

HOSTED BY



Contents lists available at ScienceDirect

International Journal of Nursing Sciences

journal homepage: <http://www.elsevier.com/journals/international-journal-of-nursing-sciences/2352-0132>

Special Issue: Medicine, Humanity and Media

HIV/AIDS related perception and behavior: A comparative study among college students of different majors in China



Xinying Sun, Lishi Fan, Chun Chang, Yuhui Shi*

School of Public Health, Peking University, Beijing, China

ARTICLE INFO

Article history:

Received 18 February 2020

Received in revised form

28 April 2020

Accepted 16 July 2020

Available online 20 July 2020

Keywords:

Acquired immunodeficiency syndrome

Attitude

China

College students

Sexual behavior

Surveys and questionnaires

ABSTRACT

Objective: In order to carry out proper education and intervention of AIDS based on different features and demands of different majors, this study aimed to compare the difference of college students from six majors in China in the aspects of AIDS-related knowledge, attitudes and behaviors.

Methods: A questionnaire survey was carried out among 18,644 students in 30 colleges/universities from 9 provinces of China, who were recruited through stratified cluster sampling. AIDS-related knowledge, attitude, condom-use intention, self-efficacy and sexual behavior of these students were investigated.

Results: AIDS-related knowledge level of students majoring in education was the lowest while that of medical students was the highest as well as highest self-efficacy of condom use. Students of music or fine arts had the strongest intention to use condoms, while the students majoring in education had the weakest. The sexually active percentages of male students from different majors ranked as follows: music or fine arts (29.5%), minority nationality (12.2%), science & tech (10.9%), medicine (10.6%), education-major (10.0%), and liberal arts (8.2%). Among female students, the rank was music or fine arts (11.0%), science & tech (6.2%), education-major school (4.5%), minority nationality (4.5%), liberal arts (4.1%), and medicine (2.8%).

Conclusion: It is urgent to enhance proper AIDS-related education and intervention based on the features and demands of students from different majors or universities, for example, to enhance comprehensive AIDS prevention education among students major in education and to increase behavioral skills to prevent sexually transmitted diseases among students from colleges or faculty of music or fine arts.

© 2020 The author(s). Published by Elsevier B.V. on behalf of the Chinese Nursing Association. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

What is known ?

- College students are the important population of AIDS prevention education in China now. Many programs and interventions have been conducted among them to prevent HIV/AIDS, but few intervention or education considered on different features and demands of students in different majors.

What is new ?

- This study compared AIDS-related knowledge, attitudes and behaviors among college or university students from six majors and the difference among students with different genders or majors were revealed. It may provide a perspective or reference to take effective measures and compare AIDS-related knowledge, attitudes and behaviors of college students during different stages.

1. Introduction

Acquired immunodeficiency syndrome (AIDS), a malignant disease with high fatality, has become a serious public health issue and a social problem since firstly being found in 1981. About 1.8 million people around the world are newly infected with human immunodeficiency virus (HIV). People aged between 15 and 24

* Corresponding author.

E-mail addresses: xysun@bjmu.edu.cn (X. Sun), fanlishi96@163.com (L. Fan), changchun@bjmu.edu.cn (C. Chang), yuhuishibmu@bjmu.edu.cn (Y. Shi).

Peer review under responsibility of Chinese Nursing Association and MHM Committee.

accounts for 37% of all new human immunodeficiency virus infections world-wide [1], which indicates that young people are especially vulnerable to HIV. In China, the number reported infections among young students increased from 527 in 2008 to 1154 in 2011 and 2695 in 2014. From 2011 to 2015, the average annual growth rate of HIV infection among people aged between 15 and 24 in China was 35%, excluding the increase of testing, respectively [2]. Since most of the college students in China are 16–24 years old, their vulnerability to HIV/AIDS is a problem which can't be neglected.

