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Title Investigation of Knowledge, Attitude and Practice of
Reproductive Health and Influencing Factors among
College Students

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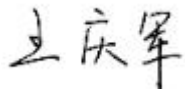
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Abstract

Objective To understand the current status of knowledge, attitude, and practice (KAP) regarding reproductive health among college students, and to explore the current situation and influencing factors of their reproductive health knowledge, attitudes, and behaviors. Based on the current situation and problems, propose optimization strategies for reproductive health education that align with student characteristics, compensating for deficiencies in traditional health education. Provide empirical support for formulating targeted intervention policies for universities, families, and public health departments.

Methods A total of 300 college students were selected as research subjects. Based on the KAP theoretical framework, the "College Student Reproductive Health Knowledge, Attitude, and Practice Questionnaire" was used for anonymous surveys [1] to investigate their current reproductive health KAP status and analyze relevant influencing factors.

Results ① Knowledge: The awareness rate of reproductive health knowledge among college students was 33.0%, with an average cognitive score of 16.54 ± 4.03 (total score 23). Factors influencing the level of reproductive health cognition included gender, grade, parental education level, annual household income, and whether they had actively learned about sexual knowledge ($P < 0.05$). Binary logistic multivariate regression analysis showed that gender ($OR=2.632$, $95\%CI:1.158-5.982$), junior year ($OR=6.489$, $95\%CI:1.208-34.863$), senior year ($OR=5.237$, $95\%CI:1.021-26.846$), and having actively learned about sexual knowledge ($OR=0.341$, $95\%CI:0.187-0.622$) were protective factors for a high level of reproductive health cognition. ② Attitude: 87.3% of students correctly recognized that contraception is the responsibility of both partners. Significant gender differences were found in contraceptive methods ($\chi^2=12.060$, $P=0.007$) and condom use during sexual activity ($\chi^2=7.792$, $P=0.020$). Regarding other sexual-related attitudes, 52.3% of students believed they could consider a partner's sexual request; 15.7% supported

sexual activity among college students; 93.3% supported the implementation of reproductive health education. Significant gender differences were found in attitudes towards sexual requests from a romantic partner ($\chi^2=65.963$, $P < 0.001$), college student sexual activity ($\chi^2=13.819$, $P < 0.001$), sexual minorities ($\chi^2=14.226$, $P=0.003$), and whether sex education would lead to more sexual activity. ③ Behavior: 28.0% of students had actively learned how to use condoms, 40.7% had viewed pornographic materials, and 15.3% had engaged in premarital sexual intercourse.

Conclusion There are differences in the understanding of reproductive health-related knowledge among college students in China. Their cognitive level of reproductive health is at a medium level. Attitudes towards sexual topics vary. The incidence of sexual behavior shows a gradually increasing trend. This group has an objective need for reproductive health issues, and a systematic reproductive health knowledge education system should be actively constructed.

Keywords: Reproductive health; College students; Knowledge, Attitude, Practice

1 Introduction

Reproductive health refers to physical and mental health related to sexuality, free from unwanted pregnancy, unsafe abortion, sexually transmitted diseases, and all forms of sexual violence, where everyone's sexual rights are respected, protected, and fulfilled [2]. Young people have the potential to make significant contributions to families, society, and the nation, and are an important reserve force for social development. There are as many as 148 million young people aged 16-25 in China, most of whom are college students. Limited research suggests they have limited understanding of reproductive health education. The reproductive health level of this group is closely related to future population quality and social development, and their reproductive health issues have received widespread attention [3].

1.1 Research Background

College students are in a crucial transitional stage of biological-psychological-social maturation. However, a structural contradiction is prevalent among college students, where physiological development outpaces relatively lagging psychological cognition. The lack of scientific sexual knowledge and reproductive health education guidance during this critical stage inevitably adversely affects their physical and mental health development. More critically, such educational deficiencies may induce high-risk sexual behaviors, ultimately leading to a series of serious and lasting health damages and social role obstacles in adulthood [4].

Against the backdrop of rapid socio-cultural changes, young people's sexual attitudes are becoming increasingly open, with the age of first sexual intercourse showing a significant decreasing trend and sexual behaviors occurring more frequently [5-6]. Sexual behavior among college students shows a low-level increasing trend [7]. Data shows that the incidence of sexual behavior among Chinese college students ranges from 16.8% to 31.7%, and only 53.2% of students used contraceptive measures during their first sexual encounter [8-9]. A study on reproductive health

among Shanghai college students by Xu Jiawei et al. found that only 20.0% of college students opposed premarital sexual behavior, and 21.3% had experienced sexual intercourse ^[10]. This indicates that premarital sexual behavior is becoming increasingly common among Chinese college students, consequently leading to rising annual incidence of premarital unwanted pregnancy, abortion, and sexually transmitted diseases ^[11].

Yang Aijuan investigated 294 female college students undergoing abortion at Guiyang Medical University Affiliated Hospital and found that college students accounted for 63.3%, and 60.5% did not use contraceptive measures due to lack of contraceptive knowledge ^[12]. A survey on sexual behavior among 1033 female college students in the Nanning, Guangxi area showed that 284 (27.49%) students had a history of sexual life, of which 132 (46.48%) had experienced one or more induced abortions or deliveries ^[13]. A survey in Pudong New Area, Shanghai, showed that 21.9% of college students engaged in premarital sexual behavior, with an unintended pregnancy rate of 21.7%, among which the repeat abortion rate was as high as 49.5%, and 97.2% of unintended pregnancies were terminated by induced abortion ^[14]. A study involving six universities in Beijing showed that only 56% of sexually active individuals used contraceptive measures every time, with an unintended pregnancy rate of 14.4%. Abortion resulting from incorrect sexual behavior poses threats not only to women's physical health (such as endometrial damage, reproductive system infections) but may also induce psychological issues like anxiety and depression ^[9]. Furthermore, research shows that only 22.6% of students master three or more core reproductive health knowledge items, the pass rate for contraceptive knowledge is less than 50%, and the accuracy rate for calculating the safe period is only 22.47% ^[14]. Knowledge gaps lead to frequent high-risk behaviors, such as weak awareness of AIDS prevention and increased risk of sexually transmitted infections. Data shows that individuals aged 20-39 in China account for 69.19% of total HIV/AIDS infections ^[15].

