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HIV seroconversion and risk factors among drug users receiving methadone maintenance treatment in China: A qualitative study

Changhe Wang^{a,1}, Cynthia X Shi^{a,b,1}, Bo Zhang^c, Hong Chen^d, Hua Wang^c, Nanci Zhang^a, Keming Rou^a, Xiaobin Cao^a, Wei Luo^a, and Zunyou Wu^{a,*}

^aNational Center for AIDS/STD Control and Prevention, Chinese Center for Disease Control and Prevention, 155 Changbai Road, Beijing 102206, China

^bDepartment of Epidemiology of Microbial Diseases and Center for Interdisciplinary Research on AIDS, Yale School of Public Health, 135 College Street, New Haven, CT 06511, USA

^cYunnan Institute for Drug Abuse, 471 Xifu Road, Kunming 650228, China

^dChongqing Center for Disease Control and Prevention, 8 Changjiang 2nd Road, Chongqing 400016, China

Abstract

Objective—We sought to explore the experiences of drug users in China who were recently diagnosed with HIV infection while engaged in methadone maintenance treatment (MMT) and to better understand their perceptions of MMT, HIV risk, and HIV prevention.

Methods—We recruited clients of MMT clinics in Chongqing and Kunming who had a baseline HIV-negative test result upon entry to MMT and had been diagnosed with HIV within the past 12 months. We conducted semi-structured qualitative interviews and thematic data analysis to identify situations and factors that increased HIV risk.

Results—Among the 27 participants who were interviewed, 15 believed their infection was due to injection drug use, 7 attributed their infection to sexual contact, and 5 were unsure as to how they became infected. High risk behaviors were common; 18 participants continued to use drugs during treatment, and 10 engaged in unprotected sex. Common themes were the difficulty of drug abstinence despite receiving MMT, social pressure to continue using drugs, and low knowledge of effective HIV prevention measures.

*Corresponding author at: Zunyou Wu, National Center for AIDS/STD Control and Prevention, Chinese Center for Disease Control and Prevention, 155 Changbai Road, Beijing, 102206, China. wuzy@263.net, wuzunyou@chinaaids.cn (Z. Wu).

¹These authors contributed equally as joint first authors.

Contributors

CW and ZW designed the study. CW, BZ, HW conducted the participant interviews. CW and CXS wrote drafts of the manuscript. All authors contributed to the interpretation of the data, revisions of manuscripts, and approved the final manuscript.

Conflict of interest statement

No conflict declared.

Disclaimer

The opinions expressed herein reflect the collective views of the co-authors and do not necessarily represent the official position of the National Center for AIDS/STD Control and Prevention, Chinese Center for Diseases Control and Prevention.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.drugalcdep.2016.08.014>.

Conclusion—While MMT is effective in reducing drug usage and needle sharing, many clients remain at risk of HIV infection due to continued injection drug use and unprotected sex. Clients may benefit from additional counseling on HIV prevention methods as well as structural interventions to increase the availability of clean injection equipment.

Keywords

HIV/AIDS; HIV risk; Methadone maintenance treatment; Substance abuse treatment; Injection drug use; China

1. Introduction

In 1989, the first outbreak of HIV in China was identified among injection drug users (Sullivan and Wu, 2007). Ten years later, the HIV prevalence among drug users reached peaks of 15% nation-wide and 30% in the five most heavily affected provinces (Wang et al., 2015a). The rise of the HIV epidemic in this population has been characterized by high rates of injection and needle-sharing, proximity to drug trafficking routes, and overlap with sexual risk behaviors, including commercial sex (Sullivan and Wu, 2007). As of the end of 2011, an estimated 221,000 individuals were thought to have acquired HIV through drug use, accounting for 28.4% of the national HIV-positive population (Ministry of Health of the People's Republic of China, 2012). National data from 2015 showed that drug users continue to be heavily affected by the HIV epidemic with an estimated prevalence of 6.0% (National Health and Family Planning Commission, 2015). In order to address the dual epidemics of drug addiction and HIV, China initiated a national methadone maintenance treatment (MMT) program in 2004 (Pang et al., 2007). By the end of 2014, a total of 767 MMT clinics had been established in 28 provinces with an average of 240 clients at each clinic (National Health and Family Planning Commission, 2015). MMT clinics are affiliated with local Centers for Disease Control (CDCs) and/or medical institutions.

