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HIV testing and awareness of partner's HIV status among Chinese men who have sex with men in main partnerships

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Abstract

Many men who have sex with men (MSM) do not use condoms with their main partners, especially if both parties are of the same HIV status. However, significant proportions of MSM have never tested or recently tested and are unaware of their main partners' HIV status. A cross-sectional survey was conducted among 524 MSM in Jiangsu, China in 2013–2014. Time-location sampling and online convenience sampling were used to recruit participants. We compared awareness of HIV status and recent HIV testing between participants who had main partners versus those who did not, and identified factors associated with recent HIV testing among men in main partnerships. Participants in main partnerships were significantly more likely to report recent HIV testing and being HIV-negative instead of HIV-unknown compared to participants in casual partnerships only. Overall, 74.5% of participants were aware of their main partners' HIV status. Among participants in main partnerships, those who had 2 to 5 male anal sex partners in the past six months and those who reported that their partners were HIV-negative had 2.36 (95% CI: 1.12, 4.97) and 4.20 (95% CI: 2.03, 8.70) fold greater odds of being tested in the past year compared to those who had main partners only and those whose partners were HIV-positive/unknown, respectively. Chinese MSM in main partnerships might be practicing serosorting and may be at lower risk for HIV infection due to increased awareness of main partners' HIV status and higher uptake of recent testing.

Keywords

HIV; men who have sex with men; testing; serosorting; China

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INTRODUCTION

Many men who have sex with men (MSM) do not use condoms when they engage in anal intercourse with their main male partners (i.e., a regular male sex partner or boyfriend), especially if both parties are of the same HIV status [1–3]. To prevent HIV acquisition and transmission in the context of condomless sex, it is essential that these men are aware of their own and their partners' HIV status [4]. This necessitates frequent HIV testing and mutual HIV status disclosure before engaging in condomless sex within a partnership [4, 5]. For relationships that are not monogamous, repeat HIV testing will be needed when high risk sex occurs outside of main partnerships. However, significant proportions of MSM have never tested or recently tested and are unaware of their primary partners' HIV status [5–7]. A modeling study of US MSM reported that 68% of HIV transmissions were from main partners [8].

The HIV epidemic among MSM in China has been in part driven by high levels of condomless sex and low levels of HIV testing. A meta-analysis reported that 64% of Chinese MSM did not use condoms consistently during anal intercourse in the past six months [9]. By partner type, 80% engaged in condomless sex with regular male partners. Another systematic review found that lifetime HIV testing and testing the past year were just 47% and 38% among Chinese MSM, respectively [10]. Limited data exists in terms of HIV status disclosure among MSM populations in China. In a study of HIV-negative MSM in Beijing, it was found that only half of participants disclosed their HIV status to at least one sex partner and that those who disclosed were more likely to be living with a main partner [11].

To fill the gaps in Chinese MSM literature, we conducted this analysis to: 1) compare awareness of HIV status and recent HIV testing between MSM participants who had main partners versus those who did not; and 2) identify factors associated with recent HIV testing among MSM participants in main partnerships. We hypothesized that: 1) Compared to MSM who did not have main partners, those who did were more likely to receive HIV testing and be aware of their HIV status; and 2) compared to MSM who were not aware of their main partners' HIV status, those who were aware were more likely to have been recently tested.

METHODS

Study Design and Recruitment

A cross-sectional baseline survey of a longitudinal study was conducted among self-reported HIV-negative/unknown MSM in Jiangsu Province, China between November and January 2014. To be eligible for the study, participants had to: 1) be biologically male; 2) be 18 years old or older; 3) be living in Jiangsu province; 4) have had oral or anal sex with another male in the past year; and 5) self-report being HIV-negative or unknown. In addition, for longitudinal data collection, we asked eligible participants to provide their contact information. As this was a part of an intervention project being implemented at both MSM venues and online, we employed both time-location sampling (TLS) and online convenience sampling to recruit participants.

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Time-location sampling (TLS)—TLS is used to sample MSM populations through creation of a sampling frame that comprises the universe of venues, days, and time periods where and when the population can be found to congregate. It has been described in detail elsewhere [12]. Briefly, a formative phase constructed an up-to-date universe or sampling frame of venues frequented by MSM, including bars, dance clubs, bathhouses, parks, public bathrooms and other public cruising areas and the days and time periods of attendance in Nanjing. From the roster of all possible venue-day-time (VDT) periods, a random sample of VDT was drawn. At the randomly selected VDT, the attendance of all potentially eligible subjects was counted and men entering or exiting the venue or crossing a predetermined line are intercepted, assessed for eligibility, and invited to participate.

