

The Current Level of HIV/AIDS Knowledge and Sexual Behaviors of Students in Southern China: A Cross-Sectional Study

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Abstract

Background: The spread of HIV/AIDS in China is predominantly driven by sexual transmission and it is a fact that HIV transmission among students is quite common, e.g., 480 000 adolescents were infected from 2000 to 2018. Our study aimed to investigate knowledge of HIV/AIDS and sexual behaviors of young students in Southern China.

Methods: A cross-sectional study was conducted based on questionnaire. The information collected included socio-demographic characteristics, knowledge of HIV and risky sexual behaviors.

Results: 9027 students were invited and 8349 were eventually enrolled in the study. The following factors were found to be associated with lower level of HIV/AIDS knowledge: female (OR: 0.757, 95% CI 0.689–0.831), residence in rural areas (OR: 0.786, 95% CI: 0.713–0.866), studying in high school (OR = 0.598, CI = 0.459–0.779) and secondary vocational school (OR = 0.713, CI = 0.545–0.933), major in pharmacy (OR = 0.453, CI = 0.331–0.621), medicine (OR = 0.592, CI = 0.402–0.872) and others (OR = 0.671, CI = 0.518–0.871), and little participation in programs for the prevention of AIDS (OR = 0.646, CI = 0.585–0.714). Kendall correlation test showed that students who had risky sexual behaviors all had lower level of HIV/AIDS Knowledge ($P < 0.05$).

Conclusions: Students who have more knowledge of HIV/AIDS were generally less likely to have risky sexual behaviors. Female students and those who reside in rural areas had lower level of HIV/AIDS knowledge, indicating that we may need to pay more attention to deliver education for these cohorts. It is suggested to follow the strategies used by some developed countries to improve students' knowledge for HIV/AIDS and prevent its transmission.

Keywords: HIV/AIDS, students, Prevention, Public health, risky sexual behaviors, Guangdong China

1. Introduction

In 2020, there were 37.7 million people living with HIV globally, including 10.2 million who were not on treatment. This figure increased rapidly from 25.5 million in 2000 (World Health Organization [WHO], 2021). Despite the availability of combination antiretroviral therapy (cART) (Ochodo, Kakourou, Mallett, & Deeks, 2018), the death rate from AIDS is high, i.e. 680 000 people died from AIDS-related illnesses in 2020 (WHO, 2021). Many studies have shown that unprotected sex remains a concern in people living with HIV (Engedashet, Worku, & Tesfaye, 2014; D. Li et al., 2010; Mburu, Limmer, & Holland, 2019). A systematic review indicated that if antiretroviral treatment and condom are used together, the HIV transmission can be reduced up to 99.2% (Patel

et al., 2014).

It is noted that unprotected sex often occurs in adolescents and young adults (Keto, Tilahun, & Mamo, 2020; Lai et al., 2020) and is considered as the most common transmission path for this specific cohort (Rahman & Berenson, 2013). AIDS is the second most common disease among young people worldwide because of the lack of knowledge (Veroniki et al., 2018). In China, the majority of young population are students (Y. Li et al., 2013). It is suggested that in the past years, the annual newly infected college students increased by 30 to 50% (G. Li, Y. Jiang, & L. Zhang, 2019). A study showed that there is significantly higher incidence of AIDS in southern part of China (Wang et al., 2016) and Guangdong is one of the most populous province in southern China (P et al., 2020). In recent years, the incidence of HIV in Guangdong Province was ranked top six in China (Gao et al., 2019; Lan et al., 2021). However there is little evidence on the level of HIV/AIDS knowledge and sexual behaviors of students in southern China.

The aim of this study was to investigate the HIV/AIDS Knowledge and sexual behaviors of students in Jiangmen, Guangdong province.

2. Methods

2.1 Study Design and Setting

From 1st September 2019 to 11th March 2020, a cross-sectional survey study was conducted in the city of Jiangmen in Guangdong Province, China. High schools, secondary and higher vocational schools were randomly selected. We also included the only university in the city of Jiangmen. This was to ensure that students from different type of schools in the city can be included such that our sample population is more representative. From each of these schools or the university, snowball sampling was used to select students for participation. Within this given study period (from 1st Sept. to 11th Mar. 2020), we collected as much questionnaires as possible to guarantee a relatively large sample size for analysis. Informed assent was obtained from participants or their legal guardians (e.g. parents) if participants were below 18 years of age.