Older adolescents or adolescents with higher levels of education, such as university students, have shown in some studies to take more risk behavior than younger ones [3]. Some of them are more likely to have sex behaviors, often with multiple partners, which are highly related to AIDS. For lack of AIDS-related knowledge and self-protection consciousness, they are vulnerable to HIV infection. Due to the change of attitude towards sexuality in China, premarital sex has become widely accepted among young people, thus premarital sex behaviors had been increasing. However, their consciousness of self-protection and skills of condom use are relatively poor. Ma et al. found that 17.6% of Chinese male university students and 8.6% of female ones were sexually active, but condom was reported never/rarely used by 35% of sexually active students in both genders in the previous year [4]. Huang et al. indicated that 14% of Chinese university students were sexually active, and risk behaviors tended to increase with age. They also indicated that 24% of the students considered themselves to be at moderate to very high risk of contracting HIV and 40% of sexually active students never used condoms [5]. Another study even showed that only 24.2% of the participants were aware that HIV could be spread through infected semen, and only 10.5% were aware that condoms would decrease the risk of HIV transmission. The major sources of HIV information were through the mass media (i.e. 69.5% Internet, 65.9% newspaper and magazines, 58.3% television). Only 17.9% reported ever having had sex, and only 21.2% used condoms during each sexual encounter [6]. Thus college students should be paid enough attention to so as to be prevented from AIDS.

In addition, the issue of how to carrying out proper education and intervention of AIDS based on various features and demands of students from different majors or universities needs to be pay more attention to. In Chinese educational system, colleges and universities are classified by majors, such as comprehensive, technology, agriculture, forestry, medicine, education-major (called normal university in China), languages, finance & economics, music, fine arts, sports, minority nationality and so on. Comprehensive universities usually have majors of both liberal arts and science & tech. Normal universities is a special type of universities in which education-major is the main major and most graduates will be teachers in middle school. Located in autonomous regions in China and enrolling most of its students from minority groups, colleges of minority nationality have their special characteristics, for example, mainly focusing on studies of culture, language, arts of the minorities and so on. Different colleges and universities are dissimilar in the composition of gender, the source of students, and the background and education models of students. These differences will have a crucial influence on the measures and emphasis of AIDS prevention among college students. However, few studies reported the difference of college students from different majors in China. Some studies showed medical students usually got a higher knowledge score than students majoring in science/engineering and social sciences [7], but little study could show the difference of AIDS perception among students of different majors. This survey has investigated the students from comprehensive universities, colleges of liberal arts, science& tech, minority nationality colleges, medicine, music or fine arts, and school of education-major. The

grouping of all the participants was based on the categories of their colleges or universities, with the exception of students from comprehensive universities being assigned to science & tech or liberal arts categories according to their majors.

This study aims to explore the difference of students from different majors in the aspects of AIDS-related knowledge, attitudes and behaviors. Using a questionnaire data, the present study tries to identify the distinct traits and main problems relating to the present issues among students of different majors, so that further AIDS prevention education could be provided accordingly.

2. Methods

2.1. Participants

Recruited through stratified cluster sampling in 30 colleges/universities from 9 provinces of China (Liaoning, Beijing, Shandong, Jiangsu, Inner Mongolia, Qinghai, Hubei, Guangdong and Yunnan), a total of 19,299 college students participated in the survey, and the response rate is 96.7%. These provinces are geographically located in the seven main parts of China respectively (i.e. Northeast China, North China, Northwest China, East China, Central China, South China and Southwestern China). About three to five colleges were chosen from each province.

The 18644 valid samples were classified by the majors, 33.9% (6336) of them were from 11 universities of science & tech or colleges of science & tech in comprehensive universities, 20.5% (3831) from 5 universities of liberal arts (including language, law and humanity) or colleges of liberal arts in comprehensive universities, 18.7% (3499) from 6 medical colleges, 11.3% (2115) from 2 colleges of minority nationality, 8.0% (1495) students from 3 colleges of music or academies of fine arts, and 7.4% (1388) from 3 normal universities (or colleges of education).

2.2. Questionnaire

The questionnaire designed by the work group of this project has five parts. The first two parts are to assess the personal characteristics of the participants, and to evaluate their knowledge about HIV/AIDS using United Nations General Assembly Special Session (UNGASS) on HIV/AIDS indicators [8]. The higher score they got, the broader knowledge they had acquired. In the third part, the attitudes towards high-risk behaviors of HIV/AIDS are assessed through a 6-item 5-point Likert scale, a higher score (ranging from 6 to 30) of which means a stronger opposition. Take an item for instance, "If your schoolmates have several sexual partners, how do you look upon this? (Strongly agree, agree, neutral, disagree, and strongly disagree)." The fourth part is to investigate the sexual behavior and condom use situation among students.

