

## Preplanned Studies

## HIV-Related Knowledge, Attitude, and Practices Research Among College Students — Six Chinese Cities, 2021

Hui Liu<sup>1,2,\*</sup>; Qiyu Zhu<sup>1,\*</sup>; Lei Zhang<sup>3</sup>; Yujing Liu<sup>1</sup>; Peng Xu<sup>1</sup>; Maohe Yu<sup>4</sup>; Jixiang Fan<sup>5</sup>; Xiaohong Pan<sup>6</sup>; Xi Chen<sup>7</sup>; Huifang Xu<sup>8</sup>; Qinying He<sup>9</sup>; Mengjie Han<sup>1,#</sup>

### Summary

#### What is already known about this topic?

The number of newly diagnosed human immunodeficiency virus (HIV) cases among Chinese youth 15–24 years of age shows an upward trend between 2010 and 2019.

#### What is added by this report?

This survey is on a larger scale as compared to previous studies. It shows inadequate HIV knowledge — especially on HIV treatment, self-testing, and post-exposure prophylaxis — among college students. A significant gap exists between knowledge and behavior as indicated by the low condom use rate despite a high knowledge level.

#### What are the implications for public health practice?

Findings suggest priorities for future HIV education and awareness creation of existing services. A low condom use rate at sexual debut suggests that HIV prevention education should start early.

Globally, around 4,000 new human immunodeficiency virus (HIV) infections occur daily including among 1,100 youth aged 15–24 years (1). In China, newly diagnosed HIV cases among 15–24-year-olds — including young students — increased from 9,373 in 2010 to 15,790 in 2019 (2). To reduce new infections among students, a combination of prevention education and behavioral as well as biomedical interventions was implemented. This implementation calls for a geographically larger-scale study to assess and identify gaps in students' HIV-related knowledge, attitudes, and practices (KAP). A survey of college students in 6 large cities was thus conducted in 2021, with a total of 54,052 respondents. In addition to finding knowledge gaps on HIV, especially on treatment, HIV self-testing (HIVST) and post-exposure prophylaxis (PEP), significant knowledge and behavior gaps in practicing safe sex were identified. These gaps, coupled with early sexual

initiation, suggest that comprehensive prevention education should start early.

The survey was conducted from September to December 2021 at 30 colleges and universities in 6 large cities (Tianjin Municipality, Changchun City, Hangzhou City, Changsha City, Guangzhou City, and Chengdu City) that rank high in newly identified student infections. Convenience sampling along with a minimum number of classes per grade and a minimum of 600 samples per school was used. A WeChat-based anonymous questionnaire was distributed and accessed by respondents via a quick response (QR) code scan. Each internet protocol (IP) address was set for one enrollment. This structured online questionnaire included both sociodemographic and KAP questions related to HIV. The KAP questions focus on basic HIV information, PEP, HIVST, and sexual experiences. Results were presented with descriptive statistics, including proportions and their 95% confidence intervals (CIs). R software (Version 4.1.3, R Foundation for Statistical Computing, Vienna, Austria) was used for data cleaning and analysis.

A total of 54,052 valid questionnaires were collected, of which 59.5% (32,178/54,052) were female and 55.9% (30,211/54,052) were freshmen. Regarding sexual orientation, 86.9% (46,985/54,052) reported being heterosexual, whereas 1.7% (930/54,052) and 5.7% (3,058/54,052) reported being homosexual or bisexual, respectively. In addition, 10.0% (5,384/54,052) of respondents reported having had sexual experience, and 0.05% (26/54,052) reported testing positive for HIV in the latest test (Table 1).

The survey consisted of 9 questions on basic HIV knowledge. Knowledge of condom use (Q7, Q8, Q9) was relatively high with an over 90% passing rate. Nearly everyone (94.2%; 50,896/54,052) knew that intentional HIV transmission was illegal (Q3). However, as many as 29.0% (15,694/54,052) of respondents did not know that HIV cannot be cured (Q1). Furthermore, 34.9% (18,865/54,052) were

TABLE 1. Sociodemographic characteristics of college students surveyed in 6 Chinese cities, 2021 (N=54,052).