Over two decades of research has documented the impact of MMT on reducing HIV incidence among drug users (MacArthur et al., 2012; Metzger et al., 1993; Williams et al., 1992). Opioid substitution therapy, including MMT, is now accepted in many countries as an integral component of harm reduction and HIV prevention strategies (Mathers et al., 2010). MMT has been shown to reduce HIV risk behaviors, including injecting drugs, sharing needles, and engaging in unprotected sex, and has demonstrated effectiveness in both developing and developed countries and across culturally diverse settings (Lawrinson et al., 2008; Sullivan et al., 2014; Wang et al., 2015b; Woody et al., 2014).

However, barriers to achieving optimal clinical outcomes in MMT include continued use of illicit drugs, poor retention rates, suboptimal dosing, and limited program resources (Marsch, 1998; Sullivan and Wu, 2007). Many MMT clients remain at risk for HIV infection through injection drug use and unsafe sexual contact (Qian et al., 2008; Sullivan et al., 2014; Zhang et al., 2012). Factors associated with concurrent opioid use and other HIV risk behaviors among MMT clients included HIV and Hepatitis C infection, longer duration of past drug use, younger age, being male, being unmarried, having drug-using family

members and friends, and lower MMT adherence (Chen et al., 2013; Li et al., 2012; Zou et al., 2015).

Although MMT has demonstrated substantial effectiveness in reducing HIV incidence in the overall client population (Zou et al., 2015), a small number of clients still become HIV-infected each year. Based on annual HIV testing and monitoring data, the National Center for AIDS/STD Control and Prevention (NCAIDS) reported in 2011 that approximately 300 new cases of HIV were diagnosed among the 144,000 clients enrolled in MMT (Ministry of Health of the People's Republic of China, 2012; National Center for AIDS/STD Control and Prevention, 2012). Cohort studies have found similar HIV seroconversion rates of 0.20–0.66/100 person-years (Chang et al., 2014; Duan et al., 2011; Zou et al., 2015). In this study, we sought to explore the socio-behavioral context in which HIV transmission occurred despite MMT engagement. We undertook a series of qualitative interviews with MMT clients who were recently diagnosed with HIV to better understand their experiences and their HIV risk perception.

2. Methods

2.1. Study sites and participants

Clients are tested for HIV infection upon entry to the national MMT program, and HIV-negative clients are re-screened every 6 months. MMT eligibility criteria and other policies have been described elsewhere (Sullivan et al., 2014; Yin et al., 2010). The daily cost of MMT to the client is maximum 10 CNY per day (approximately 1.50 USD), irrespective of dose. In 2011, 308 MMT clients who had previously tested HIV-negative were newly diagnosed with HIV infection (National Center for AIDS/STD Control and Prevention, 2012). Cases were reported to the national MMT database from 155 clinics in 76 cities in 17 province-level divisions (Mao et al., 2010).

To ensure sufficient participant recruitment, we selected the two cities, Chongqing and Kunming, reporting the most cases (44 and 33, respectively) as our study sites and verified the number of new HIV infections through records at the local CDCs. Participants were recruited at 13 MMT clinics and invited to participate in this study by their regular provider or a local CDC staff member if they were HIV-negative at the time of MMT entry and were subsequently diagnosed with HIV infection through positive screening and Western blot test results. In order to reduce recall bias, we further limited participant eligibility to clients who received their HIV diagnosis within the past 12 months. Recruitment was conducted in person during clients' daily MMT visits; however, if an eligible participant failed to present to the clinic for 2–3 consecutive days, a local CDC staff member contacted the individual by phone.

2.2. Ethical approval

This study was reviewed and approved by the Institutional Review Board of the National Center for AIDS/STD Control and Prevention (NCAIDS), Chinese Center for Disease Control and Prevention (Protocol #: X120331212). Study participants were notified that their participation in the study was strictly voluntary and refusing to participate would not

influence their MMT and HIV care. Written informed consent was obtained from all study participants. Each study participant received a voucher for 2 free days of MMT, valued at 20 CNY (3 USD) as compensation for their time.