In the last part of the questionnaire, the condom-use intention was measured with a 5-item 5-point Likert scale scoring ranging from 5 to 25, for example, "If having sex, should you prepare a condom in advance?" Self-efficacy of condom-use was also measured with a 5-item 5-point Likert scale on which a higher score (ranging from 5 to 25) means a higher level of self-efficacy, for example, "I would feel unconfident to suggest using condoms with a partner, because I would be afraid of being thought to have had a past sexual experience". Intention and self-efficacy are two important factors predicting condom-use behavior [9–14]. According to Theory of Reasoned Action (TRA), the immediate cause of volitional behavior is one's intention to engage in that behavior [15]. Self-efficacy is proposed as an important mediator of behavior and is defined as a judgment of one's capability to accomplish a certain level of performance [16], which means that a person with higher level of perceived self-efficacy is more likely to master

particular behavior than those with lower level of perceived self-efficacy. Self-efficacy is an important measurement of college students' confidence in properly using condoms and negotiating the use of condom with a new potential sex partner [17,18].

According to the pilot study, Cronbach's α coefficients in most of the parts were higher than 0.7, and the double-test consistency or the Spearman correlation coefficient of 80% of the re-tested items was higher than 0.7 or 0.4 respectively, showing that the questionnaire had good reliability. The factor structure was consistent with theoretical hypothesis and 11 of the common factors could explain 60% of the questionnaire [19].

The survey was carried out by trained investigators from 2012 to 2016. Information about the study was provided by the investigators and oral consent was obtained from each participant. The survey was in accordance with the ethical standards of the Peking University Institutional Review Board and with the Helsinki Declaration. In order to ensure the validity of the survey, every student answered the questionnaire individually and anonymously before putting the answered questionnaire in a hermetic box.

2.3. Data analysis

The software program EpiData (version 3.0, www.epidata.dk/) was used for data management. Statistical analyses were performed with SPSS software (SPSS version 20.0). Frequencies and percentages were used to describe the distributions of personal characteristics and of sexual behavior among students of different majors. Chi-square tests and bivariate logistic models were performed to compare categorical data, while Student-Newman-keuls method of ANOVA was used to compare approximately continuous variable. The α level was set at 0.05.

3. Results

3.1. A snapshot of participants

Altogether 18,644 students from 30 colleges were investigated. The average age was 20.0 ± 1.4 years. Male students were outnumbered by female students in all majors except science & tech and Minority. Taking the source of students into consideration, nearly half of the students in education-major, medical and minority nationality colleges were from cities, 15% from towns and 35% from rural areas. However, students majoring in science & tech, humanity were nearly 70% from cities, while the main sources of the music or fine arts students were cities (Table 1).

3.2. AIDS-related knowledge

Students majoring education got the lowest scores on AIDS-related knowledge. Followed by those majoring in science & tech, minority nationality, liberal arts, music or fine arts, students in

medical schools got the highest scores (Table 2).

The education-major students had the obviously lowest rates of right answers to the UNGASS indicators for both genders. But the rates of right answers in other majors were close to each other. When referring to the question "people can protect themselves from contracting HIV by having sex with only one faithful, uninfected partner", around or over 95% students thought it was right. And 80% to 90% students gave the right answers to the following three questions: "People can protect themselves from contraction HIV by using condoms", "A person can get HIV from sharing a meal with someone who is infected" and "A healthy-looking person can have HIV". The right answer rate of the item that "a person can get HIV from mosquito bites" was the lowest, which was lower than 50% for nearly all the participants of all majors. Altogether 38.4% of the male students and 37.5% of the female students got all the five answers right (Table 3).

3.3. Attitudes towards AIDS-related high-risk behavior

For males, students of education-major, medical and minority schools had significantly serious attitudes towards AIDS related high-risk behavior, but no significant difference was noted among other major groups. For females, the most serious attitudes towards AIDS related high-risk behavior were among students from education-major and minority schools, followed by students from medical schools. Students of science & tech were more open on this issue (Table 4).

3.4. Intention and self-efficacy of condom-use

Regardless of the gender, students of music or fine arts had the strongest intention and self-efficacy of condom-use, while the intention of education-major students was the weakest and the self-efficacy of Science & tech students was the weakest (Table 4).

3.5. Sexual behavior

The rates of male students having experienced sexual behavior were 29.5% in those from colleges or faculty of music or fine arts, 12.2% in minority, 10.9% in science & tech, 10.6% in medicine, 10.0% in education-major and 8.2% in liberal arts. Among females, the general rate of sexually active students was lower than those of male students (Table 5).