Characteristic	<i>n</i>	Percentage (95% <i>CI</i> )
Sex		
Male	21,874	40.5 (40.1, 40.9)
Female	32,178	59.5 (59.1, 59.9)
Age (years)		
≤17	682	1.3 (1.2, 1.4)
18–	11,635	21.5 (21.2, 21.9)
19–	19,761	36.6 (36.2, 37.0)
20–	11,118	20.6 (20.2, 20.9)
≥21	10,856	20.1 (19.7, 20.4)
School level		
First-tier	29,252	54.1 (53.7, 54.5)
Second-tier	18,096	33.5 (33.1, 33.9)
Third-tier	2,111	3.9 (3.7, 4.1)
Vocational college	4,593	8.5 (8.3, 8.7)
City of residence		
Tianjin	7,603	14.1 (13.8, 14.4)
Changchun	8,762	16.2 (15.9, 16.5)
Hangzhou	11,715	21.7 (21.3, 22.0)
Changsha	15,136	28.0 (27.6, 28.4)
Guangzhou	7,209	13.3 (13.1, 13.6)
Chengdu	3,627	6.7 (6.5, 6.9)
Grade		
Freshman	30,211	55.9 (55.5, 56.3)
Sophomore	12,516	23.2 (22.8, 23.5)
Junior	7,502	13.9 (13.6, 14.2)
Senior	2,714	5.0 (4.8, 5.2)
Graduate and higher	1,109	2.1 (1.9, 2.2)
Sexual orientation		
Heterosexual	46,985	86.9 (86.6, 87.2)
Homosexual	930	1.7 (1.6, 1.8)
Bisexual	3,058	5.7 (5.5, 5.9)
Not sure	3,079	5.7 (5.5, 5.9)
Sexual experience		
Yes	5,384	10.0 (9.7, 10.2)
No	48,668	90.0 (89.8, 90.3)
Self-reported HIV testing result		
Positive	26	0.05 (0.03, 0.07)
Negative	854	1.6 (1.5, 1.7)
Unknown	226	0.4 (0.4, 0.5)
Not tested	52,946	98.0 (97.8, 98.1)

Abbreviation: *CI*=confidence interval; HIV=human immunodeficiency virus.

unaware that being infected with sexually transmitted diseases (STDs) increases the risk of HIV infection (Q5), and 33.2% (17,940/54,052) were unaware that male homosexual behavior is the main route of HIV transmission among young Chinese students (Q4). Only 64.7% of respondents reported having heard of PEP, but nearly all respondents (91.7%, 49,549/54,052) expressed willingness to take the drug after possible HIV exposure to prevent seroconversion. When asked the multiple-choice question on where to find PEP drugs, the answers were Centers for Disease Control and Prevention (82.3%, 28,773/34,958), hospitals (83.1%, 29,067/34,958), community-based organizations (20.5%, 7,176/34,958), and online purchases (13.6%, 4,746/34,958). Nearly all respondents knew that an HIV test should be taken after risky behaviors (97.5%, 52,697/54,052) to know their status, start treatment, and suppress HIV replication (97.8%, 52,859/54,052). Furthermore, 98.2% (53,082/54,052) indicated that HIV testing could give them peace of mind. However, 37.4% (20,204/54,052) of respondents worry about others' attitudes, and 19.7% (10,669/54,052) worry about a positive result. Still 57.9% (31,321/54,052) have not heard of HIV self-testing (HIVST) (Table 2).

Among those who reported sexual experience, 33.2% (1,790/5,384) first had sex at the age of 18, followed by 22.3% (1,203/5,384) at 17 or below, and 17.4% (937/5,384) at 20. Among the first sexual experiences, 2.2% (116/5,384) were forced sex, 9.1% (489/5,384) were sex between males, and 72.4% (3,896/5,384) were with correct condom use. Among them, 84.9% (4,573/5,384) had sex in the past 12 months, of which 94.2% (4,307/4,573) reported having a fixed partner. Of those with fixed partners, 71.4% (3,076/4,307) reported consistent condom use. However, 29.7% (1,359/4,573) reported casual sex, with 65.5% (890/1,359) reporting consistent condom use. In addition, 15.5% (708/4,573) reported sex with a commercial partner, during which 64.3% (455/708) reported consistent condom use. Furthermore, 2.4% (109/4,573) reported drug use before/during sex. Approximately 6.4% (292/4,573) reported male homosexual intercourse in the past 12 months, of whom 36.0% had a role of either exclusively receptive anal sex (36.0%, 105/292) or mixed receptive and insertive anal sex (34.2%, 100/292). Among them, 42.1% (123/292) reported having more than one homosexual partner in the past 12 months. Overall, only 47.6% (139/292) reported consistent condom use

during sex with another male (Table 3).