Currently, the psychosexual maturity of college students lags behind their physiological sexual maturity. Reproductive health education for college students is

an urgent task. It requires timely, appropriate, and proper reproductive health education from dimensions such as sexual physiology and ethics to promote their comprehensive physical and mental development. To understand the current status and problems of sexual and reproductive health education among college students, master their current level of reproductive health cognition and influencing factors, attitudes and behaviors towards reproductive health, as well as gender- and family-related differences in reproductive health behaviors and influencing factors, this study surveyed the reproductive health knowledge, attitudes, and behaviors of some college students. Concurrently, based on the survey results and combined with relevant domestic and international literature, analysis and research were conducted to provide a scientific reference for improving the reproductive health level of college students and promoting population reproductive health development.

1.2 Domestic and International Research Progress

1.2.1 Current Status of Reproductive Health KAP among Foreign College Students

Existing international research indicates that a common issue among college students is insufficient reproductive health knowledge, fragmented understanding, and a coexistence of knowledge gaps and high-risk behaviors. Research by foreign scholars mainly focuses on contraception and sexual behavior ^[16]. For example, Joseph et al., in a study of 449 college students, found that only a few had taken reproductive health education courses, and there was a widespread cognitive blind spot regarding emergency contraception among college students ^[17]. Abiodun et al. surveyed 1328 unmarried, sexually active female college students and found that they commonly used emergency contraception to prevent pregnancy, lacked knowledge related to preventing unintended pregnancy, and had cognitive biases regarding emergency contraception ^[18]. Blidaru, Iolanda Elena ^[19] conducted a questionnaire survey on the knowledge, attitudes, and behaviors regarding contraception among 1105 female college students. The data showed that the average age of the study subjects at first intercourse was 18.6 years, with the incidence of sexual behavior or

marriage exceeding 66.0%. Data from preparatory students in western Addis Ababa, Ethiopia, found that although 89.6% knew the concept of sexually transmitted infections, 54.2% could not list specific types of STIs. The condom use rate during first sexual intercourse was only 25.7%, and nearly 20% of infected individuals chose traditional remedies over medical care ^[20]. Although Nordic countries have increased contraceptive use rates through school sex education, their reliance on emergency contraception reveals cognitive deficits in systematic knowledge ^[21].

1.2.2 Current Status of Reproductive Health KAP among Domestic College Students

Research has shown that misconceptions about contraception are common among college students, such as erroneous beliefs about non-efficient contraceptive methods like rhythm method, withdrawal, or relying on the "safe period," as well as low awareness of efficient contraceptive methods like intrauterine devices. Low levels of reproductive health knowledge often lead to a high proportion of unintended pregnancies ^[22]. A study on the current status of reproductive health KAP among 1170 college students in Yunnan Province showed that less than a quarter of students accurately grasped the time window for the effectiveness of emergency contraceptive pills, less than 50% knew the female ovulation period, and just over half had accurate awareness of the failure risk of the safe period/withdrawal method ^[23]. These indicate a low level of reproductive health cognition among college students. Research by Xu Jiawei et al. showed that college students' attitudes towards sex are increasingly open; only 20.0% opposed premarital sexual behavior, and only 23.0% opposed homosexual behavior among homosexuals, with more tolerant attitudes towards premarital sex, extramarital sex, and maintaining multiple sexual partners ^[24]. A study involving three universities found that 14.3% of college students had experienced sexual intercourse, and 16.3% had actively learned how to use condoms ^[25].

1.2.3 Factors Influencing the Level of Reproductive Health Cognition among Domestic and Foreign College Students

Research indicates that the level of reproductive health cognition among college students is influenced by various factors including personal, family, and social aspects

[26]. Surveys by foreign scholar Mesele et al. [27] showed significant associations between factors like gender, place of residence, and the level of reproductive health cognition. A cross-sectional survey by Berhe et al. [28] of 420 young college students indicated that previous exposure to reproductive health education was associated with higher levels of reproductive health cognition. Domestically, a survey of 2226 college students in Shanghai showed that female students had higher correct awareness rates regarding sexual knowledge, short-term risks of abortion, and dangers of unsafe sexual behavior than male students; male students had higher awareness of condoms, while female students had a more comprehensive understanding of contraceptives [14]. Research by domestic scholar Zhang Jin showed that parents' education level influences their children's reproductive health education; higher parental education levels correlate with better reproductive health cognition among children [29]. Wang Cong's research found that students with urban household registration scored higher than those from rural areas; place of residence was an important factor influencing college students' reproductive health level. Additionally, actively learning reproductive health knowledge was an independent factor for high cognitive level [30]. Combining domestic and international research, numerous factors influence the level of reproductive health cognition among college students. Therefore, this study investigates the current status of reproductive health KAP among college students to further analyze the influencing factors of reproductive health cognition in this population.

2 Subjects and Methods

2.1 Study Subjects

From June 2024 to March 2025, convenience sampling was used to select 300 college students who voluntarily participated in the survey as research subjects.

2.1.1 Inclusion Criteria

- (1) Enrolled college students;
- (2) Informed and voluntarily participating in this research survey;

2.1.2 Exclusion Criteria

- (1) Questionnaire not completed as required;
- (2) Individuals with severe mental illness.

2.2 Research Methods

The survey was conducted using the "College Student Reproductive Health Knowledge, Attitude, and Practice Questionnaire" designed by Peng Yushuang. The questionnaire includes four parts:

- (1) General demographic information: gender, ethnicity, grade, etc.;
- (2) College students' knowledge of reproductive health: basic reproductive health knowledge, contraceptive knowledge, condom use, knowledge related to STDs and AIDS, etc., totaling 23 items. Points are assigned to reproductive health knowledge items; each correct answer scores 1 point, each incorrect answer scores 0 points. The sum of scores for each item is the total cognitive score, with a maximum of 23 points. Higher scores indicate a higher level of reproductive health knowledge among students. A cognitive score greater than 18 is defined as awareness of reproductive health knowledge, while a score less than or equal to 18 is defined as lack of awareness.
- (3) College students' attitudes towards reproductive health-related issues: 12 items in total, including attitudes towards contraception and sex-related concepts;
- (4) Occurrence of college students' reproductive health-related behaviors: a total of 3 items [1]. The survey questionnaire contained 49 items. To improve data reliability and validity, the final sample size was determined to be at least $49 * 5 * 120\% = 294$ cases.

The test-retest reliability of this questionnaire was 0.923. Content validity indices included the item-level content validity index (I-CVI) and the scale-level content validity index (S-CVI). The minimum I-CVI was 0.75, the universal agreement S-CVI was 0.84, and the average S-CVI was 0.98, indicating good content validity. Electronic questionnaires were distributed to college students for anonymous surveys. The purpose, significance, and privacy protection strategies of the survey were explained in the first paragraph of the electronic questionnaire, adhering to the

principle of voluntariness. A total of 307 questionnaires were distributed. Among them, 5 questionnaires had highly consistent answers, and 2 had missing information; these were considered invalid and excluded. Finally, 300 questionnaires were collected, with an effective rate of 97.7%.