3.6. Multivariable analysis

As the proportions of gender, age and students' hometown in different majors were main confounding factors to dependent variables, multivariable regression or logistic regression were applied (Table 6). The trends of results for knowledge and perceptions were almost same with the results of simple variable

Table 1
The distribution of age, gender and source of students by majors [n (%)].

Characteristics	Science & tech ^a	Education ^b	Medicine ^c	Liberal arts ^d	Minority ^e	Music or fine arts ^f	Total
Age (Mean \pm SD)	20.0 \pm 1.4	19.7 \pm 1.6	20.3 \pm 1.3	19.7 \pm 1.4	20.2 \pm 1.4	20.0 \pm 1.6	20.0 \pm 1.4
Gender							
Male	4270 (67.8)	546 (39.5)	1418 (40.7)	1773 (46.7)	1068 (50.7)	451 (30.6)	9526 (51.4)
Female	2027 (32.2)	837 (60.5)	2070 (59.3)	2023 (53.3)	1038 (49.3)	1025 (69.4)	9020 (48.6)
Hometown							
City	4004 (64.5)	706 (51.1)	1990 (57.1)	2580 (68.1)	1060 (50.3)	1345 (90.4)	11685 (63.3)
Town	631 (10.1)	175 (12.7)	373 (10.7)	413 (10.9)	284 (13.5)	72 (4.8)	1948 (10.5)
Village	1582 (25.4)	500 (36.2)	1123 (32.2)	795 (21.0)	762 (36.2)	72 (4.8)	4834 (26.2)

Note: ^a from universities of science & tech or colleges of science & tech in comprehensive universities; ^b from normal universities or colleges of education; ^c from medical colleges; ^d from universities of liberal arts (including language, law and humanity) or colleges of liberal arts in comprehensive universities; ^e from colleges of minority nationality; ^f from colleges of music or academies of fine arts. (The same in tables below).

Table 2
Comparison of AIDS-related knowledge among college students of different majors.

Majors	Male			Female		
	n	Score (Mean ± SD)	Rank of SNK *	n	Score (Mean ± SD)	Rank of SNK *
Education	540	3.73 ± 1.12	1	833	3.65 ± 1.16	1
Science & tech	4189	3.88 ± 1.16	2	1984	3.69 ± 1.23	1
Minority	1059	4.00 ± 1.11	2	1030	3.81 ± 1.18	2
Liberal arts	1728	4.01 ± 1.14	2	1978	3.91 ± 1.12	3
Music or fine arts	436	3.87 ± 1.24	2	1004	4.04 ± 1.04	4
Medicine	1392	4.17 ± 1.10	3	2057	4.24 ± 1.00	5
Total	9344	3.96 ± 1.15		8886	3.92 ± 1.14	

Note: * Student-Newman-Keuls method was used to control the total α level. Scores were ordered from low to high, according to which, the six major groups were divided into several subgroups in each gender group. There was no significant difference among different majors in the same subgroup ($P > 0.05$).

Table 3
Awareness rates of UNGASS indicators among students from different majors (%).

UNGASS	Education		Science & tech		Minority		Liberal arts		Music or fine arts		Medicine		Total	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1	91.6	95.2	91.1	90.5	93.2	94.0	91.6	93.7	90.3	94.9	94.6	97.4	91.9	94.2
2	85.1	71.3	86.3	77.1	88.4	70.0	88.5	78.0	89.6	77.9	90.9	85.8	87.7	78.0
3	70.4	69.9	78.2	77.5	74.2	79.2	79.2	83.7	70.1	89.6	84.3	88.9	78.0	82.4
4	50.5	48.6	55.5	48.8	58.7	54.2	56.4	52.6	59.0	58.1	61.6	65.2	56.6	55.1
5	74.9	79.7	77.6	75.1	84.9	83.3	84.6	82.3	78.7	84.4	85.2	86.9	80.7	81.9
All right	26.4	26.5	35.4	29.4	39.0	34.2	40.9	35.4	38.6	40.1	48.1	52.3	38.4	37.5

Note: UNGASS: United Nations General Assembly Special Session; M: male students; F: female students; 1: People can protect themselves from contracting HIV by having sex with only one faithful, uninfected partner; 2: People can protect themselves from contraction HIV by using condoms; 3: A healthy-looking person can have HIV; 4: A person can get HIV from mosquito bites; 5: A person can get HIV from sharing a meal with someone who is infected.