During assessment, recruiters (trained volunteers from community-based organizations and staff from the provincial CDC) briefly described the study to men and asked if they were willing to participate. Men who had not previously participated in this study were referred to an interviewer who administered the eligibility screener. Eligibility screening occurred in a private area of the venue or in a designated interviewing space near the venue. In addition to the above eligibility criteria, participants recruited through TLS also had to be consecutively approached by the staff at the randomly selected VDT (i.e., they could not approach staff on their own or at a later time). Once participants were determined eligible, staff went over informed consent with them using a tablet computer and addressed questions. To consent to the study, participants had to click the “Agree” button on the electronic informed consent. Staff then oriented participants to the tablet computer-assisted interview. Once participants were familiar with the operation of the tablet computer, they completed the self-administered survey. An incentive in the form of a 50RMB (~8USD) pre-paid cell-phone card was offered to participants.

Participants were recruited during 23 randomly selected venue-day-time periods from November to December 2013. Staff enumerated 777 men from 10 venues, consecutively approached 478, screened 342 (71.5% eligibility determination), found 290 to be eligible (84.8% eligibility), and 261 (90.0% participation) consented to the study.

Online convenience sampling—We posted our study advertisement on the most popular provincial gay-oriented website to invite participation in our survey. By clicking on the advertisement, interested MSM were taken to the Internet-based survey webpage. The same eligibility screening and informed consent procedures were implemented for the online survey component as the TLS. To prevent duplicate participation, a feature within the survey software program (“Prevent Box Stuffing,” www.qualtrics.com) that would not allow potential participants to access the survey more than once from the same IP address was enabled. Furthermore, our staff double-checked the contact information provided by participants before giving out incentives (same as TLS) for completing the survey. From mid November 2013 to mid January 2014, 985 potential participants clicked on our online survey advertisement or link. Of these, 941 entered the eligibility screening page and 823 answered all eligibility questions (87.5% eligibility determination), 592 met the eligibility criteria (71.9% eligibility), and 271 (45.8% participation) consented to the study.

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The study was approved by the University of California – San Francisco's Committee on Human Research and Jiangsu Provincial Center for Disease Control and Prevention's Institutional Review Board.

Measures

Socio-demographics—Participants were asked about their age, legal marital status, official residential status (*hukou*), educational level, employment status, monthly gross income (1 USD ≈ 6 RMB), and sexual orientation. Participants also self-reported their HIV status ("HIV-negative" and "Unknown").

Sexual behaviors—Participants reported on the number of men they have had anal sex with in the past six months, and whether condoms were used consistently ("Never," "Sometimes," and "Always") when engaging in insertive and receptive anal intercourse with these partners. In the analysis, participants who responded "Never" or "Sometimes" were categorized as having had any condomless insertive and receptive anal intercourse (CIAI and CRAI), respectively. For those who had main partners, they were also asked about condom use during insertive and receptive anal intercourse with the main partners.

Relationship characteristics and partner's HIV status—Participants were asked if they currently had a main male partner (defined as a regular male sex partner or boyfriend). For those who responded "Yes," they were asked for how long they have been with this male partner and what this partner's HIV status was ("HIV-negative," "HIV-positive," and "Don't Know"). Only three participants reported that their partners' HIV status was positive and hence were combined with the "Don't Know" category. Participants who reported currently having a main partner and having more than one male anal sex partners in the past six months were categorized as in a non-monogamous relationship in the analysis.

HIV testing in the past year—First, participants were asked if they have ever been tested for HIV. Those who responded affirmatively were then asked about the number of HIV tests they had in the past year ("None," "Once," "Twice or more"). In the analysis, we dichotomized this outcome variable into having had versus having not had an HIV test in the past year. Participants who reported having never been tested and those who reported no HIV testing in the past year were categorized as having not had an HIV test in the past year.

Analysis

After cross-checking the contact information provided by TLS and online participants, 7 duplicate records were excluded from analysis. The final analytical sample included 524 participants. First, we identified socio-demographic and behavioral characteristics associated with having a main male partner by comparing MSM participants who had main male partners versus those who did not using Pearson Chi-square tests (Table 1). Second, among participants who had main male partners, we compared socio-demographics, sexual behaviors, relationship characteristics and partners' HIV status between those who had an HIV test in the past year versus those who did not using Pearson Chi-square tests (Table 2). To identify significant correlates of HIV testing in the past year among participants in main partnerships, variables that were significant at $p \leq 0.05$ in Table 2 (except for participants'

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HIV status since it was highly correlated with partners' HIV status) were entered into a multivariable logistic regression model while controlling for relationship length, number of male anal sex partners, and condomless receptive anal intercourse with main partner (Table 3). All analyses were conducted in STATA version 12.0.

