HHS Public Access

Author manuscript

*J Acquir Immune Defic Syndr*. Author manuscript; available in PMC 2019 October 26.

Published in final edited form as:

*J Acquir Immune Defic Syndr*. 2017 July 01; 75(3): e82–e86. doi:10.1097/QAI.0000000000001295.

# Cluster of HIV Infections Associated With Unsafe Injection Practices in a Rural Village in Cambodia

**Vonthanak Saphonn, MD, PhD, MS**[*], **Masami Fujita, MD**[†], **Sovannarith Samreth, MD**[‡], **Sodara Chan, MD, MSc**[§], **Francois Rouet, PharmD, PhD**[‖], **Vohith Khol, MD**[‡], **Sovatha Mam, MD**[‡], **Chandara Mom, MD**[‡], **Sovannary Tuot, BA, MA**[¶], **Linh-Vi Le, MSc, MA**[#], **Penh Sun Ly, MD**[‡], **Laurent Ferradini, MD, PhD**[†], **Chhi Vun Mean, MD**[‡]

[*]University of Health Sciences, Phnom Penh, Cambodia

[†]World Health Organization, Phnom Penh, Cambodia

[‡]Cambodian National Center for HIV/AIDS, Dermatology and Sexually Transmitted Diseases, Ministry of Health, Phnom Penh, Cambodia

[§]Centers for Disease Control and Prevention, Cambodia Office, Phnom Penh, Cambodia

[‖]HIV/Hepatitis Unit, Institut Pasteur du Cambodge, Phnom Penh, Cambodia

[¶]KHANA, Phnom Penh, Cambodia

[#]World Health Organization, Regional Office for the Western Pacific, Manila, Philippines

To the Editors:

In late 2014 in a rural village in Cambodia, a surge in HIV infections was reported and a rapid investigation identified 114 among 915 (12.4%) Roka commune residents being HIV infected, with 65% women and age ranging between 3 and 87 years. As a comparison, between January and November 2014, only 4 among 271 people in Roka commune (1.5%) were found HIV-positive. With only 1 public health care center for all villages in the commune, health services are largely shared by private health service providers including unlicensed informal health practitioners who conduct home visits and administer medical procedures, including medical injection, intravenous infusion, and blood draw. A case–control study was performed in December 2014, led by the National Center for HIV/AIDS, Dermatology and STDs (NCHADS) and the University of Health Sciences (UHS), to identify risk factors associated with recently diagnosed HIV-positive cases in Roka commune.

V.S., S.C., C.V.M., P.S.L., M.F. developed the study and followed its implementation and analysis; S.S., V.K., S.M., C.M., F.R., S.C. and S.T. implemented the study and coordinated data collection; L.-V.L. conducted the statistical analysis and drafted the manuscript, and L.F. contributed to the manuscript's discussion of policy and programmatic implications and coordinated its submission. All co-authors had the opportunity and contributed to the review of the manuscript.

The authors have no conflict of interest to disclose.

## METHODS

Cases were all residents of Roka village who were newly tested and confirmed HIV-positive from 8 to December 22, 2014. Controls were HIV-negative individuals selected from neighboring households near the cases and excluded household members of a case and those testing reactive using 1 rapid test at the time of interview. Two controls were selected and intended to be matched on age and sex, but difficulties were encountered in matching for sex, leading to imperfect matching. Individual structured face-to-face interviews were conducted with cases and controls to collect demographic data, history of invasive medical procedures, and other HIV risk factors. Investigated medical procedures included medical injections, intravenous infusion, minor and major surgical procedures, blood draw, blood transfusion, blood donation, dental procedure, and obstetric processes including childbirth, miscarriage, and induced abortion. Other behavioral risk data were collected including being tattooed, skin piercing, injection drug use, previous diagnosis of sexually transmitted infection, group sex, unprotected sex, and sex with an HIV-infected person. Univariate and multivariate logistic regression analysis was performed using STATA to identify associated risks of HIV infection. Written informed consent was obtained from adults and from a parent or legal guardian for minors below 18 years of age. Participation was anonymous, and the study was approved by the Cambodian National Ethics Committee for Health Research.

