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Analysis of risky sexual behaviors among male college students who were sexually active in Sichuan, China: a cross-sectional survey

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Abstract

Background Males have accounted for a significant share of new HIV infections among young people in the recent years. This study aimed to identify the factors associated with risky sexual behaviors, including early sexual debut, multiple sexual partnership and condomless sex, among sexually active male college students and provide implications for tailored health interventions.

Methods The cross-sectional study was conducted from December 2020 to December 2021 in 16 colleges that were located in Sichuan Province, one of the high-risk areas in China. Overall 1640 male college students who reported sexually experienced were analyzed in this study. Multivariable logistic regression analysis was applied to determine factors associated with early sexual debut, multiple sexual partnership and condomless sex.

Results The average age of included male students was 19.95 ± 1.56 . Of them, 27.74% initiated sexual behavior early, 48.60% reported multiple sexual partnership, and 16.52% did not use condoms at the latest sexual intercourse. Students who were younger (age ≤ 19 , AOR = 7.60, 95%CI: 4.84–11.93; age 20–21, AOR = 3.26, 95%CI: 2.04–5.21) and self-identified as sexual minorities (AOR = 2.38, 95%CI: 1.69–3.36) were more likely to have early sexual debut. The odds of having multiple sexual partners were higher among those who were ethnic minorities (AOR = 1.79, 95%CI: 1.33–2.41) and accepted extramarital sex (AOR = 1.33, 95%CI: 1.03–1.71). The likelihood of engaging in condomless sex at the latest sexual intercourse was lower among those who had sufficient knowledgeable about HIV (AOR = 0.63, 95%CI: 0.44–0.89), were very confident in condom use efficacy (AOR = 0.26, 95%CI: 0.16–0.43) and confident (AOR = 0.48, 95%CI: 0.34–0.69). Early sexual debut was positively associated with multiple sexual partnership (AOR = 3.64, 95%CI: 2.82–4.71) and condomless sex at the latest intercourse (AOR = 1.53, 95%CI: 1.07–2.20), respectively.

Conclusion Early sexual debut, multiple sexual partnership and condomless sex were of considerable concern among male college students. Comprehensive sex education curricula were advised by developing customized information on HIV prevention, sexuality and empowering students with assertiveness and negotiation skills with regard to condom use during and before college.

Keywords HIV, Cognition, Risky sexual behaviors, Male, College students

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Introduction

HIV infection among young people continued to be a pervasive public health issue globally [1–3]. In 2021, approximately 1.5 million people were newly infected with HIV worldwide, and nearly one third of them were young people between the ages of 10 to 24 [1]. In China, although the national-level prevalence was comparatively low [4], the transferred newly affected persons among young people experienced an alarming surge in recent years [5, 6]. According to a countrywide surveillance report, new infections in age group 15–24 years had a 3.3-fold increase from 2010 to 2019, reaching over 3400 cases per year [7].

Males dominated the new HIV infections among young people in China, constituting more than 95% in each of the recent 10 years [7]. This gender distribution disparity was similar to that in Western and Central Europe and North America but more discernible in China [2]. The leading transmission route for Chinese young males was sexual contact, with homosexual transmission accounting for more than 80% and heterosexual transmission representing about 16% [7, 8].

Sexual activity during college life was common for male students worldwide [9–11]. A study including 25,553 students from 55 universities in the U.S reported that the proportion of male college students having sexual behavior has exceeded more than 90% [10]. In China, along with sexual cultural integration and changes in sexual attitude [12], this proportion has witnessed a pronounced increase in recent years. A meta-analysis indicated the percentage of sexually experienced male students was 13.7% in the early 21st century [13], but dramatically ascended up to 52.1% in 2019 and progressively grew by ages [14, 15].

Along with sexual exploration, male college students may engage in risky sexual behaviors like early sexual debut, multiple sexual partner and condomless sex [14, 16–19]. In China, 37.3% of male sexually active students had multiple sexual partners during the previous 6 months [14], and the proportions of consistent condom use with casual partners were only 46.9% for hetero-sex and 36.4% for homo-sex [19]. The impact of risky sexual behaviors among males was enormous, such as increasing the risks of contracting Sexually transmitted diseases (STDs) [20] and unwanted pregnancy in their female partners [21], which further affected their academic career and life plan. Nine consecutive cross-sectional surveys showed that men who have sex with men who never or sometimes used condoms were 1.561 times more likely to get recently infected with HIV, and the odds of being infected with HIV was 2.141 for those who had multiple sexual partners [22].

Several studies have reported sexual knowledge, attitude and behaviors among this vulnerable age group

[14, 17, 23–26]. For example, inconsistent condom use was indicated associated with grades, sexual orientation, monthly expenditure [14], HIV knowledge [25] and condom efficacy [23]. To monitor the evolution changes of HIV epidemic, more evidence in identifying factors of leverage for effective interventions was still needed, especially among male college students, the group with a particularly high risk of HIV infection.