2.2 Measurements

2.2.1 Socio-Demographic Characteristics

The questionnaire collected information on the following variables: sex (male, female), age (age < 18, age ≥ 18), region (rural, urban), ethnicity (Han, other minorities), education level (secondary vocational school, High school, university or Higher Vocational School), major (medicine, pharmacy, nursing, other), immediate family ever studied medicine (yes, no), marital status (unmarried, married, other), ever participate in programs for the prevention of AIDS (yes, no), ever had sex (yes, no), age of first sex (age < 22, age ≥ 22), condom use in first sex (yes, no, unknown), heterosexual intercourse with fixed partners within one year (yes, no), heterosexual intercourse with casual partners within one year (yes, no), commercial sex within one year (yes, no), men who have anal sex with men within one year (yes, no), ever taken drugs (yes, no), ever tested for HIV within one year (yes, no).

2.2.2 Measurement of HIV Knowledge

A questionnaire was designed based on the evaluation framework for preventing and controlling HIV in China, a paper enacted by the State Council of China, which included 8 HIV-related questions (see appendix for details). Those who answered incorrectly or had an “unknown” answer are regarded as not having HIV/AIDS Knowledge. Each correct answer is given a score of 1 and each wrong answer is given a score of 0 such that the total score ranges from 0 to 8. According to the evaluation framework, individuals with at least 6 points were considered as having comprehensive knowledge of HIV, while those with less than or equal to 6 points were considered as having low knowledge of HIV (Dai et al., 2017).

2.2.3 Risky Sexual Behaviors

Participants with risky sexual behaviors were defined as not using condoms every time when having at least one of the following behaviors (No. 3 is specifically pointed at male participants):

- 1) Had sex with casual partners within one year
- 2) Had commercial sex within one year
- 3) Had anal sex with men within one year

3. Data Analysis

The data were analyzed using SAS 9.4. Continuous variables were summarized by mean and standard deviation

(SD) or median and interquartile range (IQR), depending on the distribution of the data. Categorical variables were summarized by absolute number and percentages. T-test and Mann-Whitney U test were used for the analysis of groups of continuous variables. Chi-square test was applied to analyze the categorical variables. Correlation analysis was performed using Kendall correlation analysis. Univariate and multivariate logistic regression models were used to identify factors that significantly influence the level of knowledge of HIV/AIDS. Odds ratios (OR) and the associated 95% confidence interval (CI) were reported. The statistical significance level was set as 0.05.

4. Results

4.1 Characteristic of Participants

9027 students were invited to fill in the questionnaire, and after excluding invalid responses (e.g., birth date later than date of questionnaire completion, having an HIV test record but the test date is not within one year of questionnaire completion, age that did not match education level, etc.), 8349 were included in our analysis. Table 1 shows the characteristic of the participants. The average age of all participants was 19.0 (SD 1.3), ranging from 14 to 25. Female participants accounted for a higher proportion (65.55%). The majority (70.51%) came from rural areas. The Han minority made up of 98.8%. Students with a vocational education or higher consisted of over 81%. Slightly over 32% of participants had immediate family who ever studied medicine. Most of the students were unmarried (99.4%). In addition, there were 8.25% students who had sexual intercourse and there were 0.23% of students who had taken drugs.

Table 1. Characteristics of the study participants (n= 8349)

Variables	Overall(n=8349)	Having low knowledge of HIV (n=3593)	Having comprehensive knowledge of HIV (n=4756)
Gender			
male	2876(34.45)	1098(30.56)	1778(37.38)
female	5473(65.55)	2495(69.44)	2978(62.62)
Age			
age<18	572(6.85)	260(7.24)	312(6.56)
age>=18	7777(93.15)	3333(92.76)	4444(93.44)
Region			
rural	5887(70.51)	2645(73.62)	3242(68.17)
urban	2462(29.49)	948(26.38)	1514(31.83)
Ethnicity			
Han	8249(98.80)	3547(98.72)	4702(98.86)
other minorities	100(1.20)	46(1.28)	54(1.14)
Education level			
secondary vocational school	224(2.68)	113(3.15)	111(2.33)
high school	232(2.78)	128(3.56)	104(2.19)
university or higher vocational school	7893 (94.54)	3352 (93.29)	4541 (95.48)
Major			
medicine	186(2.23)	85(2.37)	101(2.12)
pharmacy	467(5.59)	246(6.85)	221(4.65)
nursing	273(3.27)	90(2.50)	183(3.85)
others	7423(88.91)	3172(88.28)	4251(89.38)
Immediate family ever studied medicine			
yes	2687(32.18)	1167(32.48)	1520(31.96)
no	5662(67.82)	2426(67.52)	3236(68.04)