Table 4
Scores of attitudes towards high-risk behavior, intention and self-efficacy of condom use among different majors (Mean ± SD).

Majors	Attitude				Condom-use intention				Self-efficacy of condom-use			
	Male	Rank of SNK *	Female	Rank of SNK *	Male	Rank of SNK *	Female	Rank of SNK *	Male	Rank of SNK *	Female	Rank of SNK *
Science & tech	22.16 ± 4.69	1	24.50 ± 4.29	1	19.55 ± 3.89	2	19.40 ± 4.23	2	16.04 ± 5.36	1	15.25 ± 6.03	1
Education	23.01 ± 4.63	2	26.14 ± 3.56	4	18.55 ± 4.06	1	18.28 ± 4.41	1	18.02 ± 4.15	2,3	18.30 ± 4.68	2
Medicine	23.01 ± 4.12	2	25.74 ± 3.14	2,3	19.38 ± 3.85	2	19.61 ± 3.81	2	18.21 ± 4.42	3	19.39 ± 4.55	4
Liberal arts	22.38 ± 4.50	1	25.43 ± 3.42	2	19.44 ± 3.93	2	19.73 ± 3.88	2	17.60 ± 4.47	2	18.92 ± 4.60	3
Minority	22.91 ± 4.32	2	25.88 ± 3.34	3,4	19.28 ± 3.83	2	18.48 ± 4.04	1	18.25 ± 4.29	3	18.30 ± 4.70	2
Music or fine arts	22.34 ± 5.04	1	25.51 ± 3.26	2	20.43 ± 3.63	3	20.67 ± 3.45	3	17.96 ± 5.07	2,3	19.32 ± 5.10	4
Total	22.45 ± 4.56		25.42 ± 3.60		19.46 ± 3.89		19.45 ± 4.02		17.11 ± 4.97		18.14 ± 5.26	

Note: * Student-Newman-Keuls method was used to control the total α level. Scores were ordered from low to high, according to which, the six major groups were divided into several subgroups in each gender group. There was no significant difference among different majors in the same subgroup ($P > 0.05$).

Table 5
Percentages of sexually active students from different majors.

Majors	Male (n, %)			Female (n, %)		
	Total	Sexually active	%	Total	Sexually active	%
Science & tech	4192	455	10.9	1992	123	6.2
Education	541	54	10.0	828	37	4.5
Medicine	1416	150	10.6	2065	58	2.8
Liberal arts	1742	142	8.2	1958	80	4.1
Minority	1067	130	12.2	1033	46	4.5
Music or fine arts	438	129	29.5	992	109	11.0
Total	9396	1060	11.3	8868	453	5.1

analysis shown in Tables 2 and 4. Without Student-Newman-Keuls method' control for total α level, multivariable analysis showed more significant differences than simple variable comparison.

As for sex intercourse behavior, with the exception of influencing factors of gender, age and hometown, the results of logistic regression analysis showed that the sexual behavior rate among the

students of music or fine arts was significantly higher than that of any other major groups.

4. Discussions

In this study, the difference in AIDS-related knowledge, attitudes, condom-use intention and self-efficacy and sexual behavior among students of different majors has been found. Some researches in China had showed the existence of the differences on relevant issues among different college majors, but their comparisons were only among two to four majors [20–24].

More attentions should be paid to those from colleges or universities of education-major or minority nationality, who had the least knowledge about AIDS and the weakest intention to use condoms and self-efficacy, which is inconsistent with another study [20]. Chinese education system has tended to regard teachers as the image of model morality, so they may have little access to sex education. The later, especially female students from minority

Table 6
Multivariable regression or logistic regression analysis of AIDS-related knowledge, attitude, condom-use intention and self-efficacy and sexual behavior.