Sichuan province has more than 100,000 people living with HIV/AIDS in 2019 [27], taking up about 10% in China [28]. Also, it has the largest number of new infections among young people from 2010 to 2019 across the country [7]. However, there is little knowledge about epidemiological characteristics and associations of sexual behaviors among young people in Sichuan. To address this gap, this study aimed to (1) understand the prevalence and associated factors of risky sexual behaviors among male college students in Sichuan, and; (2) explore practical preventing approaches for risky sexual behaviors for college students.

Materials and methods

Participants and procedure

This was a cross-sectional survey conducted from December 2020 to December 2021 in Sichuan province. Sixteen vocational colleges, out of 79, were selected as the study sites. The selected colleges were distributed in 6 cities, representing different levels of socioeconomic status in Sichuan. A specific QR code, which linked to a self-administered online anonymous questionnaire, was designed and attributed to trained teachers from the 16 vocational colleges. The teachers introduced the background of the survey and QR code to potential participants by online chat tools and classes. Students who were interested in the survey could scan the QR code with their phones and were required to fulfill the questionnaire within 20 min.

Inclusion criteria

Participants were included in this study if they satisfied the following criteria: (i) males, (ii) aging 18 and above, (iii) having had oral-genital, vaginal, or anal intercourse. Totally, 13,945 students completed the survey, of which 6750 were males. Among them, 1640 students met the inclusion criteria of this study, accounting for 24.30% of the total number of males.

Measures

This study measured sociodemographic characteristics of the participants, including age, hometown, ethnic group, sexual orientation, etc. Sexual orientation was the enduring pattern of an individual's sexual attraction. Further, participants' awareness of HIV/AIDS-related knowledge, sexual attitudes, condom use efficacy, perceived

risk of HIV infection and risky sexual behaviors were explored. The outcome of interest in the study was risky sexual behaviors, including early sexual debut, multiple sexual partners and condomless sex at the latest sexual intercourse.

Operational definitions

In this study, sexual orientation was defined by asking the participants, “what do you think your sexual orientation is”. Four answers were listed, heterosexual, homosexual, bisexual and unclear. We further grouped the answers into two categories, heterosexual and sexual minorities which included homosexual, bisexual and unclear [29].

Awareness of HIV/AIDS-related knowledge was measured by a number of 8 items, which was designed by National Center for AIDS/STD Control and Prevention, China CDC [30], and widely used in national surveillance [14, 31, 32]. The answers to each item included three options (true, false and unclear). Each correct answer was given one score. If the total scores reach 6 or above, it implied that the participant had a good knowledge of HIV prevention [32].

Sexual attitudes were explained by attitudes towards premarital sex, unmarried cohabitation and extramarital sex. There were five response options listing from “totally disagree” to “totally agree”. In this analysis, options were dichotomized into agreement (totally agree/agree) and disagreement (totally disagree/disagree/do not care).

Condom use efficacy, conceptualized as a person's confidence to use condoms [33], was evaluated by three questions adapted from the Condom-Use Efficacy Scale (CUSES) [21, 34]. The questions, aiming to understand the ability to insist, negotiate and reject concerning using condoms, were listed as follows, “I feel confident in using condoms when having sexual intercourse”, “I feel confident in negotiating with sexual partners about condom use before sex”, “I feel confident in rejecting if my sexual partner did not want to use condoms”. Five options were provided, from 1 point (totally disagree) to 5 points (totally agree). The measurement scores were categorized into three groups, “unconfident, confident and very confident”, based on 3–9, 10–12, 13–15 points respectively. The Cronbach alpha coefficient was 0.772. Perceived risk of HIV infection was evaluated by asking, “do you think you are at risk of getting infected with HIV”, with two answers provided, “yes” and “no”.

In this study, risky sexual behaviors consisted of early sexual debut, having multiple sexual partners, and condom use at the latest intercourse. Early sexual debut was defined as having sex before the age of 18 [35, 36]. Having multiple sexual partners was identified when having more than one sexual partner in the previous 12 months before the survey [37].

Statistical analysis

Data were recorded by Wenjuanxing, a widely used online survey tool in China, and imported into SPSS 17 for Windows (SPSS Inc., Chicago, Illinois, USA) for further statistical analysis. Categorical variables were presented in terms of frequencies and proportions, and continuous variables were demonstrated with mean and standard deviation (SD). Chi-square was applied to compare categorical variables. Univariate logistic regression analysis was used in the bivariate analysis to document variables associated with early sexual debut, multiple sexual partnership, and condom use at the latest sexual intercourse. Since the knowledge about HIV, sexual attitudes, and condom use efficacy, etc. might vary a lot along with time span, sexual experience, and received health education [38, 39], only sociodemographic characteristics were included into the analysis of influential factors with early sexual debut. Variables significant at p -value < 0.10 and sexual orientation regardless of p -value were included in the Multivariable logistic regression model to obtain adjusted odds ratios (AOR) and 95% confidence intervals (CI). The significance level was set at $p < 0.05$. There was no evidence of multicollinearity among the variables included in the Multivariable regression models.