Marital status			
unmarried	8299(99.40)	3565(99.22)	4734(99.54)
married	29(0.35)	14(0.39)	15(0.32)
others	21(0.25)	14(0.39)	7(0.15)
Ever gotten AIDS-related promotive and preventive services			
yes	2402(28.77)	838(23.32)	1564(32.88)
no	5947(71.23)	2755(76.68)	3192(67.12)
Ever had sex			
yes	689(8.25)	238(6.62)	451(9.48)
no	7660(91.75)	3355(93.38)	4305(90.52)
Age of first sex			
	689		
age<22	639(92.74)	210(88.24)	429(95.12)
age≥22	50(7.26)	28(11.76)	22(4.88)
Condom use in first sex			
	689		
yes	463(67.20)	158(66.39)	305(67.63)
no	182(26.42)	57(23.95)	125(27.72)
unknown	44(6.39)	23(9.66)	21(4.66)
Hetero-sex with fixed partners within one year			
	378		
yes	350(92.59)	117(90.70)	233(93.57)
no	28(7.41)	12(9.30)	16(6.43)
Hetero-sex with casual partners within one year			
	689		
yes	289(41.94)	97(40.76)	192(42.57)
no	400(58.06)	141(59.24)	259(57.43)
Commercial sex within one year			
	689		
yes	53(7.69)	27(11.34)	26(5.76)
no	636(92.31)	211(88.66)	425(94.24)
Homo-sex within one year			
	689		
yes	34(8.74)	17(12.14)	17(6.83)
no	355(91.26)	123(87.86)	232(93.17)
Ever taken drugs			
yes	19(0.23)	11(0.31)	8(0.17)
no	8330(99.77)	3582(99.69)	4748(99.83)
Ever tested for HIV within one year			
yes	128(1.53)	48(1.34)	80(1.68)
no	8221(98.47)	3545(98.66)	4676(98.32)

4.2 Knowledge of HIV

4756 (56.96%) had a score of 6 or more and they were regarded as having a comprehensive knowledge of HIV. The average score of HIV knowledge among all participants was 6.48 (SD 1.39). 40 (0.48%) knew nothing about HIV (a score of 0). There were two questions that reported a particularly low correct rate: 3632 students (43.50%) did not know whether the spread of HIV was related to the number of sexual partners, 3658 students (43.81%) had a misperception on whether a person can be infected with HIV by a mosquito bite (see Table 2).

Table 2. HIV/AIDS knowledge among participants

Items	Number of correct responses (%)
HIV-positive individuals can appear healthy	6963(83.4)
Mosquito bite	4691(56.19)
Eating together	6815(81.63)
Blood transmission	8190(98.10)
Needle sharing	8207(98.30)
Mother-to-child transmission	7442(89.14)
Condom protection	7104(85.09)
Fixed sex partner reduce transmission	4717(56.50)

Univariate logistic regression model suggested that gender, region, education level, major and past participation in campaigns for HIV significantly influence the level of knowledge of HIV ($P < 0.05$). These factors were further included in multivariable analysis. As shown in Table 3, our multivariate logistic regression model indicated that female (OR = 0.757, 95% CI: 0.689–0.831) had poorer knowledge compared to men. The level of HIV knowledge was lower in those living in rural (OR = 0.786, CI = 0.713–0.866). Compared with those whose education was university or higher vocational school, lower level of HIV knowledge was found in those with an education level of high school (OR = 0.598, CI = 0.459–0.779) and secondary vocational school (OR = 0.713, CI = 0.545–0.933). As for major, students who study medicine (OR = 0.592, CI = 0.402–0.872), pharmacy (OR = 0.453, CI = 0.331–0.621) and others (OR = 0.671, CI = 0.518–0.871) all have a lower level of HIV knowledge than students who study nursing. Students who had never participated in campaigns for HIV/AIDS (OR = 0.646, CI = 0.585–0.714) had lower level of HIV knowledge.