2.3. Data collection and analysis

Data collection was conducted in April-May 2012. We conducted semi-structured interviews to gather data on sociodemographic characteristics, medical history, experience with the MMT program, drug use behaviors, and sexual risk behaviors. We compared the demographics of the study participants and the newly-diagnosed HIV-positive MMT clients nationwide using two-sided exact binomial and multinomial goodness-of-fit tests in R v3.3 (Engels, 2015). Participants were asked to identify the most likely way that they became infected with HIV and to describe their experiences and risk perceptions. The semi-structured interviews were conducted one-on-one in a private room by trained and experienced interviewers, and the duration of the interview was approximately 60 min. Interviewers were guided by a prewritten questionnaire, which is provided as a Supplementary file. In order to assess the credibility of the interview data, the interviewers had access to treatment records, including the date of MMT entry, past urine test results, and methadone dosage. If there were obvious inconsistencies between a participant's record and his or her self-reported information, the discrepancy was noted, and the interviewer asked the participant to elaborate on the issue.

Study interviews were not audio-recorded because most participants did not grant consent for doing so. During the interview, the interviewer wrote down key quotes and themes. Immediately after the end of the interview, the interviewer prepared a detailed written record that approximated a transcript of the session. The field notes were hand-coded and analyzed using Braun and Clarke's (2006) six-step approach to thematic data analysis: 1) preparing data and becoming familiar with the data; 2) generating initial codes; 3) searching for themes; 4) reviewing themes; 5) defining and naming themes; 6) reporting. Coding and analyses were completed in Chinese. Selected quotes were translated into English and checked for accuracy by another author.

3. Results

3.1. Participant demographics and main modes of transmission

Table 1 presents the sociodemographic characteristics of the 27 participants and of all MMT clients nationwide who were newly diagnosed with HIV in 2011 (except for 7 participants who were missing demographic data). Two-thirds of the participants were male, and approximately half were 40 years of age or older. Most participants had used opioid drugs for over 5 years (85.2%), and all except for one reported using drugs through injection. There was a wide range of time intervals between initiating MMT and being diagnosed with HIV with a mean of 2.1 years. In comparison to the national population of newly-diagnosed MMT clients, the study participants were significantly more likely to be of Han ethnicity ($p = 0.002$), to have a high school education ($p = 0.003$), and to be unemployed ($p = 0.026$).

When asked to identify the most likely way that they became HIV-infected, a majority (15/27) of the participants thought that they had become HIV-infected through sharing injection equipment. The second most common mode of transmission was sexual contact (7/27); of these participants, three believed that they acquired HIV from their spouse or long-term partner, and the other four thought that they had become infected after sex with a casual partner. Three participants reported both sharing injection equipment and unprotected sexual contact before testing HIV-positive and were unsure through which route they were infected. Two reported no high-risk behaviors and did not provide a likely route of infection. In total, 18 participants continued to use drugs during treatment, and 10 engaged in unprotected sex.

3.2. Infection through injection drug use

The three primary themes that emerged from our qualitative data on drug injection behaviors and HIV risk during MMT: the difficulty of full abstinence from drug use, social networks that facilitate relapse, and the decision-making of whether to share needles and syringes.

3.2.1. Barriers to drug abstinence—Participants agreed that MMT allowed them to considerably reduce their opioid use, but many also believed that full abstinence was unattainable. Participants reported that relapses during MMT were common, and we found that many episodes of relapse could be divided into two broad contexts. First, some participants found that MMT was insufficient to curb their dependence on opioids. These participants were using heroin heavily at the time of entering MMT, and they continued to inject drugs occasionally while on MMT. These participants expressed that they may be insufficiently committed to adhering to MMT, and they reported long interruptions of treatment. Second, some participants felt that other events in their life, often outside of their control, triggered a relapse. Examples of such events were experiencing a treatment interruption due to being ill, suffering depression due to a family conflict or loss of employment, or being in a situation where others were using drugs.

3.2.2. Social context of relapse—Another common theme was that drug use can be a social activity, and many participants had friends or family members who also used drugs. Participants who were regularly engaged in MMT noted that they continued to receive invitations from friends to inject:

“I had been continuing with the [MMT] medicine, and it was going well. Now when friends ask me to ‘play,’ I decline. I know that during the holidays, or when they’re together, they’ll use [heroin].” - Female, 34 years old.