Independent variable	knowledge		Attitude		Condom-use intention		Self-efficacy of condom-use		Sexual behavior	
	β	<i>t</i>	β	<i>t</i>	β	<i>t</i>	β	<i>t</i>	β	OR(95% CI)
Gender (1 = Male, 2 = Female)	-0.044	-5.785 ^a	0.323	44.907 ^a	-0.011	-1.485	0.047	6.311 ^a	-0.911	0.382 (0.338, 0.431) ^a
Age	-0.048	-6.333 ^a	-0.034	-4.775 ^a	0.025	3.339 ^b	0.082	11.133 ^a	0.207	1.230 (1.186, 1.275) ^a
Hometown (from big city to village)	-0.056	-7.375 ^a	0.117	16.265 ^a	-0.094	-12.267 ^a	0.027	3.683 ^a	-0.183	0.833 (0.803, 0.864) ^a
Major (Science & tech as reference)										
Education	-0.028	-3.485 ^a	0.062	8.278 ^a	-0.066	-8.215 ^a	0.119	15.253 ^a	-0.027	0.973 (0.769, 1.231)
Medicine	0.150	17.530 ^a	0.082	10.289 ^a	0.005	0.562	0.220	26.292 ^a	-0.277	0.758 (0.639, 0.899) ^c
Liberal arts	0.048	5.729 ^a	0.050	6.343 ^a	0.006	0.666	0.195	23.529 ^a	-0.258	0.772 (0.655, 0.911) ^a
Minority	0.032	3.965 ^a	0.061	8.037 ^a	-0.043	-5.277 ^a	0.143	17.916 ^a	0.057	1.059 (0.883, 1.270)
Music or fine arts	0.035	4.260 ^a	0.057	7.486 ^a	0.058	7.082 ^a	0.157	19.762 ^a	0.816	2.262 (1.894, 2.702) ^a

Note: ^a $P < 0.001$; ^b $P < 0.01$; ^c $P < 0.05$.

universities had relatively weaker intention to use condoms and self-efficacy. The present study found that half of students from minority universities were born and grew up in rural areas (almost same with the education-major students) lacking resources of AIDS-related education. A study among college students of a minority nationality university got almost the same results [25].

Besides, much more attention should be paid to students of music or fine arts. Though they had the strongest intention and self-efficacy of condom-use, their AIDS-related knowledge score was on the lower side of the mean level, and their sexually active rate was higher than others. It is suggested that education of AIDS-related knowledge and self-protecting skills for these students should be reinforced. Several studies in China also showed that the students of music or fine arts were more sexually active than those of other majors, needing more HIV/AIDS protection education [26,27].

Medical students got the highest mean score of AIDS-related knowledge, which agreed with several researches [21–24]. In terms of attitudes towards risk behavior, intention and self-efficacy of condom-use, they were in a middle level and were inclined to the good side. The sexually active rate of them was relatively lower than the medium level. The results may be led by plenty of medical courses and AIDS-related education, and it also may be relative to their conservative attitudes to sexual behavior. Researchers could make full use of the advantage of these students and develop their potential, at the same time, some training especially on self-protection skills and communication skills should be provided so as to make them qualified as the backbone of AIDS prevention education.

Besides the difference among students from different majors, this study also found the difference between genders. In general, female students, who had less knowledge of HIV/AIDS and more conservative attitudes towards AIDS-related high risk behavior than male students, had more self-efficacy on suggestion of using a condom with a partner, for the reason that they would not be afraid of being thought to have had sexual experience. These results imply that HIV/AIDS prevention education on campus should consider the gender difference, for instance, further discussion about attitudes towards high risk behavior and increasing skill training on self-efficacy could be taken among male students, while added knowledge education among female students.

In addition, in the study of students' AIDS knowledge, indicators of UNGASS were used. According to the results, 38.4% of male students and 37.5% of female students had answered all five questions of the indicators right. The ratio was higher than the findings (30.5% and 29.1% separately) in 2004 [28], which may suggest the effectiveness of AIDS education in the past years. Only about 50% of the participants got the right answer on the indicator "a person can get HIV from mosquito bites", which indicates that

college students still have some common misunderstanding of AIDS and AIDS-related behaviors. AIDS prevention education still needs to be improved and reinforced constantly.

Above all, it is urgent to enhance proper AIDS education and intervention based on demands of different majors, for instance, to enhance comprehensive education of AIDS prevention among education-major and minority nationality students, to increase AIDS related knowledge among music or fine arts students, and to improve medical students' self-protection skills. Also, more emphasis should be laid on female students majoring in science & tech.

There are limitations of this present study. The data of privacy were collected via self-report questionnaire, and the students may intentionally underreport their sexual behavior. Future studies should attempt to use other methods of data gathering, such as computer-assisted self-report, to resolve this problem. Also, the results of this study are based only on cross-sectional study without any longitudinal research. Therefore, it is important to conduct longitudinal studies or cross-section studies at different times in the future to assess whether students in China change their AIDS-related knowledge, attitudes and behaviors over time.

