

Original Article

Repeat HIV Testing Among Males Who Have Previously Tested Negative: A Hospital-Based Survey in Taiwan

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Repeat HIV testing is a public health problem. Understanding the cause of repeat HIV testing may enable the development of effective policies and appropriate health education programs. Only men (n=686, 93.3% of all testers) who underwent anonymous HIV testing from January 2012 to June 2013 at a medical center in Taiwan were recruited to prevent gender bias. They each completed an anonymous questionnaire. Among them, 65.9% were repeat testers. Multivariable logistic regression model showed that repeat testers are older and more highly educated, have a history of sexually transmitted infection and engaging in sex with someone they met online, are concerned that their sexual partner is infected, desire periodic testing, and believe that they have engaged in risky behavior. However, sex buyers and those who agree with the statement that AIDS is a severe condition were less likely to undergo repeat testing. Overall, repeat testers engage in high-risk sexual behavior. Additionally, sex buyers and men who believe that AIDS is a severe condition are more likely to avoid testing, which may lead to delayed diagnosis. Therefore, the actual benefits of anonymous HIV testing must be comprehensively reviewed and evaluated.

Keywords: HIV/AIDS, HIV testing, policy

Introduction

Human immunodeficiency virus (HIV) testing and counseling are essential for acquired immune deficiency syndrome (AIDS) prevention, treatment, care, and support. Through testing and consultation, people are encouraged to reduce high-risk behaviors such as engaging in unprotected sex^[1] and to alert their sexual partners^[2]. In addition, early knowledge of positive HIV status maximizes opportunities

for timely treatment, greatly reducing HIV-related morbidity and mortality. Effective HIV treatment reduces (by up to 96%) the likelihood that someone living with HIV will transmit the virus to a sexual partner^[3]. In Taiwan, those at high risk of HIV infection are often reluctant to be tested for HIV within the conventional medical system to avoid prejudice and disapproval from the general public.

Previous research has found that HIV testing and counseling is repeated in 25–66% of cases^[4–6]. Repeat testers are predominantly men^[7,8] who are aged 21–30 years^[7,9], single^[9], well-educated^[4], and work full time^[9]. They typically engage in high-risk sexual behaviors (e.g., one-night stands^[9], commercial sex within the last 3 months^[8],

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unprotected sex^[4,5], and sex with multiple partners^[7,8], commonly use illegal substances^[8], and have a history of sexually transmitted infections (STIs) [8,10]. Repeat testing may serve to ease anxiety in this group. A negative HIV test encourages repeat testers to continue engaging in the same high-risk behaviors. As the window period for the HIV test is 3 months, negative results of frequent tests might lead to HIV-positive individuals unknowingly infecting others. Thus, from a public health perspective, frequent anonymous testing may be ineffective in this high-risk group.

In recent years, HIV testing and counseling studies have largely been conducted in areas where there is high HIV prevalence, such as African countries. Most have involved large-scale testing in communities or at hospitals with referral to medical providers after early detection, reducing mortality rates^[2,11]. In Taiwan, the HIV morbidity and mortality rates have been effectively controlled^[9,12,13]. HIV testing and counseling programs can be regarded as preliminary prevention measures with the recent gradual increase in the number of repeat tests indirectly supporting this viewpoint. However, the reasons why HIV-negative individuals undergo repeat HIV testing and their sociodemographic characteristics have not been thoroughly studied. Such data could provide a basis for clinical judgments or predictions and serve as a valuable reference for policy formulation. Therefore, the aim of this study was to compare HIV-negative male repeat and single testers to clarify the sociodemographic characteristics, high-risk sexual behaviors, and HIV-related cognition and attitudes of repeat testers.

Methods

Study participants and procedures

This study was conducted from January 2012 to June 2013 at a medical center in central Taiwan. Among the 763 participants, 96.3% (n=735) completed an anonymous questionnaire. Most (n=686, 93.3%) were male. To prevent gender bias, our assessment included only male participants. As individuals with a confirmed HIV diagnosis are managed within the conventional medical system, it was assumed that all participants had previously

tested negative for HIV. Our study protocol was approved by the Chung Shan Medical University Hospital Institutional Review Board and designed to safeguard the interests of all participants. Health educators provided enrollees with information about the purpose of the study and all participants provided written consent. The participants were then divided into two groups, repeat testers and single testers. Repeat testers were those participants who self-reported that they had previously been tested at a medical institution. Single testers were those participants who self-reported that this was their first time to take an HIV test. All participants were invited to complete an anonymous questionnaire in private.