Participants reported that sharing injection equipment was more likely to occur when they were familiar with the other individual(s), although some said that they had also shared with strangers:

“It might have been a friend of mine who infected me. We used drugs together often, occasionally sharing needles. It wasn’t until later that I found out that he was HIV-infected.” - Male, 40 years old. *“I seldom injected with strangers. But I met a guy here [at the MMT clinic], and we injected together, then I was infected.”* - Female, 28 years old.

"We hadn't known each other for long. At the point when we shared needles, I didn't know he was HIV-positive."-Male, 40 years old.

"I was hospitalized for injuring my leg, and one patient in the same ward as me was a druguser, so then we used (heroin) together."-Male, 45 years old.

3.2.3. Sharing injection equipment—Consistent with previous study findings, sharing of injection equipment was related to the scarcity and inconvenience of purchasing clean needles and syringes. Many instances of drug relapse were spur-of-the-moment events when participants were not prepared with sterile equipment. Because they did not have access to clean needles, they felt that they were driven to share needles despite the risks:

"I was always very careful, using my own syringes, not sharing. One night, I just didn't have any, and since it was too late to buy some, we had to share."-Male, 36 years old.

"Sometimes it'd be too late [in the day] to buy needles, so we could only share."-Male, 45 years old.

Many participants took some steps to avoid sharing equipment whenever possible due to concerns regarding HIV infection. However, we found varying degrees of HIV knowledge and risk perception, which affected the likelihood of sharing needles. Nearly all participants knew that sharing needles was a direct route of HIV transmission, but some took ineffective measures to protect themselves, such as sharing other types of equipment or cleaning needles by rinsing with hot water:

"I was afraid of HIV infection, so I never shared needles. But we used the same syringe tube to dissolve the drugs. Maybe this was the source of infection."-Male, 40 years old.

Others thought that it was safer to share needles with long-term injection partners and underestimated their HIV risk:

"We had shared needles for a long time, and he didn't look like he was infected. I didn't think I'd get it."-Male, 47 years old.

A small number of participants said that they simply ignored the possibility that they could become infected.

3.3. Infection through sexual contact

Participants who thought they became infected through unprotected sex had divergent experiences based on whether their partner was a regular long-term partner (e.g., spouse, boyfriend, or girlfriend) or an occasional casual partner (e.g., friend, acquaintance, commercial sex worker).

3.3.1. Infection during a long-term partnership—In our study, the three participants who reported becoming infected through sexual contact in a long-term committed relationship knew their partner's HIV-positive status and were aware that they were at high risk for infection. One participant perceived himself as being in a situation where infection was practically unavoidable:

“I was infected by my girlfriend - she was positive. We have been living together for a very long time, and we are pretty dependent on each other. It’s been difficult to use a condom each time.” -Male, 33 years old.

Another participant was a woman with an HIV-positive husband. Because she wanted to become pregnant, they decided to stop using condoms. She had a clear understanding of the HIV transmission risk, but she felt that there were no other options available to her:

“My husband was infected through drug injection and tested HIV-positive early on. We used condoms every time after discovering this, and I was [not infected] during those years. I am very familiar with the subject of HIV/AIDS because I am a peer educator. I help the local [CDC] by publicizing HIV/AIDS knowledge and handing out clean needles and syringes among drug users. We enrolled in MMT a few years ago. We are older now and want to have a baby. My husband got a viral load test last year, and the doctor told us the result was low. We didn’t use a condom because I wanted to get pregnant, but then I tested HIV-positive. I worry about whether I can get pregnant now and whether or not the methadone will affect the fetus.” -Female, 39 years old.

3.3.2. Infection during a casual partnership—The four participants who self-reported being infected through a casual sexual relationship expressed that they had limited understanding of HIV transmission. One man was not aware of his partner’s status during the relationship, and he was surprised to find out she was HIV-positive:

“I think I was infected by a woman who works in the same factory as I do. We had sex occasionally. I didn’t know she was positive since she looked healthy...It is more important to tell people this than to promote condom use, that you cannot know whether someone is positive or not just by their outward appearance.” -Male, 37 years old.