## RESULTS

One-hundred and twelve HIV-infected cases and 214 HIV-uninfected controls were interviewed. Rapid testing during recruitment for the control group found 8 HIV reactive cases, who were then excluded from the control group. The mean age was 41 years (range 2–88) for cases and 38 years (range 1–81) for controls and not significantly different ($P = 0.35$). The proportions of children under 16 years of age were similar (approximately 20%). However, sex and marital status distributions significantly differed with more men (44.4% vs. 33.0%, $P = 0.047$) and single adults (17.8% vs. 6.3%, $P = 0.023$) among controls. Almost all cases (93%) and a large proportion of controls (54%) reported having had medical injections in the past 12 months. Intravenous infusion and blood draw were also common, but not surgical, dental, or obstetric procedures. With respect to other known risk factors, 14 adult male respondents reported having ever had sex with a sex worker, three respondents have had sex with an HIV-positive partner, and only one reported having ever injected drugs. No one reported ever having had group sex, homosexual sex with a man, or sex with non-spousal or nonregular partner.

Univariate logistic regression analyses demonstrated significant association between HIV infection and having received injections, intravenous infusion, or blood draw for all time frames within the past three years, with stronger associations within the past six months (Table 1). No other factors examined were significantly associated with HIV infection, including other invasive procedures, injection drug use, and sex-related risk behavior usually associated with HIV transmission. In the multivariate model (Table 1), the associations remained significant for injection [Adjusted Odd Ratio (AOR) = 4.9 (2.2–10.8)], intravenous infusion [AOR = 4.3 (2.1–8.9)], and blood draw [AOR = 5.6 (2.5–12.2)] for the period within the past 6 months, for intravenous infusion during the previous 7–12 months [AOR =

2.9 (1.4–6.3)], and for injection during the previous 13–36 months before the study [AOR = 2.2 (1.1–4.3)].

## DISCUSSION

The results provide strong evidence that recent exposure to unsafe medical injection practices was associated with HIV infection among Roka village residents in Cambodia. Cambodia is known to have one of the world's highest rates of injection usage.[1–5] Medical injections are largely perceived as more effective than other treatments by both patients and practitioners and are common in rural and urban areas.[5] In Battambang province in 2014, approximately 30% of the adult population reported a medical injection in the past year (average of 1.6 injections for women and 1.7 for men) and almost all of them had their last injections with syringes and needles taken from a new, unopened package.[5,6] In sub-Saharan Africa in 2004, it was estimated that 1%–5% of new HIV infections might be associated with unsafe medical injections.[7] The most recent global estimates indicate that unsafe medical injections accounted for 0.7%–1.3% of new HIV infections in 2010 and that between 2000 and 2010 the absolute number of HIV and hepatitis C virus (HCV) infections transmitted through injections declined by 87% and 83%, respectively.[8] Despite worldwide reductions in health care-associated HIV transmission, clusters of HIV infections related to unsafe injections have been reported in Russia,[9] Romania,[10] Libya,[11] and Kyrgyzstan.[12] More recently in 2015, an important HIV outbreak related to drug abuse-related injections was reported in Indiana, United States.[13]

The cluster of HIV infections detected in Roka reveals that injection safety remains an important challenge in Cambodia and potentially more globally in the developing world where patients still overuse injection therapy.[1] It also suggests that HIV outbreaks related to unsafe medical practices might be detected more easily in concentrated than generalized HIV epidemics where occurrences might be largely underestimated. Subsequent investigation of Roka cases showed that more than 75% of HIV-positive cases were coinfected with HCV (manuscript in draft), underlying the importance of infection control for all blood-borne disease control and prevention. Infection control in health care and community-based settings should not only address the reuse of needles and syringes, multidose vial use and unsafe product sources, but also, as recommended by the World Health Organization,[14] aim to reduce unnecessary injections and transition to safety-engineered injection devices.