2.3 Data Statistics and Analysis

This study used SPSS 27.0 software for data analysis. Descriptive statistics were used to organize respondents' basic information and reproductive health KAP status. Continuous variables were analyzed using t-tests and ANOVA. Rates were compared using the χ^2 test. Logistic regression was used to analyze the factors influencing college students' reproductive health knowledge. The significance level was set at $\alpha = 0.05$.

3 Results

3.1 General Information of College Students

A total of 300 students participated in the survey, including 66 males (22.0%) and 234 females (78.0%), with higher female participation. The average age of the study subjects was approximately 20.36 years. Almost all (97.7%) were from the Han ethnicity. 186 students (62.0%) were seniors. 160 students (53.3%) had their permanent residence in rural areas. 111 students (37.0%) had a history of being left-behind children. Nearly half had fathers with a middle school education level and mothers with an elementary school education level. 117 students (39.0%) had an annual household income between $\geq 30,000$ RMB and $< 80,000$ RMB. 180 students (60.0%) had received sex education at school, while only 75 (25.0%) had received sex education at home. More than half (194 students, 64.7%) had actively sought knowledge about sex. See Table 1 for details.

Table 1 Distribution of Basic Information of College Students (n%)

Characteristic	Number	Percentage (%)
Gender		
Male	66	22.0
Female	234	78.0
Ethnicity		
Han	293	97.7
Other	7	2.3
Grade		
Freshman	25	8.3
Sophomore	28	9.3
Junior	61	20.3
Senior	186	62.0
Residence		
Urban	140	46.7
Rural	160	53.3
History of being Left-behind		
Yes	111	37.0
No	189	63.0
Father's Education		
Illiterate	2	0.7

Characteristic	Number	Percentage (%)
Primary School	69	23.0
Junior High School	124	41.3
High School (or Technical Secondary)	74	24.7
Associate Degree	16	5.3
Bachelor's Degree or Above	15	5.0
Mother's Education		
Illiterate	9	3.0
Primary School	125	41.7
Junior High School	96	32.0
High School (or Technical Secondary)	47	15.7
Associate Degree	12	4.0
Bachelor's Degree or Above	11	3.7
Annual Household Income (10k RMB)		
<3	66	22.0
≥3 and <8	117	39.0
≥8 and <30	89	29.7
≥30 and <100	25	8.3
≥100	3	1.0
History of School Sex		

Characteristic	Number	Percentage (%)
Education		
Yes	180	60.0
No	120	40.0
History of Family Sex Education		
Yes	75	25.0
No	225	75.0
Actively Learned Sexual Knowledge		
Yes	194	64.7
No	106	35.3

3.2 Reproductive Health-related Knowledge among College Students

3.2.1 Correct Answer Rates for Reproductive Health Knowledge Items

Among all items, only 7 had a correct answer rate greater than 80%. The highest correct answer rate was for the item in the contraception dimension: "Should you check the expiration date of a condom before use?" (94.0%). This was followed by an item in the AIDS dimension: "Can correct condom use reduce the risk of HIV transmission?" (90.7%). Five items had a correct answer rate below 60%. The lowest was in the contraception dimension: "Do antibiotics weaken the effect of contraceptives?" (36.0%). Followed by "Principle of action of intrauterine device" (44.7%), "Should the condom be withdrawn after ejaculation and before the penis becomes flaccid?" (46.7%), "Does infection with HIV necessarily mean having AIDS?" (53.0%), and "Can HIV be transmitted through mosquito bites?" (55.3%). See Table 2 for specific results.

Table 2 Correct Answer Rates for Reproductive Health Knowledge Items among College Students (n%) (n=300)

Dimension and Item	College Students' Reproductive Health Knowledge	
	Correct	Incorrect
Reproductive Health Common Sense		
Which stage is the fertile period for a woman with a regular menstrual cycle?	222 (74.0)	78(26.0)
Does menstruation temporarily stop during pregnancy?	264 (88.0)	36(12.0)
Can accidental sexual intercourse lead to pregnancy?	263 (87.7)	37(12.3)
Does a male release a small amount of sperm before ejaculation?	229 (76.3)	71(23.7)
Contraception Dimension		
Method with dual protection against pregnancy and STDs	257 (85.7)	43(24.3)
Inefficient contraceptive method	228 (76.0)	72(24.0)
Principle of action of intrauterine device	134 (44.7)	166(55.3)
Do antibiotics weaken the effect of contraceptives?	108 (36.0)	192(64.0)
Condom Dimension		
Check expiration date before use	282 (94.0)	18(6.0)
Apply to erect penis before contact with	198 (66.0)	102(34.0)

genitals

Withdraw after ejaculation, before penis becomes flaccid	140 (46.7)	160(53.3)
Hold the condom opening during withdrawal	213 (71.0)	87(29.0)

STD Dimension

Does disappearance of STD symptoms mean cure?	239 (79.7)	61(20.3)
Do only people with multiple partners get STDs?	235 (78.3)	65(21.7)
Is withdrawal as effective as condoms for preventing STDs?	234 (78.0)	66(22.0)

AIDS Dimension

Is there currently an AIDS vaccine?	192 (64.0)	108(36.0)
Can AIDS be transmitted through mosquito bites?	166 (55.3)	134(44.7)
Can you get infected by dining with an HIV-infected person or AIDS patient?	254 (84.7)	46(15.3)
Can correct condom use reduce the risk of AIDS transmission?	272 (90.7)	28(9.3)
Can maintaining a single sexual partnership reduce HIV transmission risk?	219 (73.0)	81(27.0)
Can AIDS be cured currently?	251 (83.7)	49(26.3)
Does infection with HIV necessarily mean having AIDS?	159 (53.0)	141(47.0)
Is a person infectious during the period after infection but before testing positive?	204 (68.0)	96(32.0)

The research results show that the reproductive health cognition score of college

students was 16.54 ± 4.03 points. Defining a correct answer rate > 18 as awareness of relevant knowledge and ≤ 18 as lack of awareness, the total awareness rate of reproductive health knowledge among college students was 33.0%. College students almost all knew about condoms but did not understand the correct usage methods. Knowledge gaps were primarily concentrated in the contraception and AIDS dimensions. See Table 3 for specific results.

