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HIV incidence rates among drug users in northern Thailand, 1993–7

J. JITTIWUTIKARN[1], P. SAWANPANYALERT[1]*, N. RANGSIVEROJ[1] AND P. SATITVIPAWEE[2]

[1] *Department of Medical Services, Ministry of Public Health, Tivanon Road, Muang Nonthaburi 11000, Thailand*
[2] *Department of Biostatistics, Faculty of Public Health, Mahidol University, Thailand*

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SUMMARY

Drug use is a major mode of HIV transmission in Thailand. This study determined HIV incidence rates among drug users in a regional drug treatment centre in northern Thailand. A retrospective cohort of repeatedly-hospitalized drug users between 1993 and 1997 was formed and HIV incidence rates were calculated. The overall incidence was 11·44 per 100 person-years of observation. Gender, age, religion, ethnicity, education, employment, income, reasons for drug use, type of drugs, mode of use, spending on drugs, and referral for treatment are associated with HIV incidence. However, there are no associations between HIV incidence and history of treatment and mode of discharge from the centre. This implies that current treatment modality has no impact on HIV infection risk and other therapeutic approaches should be explored.

INTRODUCTION

Drug use is an important risk factor for infection with human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS). HIV transmission among drug users in Thailand resulted in the first wave of the HIV epidemic, soon followed by HIV epidemics among commercial sex workers and other risk groups [1–3]. The HIV epidemic among drug users was rapid with prevalence rates increasing significantly early in the epidemic. Parenteral infection with HIV through sharing of needles and syringes among infecting drug users has been recognized as an important mode of transmission. The explanation of why non-injecting drug users are also at high risk of HIV infection was less clear. It is probable that the non-injecting drug users have other risk behaviours, e.g. risky sexual practices, tattoos. It is also possible that non-injecting drug users actually used injecting method but did not report them as such. Because drug use is such an important mode of HIV transmission, it has become quite routine that drug-treatment facilities screen all drug users for HIV infection. Therefore, HIV prevalence rates among drug users are usually available. Although HIV prevalence is an important and easy indicator of the seriousness of the HIV epidemic among drug users, it suffers from two main limitations. First, HIV testing among drug users usually does not take into consideration that drug users might seek treatments more than once. In other words, HIV prevalence rates are typically calculated based on episodes of HIV testing, not on individual drug users. The multiple counts of the drug treatment episodes can over- or underestimate the HIV infection rates among the drug users. Secondly, HIV prevalence rates, as determined in drug treatment facilities, combine the effects of HIV transmission in the past, survival probability, and treatment seeking behaviours of drug users. Therefore, HIV prevalence rates are a less-than-ideal indicator of HIV risk among drug users.

* Author for correspondence.

HIV incidence determines the risk of infection in a group of people. A few prospective cohort studies have been conducted to determine HIV incidence rates among drug users in some regions of the world [4–8]. However, such cohort studies are not feasible in all places where data on HIV risk among drug users are also needed because they can be prohibitively expensive and logistically difficult. However, linkage of treatment episodes of the same drug-using individuals can be a useful way to estimate HIV incidence. In settings where other demographic and risk data are routinely collected, associations between such risk factors and HIV infection can also be determined. We estimated risk of HIV infection, as measured by HIV incidence rates, and its trends among drug users in a regional drug treatment centre in northern Thailand. Associations between risk factors and the HIV infection are also explored.

MATERIALS AND METHODS

Setting

The study was carried out in a regional drug treatment centre of the Department of Medical Services of the Ministry of Public Health of Thailand. The centre is located 28 km north of the central district of the Chiang Mai province. It treats approximately 2000 drug users in a year. It is the largest regional drug treatment centre in Thailand. Each opiate user who seeks medical treatment for drug use is hospitalized for detoxification with methadone. The course of detoxification is 21 days including rehabilitation and occupational therapy. For non-opiate users, the duration of treatment, which is not with methadone, is usually shorter but more than 10 days. For both opiate and non-opiate users, other psychotropic drugs are used, as indicated, for symptomatic treatment.