The level of awareness about the risk of HIV transmission through unsafe injections and the importance of using disposable syringes and needles was found high in Cambodia after large education campaigns conducted by the Ministry of Health (MoH) in the late 1990s.[2] Disposable needles and syringes became largely available in Cambodia after 2000 and were promoted for use in the 2001 National injection safety guidelines (revised in 2013).[15] Nevertheless, the recent Roka cluster showed that unsafe injections continue to occur in the country. As this may not be isolated to Roka alone, the MoH is planning to expand HIV surveillance to evaluate medical injection safety throughout the country and implement an efficient alert surveillance system. Indeed, in low-prevalence countries such as Cambodia, a better understanding of HIV transmission through unsafe injection is important and should

be integrated into epidemic modeling that estimates HIV infection numbers. Cambodia's HIV burden estimates are currently based primarily on seroprevalence sentinel surveillance among pregnant women attending antenatal clinics and key populations,[16] which may not cover all risks of infection, such as the cumulative risks of the older population exposed to medical injection. In a recent study in Cambodia, being older than 50 years and exposed to multiple parenteral infusions before the year 2000 were independently associated with HCV infection in patients with HIV.[17]

In rural areas of Cambodia, almost 29.4% of ill or injured patients reported receiving medical services in the past month by 'trained' health care workers. Another 5.3% attended the non-medical sector, whereas the vast majority attended other private and public sector services.[9] After the Roka outbreak, the MoH and Ministry of Information issued guidance in January 2015 to instruct local authorities to increase enforcement of licensing regulations toward unauthorized providers and medical clinics.[18] The current law subjects private medical practices to registrations and taxations, and the MoH is drafting new legislation to define and prohibit unlicensed practices. The MoH recognizes the importance of injection safety by having revised in 2013 the National injection safety guidelines,[15] first issued in 2001. Yet these laws and guidelines will require concomitant investments in human resources and law education, particularly in rural areas where shortages of personnel and legislative literacy, combined with the common use of roaming unlicensed medical providers, present major challenges to enforcing and regulating medical practice safety.

This study has some limitations, especially with the lack of random selection of controls for accurate matching because of incomplete and outdated household registries and records. Taking controls from neighboring households may have decreased associations because neighbors might be more likely to have similar health practices or use the same providers as their matched cases. Neighboring households limited our ability to match for sex and marital status. Despite that, our analysis could still find significant risk associations making us confident about the role of invasive medical procedures in HIV transmission.

In conclusion, in countries with low HIV prevalence like Cambodia, health care-associated HIV transmission may continue to represent substantial HIV risk and compromise HIV and other blood-borne disease control efforts. Such a risk should be closely monitored with appropriate tools and alert systems, actively prevented by improving health care providers' injection practices, both in the public and private sectors. Reduction of the demand for unnecessary medical injections should be raised through awareness of both the public and medical practitioners.

## ACKNOWLEDGMENTS

The authors would like to acknowledge Dr. Conchita Roces, Dr. Perry Killam, Dejana Selenic for their contribution in the preparation of the study and design of the protocol as well as Kunthea Soch, Sarin Eng, Bunthoeun Eng for their contribution in data collection and management.

Supported by Royal Government of Cambodia, WHO, UNAIDS, UNICEF, US-CDC, USAID Flagship project. This project has been supported, in part, by the President's Emergency Plan for AIDS Relief (PEPFAR) through the Centers for Disease Control and Prevention (CDC) under the terms ofGrant Number: 5U2GGH000989-04].

The findings and conclusions in this Letter are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention (CDC).