Results

Characteristic of the participants

Among the 1640 participants, the mean age was 19.95 years (SD=1.56). Most of the male students resided in Sichuan province (81.52%) and were Han ethnic (80.98%). Slightly more than half (53.84%) lived in towns or cities. Parents' education levels were mainly junior high school level or below. About one-tenth (10.98%) identified themselves as sexual minorities, with 3.23% as homosexual and 2.62% as bisexual (Table 1).

Correlates with early sexual debut

Of the participants, the mean age at sexual debut was 17.98 years (SD=1.85), and 455(27.74%) males initiated sexual behavior before 18 (Table 1). Univariate analysis indicated the following variables were associated with early sexual debut: age, household registration, ethnic group, father educational background and sexual orientation. By including the factors into Multivariable analysis, we found that a higher likelihood of early sexual debut was linked to aging 19 and below (AOR=7.60, 95%CI: 4.84–11.93), aging 20–21 (AOR=3.26, 95%CI: 2.04–5.21), and being self-identified as sexual minorities (AOR=2.38, 95%CI: 1.69–3.36) (Table 2).

Correlates with multiple sexual partners

The proportion of reporting multiple sexual partners was 48.60% (Table 1). According to the univariate analysis, ethnic group, mother educational background, monthly

Table 1 Characteristics and risky behaviors of the participants, n(%)

		Characteristics	early sexual debut	Multiple sexual partnership	Condom-less sex
Age(year)	≤ 19	781(47.62)	310(39.69)	369(47.25)	142(18.18)
	20–21	560(34.15)	120(21.43)	290(51.79)	100(17.86)
	≥ 22	299(18.23)	25(8.36)	138(46.15)	29(9.70)
Household registration	Sichuan province	1337(81.52)	387(28.95)	651(48.69)	233(17.43)
	Other provinces	303(18.48)	68(22.44)	146(48.18)	38(12.54)
Hometown	Rural	757(46.16)	193(25.5)	353(46.63)	138(18.23)
	Town/city	883(53.84)	262(29.67)	444(50.28)	133(15.06)
Ethnic group	Han (majority ethnic group)	1328(80.98)	393(29.59)	624(46.99)	211(15.89)
	Ethnic minorities	312(19.02)	62(19.87)	173(55.45)	60(19.23)
Father educational background	Junior high school and below	1111(67.74)	288(25.92)	528(47.52)	196(17.64)
	Senior high school	331(20.18)	110(33.23)	169(51.06)	44(13.29)
	College and above	198(12.07)	57(28.79)	100(50.51)	31(15.66)
Mother educational background	Junior high school and below	1225(74.70)	335(27.35)	575(46.94)	225(18.37)
	Senior high school	286(17.44)	87(30.42)	162(56.64)	31(10.84)
	College and above	129(7.87)	33(25.58)	60(46.51)	15(11.63)
Monthly living expenses	Less than 1,000 RMB	710(43.29)	193(27.18)	335(47.18)	134(18.87)
	1,000-1999 RMB	756(46.10)	205(27.12)	357(47.22)	112(14.81)
	2000RMB and above	174(10.61)	57(32.76)	105(60.34)	25(14.37)
Family structure	Family with biological parents	1355(82.62)	372(27.45)	657(48.49)	219(16.16)
	Other family structures	285(17.38)	83(29.12)	140(49.12)	52(18.25)
Sexual orientation	Heterosexual	1460(89.02)	381(26.10)	688(47.12)	234(16.03)
	Sexual minorities	180(10.98)	74(41.11)	109(60.56)	37(20.56)
HIV knowledge	Insufficient	477(29.09)	-	548(47.12)	114(23.90)
	Sufficient	1163(70.91)	-	249(52.20)	157(13.50)
Attitude towards unmarried cohabitation	Disagreement	270(16.46)	-	126(46.67)	35(12.96)
	Agreement	1370(83.54)	-	671(48.98)	236(17.23)
Attitude towards premarital sex	Disagreement	244(14.88)	-	99(40.57)	28(11.48)
	Agreement	1396(85.12)	-	698(50.00)	243(17.41)
Attitude towards extramarital sex	Disagreement	1179(71.89)	-	539(45.72)	167(14.16)
	Agreement	461(28.11)	-	258(55.97)	104(22.56)
Condom use efficacy	Unconfident	449(27.38)	-	249(55.46)	153(34.08)
	Confident	682(41.59)	-	310(45.45)	88(12.9)
	Very confident	509(31.04)	-	238(46.76)	30(5.89)
Perceived risk of HIV infection	No	1424(86.83)	-	681(47.82)	216(15.17)
	Yes	216(13.17)	-	116(53.7)	55(25.46)
HIV test history	Yes	314(19.15)	-	184(58.6)	55(17.52)
	No	1326(80.85)	-	613(46.23)	216(16.29)
Experience of being in love	Once or less	449(27.38)	-	122(27.17)	73(16.26)
	Two times or more	1191(72.62)	-	675(56.68)	198(16.62)
Early sexual debut	No	1185(72.26)	-	464(39.16)	149(12.57)
	Yes	455(27.74)	-	333(73.19)	122(26.81)
Condom use at the first intercourse	No	485(29.57)	-	290(59.79)	213(43.92)
	Yes	1155(70.43)	-	507(43.90)	58(5.02)
Multiple sexual partnership	No	843(51.4)	-	-	108(12.81)
	Yes	797(48.60)	-	-	163(20.45)
Condom use at the latest intercourse	Yes	1369(83.48)	-	634(46.31)	-
	No	271(16.52)	-	163(60.15)	-