RESULTS

Characteristics associated with having a main male partner

Table 1 presents socio-demographic and behavioral characteristics that were associated with having a main male partner. Of 524 participants, 236 (45.0%) reported that they currently had a main male partner. Compared to those who did not currently have a main male partner, participants who did were significantly more likely to self-identify as gay (72.9% vs. 62.9%, $\chi^2 = 5.941$, $p = 0.015$). Not surprisingly, they were also significantly more likely to have one or fewer male anal sex partners (e.g. had a main male partner but did not have anal sex) in the past six months (48.0% vs. 31.6%, $\chi^2 = 15.689$, $p < 0.001$), to have engaged in any CIAI (49.5% vs. 28.3%, $\chi^2 = 22.120$, $p < 0.001$) and any CRAI in the past six months (36.9% vs. 24.8%, $\chi^2 = 8.063$, $p = 0.005$) compared to those who did not. However, they were also significantly more likely to report having been tested for HIV in the past year (74.9% vs. 66.3%, $\chi^2 = 4.545$, $p = 0.033$) and self-report being HIV-negative instead of HIV-unknown (86.9% vs. 76.7%, $\chi^2 = 8.751$, $p = 0.003$) compared to participants who did not currently have a main male partner.

HIV testing and awareness of main partners' HIV status

Table 2 presents bivariate correlates of HIV testing in the past year among participants in main partnerships. Compared to those who had not been tested in the past year, participants who had been tested were significantly more likely to being divorced, separated or widowed subsequent to a relationship with a woman (27.4% vs. 8.5%, $\chi^2 = 7.472$, $p = 0.009$). They were significantly more likely to self-report being HIV-negative instead of HIV-unknown (93.8% vs. 66.1%, $\chi^2 = 29.497$, $p < 0.001$). Relationship characteristics and sexual risk behaviors (e.g., condom use with main partners) did not differ significantly between participants who had been tested in the past year versus those who had not been.

Overall, 74.5% of participants reported that their main partners were HIV-negative. Excluding the three participants reporting HIV-positive partners, 24.3% of participants were unaware of their main partners' HIV status. Participants who had been tested in the past year were significantly more likely to report partners' HIV status as HIV-negative (80.7% vs. 55.9%, $\chi^2 = 14.236$, $p < 0.001$) compared to those who had not been tested in the past year. Furthermore, HIV-negative participants were significantly more likely to report that their main partners were also HIV-negative compared to HIV-unknown participants (83.4% vs. 16.1%, $\chi^2 = 64.299$, $p < 0.001$; data not shown in the table).

Table 3 presents multivariable correlates of HIV testing in the past year among participants who had main male partners. Participants who were divorced, separated or widowed subsequent to a relationship with a woman had greater odds of being tested in the past year compared to those who were single (AOR = 4.67, 95% CI: 1.59, 13.71; $p = 0.005$).

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Participants who had 2 to 5 male anal sex partners in the past six months had greater odds of being tested in the past year compared to those who had main partners only (AOR = 2.36, 95% CI: 1.12, 4.97; p = 0.024). Finally, participants who reported that their partners were HIV-negative had 4.20 fold greater odds (95% CI: 2.03, 8.70; $p < 0.001$) of being tested in the past year compared to those whose partners were HIV-positive or unknown.

DISCUSSION

Consistent with the literature on Chinese MSM [9], we found that participants in main partnerships were more likely to engage in condomless anal sex than those who had casual partners only. However, our results also showed that men with main partners were more likely to self-report being HIV-negative and to engage in some form of protective behaviors to prevent HIV infection within their main partnerships and from casual outside relationships. First, participants in main partnerships were more likely to have been tested recently than those who did not. Secondly, participants who had HIV-negative main partners were much more likely to have been recently tested compared to those who had HIV-positive or unknown partners. Thirdly, those who had multiple male partners, in addition to having a main partner, were more likely to receive a recent HIV test. A qualitative study reported that one of the facilitating factors of HIV testing among Chinese MSM was a sense of responsibility to protect their partners from HIV infection [13]. While the study of US MSM estimated that a majority of HIV transmissions were from main sex partners [8], our findings suggest that compared to men in casual partnerships only, Chinese MSM in main partnerships may be at reduced risk for HIV infection due to the potential benefits of higher levels of recent HIV testing within main partnerships and among those who have both main and casual partners. That said, we recognized that a 12-month testing period might not be sufficiently frequent enough among some higher risk men (i.e., those having multiple male partners) and we did not know the recency of their partners' HIV testing.