Measures

The questionnaire used in this study was designed by the Taiwan Centers for Disease Control to elicit information regarding free HIV testing and counseling services and took approximately 15 minutes to complete. The questionnaire was divided into four parts: (1) sociodemographics (4 questions about age, marital status, educational level, and employment status); (2) assessment of risky sexual behaviors (8 questions about sexual orientation [i.e., heterosexual, bisexual, or homosexual]), whether the window period (3 months) had passed at the time of testing, whether there was a history of engaging in sex with people they had met on the Internet, whether they used condoms with casual sex partners, whether they were employed in the sex industry or were sex workers, whether they were sex buyers, whether they had used addictive drugs (e.g., 3,4-methylenedioxymethamphetamine [MDMA; also known as “ecstasy”], methamphetamines, ketamine, rush poppers, marijuana, morphine, heroin, or cocaine) within the last 6 months, and whether they had a history of STI; (3) reasons for taking HIV test (2 questions about previous testing and the reason for taking the present test, e.g., suspicion that a spouse or sexual partner has STI or is HIV positive [“yes” or “no”]); and (4) HIV-related knowledge and attitudes (4 questions about whether they considered themselves at risk of HIV infection (“never thought about it, “impossible”, or “possible”), whether they agreed that effective medication currently exists

Table 1. Correlation matrix of HIV repeat testing, sociodemographic variables, risk assessment of sexual behaviors, reasons for taking HIV test, and HIV-related knowledge and attitudes among HIV-negative adult males in Taiwan

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Repeat testing	1												
2. Age	0.01	1											
3. Marital status	-0.12**	0.31**	1										
4. Educational level	0.19**	-0.01	-0.09*	1									
5. Employment status	0.02	0.42**	0.13**	-0.04	1								
6. Sexual orientation	0.28	-0.26**	-0.31**	0.06	-0.72**	1							
7. Sex with person met online	0.15**	-0.18**	-0.22**	0.08	-0.12**	0.35**	1						
8. Sex buyer	-0.18**	0.08*	0.14**	0.02	0.07	-0.34**	-0.17**	1					
9. STI history	0.15**	0.07	-0.01	0.02	0.03	0.16**	0.21**	-0.09*	1				
10. One-night stand	-0.23**	0.00	0.17**	-0.03	-0.09*	-0.23**	0.02	-0.31**	-0.08*	1			
11. Periodic testing	0.33**	-0.07	-0.18**	0.13**	0.00	0.29**	0.18*	-0.19**	0.11**	-0.36**	1		
12. Perceived infection	-0.14**	0.00	0.04	-0.02	-0.00	-0.06	0.05	0.05	-0.02	-0.02	-0.17**	1	
13. Effective medication exists	0.15**	-0.03	-0.06	0.08**	0.06	0.12**	0.03	-0.02	0.03	-0.05	0.09*	-0.08*	1
14. AIDS is a severe condition	-0.12**	0.03	0.04	-0.05	0.08*	-0.07	-0.07	0.02	0.00	0.11**	-0.12**	0.02	-0.04

* p < 0.05; ** p < 0.01

for controlling HIV (“disagree”, “don’t know”, or “agree”), whether they perceived AIDS as a severe condition (“disagree”, “don’t know”, or “agree”), and whether they felt confident that they would always use a condom in the future (“yes” or “no”). Medical centers in Northern Taiwan^[14, 15] are using this questionnaire to study groups at high risk of STI. Thus, it was highly suitable for this study.

Statistical analysis

PASW 18.0 software was used for data analysis. Spearman’s correlation was applied to the analysis of relationships between the variables in the questionnaire and outcome variables. Multivariable logistic regression models were used to identify factors affecting repeat testing behavior. Factors related to sociodemographics, risk assessment of sexual behavior, reasons for taking HIV test, and HIV-related knowledge and attitudes were entered into the model. Adjusted odds ratio (AOR) and corresponding 95% confidence interval (CI) demonstrated the degree of correlation and statistical significance.