Table 3 Cognitive Scores and Awareness Rates for Each Dimension of Reproductive Health Knowledge among College Students

Dimension	Cognitive Score	Awareness Rate (%)
Total	16.54 ± 4.03	33.0
Reproductive Health Common Sense	3.26 ± 0.06	51.3
Contraception-related Dimension	2.42 ± 0.05	11.3
Condom-related Dimension	2.78 ± 0.07	38.3
STD-related Dimension	2.36 ± 0.06	64.3
AIDS-related Dimension	5.72 ± 0.96	10.0

3.2.2 Analysis of Factors Influencing College Students' Reproductive Health Cognition Score

Univariate analysis showed that factors influencing the level of reproductive health cognition among college students included gender, grade, parental education level, annual household income, and whether they had actively learned sexual knowledge. See Table 5 for details.

Table 4 Univariate Analysis of Factors Influencing Reproductive Health Cognition Score

Characteristic	Cognitive Score	t/F	P
Gender		-3.398	0.001
Male	14.88 ± 4.71		

Characteristic	Cognitive Score	t/F	P
Female	17.01 ± 3.7		
Ethnicity		6.873	<0.001
Han	14.8 ± 4.32		
Other	13.96 ± 5.41		
Grade	17.08 ± 3.62		
Freshman	16.99 ± 3.7		
Sophomore		1.406	0.161
Junior	16.59 ± 4.04		
Senior	14.43 ± 3.51		
Residence		-1.7	0.09
Urban	16.12 ± 4.21		
Rural	16.91 ± 3.85		
History of being Left-behind		-0.394	0.694
Yes	16.42 ± 3.93		
No	16.61 ± 4.1		
Father's Education		2.43	0.035
Illiterate	15.5 ± 6.36		
Primary School	16.54 ± 3.9		
Junior High School	16.59 ± 4.16		
High School (or Technical	17.18 ± 3.13		

Characteristic	Cognitive Score	t/F	P
Secondary)			
Associate Degree	16.5 ± 4.52		
Bachelor's Degree or Above	13.27 ± 5.65		
Mother's Education		2.26	0.049
Illiterate	17.0 ± 4.9		
Primary School	16.78 ± 3.68		
Junior High School	16.99 ± 3.74		
High School (or Technical Secondary)	15.98 ± 3.91		
Associate Degree	15.5 ± 5.66		
Bachelor's Degree or Above	13.18 ± 6.52		
Annual Household Income (10k RMB)		2.654	0.033
<3	15.86 ± 4.76		
≥3 and <8	17.07 ± 3.42		
≥8 and <30	16.89 ± 3.38		
≥30 and <100	15.12 ± 5.22		
≥100	12.67 ± 10.41		
History of School Sex Education		1.16	0.247

Characteristic	Cognitive Score	t/F	P
Yes	16.78 ± 3.46		
No	16.19 ± 4.76		
History of Family Sex Education		-0.058	0.954
Yes	16.52 ± 4.46		
No	16.55 ± 3.89		
Actively Learned Sexual Knowledge		3.876	<0.001
Yes	17.25 ± 3.44		
No	15.25 ± 4.69		

Note: Comparison between variable groups, $p > 0.05$ indicates no difference between groups, $p < 0.05$ indicates a difference.

Based on the univariate analysis, variables with statistical significance ($P < 0.05$) were included in Logistic regression analysis. See Table 5 for variable assignment. Binary logistic multivariate regression analysis showed that gender (OR=2.632, 95%CI:1.158-5.982), junior year (OR=6.489, 95%CI:1.208-34.863), senior year (OR=5.237, 95%CI:1.021-26.846), and actively learning sexual knowledge (OR=0.341, 95%CI:0.187-0.622) were protective factors for a high level of reproductive health cognition. See Table 6 for details.

Table 5 Independent Variable Assignment Table

Variable	Assignment
Gender	Male=1, Female=2
Grade	Freshman=1, Sophomore=2, Junior=3, Senior=4
Father's Education	Illiterate=1, Primary School=2, Junior High=3, High School/Tech Secondary=4, Associate Degree=5, Bachelor's or Above=6

Variable	Assignment
Mother's Education	Illiterate=1, Primary School=2, Junior High=3, High School/Tech Secondary=4, Associate Degree=5, Bachelor's or Above=6
Annual Household Income (10k RMB)	<3=1, ≥3 & <8=2, ≥8 & <30=3, ≥30 & <100=4, ≥100=5
Actively Learned Sexual Knowledge	No=0, Yes=1

Table 6 Multivariate Analysis of Factors Influencing Reproductive Health Cognition Level

Characteristic	Regression Coefficient	Standard Error	Walds	P	OR	(95%CI)
Gender	0.968	0.419	5.333	0.021	2.632	(1.158-5.982)
Grade			9.007	0.029		
Sophomore	0.213	1.012	0.044	0.834	1.237	(0.17-8.988)
Junior	1.87	0.858	4.753	0.029	6.489	(1.208-34.863)
Senior	1.656	0.834	3.942	0.047	5.237	(1.021-26.846)
Father's Education			1.944	0.857		
Primary School	-1.676	1.997	0.704	0.401	0.187	(0.004-9.381)
High School	-1.459	2.01	0.527	0.468	0.232	(0.005-11.954)
Technical Secondary	-1.244	2.031	0.375	0.54	0.288	(0.005-15.442)
Associate Degree	-1.52	2.13	0.51	0.475	0.219	(0.003-14.206)

Characteristic	Regressi on Coeffici ent	Stand ard Error	Walds	P	OR	(95%CI)
Bachelor's or Above	-2.008	2.249	0.797	0.372	0.134	(0.002-11.023)
Mother's Education			1.767	0.88		
Primary School	-0.739	0.79	0.875	0.349	0.478	(0.102-2.246)
High School	-0.412	0.82	0.253	0.615	0.662	(0.133-3.304)
Technical Secondary	-0.563	0.901	0.391	0.532	0.569	(0.097-3.327)
Associate Degree	-0.652	1.176	0.308	0.579	0.521	(0.052-5.22)
Bachelor's or Above	-0.918	1.341	0.469	0.493	0.399	(0.029-5.527)
Annual Household Income (10k RMB)			3.198	0.525		
<3	0.427	0.382	1.251	0.263	1.533	(0.725-3.241)
≥3 & <8	0.432	0.416	1.078	0.299	1.541	(0.681-3.485)
≥8 & <30	0.512	0.637	0.647	0.421	1.669	(0.479-5.811)
≥30 & <100	2.376	1.536	2.394	0.122	10.758	(0.53-218.172)
Actively Learned Sexual Knowledge	-1.076	0.307	12.305	<0.01	0.341	(0.187-0.622)
Constant	-0.994	2.14	0.216	0.37		

3.3 Reproductive Health-related Attitudes among College Students

3.3.1 Attitudes towards Contraception

The results showed that 262 students (87.3%) recognized that both men and women need to share responsibility for contraception. Regarding the choice of contraceptive method, 246 students (82.0%) prioritized contraceptive effectiveness, with a significant gender difference ($\chi^2=12.060$, $P=0.007$). Male students prioritizing effectiveness (72.7%) was significantly lower than female students (84.6%), and a higher proportion of males (9.1%) prioritized convenience compared to females (1.3%). Regarding condom use during sexual activity, 251 students (83.7%) indicated they would use condoms, with a gender difference ($\chi^2=7.792$, $P=0.020$). Among males, 72.7% said they would use condoms, while 86.8% of females said they would make their partner use condoms. Regarding the place to purchase contraceptives, 244 (81.3%) students chose institutions (hospitals or pharmacies). See Table 7 for specific results.