living expenses, etc. were associated with multiple sexual partnership. By applying Multivariable analysis, participants who were ethnic minorities (AOR=1.79, 95%CI: 1.33–2.41), had a senior high school educated mother

(AOR=1.57, 95%CI: 1.16–2.12), had more than 2000RMB as monthly living expenses (AOR=1.55, 95%CI: 1.03–2.32), agreed with extramarital sex (AOR=1.33, 95%CI: 1.03–1.71), had two times or more experiences of getting

Table 2 Factors correlated with early sexual debut

		Univariate analysis		Multivariable analysis	
		OR(95% CI)	P value	AOR(95% CI)	P value
Age(year)	≤ 19	7.21(4.67–11.13)	< 0.001	7.60(4.84–11.93)	< 0.001
	20–21	2.99(1.89–4.72)	< 0.001	3.26(2.04–5.21)	< 0.001
	≥ 22	1		1	
Household registration	Sichuan province	1			
	Other provinces	0.71(0.53–0.95)	0.023		
Hometown	Rural	1			
	Town/city	1.23(0.99–1.53)	0.060		
Ethnic group	Han (majority ethnic group)	1			
	Ethnic minorities	0.59(0.44–0.8)	0.001		
Father educational background	Junior high school and below	1			
	Senior high school	1.42(1.09–1.85)	0.009		
	College and above	1.16(0.83–1.62)	0.399		
Sexual orientation	Heterosexual	1		1	
	Sexual minorities	1.98(1.44–2.72)	< 0.001	2.38(1.69–3.36)	< 0.001

in love (AOR=3.80, 95%CI: 2.92–4.94), and had early sexual debut (AOR=3.64, 95%CI: 2.82–4.71) were more likely to have multiple sexual partnership. Those who used condoms at the first sex (AOR=0.72, 95%CI: 0.54–0.95), and never tested HIV (AOR=0.60, 95%CI: 0.45–0.81) had lower possibility of reporting multiple sexual partners (Table 3).

Correlates with condomless sex at the latest sexual intercourse

Overall, 271 (16.52%) did not use condoms at the latest sexual intercourse (Table 1). In the univariate analysis, influential factors included age, mother educational background, HIV knowledge, condom use efficacy, etc. From the Multivariable analysis, the likelihood of engaging in condomless sex was lower among those who had a senior high school educated mother (AOR=0.49, 95%CI: 0.29–0.82), had sufficient knowledgeable about HIV (AOR=0.63, 95%CI: 0.44–0.89), used condoms at the first intercourse (AOR=0.08, 95%CI: 0.06–0.12), and being confident (AOR=0.48, 95%CI: 0.34–0.69) and very confident (AOR=0.26, 95%CI: 0.16–0.43) in condom use. The odds of having condomless sex increased among participants aging 19 and below (AOR=1.91, 95%CI: 1.13–3.23), reporting perceived risk of HIV infection (AOR=2.05, 95%CI: 1.33–3.16), and having early sexual debut (AOR=1.53, 95%CI: 1.07–2.20) (Table 4).

Discussion

Risky sexual behaviors remained significant public health challenges among young males [2]. We found that of the participants, 27.74% initiated sex before age 18, which was higher than the 23.9% of a national level study [40]. The proportions of reporting multiple sexual partnership and not using condoms at the latest sexual intercourse were 48.60% and 16.52% respectively.