Results

There were 686 adult males (452 [65.9%] repeat testers and 234 [34.1%] first-time testers) enrolled in this study. Repeat testing was positively correlated with higher educational level ($r = 0.19, p < 0.0001$), engaging in sex with someone met on the Internet ($r = 0.15, p < 0.0001$), history of STI ($r = 0.15, p < 0.0001$), concept of periodic testing ($r = 0.33, p < 0.0001$), and agreement with the statement that effective medication currently exists for controlling HIV ($r = 0.15, p < 0.0001$). It was negatively correlated with marital status ($r = -0.12, p = 0.002$), sex buying behavior ($r = -0.18, p < 0.0001$), engaging in one-night stands ($r = -0.23, p < 0.0001$), perception of symptoms of infection related to HIV ($r = -0.14, p = 0.003$), and agreement with the statement that AIDS is a severe disease ($r = -0.12, p = 0.001$) (Table 1).

After controlling for other factors, the results of multivariable logistic regression analyses (Table 2) revealed that male repeat testers are more likely to be older and more highly educated. Furthermore,

the likelihood of repeat testing was higher among bisexual (adjusted odds ratio [AOR] 2.4, CI [1.4, 4.1]) and homosexual (AOR 3.4, CI [2.3, 5.3]) men than among heterosexual men. Men with previously diagnosed STI were twice as likely (AOR 2.0, CI [1.1, 3.9]) to have a repeat test than men with no previously diagnosed STI. However, sex buyers tended not to undergo repeat testing (AOR 0.5, CI [0.3, 1.0]). The frequency of repeat tests was much higher in individuals who suspected that their spouse or sexual partner has STI or is HIV positive (AOR 2.0, CI [1.1, 3.5]), who wanted to undergo periodic testing (AOR 3.2, CI [2.0, 5.1]), and who believed themselves at risk of HIV infection (AOR 1.7, CI [1.1, 2.8]) and lower in individuals who agreed with the statement that AIDS is a severe condition (AOR 0.3, CI [0.7, 1.0]).

Discussion

Rate of repeat testing and sociodemographic characteristics

Compared to the rate of repeat testing and counseling (25–66%) in previous studies [4], the estimated rate in this study (65.9%) was high. We did not take into consideration that some participants may have been erroneously categorized as first-time testers due to incomplete data. From the results of this study, among HIV-negative men, those who are older and more highly educated are more likely to engage in repeat testing behavior. This is consistent with the results of research conducted in the West^[5]. HIV repeat test frequency and probability are higher among older men. Compared to less highly educated men, those who are more highly educated have better access to diverse sources of information, more knowledge about HIV, and a more positive attitude towards HIV testing, increasing their probability of repeat testing..

Repeat testing and risk behaviors

From the results of this study, repeat testing is related to sexual orientation and certain high-risk sexual behaviors (i.e., bisexuality, homosexuality, and engaging in sex with someone met on the Internet). These results are consistent with the findings of previous studies^[5,8] which demonstrate

Table 2. Multivariable logistic regression of repeat testing among HIV negative adult males

Variable	Total number (n=686) n (%)	HIVtesting		AOR ^a (95% CI)
		First-time testers (n=234) n (%)	Repeat testers (n=452) n (%)	
Sociodemographic variables				
Age				
0-19	42 (6.1)	24 (10.3)	18 (4.0)	1.0
20-29	406 (59.2)	124 (53.0)	282 (62.4)	2.3 (1.1-4.8)*
30-39	197 (28.7)	70 (29.9)	127 (28.1)	2.4 (1.1-5.6)*
40+	41 (6.0)	16 (6.8)	25 (5.5)	3.1 (1.1-9.0)*
Marital status				
Married	50 (7.3)	27 (11.5)	23 (5.1)	1.0
Single	636 (92.7)	207 (88.5)	429 (94.9)	1.2 (0.6-2.3)
Educational level				
High-school or below	104 (15.2)	57 (24.4)	47 (10.4)	1.0
Above high-school	582 (84.8)	177 (75.6)	405 (89.6)	2.5 (1.5-4.0)*
Employment status				
Full-time	421 (61.4)	141 (60.3)	280 (61.9)	1.0
Part-time	265 (38.6)	93 (39.7)	172 (38.1)	0.8 (0.5-1.1)
Risk assessment of sexual behavior				
Sexual orientation Heterosexual				
Bisexual	112 (6.3)	35 (15.0)	77 (17.0)	2.4 (1.4-4.1)*
Homosexual	353 (51.5)	81 (34.6)	272 (60.2)	3.4 (2.2-5.3)*
Window period has passed				
No	125 (18.2)	46 (19.7)	79 (17.5)	1.0
Yes	561 (81.8)	188 (80.3)	373 (82.5)	1.0 (0.5-1.3)
Sex with someone met on Internet				
No	270 (39.4)	116 (49.6)	154 (34.1)	1.0
Yes	416 (60.6)	118 (50.4)	298 (65.9)	1.2 (0.8-1.7)
Frequency of condom use with casual sex partners				
Every time	260 (37.9)	155 (66.2)	271 (60.0)	1.0
Not every time	426 (62.1)	79 (33.8)	181 (40.0)	0.8 (0.5-1.1)
Sex worker				
No	682 (99.4)	232 (99.1)	450 (99.6)	1.0