In late 1992, the centre established a systematic way to collect demographic and drug-related data for all hospitalized patients. Variables collected included address, gender, age, religion, marital status, ethnicity, educational attainment, occupation, income, reasons for starting drugs, type of drugs, amount of drugs used, route of drug use, amount of money spent on drugs, previous treatment history, mode of referral for treatment, and mode of discharge from the centre. Each drug user was assigned a unique number on his/her patient's card for identification if he/she represented. A soundex system was also developed so that the hospital could trace the unique identification number in patients who did not bring their card. The unique identification helped identify several admissions of a same individual. We present analysis of 5 years of data (1993–7) of risk factors and HIV infection.

Methods

Data on all hospitalized drug users seeking treatment at the centre between 1 January 1993 and 31 December 1997 were abstracted and recorded in a specially-designed form. Data were then double-entered in two separate computer database files and subsequently validated against each other for possible transcription, typographic and other errors. Records were linked and drug users who were treated more than once were identified. A retrospective cohort of drug users seeking treatment more than once was delineated. For drug users who were repeatedly treated, the dates of their first HIV-negative (if any), last HIV-negative (if any), and first HIV-positive test results (if any) were identified. Drug users who were initially HIV negative on one visit and later found to be HIV positive were considered HIV seroconverters. For each HIV seroconverter, the seroconversion was assumed to occur with a uniform probability from the date of last HIV negative to the date of first HIV positive. For the HIV seroconverters, the period of person-years of HIV-seronegative observation was identified. For the period of the first HIV-negative and the last HIV-negative test results, the portion of the HIV-negative observation could be estimated in a straightforward fashion. However, the fact that HIV seroconversion could happen on any single day was used to discount the period of seronegative observation between the last HIV-negative and the first HIV-positive test results. This latter portion of the HIV-seronegative window-period observation was added to the former portion to be the denominator for the HIV seroconversions. The HIV incidence was defined as the number of HIV seroconversions divided by the HIV-negative window period. Repeatedly HIV-negative drug users did not contribute to the numerators, but to the denominators. The HIV seroconversion rates and their associated 95% confidence intervals (CIs) were calculated, assuming Poisson distribution, by age, sex, and other demographic and drug-use-related variables. To dichotomize continuous variables, medians, instead of means, were used because of the wide range of data.

The drug users could also be classified as HIV positive or HIV negative on their initial visits. HIV prevalence rates, defined as the number of HIV-

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positive individuals divided by the total number of those being tested for HIV at the beginning of the considered period, were then calculated.

Serologic testing

Regardless of previous HIV status, all drug users were tested for anti-HIV antibody by using Genelavia Mixt (HIV) (Sanofi Diagnostics, Pasteur, France) and Genscreen® HIV1/2 (Sanofi Diagnostics, Pasteur, France). Repeatedly (twice) reactive to the tests were considered HIV positive. No immunoblotting confirmation was performed.

RESULTS

There were 9774 drug users admitted to the centre during the 5-year period (1 January 1993–31 December 1997), who contributed 673890 person-days of observation [equivalent to 1845 person-years of observation (PYO)]. During the 1845 PYO, there were 211 seroconverters, which is equivalent to an incidence of 11·44 per 100 PYO (95% CI = 9·87, 13·01). As shown in Figure 1, the incidence rates dropped from 19·79 per 100 PYO in 1993 to 16·54, 9·43, and 6·80 per 100 PYO in 1994, 1995, and 1996 respectively, only to slightly increase to 7·51 per 100 PYO in 1997. During the same time, the prevalence rates increased markedly from 4·55% (100/2197) in 1993 to 18·96% (380/2004) in 1994 and then declined to 15·84% (353/2229), 15·33% (285/1859) and 13·40% (199/1485) in 1995, 1996 and 1997 respectively.