CRedit authorship contribution statement

Xinying Sun: Methodology, Software, Writing-original draft preparation. **Lishi Fan:** Data curation, Software. **Chun Chang:** Conceptualization, Investigation, Supervision. **Yuhui Shi:** Investigation, Writing-reviewing and Editing.

Declaration of competing interest

The authors declare that they have no conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijnss.2020.07.010>.

References

- [1] UNAIDS. UNAIDS report on the global AIDS epidemic. Geneva: UNAIDS; 2017. <https://www.aidsdatahub.org/unais-data-2017-unais-2017-0>.
- [2] Wu ZY. Situation and strategy of school AIDS prevention and control in China. *China School Health* 2015;36(11):1604–5. <https://doi.org/10.16835/j.cnki.1000-9817.2015.11.004> [in Chinese].
- [3] Espada JP, Escibano S, Orgilés M, Morales A, Guillén-Riquelme A. Sexual risk behaviors increasing among adolescents over time: comparison of two cohorts in Spain. *AIDS Care* 2015;27(6):783–8. <https://doi.org/10.1080/09540121.2014.996516>.
- [4] Ma Q, Ono-Kihara M, Cong L, Xu G, Zamani S, Ravari SM, et al. Sexual behavior and awareness of Chinese university students in transition with implied risk

