. HIV transmission by seronegative blood components: report of 2 probable cases. *Vox Sang*. 1993;65:114-6.
4. Chuanrumrit A, Iamsilp W, Hathirat P, Chiewsilp P, Isarangkura P. Eluding transfusion-transmitted HIV infection: report of two cases. *J Med Assoc Thai* 1997; 80:S99-S101.
5. Sawanpanyalert P, Yanai H, Kitsuwannakul S, Nelson KE. An estimate of the number of human immunodeficiency virus (HIV)-positive blood donations by HIV-seronegative donors in a northern Thailand HIV epicenter. *JID* 1996;174:870-3.
6. Dean AG, Dean JA, Burton AH, Dicker RC. *Epi Info. Version 5.01b: a word processing, database and statistics program for epidemiology on microcomputers*. Atlanta: CDC, 1991.
7. Kitayaporn D, Uneklabh C, Weniger BG, et al. HIV-1 incidence determined retrospectively among drug users in Bangkok, Thailand. *AIDS* 1994;8:1443-50.
8. Petesen LR, Satten GA, Dodd R, et al. Duration of time from onset of human immunodeficiency virus type 1 infectiousness to development of detectable antibody. The HIV Seroconversion Study Group. *Transfusion*. 1994;34: 283-9.

9. Kleinman S, Bush MP, Korelitz JJ, Schreiber GB. The Incidence/Window Period Model and its Use to Assess the Risk of Transfusion - Transmitted Human Immunodeficiency Virus and Hepatitis C Virus Infection. *Transfusion Medicine Reviews*. 1997;11:155-72.

10. Lackritz EM, Satten GA, Aberlec-Grasse J, et al. Estimated risk of transmission of the human immunodeficiency virus by screened blood in the United States. *N Engl J Med*. 1995; 333: 1721-5.

11. Schreiber GB, Busch MP, Kleinman SH, et al. The risk of transfusion-transmitted viral infections. *N Engl J Med*. 1996;334:1685-90.

12. National Blood Center, Thai Red Cross Society. The Fourth National Conference on Donor Recruitment Strategy (Abstract). Bangkok. 1996:32-42.

The Risk of HIV Infection and Safe Donor Recruitment and Retention Program in Chiangrai

Somporn Khaisuwan, Pathom Sawanpanyalert*, and Hideki Yanai**.

Chiangrai Regional Hospital, Muang, Chiangrai, *Bureau of Medical Technical Development, Department of Medical Services, Ministry of Public Health, Nonthaburi, **TB/HIV Research Project, Chiangrai

บทคัดย่อ: หน้าที่สำคัญประการหนึ่งของศูนย์บริการโลหิตคือการจัดหาเลือดปลอดภัยอย่างเพียงพอ ความปลอดภัยของเลือดอาจจะถูกกระทบจากปัจจัยหลายอย่างโดยเฉพาะอย่างยิ่งการถ่ายทอดเชื้อโรคต่างๆ โดยการให้เลือดโดยเฉพาะอย่างยิ่งโอกาสที่จะถ่ายทอดเชื้อไวรัสเอดส์ ถึงแม้ว่าจะมีการใช้น้ำยาตรวจหาแอนติบอดีต่อเชื้อไวรัสเอดส์ที่มีความไวมากก็ตาม แต่ก็ยังมีความเสี่ยงหลงเหลืออยู่เพราะการถ่ายทอดเชื้อดังกล่าวเกิดในช่วงระยะเวลาที่ยังตรวจไม่พบแอนติบอดีต่อเชื้อไวรัสเอดส์ (window period) การศึกษาที่มีวัตถุประสงค์ที่จะประมาณอัตราความเสี่ยงดังกล่าวและศึกษามาตรการของธนาคารเลือดของโรงพยาบาลเชียงรายประชานุเคราะห์ที่ได้ใช้ในการหาและรักษาผู้บริจาคโลหิตที่ปลอดภัยไว้ ข้อมูลของธนาคารเลือดเป็นเวลา 10 ปี (พ.ศ.2532-2541) ได้รับการบันทึกลงในฐานข้อมูลและตรวจสอบความถูกต้อง หลังจากนั้น มีการกำหนด retrospective cohort ของผู้บริจาคโลหิตที่บริจาคมากกว่าหนึ่งครั้งและมีผลตรวจหาแอนติบอดีต่อเชื้อไวรัสเอดส์ครั้งแรกเป็นลบ ได้คำนวณอัตราอุบัติการณ์ของการติดเชื้อไวรัสเอดส์ในกลุ่มนี้ และยังมีการศึกษากิจกรรมของโครงการที่หาและรักษาผู้บริจาคโลหิตที่ปลอดภัยของโรงพยาบาลแห่งนี้ด้วย ความเสี่ยงของการถ่ายทอดเชื้อไวรัสเอดส์ในช่วงระยะเวลาที่ยังตรวจไม่พบแอนติบอดีเท่ากับ 130.1 ต่อ การบริจาค 100,000 ครั้ง (ช่วงความเชื่อมั่นร้อยละ 95 เท่ากับ 115.1-146.5) อัตราอุบัติการณ์ของการติดเชื้อไวรัสเอดส์รายใหม่ลดลงเมื่อจำนวนการบริจาคมากขึ้น ในช่วงระยะเวลาที่ทำการศึกษพบว่าสัดส่วนของสถานที่รับบริจาคนอกโรงพยาบาลที่ได้รับการจัดให้เป็นสถานที่รับบริจาคอย่างสม่ำเสมอ (3 หรือ 4 ครั้ง ต่อปี) นั้นเพิ่มขึ้นเรื่อย ๆ และผูกพันกับอัตราความชุกที่ลดลง ฉะนั้น จึงเป็นไปได้อย่างมากที่การหาและรักษาผู้บริจาคโลหิตที่ปลอดภัยไว้เป็นปัจจัยสำคัญที่สัมพันธ์กับการลดความเสี่ยงของการถ่ายทอดเชื้อไวรัสเอดส์ในระยะเวลาที่ยังตรวจไม่พบแอนติบอดี

Key Words : ● HIV incidence ● Safe donor recruitment and retention ● Chiangrai
วารสารโลหิตวิทยาและเวชศาสตร์บริการโลหิต 2542;9:195-202.