Among the 9774 drug users, 5086 (52%) were heroin users. Heroin users had an about 4·5-time higher HIV incidence rate [17·12 (14·58, 19·67) per 100 PYO] than non-heroin users [3·81 (2·57, 5·43) per 100 PYO]. The trend in HIV incidence rates among heroin and non-heroin users over the 5-year period, as shown in Figure 2, is similar to the overall trend. Figure 3 shows the trend in HIV incidence rates among drug injectors and that among drug non-injectors. The overall HIV incidence rate among drug injectors [24·90 (20·67, 29·13) per 100 PYO] is about 4·5-time that of the drug non-injectors [5·60 (4·41, 7·09) per 100 PYO].

Table 1 shows HIV incidence rates of the initially-HIV-negative drug users by demographic and drug-related characteristics. The following characteristics are associated with higher HIV incidence rates, e.g. male gender, young age, Buddhism, not living with a partner, Thai lowlanders, formal education, unem-

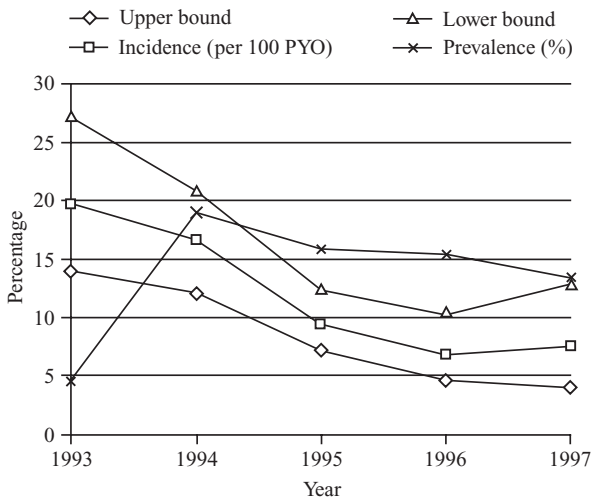

Fig. 1. HIV incidence and prevalence rates among drug users in northern Thailand, 1993–7.

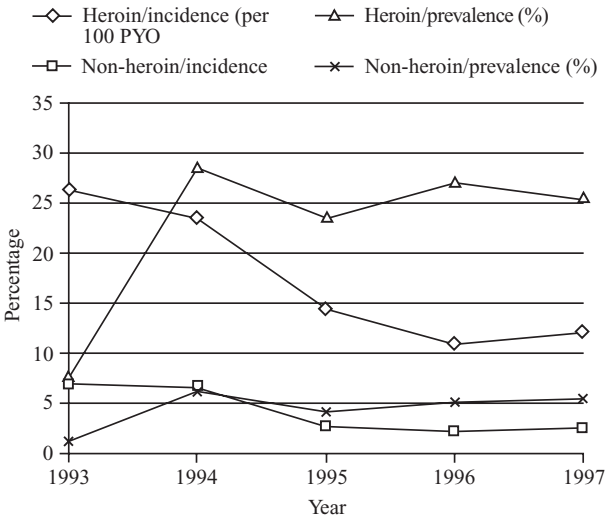

Fig. 2. HIV incidence and prevalence rates among heroin and non-heroin users in northern Thailand, 1993–7.

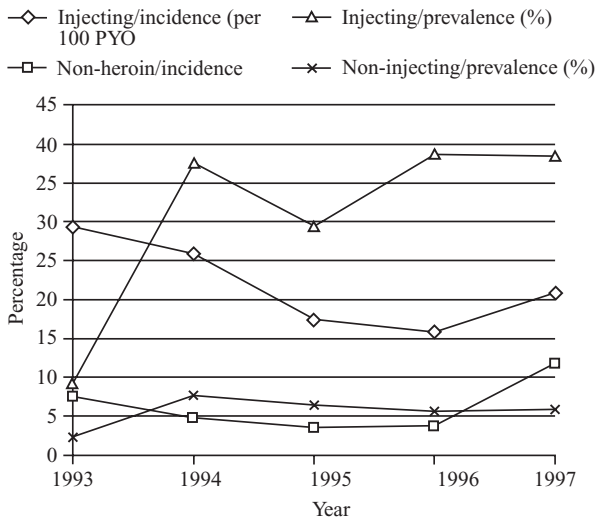

Fig. 3. HIV incidence and prevalence rates among injecting and non-injecting drug users in northern Thailand, 1993–7.