Table 7 Comparison of Attitudes towards Contraception-related Issues by Gender

Item	Number (%)	Male (n=66)	Female (n=264)	χ^2 value	P
Who bears contraceptive responsibility?				5.112	0.078
Male	33 (11.0)	5 (7.6)	28 (12.0)		
Female	5 (1.7)	3 (4.5)	2 (0.9)		
Both	262 (87.3)	58 (87.9)	204 (87.2)		
Priority when choosing contraceptive method				12.06	0.007
Comfort	32 (10.7)	9 (13.6)	23 (9.8)		

Item	Number (%)	Male (n=66)	Female (n=264)	χ^2 value	P
Effectiveness	246 (82.0)	48 (72.7)	198 (84.6)		
Convenience	9 (3.0)	6 (9.1)	3 (1.3)		
Other	13 (4.3)	3 (4.5)	10 (4.3)		
Would you use a condom during sexual activity?				7.792	0.02
Yes	251 (83.7)	48 (72.7)	203 (86.8)		
No	9 (3.0)	4 (6.1)	5 (2.1)		
Unsure	40 (13.3)	14 (21.2)	26 (11.1)		
First choice for purchasing contraceptives?				5.979	0.113
Shop	37 (12.3)	9 (13.6)	28 (12.0)		
Vending Machine	15 (5.0)	7 (10.6)	8 (3.4)		
Hospital/Pharmacy	244 (81.3)	49 (74.2)	195 (83.3)		
Free from institutions	4 (1.3)	1 (1.5)	3 (1.3)		

3.3.2 Attitudes towards Sexuality

The results indicated that only 87 (29.0%) students would continue normal interaction with acquaintances, classmates, friends, or relatives infected with HIV. Only 81 (27.0%) students stated they would not discriminate against STD patients. Only 21 (7.0%) students approved of Western-style sexual liberation. 52.3% of

students would consider a romantic partner's sexual request, with only 7.3% choosing to comply basically, and 40.3% choosing to refuse. There was a significant gender difference ($\chi^2=65.963$, $P<0.001$): among males, only 7 (10.6%) chose to refuse, whereas 114 (48.7%) females chose to refuse. 47 students (15.7%) supported college students having sexual intercourse, with a significant gender difference ($\chi^2=13.819$, $P<0.001$): 28.8% of male students supported it, while only 12.0% of female students supported it. 30.0% of students supported and did not discriminate against homosexuality, while only 3.0% did not support and discriminated. There was a significant gender difference in attitudes towards this issue ($\chi^2=14.226$, $P=0.003$): only 15.2% of males supported and did not discriminate, whereas 34.2% of females supported and did not discriminate. 41.7% of students believed sex education would not lead to more sexual behavior, with a significant difference between genders ($\chi^2=13.633$, $P=0.001$): 45.7% of females believed sex education would not lead to more sexual behavior, while only 27.3% of males agreed. The majority of students (93.3%) supported universities providing sex education. See Table 8 for details.

Table 8 Basic Situation of College Students' Sexual Concepts (%)

Item	Number (%)	Male (n=66)	Female (n=264)	χ^2 value	P
Would you continue interacting with acquaintances/ classmates/ friends/relatives with HIV?				4.923	0.085
Yes	87 (29.0)	25 (37.9)	62 (26.5)		
No	89 (29.7)	21 (31.8)	68 (29.1)		
Unsure	124 (41.3)	20 (30.3)	104 (44.4)		
Would you look differently upon STD patients?				1.754	0.416

Item	Number (%)	Male (n=66)	Female (n=264)	χ^2 value	P
Yes	81 (27.0)	20 (30.3)	61 (26.1)		
No	112 (37.3)	27 (40.9)	85 (36.3)		
Unsure	107 (35.7)	19 (28.8)	88 (37.6)		
Do you approve of Western-style sexual liberation?				2.375	0.305
Yes	21 (7.0)	7 (10.6)	14 (6.0)		
No	241 (80.3)	49 (74.2)	192 (82.1)		
Unsure	38 (12.7)	10 (15.2)	28 (12.0)		
If your romantic partner makes a sexual request, you would...					
Consider it	157 (52.3)	41 (62.1)	116 (49.6)	65.963	<0.001
Basically comply	22 (7.3)	18 (27.3)	4 (1.7)		
Refuse	121 (40.3)	7 (10.6)	114 (48.7)		
View on college students having sex				13.819	<0.001
Support	47 (15.7)	19 (28.8)	28 (12.0)		

Item	Number (%)	Male (n=66)	Female (n=264)	χ^2 value	P
Oppose	44 (14.7)	4 (6.1)	40 (17.1)	14.226	0.003
Neither	209 (69.7)	43 (65.2)	166 (70.9)		
Attitude towards homosexuality					
Support, no discrimination	90 (30.0)	10 (15.2)	80 (34.2)		
Don't support, discriminate	9 (3.0)	5 (7.6)	4 (1.7)		
Don't support, no discrimination	128 (42.7)	30 (45.5)	98 (41.9)	13.633	0.001
It's none of my business	73 (24.3)	21 (31.8)	52 (22.2)		
Does sex education lead to more sexual behavior?					
Yes	23 (7.7)	11 (16.7)	12 (5.1)		
Possibly	152 (50.7)	37 (56.1)	115 (49.1)		
No	125 (41.7)	18 (27.3)	107 (45.7)	4.823	0.09
Should universities provide sex education?					
Yes	280 (93.3)	58 (87.9)	222 (94.9)		
No	8 (2.7)	4 (6.1)	4 (1.7)		

Item	Number (%)	Male (n=66)	Female (n=264)	χ^2 value	P
Indifferent	12 (4.0)	4 (6.1)	8 (3.4)		

3.4 Reproductive Health-related Behaviors among College Students

The results showed that 84 students (28.0%) had actively learned how to use condoms, including 31 males (47.0%) and 53 females (22.6%). 123 students (40.7%) had viewed pornographic materials, including 42 males (60.4%) and 81 females (41.0%). 46 students (15.3%) had engaged in sexual intercourse, including 18 males (27.3%) and 28 females (12.0%). See Figure 1 for details.