Furthermore, we also found HIV-negative participants were significantly more likely to have HIV-negative main partners compared to HIV-unknown participants. This finding indicates that HIV-negative Chinese MSM might be practicing serosorting, where an individual chooses sex partners of the same HIV serostatus often to engage in condomless sex in order to reduce HIV transmission and acquisition risk [14], in the context of establishing main partnerships. While serosorting has been widely documented among MSM in developed countries, it has not been examined in previous studies of Chinese MSM [2, 3, 15]. Practice of serosorting is probably even more salient for men who intend to establish main or long-term partnerships because they are more likely to forgo condom use with their main partners (i.e., negotiated safety) [16]. In addition, AIDS phobia and HIV stigma are prevalent within the Chinese MSM communities and society [17, 18]. However, limited by our measures and study design, we were not able to describe and capture the nuances and spectrum of "true serosorting." Future research is needed to examine serosorting as well as other seroadaptive behaviors among both HIV-negative and HIV-positive Chinese MSM.

Our study has several limitations. First, participants were recruited from MSM venues and a gay-oriented website in one Chinese province. Thus, our findings may not be generalizable to MSM who do not frequent these venues, do not visit the website, and those in other parts

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of China. Second, participants could have responded to sensitive questions in a socially desirable manner. However, our self-administered interview mode should have mitigated this bias. Third, our survey did not ask participants their main partners' HIV testing histories, their causal partners' HIV status, and practices of negotiated safety (i.e., condom use with casual partners outside of main partnerships). Future studies should include more sophisticated and established measurements, such as partner-by-partner assessment to capture participants' detailed sexual histories and their partners' characteristics in order to better understand risks for HIV infection.

In conclusion, our study suggests that Chinese MSM in main partnerships may be at lower risk for HIV transmission and acquisition due to increased awareness of their main partners' HIV status and higher uptake of recent testing. However, strategies to promote HIV testing uptake among MSM with casual partners only and to increase testing frequency (e.g., every six months) among those with main partners are still needed. Finally, as HIV testing by itself is not considered an intervention that specifically reduces HIV risk, information and education about risk reduction strategies (e.g., serosorting, negotiated safety), other sexually transmitted diseases, and new and emerging prevention options (e.g., treatment as prevention) should be carefully communicated to MSM communities.

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Table 1

Comparisons of socio-demographic and behavioral characteristics between MSM participants who had main male partners vs. those who did not, Jiangsu, China 2013–2014 (N = 524)

	No main male partner n (%)	Have a main male partner n (%)	χ^2	*p*
Age				
18 – 25	90 (21.5%)	67 (28.6%)	0.548	0.760
26–35	102 (35.7%)	89 (38.0%)		
>=36	94 (32.9%)	78 (33.3%)		
Marital status				
Single	166 (57.6%)	134 (57.0%)	0.036	0.982
Married	59 (20.5%)	48 (20.4%)		
Divorced/Separated/Widowed	63 (21.9%)	53 (22.6%)		
Hukou				
Nanjing/Jiangsu	230 (79.9%)	186 (78.8%)	0.087	0.768
Other province	58 (20.1%)	50 (21.2%)		
Education				
Middle school or less	47 (16.3%)	29 (12.3%)	2.104	0.349
High school/Technical	126 (43.8%)	102 (43.2%)		
College or higher	115 (39.9%)	105 (44.5%)		
Employment				
Full-time	243 (84.4%)	192 (81.4%)	0.839	0.360
Other	45 (15.6%)	44 (18.6%)		
Monthly income (RMB)[b]				
≤ 2,999	100 (34.7%)	78 (27.1%)	0.440	0.803
3,000 – 4,999	110 (38.2%)	88 (37.3%)		
≥ 5,000	78 (33.0%)	70 (29.7%)		
Sexual orientation				
Gay	181 (62.9%)	172 (72.9%)	5.941	0.015
Bisexual/Heterosexual/Not sure	107 (37.1%)	64 (27.1%)		
Number of male anal sex partners				
≤ 1	85 (31.6%)	110 (48.0%)	15.689	< 0.001
2 – 5	133 (49.4%)	94 (41.1%)		
≥ 6	51 (19.0%)	25 (10.9%)		
Any CIAI				
No	182 (71.7%)	108 (50.5%)	22.120	< 0.001
Yes	72 (28.3%)	106 (49.5%)		
Any CRAI				
No	191 (75.2%)	135 (63.1%)	8.063	0.005
Yes	63 (24.8%)	79 (36.9%)		
Tested for HIV in past year				
No	97 (33.7%)	59 (25.1%)	4.545	0.033