## REFERENCES


1. Simonsen L, Kane A, Lloyd J, et al. Unsafe injections in the developing world and transmission of bloodborne pathogens: a review. Bull World Health Organ. 1999;77:789–800. [PubMed: 10593026]
2. Vong S, Perz JF, Sok S, et al. Rapid assessment of injection practices in Cambodia, 2002. BMC Public Health. 2005;5:56. [PubMed: 15929800]
3. Hutin YJ, Hauri AM, Armstrong GL. Use of Injection in health-care settings worldwide, 2000: literature review and regional estimates. BMJ. 2003;327:1075. [PubMed: 14604927]
4. Men C, Hutin Y, Kanal K, et al. Interactional Group Discussion: Reducing the Overuse of Injections at Public Healthcare Facilities in Cambodia. Phnom Penh, Cambodia: MoH publisher; 2004.
5. Men C Final Report: A Comprehensive Strategy to Prevent Health-Care Associated Infections With HIV and Other Blood Borne Pathogens in Cambodia. Phnom Penh, Cambodia: MoH publisher; 2006.
6. National Institute of Statistics, Directorate General for Health, and ICF International. Cambodia Demographic and Health Survey 2014. Phnom Penh, Cambodia, Rockville, MD: National Institute of Statistics, Directorate General for Health and ICF International; 2015.
7. Schmid GP, Buvé A, Mugyenyi P, et al. Transmission of HIV-1 infection in sub-Saharan Africa and effect of elimination of unsafe injections. Lancet. 2004;363:482–488. [PubMed: 14962531]
8. Pépin J, Abou Chakra CN, Pépin E, et al. Evolution of the global burden of viral infections from unsafe medical injections, 2000–2010. PLoS One. 2014;9:e99677. [PubMed: 24911341]
9. Bobkov A, Garaev MM, Rzhaninova A, et al. Molecular epidemiology of HIV-1 in the former Soviet Union: analysis of env V3 sequences and their correlation with epidemiologic data. AIDS. 1994;8:619–624. [PubMed: 8060542]
10. Patrascu IV, Dumitrescu O. The epidemic of human immunodeficiency virus infection in Romanian children. AIDS Res Hum Retroviruses. 1993;9:99–104. [PubMed: 8427718]
11. Yerly S, Quadri R, Negro F, et al. Nosocomial outbreak of multiple blood-borne viral infections. J Infect Dis. 2001;184:369–372. [PubMed: 11443566]
12. Utyasheva L Kyrgyzstan: nine health care workers guilty of negligence causing HIV transmission among children. HIV AIDS Policy Law Rev. 2008;13:48–49.
13. Conrad C, Bradley HM, Broz D, et al. Community outbreak of HIV infection linked to injection drug use of oxymorphone-Indiana, 2015. MMWR Morb Mortal Wkly Rep. 2015; 64:443–444. [PubMed: 25928470]
14. WHO. Global Health Sector Strategies on HIV and Viral Hepatitis 2016–2021, toward ending AIDS. Geneva, Switzerland: WHO Available at: http://www.who.int/hiv/strategy2016-2021/ghss-hiv/en/. Accessed December 20, 2016.
15. National Injection Safety Guidelines 2013, for All Private and Public Healthcare Facilities. Kingdom of Cambodia. Phnom Penh, Cambodia: MoH; 2013.
16. Cambodia AIDS Epidemic Model: Impact & Analysis Case Study, NCHADS and UNAIDS Report. Phnom Penh, Cambodia: NCHADS and UNAIDS; 2014.
17. Goyet S, Lerolle N, Fournier-Nicolle I, et al. Risk factors for Hepatitic C transmission in HIV patients, Hepacam Study, ANRS 12267 Cambodia. AIDS Behav. 2014;18:495–504. [PubMed: 23612943]
18. Joint Prakas on “Quality Control, Service and Measure for the Elimination of Illegal Health Product and Illegal Private Health Service for Health and Social Safety,” No: 142 Pra.K. Phnom Penh, Cambodia: Cambodia Ministry of Interior and Ministry of Health; 2015.