Another participant said that at the time, he did not think he was at risk of acquiring HIV:

“I was infected through sex. I know her, we’ve [used drugs] together before. One day when we wanted to have sex, she said ‘I am sick, I’m HIV-positive, do you care?’ I thought she was only joking, so I said ‘You are sick, me too, I’m not afraid!.’” -Male, 50 years old.

4. Discussion

While MMT is effective in reducing HIV risk behaviors, many clients are still vulnerable to infection (MacArthur et al., 2012). In this exploratory study, we used qualitative interviews to understand the experiences of drug users in China who were diagnosed with HIV while on MMT. In 2011, the Chinese national MMT program identified 308 new cases of HIV among the client population of 144,000 (Ministry of Health of the People’s Republic of China, 2012; National Center for AIDS/STD Control and Prevention, 2012). Because there are relatively few cases of seroconversion per year, we undertook a qualitative research approach using semi-structured interviews to understand the particular experiences of each participant.

Among the 27 participants, most were able to identify whether they were infected through drug injection or through sexual contact. A common theme was that participants thought that they would be able to visually distinguish whether an injection or sexual partner was infected with HIV. Participants also felt that they could moderate their HIV risk by injecting or having sex with regular long-term partners. We found that most participants had low knowledge of HIV and an insufficient understanding of effective prevention methods. We also discovered that 44% of the participants had been in MMT for at least 2 years prior to their diagnosis, indicating that long-term MMT clients remain at risk for seroconversion. This illustrates the necessity of adhering to current national MMT guidelines, which states that all HIV-negative MMT clients should receive HIV testing at least once every 6 months.

Despite a large reduction in drug use after enrollment in MMT, drug abstinence is difficult for most clients (Cao et al., 2010; Chen et al., 2013; Liu et al., 2008b). The complete avoidance of drug use is ideal for HIV prevention and optimal MMT outcomes, but participants expressed that they frequently struggled with relapse. This may indicate inadequate methadone dosage, which is a predictor of treatment drop-out (Liu et al., 2008a; Marienfeld et al., 2015; Yin et al., 2010). While clients should be initiated at lower doses to minimize the risk of overdose, gradual increases in daily doses can deliver improvements in retention if monitored appropriately by providers. Many participants tried to reduce their HIV risk by refusing to share equipment, especially with strangers, or by attempting to sterilize their equipment. Participants were most likely to share equipment when they had not planned in advance to inject drugs and when they were among friends who were injecting. This exemplifies the influence of social networks on needle-sharing and other HIV risk behaviors (Unger et al., 2006).

A few participants noted that they were unable to obtain clean needles and syringes due to the time of day, which reiterates the need for wider access to needle and syringe exchange programs (NSPs) to prevent HIV transmission among all drug users (Aspinall et al., 2014; Luo et al., 2015; Zhang et al., 2011). In addition to adding more sites, we suggest that these programs should seek input from drugs users to identify the most appropriate hours of operation. NSPs also have the potential to help curb the spread of HIV because they provide an avenue to reach people who inject drugs who are uninterested or unable to stop drug use through MMT, which requires real-name registration. Approximately 50% of NSP attendees report no past engagement in MMT, which suggests that NSPs can access a segment of the drug-using population that has been previously bypassed (Luo et al., 2015; Philbin and FuJie, 2014). As noted by international experts, NSPs have been an underutilized entry point to refer people who inject drugs to HIV care and drug addiction treatment (Kawichai et al., 2006; Metzger and Navaline, 2003; Schwartz et al., 2013). By reducing the overall HIV risk in the local population of people who inject drugs, the risk of seroconversion for MMT clients is also reduced.