Early sexual debut was a recurring problem with varied negative health outcomes such as increased rate of acquiring STDs and higher possibility of unprotected sexual behaviors [36, 41]. This study, echoing previous results [26, 42], revealed a worrisome trend that male college students aging younger were more likely to initiate sex early. The lowering trend of sexual debut age put young people particularly susceptible to HIV and other STDs, because they might be exposed to more sexual partners subsequently and unprotected sexual behaviors than their counterparts who debuted late [43]. According to the results, male students who had early sexual debut were 3.66 times and 1.53 times more likely to have multiple sexual partners and condomless sex at the latest intercourse, respectively. The study also showed being sexual minorities was positively associated with early sexual debut. Adolescents are reported to be naturally predisposed to escalated urge for sexual activities from puberty. This inclination might be more pronounced among those with sexual identity confusion, because they tried to engage in early sex experimentation to determine sexual orientation [36, 44]. These findings indicated that programs aiming at delaying sexual debut among youth was an important issue of concern.

Multiple sexual partnership was common among youth [22, 45]. A study in Malawi revealed that 69% of young males had more than one sexual partners [46]. Compared to a national meta-analysis report in China [13], the rate of having more than one sexual partner was higher in our results. Ethnic minority male students were more likely to report multiple sexual partnership, which might be explained by different social norms and values concerning sex and marriage [47]. The odds of having multiple sexual partners was higher among male students who accepted extramarital sex. This revealed that sexuality,

Table 3 Factors correlated with multiple sexual partnership

		Univariate analysis		Multivariable analysis	
		OR(95% CI)	P value	AOR(95% CI)	P value
Ethnic group	Han (majority ethnic group)	1			
	Ethnic minorities	1.4(1.1–1.8)	0.007	1.79(1.34–2.41)	< 0.001
Mother educational background	Junior high school and below	1			
	Senior high school	1.48(1.14–1.91)	0.003	1.57(1.16–2.12)	0.003
	College and above	0.98(0.68–1.41)	0.926		
Monthly living expenses	Less than 1,000 RMB	1			
	1,000–1999 RMB	1(0.82–1.23)	0.988		
	2000RMB and above	1.7(1.22–2.39)	0.002	1.55(1.03–2.32)	0.034
Sexual orientation	Heterosexual	1			
	Sexual minorities	1.72(1.26–2.36)	0.001		
Attitude towards premarital sex	Disagreement	1			
	Agreement	1.47(1.11–1.93)	0.007		
Attitude towards extramarital sex	Disagreement	1			
	Agreement	1.51(1.22–1.87)	< 0.001	1.33(1.03–1.71)	0.029
Condom use efficacy	Unconfident	1			
	Confident	0.67(0.53–0.85)	0.001		
	Very confident	0.71(0.55–0.91)	0.007		
HIV test history	Yes	1			
	No	0.61(0.47–0.78)	< 0.001	0.60(0.45–0.81)	0.001
Experience of being in love	Once or less	1			
	Two times or more	3.51(2.77–4.45)	< 0.001	3.80(2.92–4.94)	< 0.001
Early sexual debut	No	1			
	Yes	4.24(3.34–5.38)	< 0.001	3.64(2.82–4.71)	< 0.001
Condom use at the first intercourse	No	1			
	Yes	0.53(0.42–0.65)	< 0.001	0.72(0.54–0.95)	0.019
Condom use at the latest intercourse	Yes	1			
	No	1.75(1.34–2.28)	< 0.001		

including ethics of sexual activity and pleasure, should be incorporated into sex education in college.

Condom use was one of the most reliable indicators assessing sexual behavior risks [45]. A typically effective strategy for promoting condom use was increasing condom use efficacy, which was supposed to explain more than 50% of the variance in use intentions and 33% in actual use [48]. We found that condom use efficacy, in terms of insistence, negotiation, rejection, was negatively correlated with condomless sex, and more than half reported unconfident among the participants who did not use condoms. This highlighted health intervention might underscore assertiveness in terms of condom use as well as communication skills with sexual partners [49].

A previous study indicated that no statistical difference of safe sex rate was found among students with different levels of HIV knowledge [19]. However, our study demonstrated that HIV prevention knowledge cast significant impact on condom use behavior. A probable reason of the conflicts in these studies [14, 19, 23], was whether current sex related education could meet the demands of the target population or not [50]. A qualitative research in the USA in 2019 pointed out, received sex education was not helpful and themes of potential improvements

were advised to be upon diverse sexual behaviors and identities, and social contexts about sex [51]. Changes to more detailed and customized sex education about HIV prevention knowledge and safe sexual behaviors might be considered.

This study also indicated a positive correlation between heightened HIV risk perceptions and condomless sex at the latest sexual behavior among male college students. Several hypotheses might be accountable. First, the perceived high risk resulted from failure of condom use at the latest sex. Second, despite the awareness of HIV risk infection, young males still chose not to use condoms, which implied that the transition from cognition to adopting safe behaviors was interrupted. A few studies have stressed the threatening existence of risk discordance recently [49, 52], the phenomena in our study, however, was even complicated and needed further exploration to identify the influencing factors.