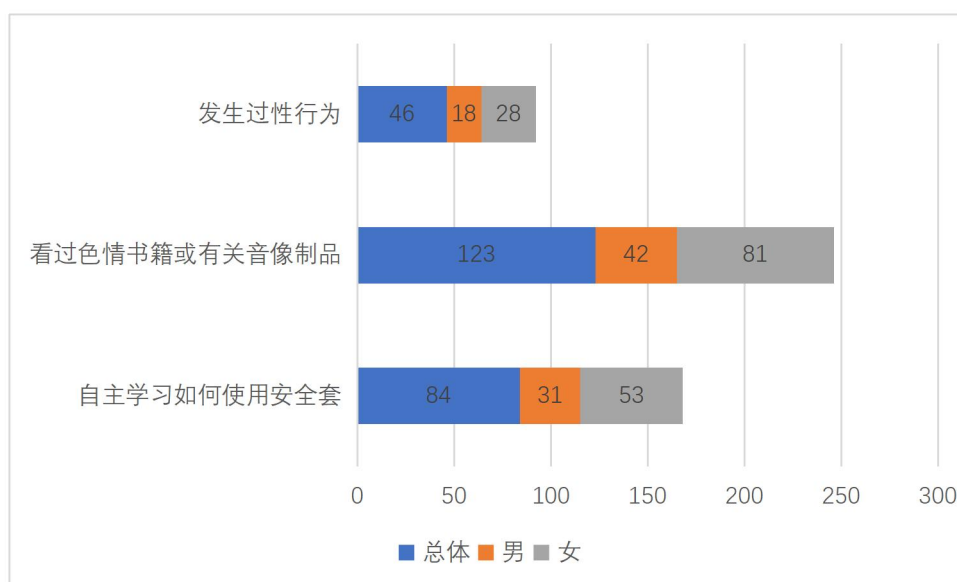


Figure 1 Basic Situation of College Students' Sexual-related Behaviors

4 Discussion

4.1 Current Status of Reproductive Health Knowledge among College Students

4.1.1 Low Level of Reproductive Health Knowledge among College Students

Among the 23 items on reproductive health knowledge, the overall correct answer rate for students ranged from 34.0% to 94.0%, with a total awareness rate of 33.0%. This indicates that college students' understanding of reproductive health knowledge items varies, and their level of reproductive health knowledge is low, consistent with findings from other domestic studies [31-33]. The mean cognitive score for reproductive health knowledge was 16.54 ± 4.03 , which is higher than the result

reported by Wang Ziyang et al. (14.21 ± 5.36) but still at a moderate level ^[34]. The study found that in the dimension of reproductive health common sense, only 74.0% of students knew the fertile period of a normal menstrual cycle, with the correct rate among females (84.6%) being much higher than among males (36.4%). Additionally, only 22.0% of participants were male, reflecting lower attention and participation of male college students in reproductive health issues compared to females. This may be because traditional society assigns women the reproductive role, responsible for bearing and raising future offspring, while men are assigned the productive role, responsible for economic provision and decision-making. This role rigidity tends to view contraception as a female obligation, leading to weaker initiative in contraceptive knowledge among males ^[35]. It may also be because women independently bear the health risks of unintended pregnancy, such as fallopian tube blockage, intrauterine adhesions, secondary infertility ^[36], spontaneous abortion ^[37], preterm birth ^[38], increased pregnancy-related stress in the first trimester, and depression ^[39]. Therefore, reproductive health education needs to enhance male participation, focusing on strengthening male responsibility awareness, clarifying that protecting one's own and one's partner's reproductive health is a shared responsibility. Simultaneously, it is necessary to strengthen women's attention to their own health, cultivate self-respect and self-love awareness, and practice safe and healthy sexual behaviors.

The results show that in the condom use dimension, the correct rates for specific usage methods, such as "condom should be applied before erection contact with genitals" and "condom should be withdrawn after ejaculation and before the penis becomes flaccid," were much lower than other items in the same dimension. This indicates that college students have misconceptions about the correct use of condoms, consistent with previous research findings. College students lack scientific contraceptive knowledge, leading to a series of adverse reproductive health outcomes. Learning how to use condoms correctly is an effective measure to prevent STDs like AIDS. Reproductive health education courses should not only teach effective contraceptive methods but also include related content such as contraceptive

principles, popularize contraceptive knowledge, and provide reproductive health education to prevent adverse reproductive health outcomes and help students recognize the importance and necessity of self-protection.

In the STD and AIDS dimensions, the correct answer rates for most items exceeded 70%, which is higher than many other studies ^[40-41]. However, the cognitive level regarding "whether AIDS is transmitted through mosquito bites" and "whether infection with HIV necessarily means AIDS" was low. This indirectly reflects that students possess basic disease-related knowledge but lack sufficient understanding of AIDS transmission routes and HIV infection symptoms. Education on STD-related knowledge should be strengthened to enhance self-protection awareness.

The results of this study suggest that most college students understand some basic reproductive health common sense and the main transmission routes of AIDS and STDs. However, they have cognitive errors regarding non-efficient contraceptive methods like the rhythm method and withdrawal, low awareness of efficient contraceptive methods like the IUD, and cognitive misconceptions regarding non-primary transmission routes of STDs and contraceptive knowledge. These influence their choice of contraceptive methods, thereby increasing reproductive risks such as unintended pregnancy and abortion ^[42]. It is recommended that reproductive health education be established as a compulsory module in universities ^[43], further strengthening the scientific popularization of contraceptive knowledge among college students.