The majority of participants who became infected through sexual contact were aware of their partner's positive HIV status. For participants in long-term relationships, they felt that it was very difficult to use condoms during every contact. Inconsistent condom use was likely not due to barriers of cost, convenience, or access because these issues did not emerge during the qualitative interviews. Furthermore, free condoms are provided at every MMT clinic, and

providers have reported that clients are willing to accept these condoms. Rather, the study participants said that they were more likely to not use a condom if they were with a long-term partner, perceived that their partner is at lower risk for HIV, or wanted to conceive, which is consistent with other studies (Rosengard et al., 2006; Unger et al., 2006). Serodiscordant couples face a multitude of challenges. MMT clients with HIV-positive partners should be educated on the benefits of antiretroviral therapy (ART) and on ways to encourage their partners to initiate and to adhere to ART. This is particularly urgent for serodiscordant couples attempting to conceive children, who should be made aware of other methods to reduce risk in conjunction with ART and other reproductive options (Matthews et al., 2012). MMT clients who have sexual partners of a negative or unknown HIV status should be counseled to encourage regular testing for their partners. This may be facilitated by increasing the integration of HIV testing services and drug treatment programs (Simeone et al., 2015; Sylla et al., 2007).

The strength of this study is that we were able to recruit a relatively large sample size of 27 MMT clients who were newly diagnosed with HIV infection in the past 12 months; this is approximately 9% of the annual new seroconversion cases reported nationwide in the MMT program. This allowed us to appreciate the diversity of situations faced by our participants and to better high-light the themes that were expressed frequently. However, it is important to acknowledge that our qualitative data were subject to recall and social desirability biases. In particular, this may be why two participants stated that they had not engaged in any HIV risk behaviors and were unsure how they became infected. There were also some discrepancies between our study population and the national population of newly-diagnosed MMT clients which could affect the representativeness of our findings. Furthermore, participants were asked to self-report their most likely route of infection and to describe their past history of HIV risk behaviors; we did not corroborate participants' self-reported data with other sources, such as the HIV case reporting database or interviews with their injection or sexual partners.

We found that among many drug users who seroconverted to HIV-positive while on MMT, poor understanding of HIV transmission prevented them from taking effective precautions to avoid infection. Other participants were aware of HIV prevention methods but encountered situations where they felt like they could not implement these steps, such as being unable to obtain clean needles or discontinuing condom use in order to become pregnant. MMT providers should consider adjusting methadone doses for clients who experience difficulty with drug abstinence. Clients would also benefit from additional counseling on HIV prevention methods at entry as well as periodic follow-up counseling. We also recommend the expansion of NSPs to facilitate access to clean injection equipment. Finally, we remind MMT providers that it is of vital importance to provide regular testing for HIV, Hepatitis C, and other infections as described in the national treatment guidelines. Future research on the risk of seroconversion during MMT is needed to inform the development of programmatic changes and educational interventions to further decrease HIV risk among MMT clients.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1
Demographics of clients who were newly diagnosed with HIV in 2011 while on MMT (N = 301)^a.

	<u>Study participants</u>		<u>All clients</u>		<u>p-value</u>
	N	%	N	%	
City					<0.001
Chongqing	18	66.7	44	14.6	
Kunming	9	33.3	33	11.0	
Gender					0.175
Female	9	33.3	68	22.6	
Male	18	66.7	233	77.4	
Age (years)					0.263
<30	1	3.7	42	14.0	
30–39	13	48.1	146	48.5	
40	13	48.1	113	37.5	
Ethnicity					0.002
Han	26	96.3	217	72.1	
Minority	1	3.7	84	27.9	
Marital Status					0.700
Unmarried	12	44.4	131	43.5	
Married	11	40.7	137	45.5	
Divorced	4	14.8	33	11.0	
Education					0.003
Primary school or below	3	11.1	68	22.6	
Middle school	9	33.3	159	52.8	
High school or above	15	55.6	74	24.6	
Employment					0.026
Employed	4	14.8	106	35.2	
Unemployed	23	85.2	195	64.8	
Duration of opioid use before entering MMT (years)					0.902
<5	4	14.8	59	19.6	
5–9	8	29.6	79	26.2	

	<u>Study participants</u>		<u>All clients</u>		<u>p-value</u>
	N	%	N	%	
10–14	8	29.6	96	31.9	0.167
15	7	25.9	67	22.3	
History of injecting drugs					
Yes	26	96.3	257	85.4	0.057
No	1	3.7	44	14.6	
Years between initiating MMT and being diagnosed with HIV infection					
<1	7	25.9	37	12.3	0.057
1	8	29.6	71	23.6	
2	7	25.9	78	25.9	
5	5	18.5	115	38.2	
Total	27		301		

MMT = methadone maintenance treatment.

^aData were missing for 7 individuals.