This study had several limitations. First, no causality could be concluded given the cross-sectional study design. Second, participants were enrolled from vocational college schools, as a consequence of which may induce selection bias. Third, this survey was conducted during Covid-19 pandemic. The societal mobility

Table 4 Factors correlated with condomless sex at the latest sexual intercourse

		Univariate analysis		Multivariable analysis	
		OR(95% CI)	P value	AOR(95% CI)	P value
Age(year)	≤ 19	2.07(1.35–3.16)	0.001	1.91(1.13–3.23)	0.016
	20–21	2.02(1.3–3.14)	0.002		
	≥ 22	1			
Household registration	Sichuan province	1			
	Other provinces	0.68(0.47–0.98)	0.040		
Hometown	Rural	1			
	Town/city	0.8(0.61–1.03)	0.085		
Father educational background	Junior high school and below	1			
	Senior high school	0.72(0.5–1.02)	0.063		
	College and above	0.87(0.57–1.31)	0.497		
Mother educational background	Junior high school and below	1		0.49(0.29–0.82)	0.006
	Senior high school	0.54(0.36–0.81)	0.003		
	College and above	0.58(0.33–1.02)	0.059		
Monthly living expenses	Less than 1,000 RMB	1			
	1,000–1999 RMB	0.75(0.57–0.98)	0.038		
	2000RMB and above	0.72(0.45–1.15)	0.167		
Sexual orientation	Heterosexual	1			
	Sexual minorities	1.36(0.92–2)	0.124		
HIV knowledge	Insufficient	1		0.63(0.44–0.89)	0.008
	Sufficient	0.50(0.38–0.65)	< 0.001		
Attitude towards unmarried cohabitation	Disagreement	1			
	Agreement	1.4(0.95–2.05)	0.086		
Attitude towards premarital sex	Disagreement	1			
	Agreement	1.63(1.07–2.47)	0.022		
Attitude towards extramarital sex	Disagreement	1			
	Agreement	1.77(1.34–2.32)	< 0.001		
Condom use efficacy	Unconfident	1		0.48(0.34–0.69)	< 0.001
	Confident	0.29(0.21–0.39)	< 0.001		
	Very confident	0.12(0.08–0.18)	< 0.001		
Perceived risk of HIV infection	No	1		2.05(1.33–3.16)	0.001
	Yes	1.91(1.36–2.68)	< 0.001		
Early sexual debut	No	1		1.53(1.07–2.20)	0.021
	Yes	2.55(1.95–3.33)	< 0.001		
Condom use at the first intercourse	No	1		0.08(0.06–0.12)	< 0.001
	Yes	0.07(0.05–0.09)	< 0.001		
Multiple sexual partnership	No	1			
	Yes	1.75(1.34–2.28)	< 0.001		

restrictions in response to the pandemic might alter the pattern of students' behaviors. In addition, when addressing sensitive questions related to sexual behaviors for instance, answers from the participants may be subject to information bias.

Conclusion

Our study demonstrated the prevalence of early sexual debut, multiple sexual partnership and condomless sex among male college students, as well as the correlations between risky behaviors and HIV knowledge, condom use efficacy and perceived HIV risk. Simultaneously, the trend was noted that aging younger became more susceptible to early sexual debut. As the influence of Covid-19

pandemic decreased, human mobility networks gradually resumed. There was an urgently crucial need for comprehensive sex education curricula by developing customized information on HIV prevention, sexuality, and empowering students with assertiveness and negotiation skills concerning condom use during and before college.

Abbreviations

HIV/AIDS	Human immunodeficiency virus/acquired immunodeficiency syndrome
PLWH	People living with HIV
STDs	Sexually transmitted diseases
CI	Confidence interval
AOR	Adjusted odds ratio
SD	Standard deviation

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Author contributions

All the authors contributed to the final presentation of the manuscript. YD, YL and JZ designed the study procedure, and were responsible for implementation the study, and data collection. YD and YL analysed data. With the assistance from DZ and JZ, YD wrote and revised the manuscript. All the authors approved the final manuscript.