Among all respondents, 1,106 (2.0%, 1,106/54,052) reported ever having had an HIV test, with 67.5% (746/1,106) of them testing only once. Nearly half (48.0%, 531/1,106) had an HIV test in the past 6 months, and 32.6% (361/1,106) have had an HIVST. As for the major reasons for not using HIVST, 25.0% (186/745) did not know where to obtain HIVST kits and 18.3% (136/745) did not know how to conduct an HIVST.

## DISCUSSION

The Implementation Plan for the Containment and Control of HIV/AIDS (2019–2022), jointly released by the National Health Commission and nine other ministries and commissions, defines the target HIV knowledge rate among college students at 95% (3). In this survey, some basic HIV knowledge questions scored as low as around 65% (Q4, Q5) and 71% (Q1). While the sample's high proportion of freshmen may negatively affect HIV knowledge results, HIV knowledge among college students as a whole falls short in both structure and comprehensiveness, as seen in the low-scored questions above. Over 90% of respondents are open to taking PEP to prevent HIV infection after unprotected sex, however, the 64.7% awareness rate and the lack of knowledge of where to find it impede access to PEP. HIVST, given its convenience and confidentiality (4), has been proven as a preferred testing method by college students (5). Additionally, HIVST kits can often be obtained from campus vending machines or online shops (6–7). However, over half of the respondents have not heard of HIVST, suggesting the need for its more prominent role in college prevention education and health services.

About 10% of respondents reported having had sexual experiences. The mean age for sexual debut was 18.39 years, which is consistent with the results of previous research (8). Among them, 22.3% reported first having sex at 17 or below and 33.2% reported having sex at the age of 18, mostly around a time before entering college or during the freshman year. Early sexual debut is associated with unintended pregnancy, more sexual partners, and unprotected sex (9). Future prevention education should therefore highlight preparedness before sexual debut. The correct condom use rate was low at first sex, and consistent condom use rates were low for sex in the past 12

TABLE 2. HIV/AIDS-related knowledge, attitudes of college students surveyed in 6 Chinese cities, 2021 (N=54,052).

Characteristic	n	Percentage (95% CI)
Basic HIV knowledge		
Q1. AIDS cannot be cured		
Yes	38,358	71.0 (70.6, 71.3)
No	15,694	29.0 (28.7, 29.4)
Q2. A healthy-looking person can have HIV		
Yes	47,046	87.0 (86.8, 87.3)
No	7,006	13.0 (12.7, 13.2)
Q3. It is illegal to transmit HIV intentionally		
Yes	50,896	94.2 (94.0, 94.4)
No	3,156	5.8 (5.6, 6.0)
Q4. HIV among young Chinese students is mainly through male homosexual behavior		
Yes	36,112	66.8 (66.4, 67.2)
No	17,940	33.2 (32.8, 33.6)
Q5. Infection with STDs could increase the risk of HIV infection		
Yes	35,187	65.1 (64.7, 65.5)
No	18,865	34.9 (34.5, 35.3)
Q6. Substance abuse could increase the risk of HIV infection		
Yes	46,003	85.1 (84.8, 85.4)
No	8,049	14.9 (14.6, 15.2)
Q7. Proper use of condoms during sex reduces the risk of HIV transmission		
Yes	51,128	94.6 (94.4, 94.8)
No	2,924	5.4 (5.2, 5.6)
Q8. It is necessary to use condoms even when having sex with acquaintances		
Yes	50,191	92.9 (92.6, 93.1)
No	3,861	7.1 (6.9, 7.4)
Q9. Condoms should be used even if the genital looks normal		
Yes	50,110	92.7 (92.5, 92.9)
No	3,942	7.3 (7.1, 7.5)
Knowledge and attitudes toward PEP		
Heard of PEP		
Yes	34,958	64.7 (64.3, 65.1)
No	19,094	35.3 (34.9, 35.7)
Knowledge on where to get PEP drugs (n=34,958)		
Centers for Disease Control and Prevention		
Yes	28,773	82.3 (81.9, 82.7)
No	6,185	17.7 (17.3, 18.1)
Hospitals		
Yes	29,067	83.1 (82.8, 83.5)
No	5,891	16.9 (16.5, 17.2)
Community-based organizations		
Yes	7,176	20.5 (20.1, 21.0)
No	27,782	79.5 (79.0, 79.9)

TABLE 2. (Continued)