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Table 1. *HIV incidence rates among drug users in northern Thailand, 1993–7*

Characteristic	HIV incidence rate (95% confidence interval)
Gender	
Male	12·77 (11·00, 14·54)
Female	1·79 (0·49, 4·57)
Age	
⩽ 32 years	16·64 (13·79–19·30)
> 32 years	6·06 (4·61–7·95)
Religion	
Buddhism	12·99 (11·11, 14·87)
Animism	5·02 (2·41, 9·24)
Others	5·70 (2·73, 10·48)
Marital status	
Single	21·14 (17·29, 25·00)
Living with a partner	5·90 (4·58, 7·58)
Separated/divorced/widowed	13·86 (9·06, 20·31)
Ethnicity	
Thai lowlanders	16·77 (14·13, 19·40)
Ethnic minority	5·58 (4·12, 7·37)
Educational level	
No formal education	4·60 (3·20, 6·40)
Primary school (6 years)	16·90 (13·58, 21·00)
> Primary school	15·66 (12·68, 19·32)
Occupation	
Unemployment	16·88 (11·39, 24·09)
Agriculture	7·79 (5·74, 10·32)
Unskilled labour	13·60 (11·07, 16·68)
Grocery ownership	15·60 (10·09, 23·02)
Studentship	12·00 (5·49, 22·79)
Civil services/state enterprise	3·17 (0·66, 9·28)
Others	0 (0, 16·56)
Monthly income	
No income	15·61 (11·20, 21·18)
⩽ 1500 baht*	8·11 (6·08, 10·79)
> 1500 baht	12·42 (10·15, 14·70)
Reasons for drug use	
Medical (e.g. pain, cough)	3·21 (1·80, 5·30)
Non-medical	14·22 (12·19, 16·25)
Type of drugs	
Heroin	17·12 (14·58, 19·67)
Non-heroin	3·81 (2·57, 5·43)
Route of drug use	
Injecting	24·90 (20·67, 29·13)
Non-injecting	5·60 (4·41, 7·09)
Amount of drugs used per day	
> 1 Equivalent unit†	12·30 (10·41, 14·18)
⩽ 1 Equivalent unit	8·86 (6·36, 12·03)
Money spent on drug per day	
⩾ 80 baht*	14·03 (11·82, 16·24)
< 80 baht	7·17 (5·38, 9·53)
Ever treated for drug use	
Yes	12·35 (9·48, 16·04)
No	11·12 (9·31, 12·92)
Even treated for drug use in this centre	
Yes	13·84 (10·37, 18·39)
No	10·85 (9·14, 12·56)
Sender for this episode of treatment	

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Table 1. (*cont.*),

Characteristic	HIV incidence rate (95% confidence interval)
Self	12·91 (10·39, 15·42)
Relatives	12·50 (9·90, 15·76)
Others	7·08 (4·78, 10·09)
Mode of discharge from this centre	
Against advice/escape	13·66 (5·90, 26·91)
By permission	11·36 (9·77, 12·95)

* Rate of exchange in December 1998 was approximately 1 US dollar = 36 baht.
† The amount of 1 equivalent unit is equal to 0·3 g heroin, 1·5 g of opium, 120 fluid ounces of 40%-alcohol liquor.

ployment, unskilled labour, grocery ownership, studentship, no monthly income, monthly income higher than median, non-medical reasons for drug use, heroin use, injection, high amount of daily drug use, high daily spending on drugs, and referral for treatment by self or relatives. History of previous treatments and mode of discharge from the centre do not seem to be associated with HIV risk.

DISCUSSION

The HIV incidence as determined in this study are higher than a similar study in a nearby northern province [9] and a report from Bangkok [10]. However, the trend is downwards. The incidence in 1993–5 is compatible with a preliminary report from the same centre [11].