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Data availability

The datasets analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study was approved by the institutional review board of Chengdu Preventive Medicine Association. Informed consent was obtained from all the participants, and the methods were conducted in conformity with relevant guidelines and regulations.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

1. (UNAIDS), J.U.N.P.o.H.A. *IN DANGER: UNAIDS Global AIDS Update 2022*. 2022; https://indanger.unaids.org/?utm_source=UNAIDS%20Newsletter&utm_campaign=53b6cdeebc-20220802_aids2022-closes&utm_medium=email&utm_term=0_e7a6256e25-53b6cdeebc-114230746.
2. UNICEF. HIV and AIDS in adolescents. 2022 [cited 2022 2022/12/18]; <https://data.unicef.org/topic/hiv-aids/>.
3. Koenig LJ, et al. Young people and HIV: a call to action. *Am J Public Health*. 2016;106(3):402–5.
4. Liu XJ, McGoogan JM, Wu ZY. Human immunodeficiency virus/acquired immunodeficiency syndrome prevalence, incidence, and mortality in China, 1990 to 2017: a secondary analysis of the global burden of Disease Study 2017 data. *Chin Med J (Engl)*. 2021;134(10):1175–80.
5. zunyou. W. Characteristics of HIV sexually transmission and challenges for controlling the epidemic in China. *Zhonghua Liu Xing Bing Xue Za Zhi*. 2018;39(06):707–9.
6. He N. Research Progress in the epidemiology of HIV/AIDS in China. *China CDC Wkly*. 2021;3(48):1022–30.
7. Cai C, et al. Characteristics and trends of newly reported HIV infection in young students in China, 2010–2019. *Zhonghua Liu Xing Bing Xue Za Zhi*. 2020;41(9):1455–9.
8. BRIEF CD. *HIV in China: cases still rising among high-risk groups*. 2021 [cited 2022 2022/12/18]; <https://chinadevelopmentbrief.org/reports/hiv-in-china-cases-still-rising-among-high-risk-groups/>.
9. Shu C, et al. Association between age at first sexual intercourse and knowledge, attitudes and practices regarding reproductive health and unplanned pregnancy: a cross-sectional study. *Public Health*. 2016;135:104–13.
10. Oswalt SB, Wyatt TJ. Sexual health behaviors and sexual orientation in a U.S. national sample of college students. *Arch Sex Behav*. 2013;42(8):1561–72.
11. Dodd RH, et al. Awareness of the link between human papillomavirus and oral cancer in UK university students. *Prev Med*. 2021;150:106660.
12. Ho PSY, et al. Sex with Chinese characteristics: Sexuality Research in/on 21st-Century China. *J Sex Res*. 2018;55(4–5):486–521.
13. Yu XM, Guo SJ, Sun YY. Sexual behaviours and associated risks in Chinese young people: a meta-analysis. *Sex Health*. 2013;10(5):424–33.
14. Du X, et al. Factors associated with risk sexual behaviours of HIV/STDs infection among university students in Henan, China: a cross-sectional study. *Reprod Health*. 2021;18(1):172.
15. Junjie W, Qingfeng C, Mengjie H. *Survey on emotion, psychology behavior between different genders and HIV testing among college students* Chin. *J AIDS STD*. 2022;28(12):1424–7.
16. Bossonario PA, et al. Risk factors for HIV infection among adolescents and the youth: a systematic review. *Rev Lat Am Enfermagem*. 2022;30(spe):e3697.
17. Li W, Chu J, Zhu Z. Epidemiological characteristics of HIV infection among college students in Nanjing, China: a cross-sectional survey. *BMJ Open*. 2020;10(5):e035889.
18. Saffier IP, Kawa H, Harling G. A scoping review of prevalence, incidence and risk factors for HIV infection amongst young people in Brazil. *BMC Infect Dis*. 2017;17(1):675.
19. Xu H, et al. Sexual attitudes, sexual behaviors, and use of HIV prevention services among male undergraduate students in Hunan, China: a cross-sectional survey. *BMC Public Health*. 2019;19(1):250.
20. Chawla N, Sarkar S. Defining high-risk sexual behavior in the Context of Substance Use. *J Psychosexual Health*. 2019;1:26–31.
21. Yang Z, et al. Analysis of factors influencing casual sexual behavior among male college students in Zhejiang Province, China. *PLoS ONE*. 2021;16(5):e0250703.
22. Chen Q, et al. Trends of HIV incidence and prevalence among men who have sex with men in Beijing, China: nine consecutive cross-sectional surveys, 2008–2016. *PLoS ONE*. 2018;13(8):e0201953.
23. Wang H, Yu S. Condom use consistency and Associated factors among College Student men who have sex with men from seven Colleges in Changsha City: a cross-sectional survey. Volume 13. *HIV AIDS; Auckl* 2021. pp. 557–69.
24. Qing L, et al. Study on HIV/AIDS knowledge, sexual attitudes, sexual behaviors, and preventive services among young students in Chongqing, China. *Front Public Health*. 2022;10:982727.
25. Ren Z, Zhou Y, Liu Y. *Factors associated with unsafe sexual behavior among sexually active Chinese University students, Hebei Province, 2019* BMC Public Health. 2021. 21(1): p. 1904.
26. Lyu J, Shen X, Hesketh T. Sexual knowledge, attitudes and behaviours among undergraduate students in China-implications for Sex Education. *Int J Environ Res Public Health*. 2020. 17(18).
27. Yan Z, et al. Analysis of treatment efficacy and drug resistance of patients receiving HIV-1 antiretroviral therapy in Sichuan area from 2016 to 2019. *Int J Lab Med*. 2022;43(08):973–8.
28. Agency XN. *China reported 958,000 people living with HIV with the epidemic at a low level*. 2019; http://www.gov.cn/xinwen/2019-12/01/content_5457448.htm.
29. Post D, Veling W. Sexual minority status, social adversity and risk for psychotic disorders-results from the GROUPE study. *Psychol Med*. 2021;51(5):770–6.
30. Office T. *China HIV/AIDS monitoring and evaluation framework trial*. Beijing: Beijing Medical Publishing House; 2007.
31. Hongjie S, et al. Associated factors on multi-sexual partner behavior among college students have multiple sex partners in Nanjing, based on a two-level logistic regression model. *Chin J AIDS STD*. 2021;27(07):719–23.
32. Zhou Q, et al. HIV knowledge, sexual practices, condom use and its associated factors among international students in one Province of China: a cross-sectional study. *BMJ Open*. 2022;12(8):e058108.
33. Wang C, et al. Condom use social norms and self-efficacy with different kinds of male partners among Chinese men who have sex with men: results from an online survey. *BMC Public Health*. 2018;18(1):1175.
34. Brafford LJ, Beck KH. Development and validation of a condom self-efficacy scale for college students. *J Am Coll Health*. 1991;39(5):219–25.
35. Dolphin L, Fitzgerald A, Dooley B. Risky sex behaviours among college students: the psychosocial profile. *Early Interv Psychiatry*. 2018;12(6):1203–12.
36. Muhammad T, Srivastava S. What predicts the early sexual debut among unmarried adolescents (10–19 years)? Evidence from UDAYA survey, 2015–16. *PLoS ONE*. 2021;16(6):e0252940.
37. Yang Z, Ma Q, Chen W. Analysis of multiple sexual partners among 2665 male College Students who have sexual Behaviour in Zhejiang Province, China. *Biomed Res Int*. 2022;2022:p8006537.
38. Millanzi WC, Osaki KM, Kibisi SM. Attitude and prevalence of early sexual debut and associated risk sexual behavior among adolescents in Tanzania; evidence from baseline data in a Randomized Controlled Trial. *BMC Public Health*. 2023;23(1):1758.
39. Rapsey CM. Age, quality, and context of first sex: associations with sexual difficulties. *J Sex Med*. 2014;11(12):2873–81.