- of sexually transmitted diseases and HIV infection: a cross-sectional study. *BMC Public Health* 2006;6:232. <https://doi.org/10.1186/1471-2458-6-232>.
- [5] Huang J, Bova C, Fennie KP, Rogers A, Williams AB. Knowledge, attitudes, behaviors, and perceptions of risk related to HIV/AIDS among Chinese university students in Hunan, China. *AIDS Patient Care STDS* 2005;19:769–77. <https://doi.org/10.1089/apc.2005.19.769>.
- [6] Tung W, Hu J, Efirid J, Yu L, Su W. HIV-related knowledge, attitudes and behaviours among college students in China. *Health Educ J* 2012;71(5):606–16. <https://doi.org/10.1177/0017896911406968>.
- [7] Liang H, Yun C, Zhang Y. Research progress of college students' cognition of AIDS and campus intervention. *J. Shenyang Med. Coll.* 2018;20(3):277–81. <https://doi.org/10.16753/j.cnki.1008-2344.2018.03.023> [in Chinese].
- [8] UNAIDS. United Nations general assembly special session on HIV/AIDS. In: Monitoring the declaration of commitment on HIV/AIDS: guidelines on construction of core indicators. Switzerland: UNAIDS/09.10E/JC1676E; 2009. <http://www.hivpolicy.org/bib/HPP000617.htm>.
- [9] Jemmott III JB, Jemmott LS, Spears H, Hewitt N, Cruz-Collins M. Self-efficacy, hedonistic expectancies, and condom-use intentions among inner-city black adolescent women: a social cognitive approach to AIDS risk behavior. *J Adolesc Health* 1992;13:512–9. [https://doi.org/10.1016/1054-139X\(92\)90016-5](https://doi.org/10.1016/1054-139X(92)90016-5).
- [10] Ballester-Arnal R, Ruiz-Palomino E, Gil-Llario MD. Structural equation modeling test of an integrated model of Spanish youth's condom use. *AIDS Behav* 2017;21(5):1407–16. <https://doi.org/10.1007/s10461-016-1430-x>.
- [11] Zhang L, Li X, Zhou Y, Lin D, Su S, Zhang C, et al. Predictors of consistent condom use among Chinese female sex workers: an application of the protection motivation theory. *Health Care Women Int* 2015;36(7):816–33. <https://doi.org/10.1080/07399332.2014.942902>.
- [12] McCall S, Brady C, Carlton K, Boyd K. Condom negotiation efficacy and condom use attitudes as predictors of condom use in African American college students. *J AIDS Clin Res* 2016;7(4):000563. <https://doi.org/10.4172/2155-6113.1000563>.
- [13] Heeren GA, Mandeya A, Tyler JC. Sub-Saharan African university students' beliefs about condoms, condom-use intention, and subsequent condom use: a prospective study. *AIDS Behav* 2009;13:268–76. <https://doi.org/10.1007/s10461-008-9415-z>.
- [14] Nesoff ED, Dunkle K, Lang D. The impact of condom use negotiation self-efficacy and partnership patterns on consistent condom use among college-educated women. *Health Educ Behav* 2016;43(1):61–7. <https://doi.org/10.1177/1090198115596168>.
- [15] Montano DE, Kasprzyk D, Taplin SH. The theory of reasoned action and the theory of planned behavior. In: Glanz K, Lewis RM, Rimer Bk, editors. *Health behavior and health education*. San Francisco, Calif: Jossey-Bass Publishers; 1997. p. 85–112. http://xueshu.baidu.com/usercenter/paper/show?paperid=980d762756714b4a862a23e67f3e2baf&site=xueshu_se.
- [16] Bandura A. Self-efficacy: toward a unifying theory of behavioral change. *Psychol Rev* 1977;84:191–215. <https://doi.org/10.1037/0033-295X.84.2.191>.
- [17] Haffeejee F, Koorbanally D, Corona R. Condom use among South African university students in the province of KwaZulu-Natal. *Sex Cult* 2018;22(4):1279–89. <https://doi.org/10.1007/s12119-018-9523-5>.
- [18] Ruan F, Fu G, Yan Y, Li Y, Shi Y, Luo L, et al. Inequities in consistent condom use among sexually experienced undergraduates in mainland China: implications for planning interventions. *BMC Publ Health* 2019;19(1):1195. <https://doi.org/10.1186/s12889-019-7435-4>.
- [19] Shi Y, Sun X, Wang H, Fang H, Chang C. Reliability and validity of a questionnaire on HIV/AIDS preventive knowledge and ability among college students. *Chin J Health Educ*. 2007;23:886–8. <https://doi.org/10.16168/j.cnki.issn.1002-9982.2007.12.002> [in Chinese].
- [20] Yin L, Wang S, Qian Y, Ma W. Survey on knowledge, attitude and behavior of AIDS prevention and control among normal university students and the effect of intervention. *Prev Med Forum* 2015;21:573–5. <https://doi.org/10.16406/j.pmt.issn.1672-9153.2015.08.005>. 08, 578 [in Chinese].
- [21] Meng W, Ma J, Huang L, Tian Y, Sun N, Xu X, et al. Investigation and analysis of AIDS knowledge, attitude and behavior of college students in Weifang City. *China Higher Med. Educ*. 2019:61–2. <https://doi.org/10.3969/j.issn.1002-1701.2019.08.031>. 08, [in Chinese].
- [22] Bao R, Zhang Y, Li S, Hu Z, Li X, Chu Z, et al. A survey of AIDS related high risk behaviors and willingness to accept HIV self testing among college students in Shenyang. *China AIDS and STD* 2019;25(11):1136–9. <https://doi.org/10.13419/j.cnki.aids.2019.11.11>. 1160. [in Chinese].
- [23] Li R, Dong W, He W, Liu M. Chinese dental students' knowledge and attitudes toward HIV/AIDS. *J Dental Sci* 2016;11(1):72–8. <https://doi.org/10.1016/j.jds.2015.09.001>.
- [24] Wang X, Li L, Hu Y. Analysis of knowledge, belief and practice of AIDS among young students in Xiamen. *Trop Med China* 2015;15:37–40. <https://doi.org/10.13604/j.cnki.46-1064/r.2015.01.014>. 01, [in Chinese].
- [25] Li Y. Study of sexual behavior and drug abuse behavior among 5259 minority students of university related to AIDS in Urumqi. *Int J Nurs* 2010;29(4):501–4. <https://doi.org/10.3760/cma.j.issn.1673-4351.2010.04.009> [in Chinese].
- [26] Huang Y, Ma Y, Zhou J, Li T, Li X. Survey on the knowledge of comprehensive AIDS prevention and control among college students in 15 provinces and cities in China. *Health Med Res Pract* 2016;13:14–7. <https://doi.org/10.11986/j.issn.1673-873X.2016.04.003>. 04, [in Chinese].
- [27] Hu J, Yan Y, Yan M, Zhang X, Luan R. Analysis of AIDS awareness and health education needs of college students in Shenzhen. *Chin J Dis Contr* 2018;22(12):1300–2. <https://doi.org/10.16462/j.cnki.zhjbkz.2018.12.023> [in Chinese].
- [28] Ma Y, Wang C, Ji C, Zhang X. The application of UNGASS indicators in the evaluation of HIV/AIDS education in national universities. *Chin J School Health* 2006;27:215–6. <https://doi.org/10.3969/j.issn.1000-9817.2006.03.011> [in Chinese].