Table 3. Logistic regression analysis of factors associated with HIV-related knowledge

Variables	OR (95%CI)	P-value
Gender		
male	1	
female	0.757 (0.689, 0.831)	<0.001
Region		
urban	1	
rural	0.786 (0.713, 0.866)	<0.001
Education level		
university or higher vocational school	1	<0.001
high school	0.598 (0.459, 0.779)	<0.001
secondary vocational school	0.713 (0.545, 0.933)	0.014
Major		
nursing	1	<0.001
pharmacy	0.453 (0.331, 0.621)	<0.001
medicine	0.592 (0.402, 0.872)	0.008
others	0.671 (0.518, 0.871)	0.003
Ever gotten AIDS-related promotive and preventive services		
yes	1	
no	0.646 (0.585, 0.714)	<0.001

Note. OR=Odds Ratio; CI=Confidence Interval.

4.3 Risky Sexual Behaviors

Among those who have ever had sex, only 11.2% students' first sex partner were considered risky. Among students who had risky sexual behaviors, having heterosexual intercourse with casual partners while not using condoms accounted for 16.57%, having commercial sex while not using condoms accounted for 18.87% and men having anal sex with men while not using condoms accounted for 20.59%. Our chi-squared test suggested that students who had risky sexual behaviors all had a correlation with knowledge of AIDS ($P < 0.05$). The correlation test showed that those who have risky sexual behaviors generally have lower level of HIV knowledge ($P < 0.05$).

5. Discussion

Our study explored the relationship between HIV/AIDS knowledge and sexual behaviors in students in Southern China and important findings can be summarized as: (i) a high proportion of students had their first sex before the age of 22; (ii) students had low level of knowledge with respect to certain aspects of HIV (e.g. transmission of HIV through mosquito bites and the relationship between number of sexual partner and HIV transmission); (iii) there were significant differences in the level of knowledge in HIV across different cohorts (e.g. females, students study different majors); (iv) students who had risky sexual behaviors (e.g. not using condoms) generally had lower knowledge level of HIV/AIDS.

We found that misconceptions regarding some of transmission are still highly prevalent. Specifically, many participants accepted that HIV can be transmitted via mosquito bites (56.19%) and some participants (43.50%) even don't know fixed sexual partner largely protect them from infection. Similar findings (Tan, Pan, Zhou, Wang, & Xie, 2007; Tung, Lu, & Cook, 2013) were also identified in studies conducted in Chinese college students. However, there is still room to improve compared with other developed countries such as Italy, where around one third of the participants have misperception on the HIV transmission via mosquito bites (Loconsole et al., 2020). Moreover, students in Guangdong Province showed much less awareness (e.g. 21% lower) with respect to the protective effects of fixed sexual partner compared to other provinces in China (T. Liu et al., 2021).

According to results from our study, males, students living in urban areas, those who major in nursing and with a higher education level, or who ever had participated in campaigns for HIV generally had more knowledge regarding HIV. This is consistent with other studies in China, USA and Finland (Ebersole, Boch, Bonny, Chisolm, & Berlan, 2021; He et al., 2019; Suominen, Karanja-Pernu, Kylmä, Houtsonen, & Välimäki, 2011; Tung et al., 2013). This result may be explained by the fact that men that having anal sex with men is often reported as a route of HIV transmission (Sun, G. Li, H. Lu, 2021), which seem to bring more alerts for males compared with females. Although rural areas developed fast in the past years, we still see the fact that students living in urban areas are more likely to receive safe-sex education prior to entering university (Chen et al., 2016) and parental education is generally better (Y. Liu et al., 2020) in urban areas in China. Another indication is that studying nursing and getting a higher education level can help students get a better understanding of HIV.

Clearly, HIV prevention education delivered towards certain cohorts (e.g. those with relatively low education level) is likely to show substantial benefits. Education was shown to be a factor associated with awareness as adolescents with at least a primary education reported higher level of HIV awareness compared to those without any formal schooling (Ruan et al., 2021; Menna, Ali, & Worku, 2015). The education and public programmes on HIV/AIDS are still considered as the key measure to reduce the transmission. Thus, it urges the need to make reform on school curriculums by including a compulsory course on the relevant topics for students as earlier as possible. The government is also expected to provide support for school curriculum design and implementation by developing appropriate and culturally conducive policies and programmes in liaison with programme organizers, principals, teachers and other relevant personnel.