Characteristic	<i>n</i>	Percentage (95% CI)
Purchase online		
Yes	4,746	13.6 (13.2, 13.9)
No	30,212	86.4 (86.1, 86.8)
Willing to use PEP after risky behavior		
Yes	49,549	91.7 (91.4, 91.9)
No	800	1.5 (1.4, 1.6)
Not sure	3,703	6.9 (6.6, 7.1)
Knowledge and attitudes toward HIV testing and counseling		
I should seek HIV testing and counseling after risky behavior		
Yes	52,697	97.5 (97.4, 97.6)
No	1,355	2.5 (2.4, 2.6)
Testing helps me know my status, start early treatment, and suppress HIV replication		
Yes	52,859	97.8 (97.7, 97.9)
No	1,193	2.2 (2.1, 2.3)
HIV testing gives me peace of mind		
Yes	53,082	98.2 (98.1, 98.3)
No	970	1.8 (1.69, 1.91)
Worry about others' attitude after HIV testing		
Yes	20,204	37.4 (37.0, 37.8)
No	33,848	62.6 (62.2, 63.0)
Worry about positive HIV testing results		
Yes	10,669	19.7 (19.4, 20.1)
No	43,383	80.3 (79.9, 80.6)
Heard of HIV self-testing		
Yes	22,731	42.1 (41.6, 42.5)
No	31,321	57.9 (57.5, 58.4)

Abbreviation: AIDS=acquired immunodeficiency syndrome; CI=confidence interval; HIV=human immunodeficiency virus; PEP=post-exposure prophylaxis; STDs=sexually transmitted diseases.

TABLE 3. Sex experience and HIV testing among college students in 6 Chinese cities, 2021 (*N*=5,384).

Characteristic	<i>n</i>	Percentage (95% CI)
First sex ( <i>n</i> =5,384)		
Age at sexual debut (years)		
≤17	1,203	22.3 (21.2, 23.5)
18–	1,790	33.2 (32.0, 34.5)
19–	897	16.7 (15.7, 17.7)
20–	937	17.4 (16.4, 18.4)
≥21	557	10.3 (9.6, 11.2)
Forced sex at sexual debut		
Yes	116	2.2 (1.8, 2.6)
No	5,268	97.8 (97.4, 98.2)
Partner type at sexual debut		
Heterosexual	4,895	90.9 (90.1, 91.7)
Homosexual	489	9.1 (8.33, 9.9)

TABLE 3. (Continued)

Characteristic	<i>n</i>	Percentage (95% CI)
Condom use at sexual debut		
None	1,142	21.2 (20.1, 22.3)
Incorrect use	346	6.4 (5.79, 7.12)
Correct use	3,896	72.4 (71.1, 73.5)
Sex behavior (past 12 months; <i>n</i> =4,573)		
Sex with fixed partner (past 12 months)		
Yes	4,307	94.2 (93.5, 94.8)
No	266	5.8 (5.2, 6.5)
Condom use with fixed sex partner (past 12 months; <i>n</i> =4,307)		
None	288	6.7 (6.0, 7.5)
Not consistent use	943	21.9 (20.7, 23.2)
Consistent use	3,076	71.4 (70.0, 72.8)
Casual sex (past 12 months)		
Yes	1,359	29.7 (28.4, 31.1)
No	3,214	70.3 (68.9, 71.6)
Condom use with casual sex partner (past 12 months; <i>n</i> =1,359)		
None	204	15.0 (13.2, 17.0)
Not consistent use	265	19.5 (17.4, 21.7)
Consistent use	890	65.5 (62.9, 68.0)
Commercial sex (past 12 months)		
Yes	708	15.5 (14.5, 16.6)
No	3,865	84.5 (83.4, 85.5)
Condom use with commercial sex partner (past 12 months; <i>n</i> =708)		
None	152	21.5 (18.5, 24.7)
Not consistent use	101	14.3 (11.8, 17.1)
Consistent use	455	64.3 (60.6, 67.8)
Male homosexual behavior (past 12 months)		
Yes	292	6.4 (5.1, 7.1)
No	4,281	93.6 (92.9, 94.3)
Sex role (past 12 months; <i>n</i> =292)		
Receptive	105	36.0 (30.5, 41.8)
Insertive	87	29.8 (24.7, 35.5)
Receptive and insertive	100	34.2 (28.9, 40.0)
Homosexual sex partner number (past 12 months; <i>n</i> =292)		
1	169	57.9 (52.0, 63.6)
2–9	100	34.2 (28.9, 40.0)
10–	23	7.9 (5.2, 11.7)
Condom use with homosexual partner (past 12 months; <i>n</i> =292)		
None	89	30.5 (25.3, 36.2)
Not consistent use	64	21.9 (17.4, 27.2)
Consistent use	139	47.6 (41.8, 53.5)
Any drug use before/during sex (past 12 months)		
Yes	109	2.4 (1.97, 2.9)
No	4,464	97.6 (97.1, 98.0)