**TABLE 1.**

Univariate and Multivariate Logistic Regression Analysis of Factors Associated With HIV Infection

| | | | Univariate Analysis | | Multivariate Analysis | |
|---|---|---|---|---|---|---|
| **Variables** | **Cases (N = 112), %** | **Controls (N = 214), %** | **Unadjusted OR** | **95% CI** | **Adjusted OR*** | **95% CI** |
| Injection, mo | | | | | | |
| 0–6 | 88.4 | 28.0 | 19.5† | 10.2 to 37.5 | 4.9 | 2.2 to 10.8 |
| 7–12 | 68.8 | 28.0 | 5.65† | 3.4 to 9.3 | | |
| 13–36 | 73.2 | 42.5 | 3.7† | 2.2 to 6.1 | 2.2 | 1.1 to 4.3 |
| Intravenous infusion | | | | | | |
| 0–6 | 67.0 | 13.6 | 12.9† | 6.7 to 25.1 | 4.3 | 2.1 to 8.9 |
| 7–12 | 49.1 | 13.1 | 6.4† | 3.7 to 11.0 | 2.9 | 1.4 to 6.3 |
| 13–36 | 47.3 | 29.4 | 2.2† | 1.3 to 3.5 | | |
| Blood draw | | | | | | |
| 0–6 | 83.9 | 44.4 | 6.5† | 3.7 to 11.6 | 5.6 | 2.5 to 12.2 |
| 7–12 | 28.6 | 13.1 | 2.7† | 1.5 to 4.7 | | |
| 13–36 | 21.4 | 22.0 | 1.0 | 0.6 to 1.7 | | |
| Minor surgery | | | | | | |
| 0–6 | 1.8 | 3.7 | 0.5 | 0.1 to 2.2 | | |
| 7–12 | 2.7 | 1.9 | 1.4 | 0.3 to 6.6 | | |
| 13–36 | 3.6 | 5.6 | 0.6 | 0.2 to 2.0 | | |
| Major surgery | | | | | | |
| 0–6 | 2.7 | 0 | NA | NA | | |
| 7–12 | 1.8 | 0.9 | 1.9 | 0.5 to 13.9 | | |
| 13–36 | 2.7 | 1.9 | 1.4 | 0.6 to 6.6 | | |
| Dental | | | | | | |
| 0–6 | 5.3 | 7.0 | 0.8 | 0.3 to 2.0 | | |
| 7–12 | 3.6 | 4.7 | 0.8 | 0.2 to 2.5 | | |
| 13–36 | 6.3 | 15.9 | 0.4† | 0.2 to 0.8 | 0.2 | 0.1 to 0.6 |
| Obstetrics‡ | | | | | | |

*J Acquir Immune Defic Syndr*. Author manuscript; available in PMC 2019 October 26.

| | | | Univariate Analysis | | Multivariate Analysis | |
|---|---|---|---|---|---|---|
| **Variables** | **Cases (N = 112), %** | **Controls (N = 214), %** | **Unadjusted OR** | **95% CI** | **Adjusted OR*** | **95% CI** |
| 0–6 | 11.7 | 5.0 | 2.5 | 0.8 to 8.3 | | |
| 7–12 | 10.0 | 3.0 | 3.6 | 0.8 to 14.9 | | |
| 13–36 | 10.0 | 8.0 | 1.3 | 0.4 to 3.9 | | |
| Tattoo/skin piercing | | | | | | |
| 0–6 | 0.9 | 3.3 | 0.3 | 0.1 to 2.2 | | |
| 7–12 | 0.9 | 1.4 | 0.6 | 0.1 to 6.2 | | |
| 13–36 | 1.8 | 3.7 | 0.3 | 0.1 to 2.2 | | |
| Ever had sex with a sex worker[§] | | | | | | |
| Yes | 3.5 | 18.8 | 0.2 | 0.1 to 1.2 | | |

*Adjusted for age, sex and all variables in the model, only significant associations shown.

†Statistically significant at $P < 0.05$.

‡N =194 (female respondents only).

§N = 128 (male respondents only).