4.1.2 Multiple Factors Influence College Students' Reproductive Health Cognition

Analysis of factors influencing the level of reproductive health cognition showed that ethnicity, history of being left-behind, and urban/rural residence did not significantly differ in relation to cognitive level, which is inconsistent with some research findings ^[44]. The rapid development of internet technology and the efficiency of information dissemination are gradually weakening the influence of these factors on differences in college students' reproductive health cognition. As grade level increases, students' opportunities to access reproductive health knowledge through

campus social activities significantly increase, and their related cognitive level shows a distinct advantage. This is generally consistent with findings from other scholars [46]. The analysis results also found that annual household income affects college students' reproductive health cognition level. Research shows that family economic conditions influence family investment in children's education [47]. In this study, students with an annual household income between $\geq 30,000$ RMB and $< 80,000$ RMB, and $\geq 80,000$ RMB and $< 300,000$ RMB, had relatively higher reproductive health cognition levels, which is basically consistent with findings from other scholars [48]. However, when family economic conditions exceed a certain threshold, family investment in children's education may decrease. Students who had received school sex education or actively sought reproductive health knowledge had higher levels of reproductive health cognition, proving that reproductive health education is an effective measure to improve college students' cognitive level [49]. However, 40.0% of college students in this survey had never received school sex education, highlighting that the coverage of reproductive health education in Chinese universities still needs improvement. Simultaneously, family members should be encouraged to learn about and communicate reproductive health issues, helping college students establish healthy sexual attitudes.

4.2 Reproductive Health-related Attitudes

The results of this study show that the vast majority of college students already recognize that both men and women share responsibility for contraception. However, in-depth analysis reveals significant gender differences in the choice of specific contraceptive strategies and willingness to use condoms. Compared to males, female students exhibited relatively more traditional and conservative attitudes toward contraception-related issues, demonstrating a higher sense of risk avoidance and self-protection. When faced with a sexual request from a romantic partner, nearly half of the female students chose to refuse, whereas only 10.6% of male students chose to refuse. This data discrepancy clearly reflects that male college students have more open attitudes towards sexual behavior than female college students. Over 50% of

students said they would consider accepting a sexual request from a romantic partner, and more than two-thirds of students held an accepting attitude towards college students engaging in sexual activity. These data confirm that contemporary college students generally show relatively liberal attitudes towards sexual behavior, a conclusion consistent with previous research findings ^[50-51]. Over the past 30 years, the attitudes of young Chinese people towards premarital sex have undergone a significant shift from conservatism to openness, a transition closely related to the increasing influence of Western culture and the implementation of China's late marriage and late childbearing policies ^[3]. However, it can be observed that college students do not blindly pursue Western-style sexual liberation; only 7.0% support it ^[52]. Regarding attitudes towards sexual minorities like homosexuals, about 50% of students chose a neutral stance of "don't support, no discrimination," which aligns with findings from scholars like Deng Zhaoxia ^[53]. This attitudinal tendency reflects an increase in tolerance towards homosexual groups among Chinese college students and a gradual move away from stigmatizing sexual minorities. Less than one-third of college students indicated they would interact normally with AIDS patients, indicating that students still harbor fear towards AIDS and other STDs, exposing significant deficiencies in disease prevention and cognitive responses. Incorrect reproductive health knowledge can not only lead to risks of disease transmission and unintended pregnancy but also induce psychological problems such as anxiety and depression ^[54]. Based on the above research data, it is recommended to further improve the reproductive health knowledge education system in universities ^[55], correct students' misconceptions through scientific guidance, and help them establish scientific and accurate concepts of disease prevention.

4.3 Sexual-related Behaviors of College Students

The results of this study show that among the surveyed students, 15.3% had a history of sexual intercourse, with the proportion of males significantly higher than that of females. This figure is basically consistent with the results of a meta-analysis by domestic scholars on the incidence of sexual behavior among Chinese college

students (15.1%)^[7]. The survey also found that 28.0% of students had actively learned how to use condoms, and 40.7% had been exposed to pornographic materials. These findings indicate that college students are in a sexually active stage and have a strong demand for accessing sex-related knowledge, yet they lack channels to acquire correct reproductive health knowledge. There is an imbalance between knowledge demand and educational supply. To address this situation, it is first recommended that the state and government provide financial support to integrate reproductive health education into the school health education system [56]. Schools should teach content related to physiological knowledge to improve college students' reproductive health literacy^[57]. Furthermore, family reproductive health education is a crucial link. Parents should actively guide their children to correctly approach male-female relationships and establish healthy sexual attitudes with an open mind. The reproductive health knowledge college students receive from various channels is of mixed quality. If misled by incorrect information, they may face increased risks of adverse reproductive health outcomes such as unintended pregnancy, abortion, and STDs.

4.4 Limitations

First, the study sample primarily consisted of college students from some universities in central and southeastern provinces (Jiangxi, Guangdong, Hunan, etc.). Whether the results can be extrapolated to the national level requires further verification. Second, this study uses a cross-sectional design, making it difficult to establish specific causal relationships among the research variables. Third, considering the sensitivity of the research topic, even though an anonymous electronic survey method was used, some respondents may have still concealed information. Additionally, the sample coverage is limited, focusing on participants around 20 years of age at a specific time, making it difficult to fully outline the knowledge levels of different age groups. Finally, the study focused on all college students without distinguishing by major, primarily to more accurately reflect the reproductive health knowledge status of general college students. Medical students, due to their curriculum covering extensive reproductive health knowledge, may have significantly

different cognitive levels compared to non-medical students, potentially interfering with the generalizability of the results. However, the impact of major differences on reproductive health cognition cannot be ignored. Future research will consider using stratified sampling for comparative analysis among different professional groups.

5 Conclusion

Overall, significant differences exist in the level of reproductive health cognition among Chinese college students, and the systematic nature and accuracy of their related knowledge need improvement. Regarding knowledge mastery, most college students lack sufficient reproductive health knowledge, have superficial contraceptive cognition, and low accuracy in disease-related knowledge. While they have some understanding of contraceptive methods, they know little about the specific mechanisms and principles of contraception. Their understanding of condom use is limited to the theoretical level, lacking practical operational knowledge. Most students have a basic understanding of general AIDS prevention methods but have fuzzy cognition regarding key information such as transmission routes and the infectious period. Looking at the educational status quo, the sex education received by college students from both school and family is insufficient. They lack channels for acquiring reproductive health-related knowledge, with most students tending to seek sex knowledge independently. Students who have received systematic school education or actively sought related knowledge have higher levels of reproductive health cognition. There is also a certain correlation between annual household income and college students' reproductive health cognition level.

Gender differences exist in attitudes towards contraception, with female students tending to prefer more scientific and conservative contraceptive methods and also adopting a more cautious attitude towards engaging in sexual behavior. Notably, regarding attitudes towards sexual minorities like homosexuals, female students show significantly higher acceptance than male students. Furthermore, although over half of the college students believe that reproductive health education would promote sexual behavior, 93.3% support its implementation.