Several factors were found to be associated with increased risks of HIV infection, most of which are easily understandable. The fact that Buddhist drug users are at a higher risk of HIV seroconversion is surprising and needs further investigation. The association could have been confounded by other factors or it could be simply due to the small number of non-Buddhist drug users. Drug users with no formal education seem to have a much lower risk. The effect of education could be mediated through other measured and unmeasured factors including occupation, income and access to drugs. Previous treatment and mode of discharge from the centre do not seem to be associated with HIV seroconversion. This means that these two factors have no significant effects on other risk factors of HIV infection. This implies that current treatment modality, i.e. methadone detoxification, has no impact on HIV incidence among the drug users and new ways of treatment, e.g. methadone maintenance, may be needed.

HIV prevention and control efforts in the past decade in northern Thailand have resulted in significant changes in sexual behaviours of Thai men, especially increased condom use, and reduction in sexually-transmitted HIV infection [12]. However, the same report showed more frequent use of illicit injection drugs among young men. This finding together with results from this study indicate that drug use will continue to play an important role as a major HIV transmission mode in northern Thailand. More efforts are needed to reduce HIV infection among the drug users and continuous monitoring of HIV incidence in the group is an essential component of any intervention programme.

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REFERENCES

1. Weniger BG, Limpakarnjanarat K, Ungchusak K, et al. The epidemiology of HIV infection and AIDS in Thailand. AIDS 1991; **5** (suppl. 2): S71–85.
2. Ou CY, Takebe Y, Weniger BG, et al. Independent introduction of two major HIV-1 genotypes into distinct high-risk population in Thailand. Lancet 1993; **341**: 1171–4.
3. Weniger BG, Takebe Y, Ou CY, Yamazaki S. The molecular epidemiology of HIV in Asia. AIDS 1994; **8** (suppl. 2): S13–28.
4. Nicolsi A, Musicco M, Saracco A, Molinari S, Ziliani N, Lazzarin A. Incidence and risk factors of HIV

infection: a prospective study of seronegative drug users from Milan and northern Italy, 1987–1989. Epidemiology 1990; **1**: 453–9.
5. Metzger DS, Woody GE, McLellan AT, et al. Human immunodeficiency virus seroconversion among intravenous drug users in- and out-of-treatment: an 18-month prospective follow-up. J Acquir Immune Defic Syndr 1993; **6**: 1049–56.
6. Rebagliato M, Avino MJ, Hernandez-Aguado I, et al. Trends in incidence and prevalence of HIV-1 infection in intravenous drug users in Valencia, Spain. J Acquir Immune Defic Syndr Hum Retrovirol 1995; **8**: 297–301.
7. Wiebel WW, Jimenez A, Johnson W, et al. Risk behavior and HIV seroincidence among out-of-treatment injection drug users: a four-year prospective study. J Acquir Immune Defic Syndr Hum Retrovirol 1996; **12**: 282–9.
8. Fisher DG, Fenaughty AM, Trubatch B. Seroconversion issues among out-of-treatment injection drug users. J Psychoactive Drugs 1998; **30**: 299–305.
9. Sawanpanyalert P, Supawitkul S, Yanai H, Saksoong P, Piyaworawong S. Trend of HIV incidence rates among drug users in an HIV epicenter in northern Thailand (1989–1997). J Epidemiol 1999; **9**: 114–20.
10. Kitayaporn D, Uneklabh C, Weniger BG, et al. HIV-1 incidence determined retrospectively among drug users in Bangkok, Thailand. AIDS 1994; **8**: 1443–50.
11. Celentano DD, Jittiwutikarn J, Hodge MJ, et al. HIV-1 incidence among opiate users in northern Thailand [abstract A(O)011]. Fourth International Congress on AIDS in Asia and the Pacific (Manila, The Philippines). Manila: Abbott Laboratories, 1997.
12. Nelson KE, Celentano DD, Eiumtrakul S, et al. Changes in sexual behavior and a decline in HIV infection among young men in Thailand. NEJM 1996; **335**: 297–303.