40. Liu Y, et al. Self-identified sexual orientations and high-risk sexual behaviours among Chinese youth. *BMJ Sex Reprod Health*. 2019.
41. Liang H, Hu Z. Predictors and consequences of early sexual debut among 43,251 University students in China. *Arch Sex Behav*. 2021;50(7):2789–92.
42. Hongjin Z, Hong L. Status of sexual behavior and associated influencing factors among college students in Kunming. *Chin J AIDS STD*. 2019;25(03):276–80.
43. Konkor I, et al. Sexual debut among heterosexual men of African and Caribbean descent: are the Youth Initiating Sex earlier than the older generation? *Arch Sex Behav*. 2021;50(6):2359–69.
44. Brown MJ, et al. Sex and sexual orientation disparities in adverse childhood experiences and early age at sexual debut in the United States: results from a nationally representative sample. *Child Abuse Negl*. 2015;46:89–102.
45. Dimbuene ZT, Emina JB, Sankoh O. UNAIDS 'multiple sexual partners' core indicator: promoting sexual networks to reduce potential biases. *Glob Health Action*. 2014;7:23103.
46. N WC. Associated Risk factors of STIs and multiple sexual relationships among youths in Malawi. *PLoS ONE*. 2015;10(8):e0134286.
47. Yang Y, et al. Casual sex and concurrent sexual partnerships among young people from an Yi community with a high prevalence of HIV in China. *Asian J Androl*. 2012;14(5):758–65.
48. Baele J, Dusseldorp E, Maes S. Condom use self-efficacy: effect on intended and actual condom use in adolescents. *J Adolesc Health*. 2001;28(5):421–31.
49. Liu Y, et al. Discordance between perceived risk and actual risky sexual behaviors among undergraduate university students in mainland China: a cross-sectional study. *BMC Public Health*. 2022;22(1):729.
50. Dodd S, et al. School-based peer education interventions to improve health: a global systematic review of effectiveness. *BMC Public Health*. 2022;22(1):2247.
51. Astle S, et al. College students' suggestions for improving sex education in schools beyond 'blah blah blah condoms and STDs'. *Sex Educ*. 2021;21(1):91–105.
52. Seekaew P, et al. Discordance between self-perceived and actual risk of HIV infection among men who have sex with men and transgender women in Thailand: a cross-sectional assessment. *J Int AIDS Soc*. 2019;22(12):e25430.

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