Sex buyer

No	630 (91.8)	199 (85.0)	431 (95.4)	1.0
Yes	56 (8.2)	35 (15.0)	21 (4.6)	0.5 (0.3-1.0)

STI history

No	592 (86.3)	219 (93.6)	373 (82.5)	1.0
Yes	94 (13.7)	15 (6.4)	79 (17.5)	2.0 (1.1-3.9)*

Used addictive drugs within the last 6 months

No	659 (96.1)	227 (97.0)	432 (95.6)	1.0
Yes	27 (3.9)	7 (3.0)	20 (4.4)	1.0 (0.4-2.4)

Syphilis testing

Variable	Total number (n=686) (n=234)	HIV testing		AOR ¹ (95% CI) n (%)
		First-time testers (n=452) n (%)	Repeat testers n (%)	
Negative	650 (94.8)	227 (97.0)	423 (93.6)	1.0
Positive	36 (5.2)	7 (3.0)	29 (6.4)	1.4 (0.6-3.6)
Reasons for taking HIV test				
Suspect that spouse or sexual partner has STI or is HIV positive				
No	569 (82.9)	201 (85.9)	368 (81.4)	1.0
Yes	117 (17.1)	33 (14.1)	84 (18.6)	2.0 (1.1-3.5)*
Someone close is HIV positive				
No	664 (96.8)	226 (96.6)	438 (96.9)	1.0
Yes	22 (3.2)	8 (3.4)	14 (3.1)	1.5 (0.5-4.0)
Contracted STI				
No	675 (98.4)	231 (98.7)	444 (98.2)	1.0
Yes	11 (1.6)	3 (1.3)	8 (1.8)	0.5 (0.1-2.3)
Engaged in one-night stand				
No	469 (68.4)	125 (53.4)	344 (76.1)	1.0
Yes	217 (31.6)	109 (40.6)	109 (40.6)	0.7 (0.4-1.2)
Periodic testing				
No	370 (53.9)	180 (76.9)	262 (58.0)	1.0
Yes	316 (46.1)	54 (23.1)	262 (58.0)	3.2 (2.0-5.1)*
Getting married or having a new boy/girlfriend				
No	595 (86.7)	199 (85.0)	396 (87.6)	1.0
Yes	91 (13.3)	35 (15.0)	56 (12.4)	0.9 (0.5-1.6)

¹ Adjusted odds ratio after controlling for other variables *p < 0.05

Perceived symptoms of infection

No	640 (93.3)	209 (89.3)	431 (95.4)	1.0
Yes	46 (6.7)	25 (10.7)	21 (4.6)	0.5 (0.3-1.1)

HIV-related knowledge and attitudes

Being at risk of HIV infection

Never thought about it	121 (17.6)	51 (21.8)	70 (15.5)	1.0
Impossible	201 (29.3)	71 (30.3)	130 (28.8)	1.3 (0.8-2.2)
Possible	364 (53.1)	112 (47.9)	252 (55.8)	1.7 (1.1-2.8)*

Effective medication currently exists for controlling HIV

Disagree	50 (7.3)	23 (9.8)	27 (6.0)	1.0
Don't know	147 (21.4)	69 (29.5)	78 (17.3)	0.7 (0.4-1.5)
Agree	489 (71.3)	142 (60.7)	347 (76.8)	1.6 (0.8-3.0)