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	No main male partner n (%)	Have a main male partner n (%)	χ^2	*p*
Yes	191 (66.3%)	176 (74.9%)		
Self-reported HIV status				
Negative	221 (76.7%)	205 (86.9%)	8.751	0.003
Unknown	67 (23.3%)	31 (13.1%)		

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Table 2

Bivariate correlates of HIV testing in the past year among MSM participants who had main male partners, Jiangsu, China 2013–2014 (N = 235)

	Not tested in the past year n (%)	Tested in the past year n (%)	χ^2	*p*
Age				
18 – 25	19 (32.2%)	47 (27.0%)	1.501	0.472
26–35	24 (40.7%)	65 (37.4%)		
>=36	16 (27.1%)	62 (35.6%)		
Marital status				
Single	38 (64.4%)	95 (54.3%)	7.472	0.009
Married	16 (27.1%)	32 (18.3%)		
Divorced/Separated/Widowed	5 (8.5%)	48 (27.4%)		
Hukou				
Nanjing/Jiangsu	48 (81.4%)	137 (77.8%)	0.326	0.568
Other province	11 (18.6%)	39 (22.2%)		
Education				
Middle school or less	6 (10.2%)	23 (13.1%)	1.264	0.532
High school/Technical	23 (39.0%)	78 (44.3%)		
College or higher	30 (50.8%)	75 (42.6%)		
Employment				
Full-time	47 (79.7%)	144 (81.8%)	0.135	0.713
Other	12 (20.3%)	32 (18.2%)		
Monthly income (RMB)[b]				
≤ 2,999	19 (32.2%)	58 (32.9%)	0.022	0.989
3,000 – 4,999	22 (37.3%)	66 (37.5%)		
≥ 5,000	18 (30.5%)	52 (29.5%)		
Sexual orientation				
Gay	43 (72.9%)	128 (72.7%)	0.001	0.982
Bisexual/Heterosexual/Not sure	16 (27.1%)	48 (27.3%)		
Relationship length				
Less than 1 year	28 (47.5%)	84 (47.7%)	0.351	0.839
1–3 years	14 (23.7%)	36 (20.5%)		
More than 3 years	17 (28.8%)	56 (31.8%)		
Relationship type				
Monogamous	33 (55.9%)	77 (43.8%)	2.633	0.105
Non-monogamous	26 (44.1%)	99 (56.2%)		
Number of male anal sex partners				
1	33 (58.9%)	77 (44.8%)	4.632	0.099
2 – 5	16 (28.6%)	77 (44.8%)		
≥ 6	7 (12.5%)	18 (10.5%)		
Any CIAI with main partner				

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	Not tested in the past year n (%)	Tested in the past year n (%)	χ^2	*p*
No	33 (55.9%)	98 (55.7%)	0.001	0.973
Yes	26 (44.1%)	78 (44.3%)		
Any CRAI with main partner				
No	36 (61.0%)	123 (69.9%)	1.589	0.208
Yes	23 (39.0%)	53 (30.1%)		
Participant HIV status				
Negative	39 (66.1%)	165 (93.8%)	29.497	<0.001
Unknown	20 (33.9%)	11 (6.2%)		
Partner HIV status				
Positive/Unknown	26 (44.1%)	34 (19.3%)	14.236	<0.001
Negative	33 (55.9%)	142 (80.7%)		

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Table 3

Multivariable correlates of HIV testing in the past year among MSM participants who had main male partners, Jiangsu, China 2013–2014 (N = 235)

	Tested in the past year	
	AOR (95% CI)	***p***
Marital status		
Single	1	
Married	0.78 (0.35, 1.76)	0.557
Divorced/Separated/Widowed	4.67 (1.59, 13.71)	0.005
Relationship length		
Less than 1 year	1	
1–3 years	0.89 (0.38, 2.08)	0.784
More than 3 years	0.84 (0.37, 1.90)	0.680
Number of male anal sex partners		
1	1	
2 – 5	2.36 (1.12, 4.97)	0.024
≥ 6	0.95 (0.33, 2.70)	0.919
Any CRAI with main partner		
No	1	
Yes	0.69 (0.35, 1.40)	0.306
Partner HIV status		
Positive/Unknown	1	
Negative	4.20 (2.03, 8.70)	< 0.001