The proportion of college students engaging in sexual-related behaviors is continuously rising, making the implementation of reproductive health education particularly urgent for college students. Domestic research data confirms that systematic sexual health education can significantly enhance college students' reproductive health knowledge, optimize their perception of sexual values, and effectively guide safe sexual behavior decisions. Public health institutions and medical practitioners, especially gynecologists and primary care physicians, need to, on one hand, intensify the popularization of reproductive health knowledge and, on the other hand, ensure the supply and accessibility of contraceptives. They should guide students to establish correct sexual values, enhance their self-protection awareness, advocate for safe sexual behavior, promote scientific contraceptive knowledge, reduce the risks of unintended pregnancy and STDs, and promote the physical and mental health of college students.

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Appendix: Survey Questionnaire on Reproductive Health among College Students

Hello! As reproductive health issues show a trend of affecting younger populations, in-depth exploration of reproductive health among college students is warranted. This survey focuses on the current status of reproductive health knowledge, attitudes, and behaviors among college students, aiming to provide a basis for reproductive health education in universities. This questionnaire is anonymous and is used solely for academic analysis. Your honest responses will provide important support for this research. Thank you for your participation!

1. Gender: ① Male ② Female
2. Ethnicity: ① Han ② Other
3. Grade: ① Freshman ② Sophomore ③ Junior ④ Senior
4. Permanent residence: ① Urban ② Rural
5. Were you a left-behind child during childhood (rural household registration, under 16 years old, unable to live normally with parents due to both parents working away from home or one parent working away while the other lacks guardianship capacity): ① Yes ② No
6. Father's education level: ① Illiterate ② Primary school ③ Junior high school ④ Senior high school (or technical secondary school) ⑤ Junior college ⑥ Bachelor's degree or above
7. Mother's education level: ① Illiterate ② Primary school ③ Junior high school ④ Senior high school (or technical secondary school) ⑤ Junior college ⑥ Bachelor's degree or above
8. Annual household income (in ten thousand RMB): ① <3 ② ≥ 3 and <8 ③ ≥ 8 and <30 ④ ≥ 30 and <100 ⑤ ≥ 100
9. Previous school-based sex education: ① Yes ② No
10. Previous home-based sex education: ① Yes ② No
11. Have you ever actively learned about sexual knowledge: ① Yes ② No
12. During which phase is a woman with a normal menstrual cycle most fertile? ① Before menstruation ② During menstruation ③ Around 14 days before the next

menstrual period ④ After menstruation ⑤ Not sure

13. Will menstruation temporarily stop after a woman becomes pregnant? ① Yes ② No ③ Not sure

14. Can casual sexual intercourse lead to pregnancy? ① Yes ② No ③ Not sure

15. Is a small amount of sperm released before male ejaculation? ① Yes ② No ③ Not sure

16. The method that provides dual protection against pregnancy and STDs: ① Condom ② Oral contraceptive pill ③ Fertility awareness-based methods (rhythm/calendar) ④ Withdrawal (coitus interruptus) ⑤ Intrauterine device (IUD)/coil ⑥ Diaphragm ⑦ Sterilization (tubal ligation/vasectomy) ⑧ Not sure

17. Which of the following is a less effective contraceptive method? ① Oral contraceptive pill ② Condom use ③ Diaphragm use ④ Withdrawal (coitus interruptus) ⑤ Not sure

18. The contraceptive principle of an intrauterine device (IUD): ① It forms a barrier preventing sperm from entering the uterus ② It prevents ovulation ③ It inhibits sperm activity ④ It prevents the fertilized egg from implanting in the uterus ⑤ Not sure

19. Can antibiotics reduce the effectiveness of contraceptives? ① Yes ② No ③ Not sure

20. Should you check the expiry date of a condom before use? ① Yes ② No ③ Not sure

21. When using a condom, should it be put on after the penis is erect and before it contacts the partner's genitals? ① Yes ② No ③ Not sure

22. When using a condom, should the penis be withdrawn while still erect (before it goes soft) after ejaculation? ① Yes ② No ③ Not sure

23. When using a condom, should you hold the rim of the condom firmly during withdrawal? ① Yes ② No ③ Not sure

24. Does the disappearance of STD symptoms mean the STD is cured? ① Yes ② No ③ Not sure

25. Do only people with multiple sexual partners get STDs? ① Yes ② No ③ Not sure
26. Is withdrawal (coitus interruptus) as effective as condom use in preventing STDs? ① Yes ② No ③ Not sure
27. Is there currently a vaccine to prevent AIDS? ① Yes ② No ③ Not sure
28. Can AIDS be transmitted through mosquito bites? ① Yes ② No ③ Not sure
29. Can you get infected by dining with someone who has HIV/AIDS? ① Yes ② No ③ Not sure
30. Can correct condom use reduce the risk of HIV (AIDS) transmission? ① Yes ② No ③ Not sure
31. Can maintaining a mutually monogamous sexual relationship reduce the risk of HIV (AIDS) transmission? ① Yes ② No ③ Not sure
32. Can AIDS be cured at present? ① Yes ② No ③ Not sure
33. Does once being infected with HIV mean one has AIDS? ① Yes ② No ③ Not sure
34. Is the period after infection but before HIV is detected infectious? ① Yes ② No ③ Not sure
35. Who do you think should bear the responsibility for contraception? ① Male ② Female ③ Both
36. What is your priority when choosing a contraceptive method? ① Comfort ② Contraceptive effectiveness ③ Convenience ④ Other
37. Would you use a condom if you engage in sexual intercourse? ① Yes ② No ③ Not sure
38. If you need to purchase contraceptive pills, where would you choose to buy them? ① Store ② Vending machine ③ Hospital or pharmacy ④ Free distribution by organizations
39. Would you continue to associate with an acquaintance, classmate, friend, or relative who is infected with HIV? ① Yes ② No ③ Not sure
40. Would you look at people with STDs differently? ① Yes ② No ③ Not sure

41. Do you agree with the Western concept of sexual liberation? ① Yes ② No ③ Not sure
42. If your romantic partner proposes sexual intercourse, would you: ① Consider it ② Mostly comply ③ Refuse
43. What is your view on college students engaging in sexual behavior? ① Support ② Oppose ③ Neither support nor oppose
44. What is your attitude towards homosexuality? ① Support and do not discriminate ② Do not support and discriminate ③ Do not support but do not discriminate ④ Indifferent/Doesn't matter to me
45. Do you think sex education would lead to more sexual behavior? ① Yes ② Possibly/Maybe ③ No
46. Do you think universities should provide sex education? ① Yes ② No ③ Indifferent/Doesn't matter
47. Have you ever actively learned how to use a condom? ① Yes ② No
48. Have you ever viewed pornographic books or audio-visual materials? ① Yes ② No
49. Have you ever had sexual intercourse? ① Yes ② No