AIDS is a severe condition

Disagree	26 (3.8)	3 (1.3)	23 (5.1)	1.0
Don't know	88 (12.8)	22 (9.4)	66 (14.6)	0.6 (0.1-2.2)
Agree	572 (83.4)	209 (89.3)	363 (80.3)	0.3 (0.7-1.0)

Self-confident about correct use of a condom

Yes	371 (54.1)	115 (49.1)	200 (44.2)	1.0
No	315 (45.9)	119 (50.9)	252 (55.8)	1.1 (0.8-1.6)

that a large proportion of homosexual males have unprotected sex with partners of unknown HIV status^[16]. To confirm that their high-risk sexual behavior (e.g., anal and oral sex without a condom) has not led to HIV infection, they undergo repeat testing^[8,17]. Studies have even indicated that homosexual males consider repeat HIV tests a type of regular health examination^[10]. Thus, the expectation of a high repeat test rate in this group was met in this study as 58.0% of repeat testers considered this test routine or were suspicious or certain that their spouse or sexual partner has STI or is HIV positive. As bisexuals, homosexuals, and those who engage in sex with people they meet on the Internet are likely having unprotected sex with strangers, their risk of acquiring infections is greater and partly explains the high prevalence of repeat tests among individuals who have previously been diagnosed with an STI. This is consistent with the findings of previous studies^[5,8,10].

Although sex buying is generally regarded as a high-risk behavior, from the results of this study the risk of repeat HIV testing behavior decreased rather than increased among sex buyers. As sex buyers are predominantly heterosexual, the high proportion of homosexual and bisexual participants in this study may have obscured the true relationship between the buying of sex and repeat HIV testing. Sex workers and sex buyers typically take precautionary measures during sexual intercourse, reducing their concern about infection and HIV test frequency. Or, sex buyers may attempt to hide their repeat testing behavior. As buying sex is less accepted in ethnic Chinese society than in Western society, repeat testers may feel ashamed about buying sex and withhold this information from medical staff. Thus, their likelihood of being identified as repeat HIV testers is reduced. Studies comparing patients who visit STI clinics in the US and China found a higher probability of repeat HIV testing among sex buyers

in the US^[8] than among sex buyers in China^[18].

Repeat testing and HIV-related knowledge and attitudes

Most of the study participants self-identified as at high risk of HIV infection, which further implies a connection between repeat testing and high-risk behavior. Notably, participants who agreed with the statement that AIDS is a severe infectious disease were less amenable to repeat testing. A similar result was found in a previous study^[19], indicating that some people avoid testing for fear of a positive result. In this study, we were unable to demonstrate this phenomenon. However, delayed diagnosis in high-risk individuals who avoid testing is a formidable challenge. Although the government of Taiwan has been providing highly effective antiretroviral therapy for 20 years, there was no significant correlation between agreement with the statement that effective medication exists for controlling HIV and repeat testing in this study. This demonstrates that some high-risk individuals who do not thoroughly comprehend the severity of AIDS and the effectiveness of HIV treatment continue to go undetected. Our results indicated that the relationship between believing that AIDS is a severe condition and low repeat testing prevalence must be clarified to increase the number of people seeking HIV prevention services.

Study limitations

This study has two limitations. First, a cross-sectional design was adopted. Therefore, we were unable to determine whether first-time testers become repeat testers. This limitation blurred the difference in related risk factors between repeat and first-time testers. Second, self-administration of the questionnaire may have led to censoring of answers to questions on sexual behavior and other privacy concerns, leading to underestimation of the situation.

Conclusion

The results of this study showed that most adult

male repeat HIV testers engage in high-risk sexual behavior and persist in this behavior even though they are highly educated and perceive themselves to be at high risk of HIV infection. People in this high-risk group seem unperturbed by the possibility of becoming infected with HIV because most of them are aware that effective medication exists for controlling HIV infection. Therefore, their repeat testing behavior might be explained as the desire to confirm HIV-negative status or to detect HIV-positive status at an early stage when treatment is more effective. In this sense, such people are misusing the anonymous testing system. Moreover, if results are negative, this indirectly encourages them to continue engaging in high-risk behavior. The tangible benefits of free anonymous HIV testing have yet to be comprehensively evaluated. It is worth noting that some people may avoid testing for fear of a positive result because they perceive AIDS as a severe condition. Measures must be taken to encourage such people to overcome this fear and be tested. Only then can this testing loophole be closed and the problem of delayed diagnosis be reduced.

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