TABLE 3. (Continued)

Characteristic	n	Percentage (95% CI)
HIV testing and counseling practices (n=1,106)		
Number of HIV tests taken		
1	746	67.5 (64.6, 70.2)
2–	344	31.1 (28.4, 33.9)
10–	5	0.5 (0.2, 1.1)
20–	11	1.0 (0.5, 1.8)
The last HIV test was in the past		
6 months	531	48.0 (45.0, 51.0)
7–12 months	148	13.4 (11.5, 15.6)
1–2 years	177	16.0 (13.9, 18.3)
≥2 years	250	22.6 (20.2, 25.2)
Ever had HIV self-testing		
Yes	361	32.6 (29.9, 35.5)
No	745	67.4 (64.5, 70.1)
Reason for not doing HIV self-testing (n=745)		
Unaware of where to obtain HIV self-testing kits		
Yes	186	25.0 (21.9, 28.3)
No	213	28.6 (25.4, 32.0)
No answer	346	46.4 (42.8, 50.1)
Unsure about how to conduct HIV self-testing		
Yes	136	18.3 (15.6, 21.3)
No	263	35.3 (31.9, 38.9)
No answer	346	46.4 (42.8, 50.1)
Distrustful of the result of HIV self-testing		
Yes	55	7.4 (5.7, 9.6)
No	344	46.2 (42.6, 49.8)
No answer	346	46.4 (42.8, 50.1)
Unsure about what to do after HIV self-testing		
Yes	75	10.1 (8.1, 12.5)
No	324	43.5 (39.9, 47.1)
No answer	346	46.4 (42.8, 50.1)

Abbreviation: CI=confidence interval; HIV=human immunodeficiency virus.

months. In addition, 292 male respondents reported having sex with another male in the past 12 months, with a low rate of consistent condom use (47.6%). The risks of unprotected sex should thus be discussed in greater depth in prevention education, coupled with condom availability, including for men who have sex with men (MSM). In the present survey, 2.0% of respondents reported having had an HIV test. As voluntary HIV testing becomes a process of education and intervention, promoting HIV testing can add great value, especially for students with sexual experiences.

The HIV knowledge rate was compared with a previous study conducted in Henan Province (10). The

questions with low awareness rates were similar (Q1, Q4). Therefore, this survey can represent both the knowledge gaps of college students and where the gaps are.

This study has several limitations. First, the self-reported data may lead to underreporting of “not-encouraged behaviors” (i.e., unprotected sex). Second, considering the cross-sectional study design, recall bias may exist on past events. Third, as students from lower grades were over represented, further analysis is needed to factor in grade levels.

Overall, this survey provided empirical guidance on HIV education among students. First, as over half of

respondents with sexual experience reported their first sex at or before age 18 and condom use rate was low, prevention education should begin no later than middle school. Second, the curriculum should be specific about risky sexual behaviors, including unprotected sex between males. Third, college HIV prevention must integrate education with access to services, including those on HIVST and PEP.

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# Corresponding author: Mengjie Han, [mjhan@chinaaids.cn](mailto:mjhan@chinaaids.cn).

<sup>1</sup> National Center for AIDS/STD Control and Prevention, Chinese Center for Disease Control and Prevention, Beijing Municipality, China; <sup>2</sup> Chinese Association of STD and AIDS Prevention and Control, Beijing Municipality, China; <sup>3</sup> Beijing Chaoyang Kangzhong Health and Education Center, Beijing Municipality, China; <sup>4</sup> Tianjin Center for Disease Control and Prevention, Tianjin Municipality, China; <sup>5</sup> Jilin Provincial Center for Disease Control and Prevention, Changchun City, Jilin Province, China; <sup>6</sup> Zhejiang Provincial Center for Disease Control and Prevention, Hangzhou City, Zhejiang Province, China; <sup>7</sup> Hunan Provincial Center for Disease Control and Prevention, Changsha City, Hunan Province, China; <sup>8</sup> Guangdong Provincial Association of STD and AIDS Prevention and Control, Guangzhou City, Guangdong Province, China; <sup>9</sup> Chengdu Center for Disease Control and Prevention, Chengdu City, Sichuan Province, China.

⊗ Joint first authors.

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