Our study indicated that a high proportion of students had their first sex before the age of 22, which is comparable to another study conducted in China (Du et al., 2021). We echo their viewpoint that there is a trend for young students to have their first sex at an earlier age. In addition, we also found that almost all kinds of sexual behaviors (see 3.2.3 for definition) are closely related to HIV knowledge. This result seemed to deviate from what other have found previously. For example, Stephens et al. and Xu et al. reported that high level of HIV knowledge did not show significant associations with safe sex behaviors in students because of the lack of translation from knowledge to prevention action (Stephens et al., 2012; Xu et al., 2019). In the current study, a considerable number of subjects did not use condoms in the high-risk sexual behaviors defined previously. The usage of condom (measure as the percentage of students who used condom against all students) in heterosexual intercourse students with fixed and casual partners were inconsistent with findings by Long et al., e.g. 83% and 55%, respectively (Long, Han, Tong, & Chen, 2019). The usage of condom in homosexual male students was higher than that reported by Xu et al. by 10% (Xu et al., 2019). Surprisingly, nearly 67.20% (Sudhinaraset, Astone, & Blum, 2012) reported condom use in first

sex in China as the same as the reports conducted in Nigeria (Badru et al., 2020) among youth. While in Germany (Scharmanski & Heßling, 2021), 77% adolescents used condoms in their first sex. Although the usage of condom in China is rising, it is still lower than that in Germany, and we consider Germany as a country with a low level of AIDS in the world. It is therefore necessary to enhance the awareness of the importance of condom use when having sex in Chinese teenagers. Choosing high-quality condoms and ensuring the correct use of condoms can effectively prevent the transmission of AIDS.

At present, there is no vaccine to directly prevent AIDS such that knowledge of prevention, refusal of risky sexual behavior and self-protection are the most effective ways to cut off the disease spread. Adolescence is considered as an important stage for physiological and psychological development. It is therefore essential to help adolescence be aware of the nature, transmission path as well as consequences of HIV infection and build up their relevant knowledge and self-discipline. For example, nowadays students tend to use the Internet and mobile phone to acquire relevant knowledge rather than taking part in the traditional health education program for HIV/AIDS due to the availability of modern technology (Zheng et al., 2020). Therefore, the way to deliver education may need to be modified. Digital technologies, particularly game-based teaching and learning, can provide a user-friendly learning environment for adolescents. Students are also likely to participate more actively in this way, resulting in better knowledge acquisition (Haruna et al., 2021). Students can also be provided with the sexual health education in a quiz format based on an award system. This will create competition and motivate them to learn more and in depth (Haruna et al., 2018). We can refer to Germany in providing regular seminars in school for students to openly discuss topics related to sex and HIV (Federal Ministry of Health & Federal Ministry for Economic Cooperation and Development, 2016). A variety of educational mode should be used in combination to help improve students' HIV knowledge and prevent AIDS more effectively.

5.1 Limitation

The cross-sectional study design is considered as a limitation of this study because any causal relationship between the level of HIV/AIDS knowledge and risky sexual behaviors cannot be fully determined, e.g. we have little information on whether a student developed knowledge of HIV first or they had risky sexual behaviors first. Therefore, studies with a cohort study design are needed to further clarify this. Recall bias is another limitation as some participants may not recall exactly what they have done in the past, which is likely to have some influence on our data.

6. Conclusion

Our study suggested that the level of knowledge for HIV tends to influence the chance of having risky sexual behaviors in Chinese students. Moreover, knowledge of HIV with respect to certain aspects and in specific cohorts is still low. With an increasing trend in HIV transmission in Chinese students nowadays, it is essential to improve their awareness of HIV by using more effective education programs (e.g. targeted at specific aspects of HIV for specific cohorts) so as to reduce and prevent the spread of HIV more effectively.

Competing Interests Statement

The authors declare that there are no competing or potential conflicts of interest.

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Appendix: HIV-related knowledge questionnaire

1. Can a person observe that another person be infected with HIV based on his/her appearance?
2. Can a person be infected with HIV by a mosquito bite?
3. Can a person be infected with HIV by eating with a person with HIV?
4. Can a person be infected with HIV via an HIV-infected blood transfusion?
5. Can a person be infected with HIV by sharing syringes with a person with HIV?
6. Can a baby born to an HIV-positive mother be infected with HIV?
7. Can the correct use of condom reduce the spread of AIDS?
8. Can a person having sex with only one partner reduce the spread of AIDS?

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