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Knowledge, attitudes and practices regarding sexual health among Chinese medical students: a multicenter cross-sectional study

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Abstract

Background Sexual health is crucial for overall well-being, yet sexual health education among medical students in China remains limited. This multicenter cross-sectional study assesses the knowledge, attitudes, and practices (KAP) regarding sexual health among Chinese medical students to inform educational policies.

Methods An electronic survey was conducted across three leading medical institutions in Beijing, targeting postgraduate medical students. The survey assessed demographics, sexual health knowledge, attitudes, and behaviors. Data were analyzed using descriptive statistics and logistic regression to identify factors associated with sexual behavior.

Results Among 765 participants, 79% identified as heterosexual, and 28.2% reported engaging in sexual activity. While the overall sexual health knowledge was relatively high, students with sexual experience had significantly higher contraceptive knowledge. Misconceptions were common, with 25.8% believing that sex during the safe period doesn't lead to pregnancy, and 14.9% considering withdrawal before ejaculation effective for contraception. Positive attitudes toward sexual health were noted, though traditional views on committed relationships persisted. Logistic regression identified factors associated with sexual activity: higher monthly expenses, rural residency, and non-heterosexual orientation. Undergraduate and female students were less likely to engage in sexual activity.

Conclusions This study highlights significant gaps in sexual health knowledge, particularly about contraception and HPV vaccination. The findings stress the need for comprehensive sexual health education to address knowledge gaps and cultural attitudes, preparing future healthcare professionals for effective, non-judgmental patient care.

Keywords Sexual health, Medical students, KAP, Sex education

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Introduction

Sexual health is a critical component of overall health, defined as 'a state of physical, emotional, mental, and social well-being in relation to sexuality, encompassing sex, gender identities and roles, sexual orientation, eroticism, pleasure, intimacy, and reproduction' [1]. Adolescents frequently encounter significant health challenges due to inadequate sexual education, including the transmission of Human Papillomavirus (HPV) [2] repeat adolescent pregnancies [3], and an alarming rise in youth abortions [4-6]. Moreover, the lack of comprehensive education exacerbates critical social issues, such as increased partner-related sexual violence and the inability to identify or respond to sexual assault [7, 8]. These trends highlight the urgent need for implementing comprehensive sexual education programs, which are essential for cultivating healthy, confident, and egalitarian sexual attitudes. Such initiatives not only enhance individual and population health but also play a pivotal role in reducing health disparities.

Within the adolescent population, medical students constitute a unique subgroup, as they represent the future healthcare providers and knowledge mediators. Evidence suggests that healthcare providers' competence in sexual health directly impacts patient outcomes. However, cultural, normative, and cognitive barriers frequently hinder adequate integration of sexual health into clinical practice [9–11]. For medical students, comprehensive and standardized sexual health education is a foundational pillar of their professional development. It equips them with the necessary knowledge to navigate the multifaceted dimensions of sexual health, including fertility management, prevention and treatment of sexually transmitted infections (STIs), and understanding sexual function, desire, and arousal [12]. Additionally, fostering a supportive and inclusive attitude towards sexual health is imperative for effective communication with patients, enabling the dismantling of stigma and discrimination in reproductive health services [13–15]. An integrative review found that many instances of inadequate nursing care may be attributed to a heteronormative culture and a lack of education on LGBTQ health, while information specific to LGBTQ populations is rarely incorporated into undergraduate curricula or healthcare policy [16]. A study in the UK indicated that although most health professionals agreed that sexual issues should be addressed, only 6% frequently initiated discussions with patients, largely due to insufficient training and embarrassment. Besides, a previous study found that Chinese students scored high level of knowledge compared to foreigners while several misconceptions, confusion, and fear existed. There is a growing need to strengthen medical education on HIV/ AIDS and sexually transmitted infections [17]. Without sexual health education in medical education, medical practitioners may provide medications and other treatments with sexual side effects and not address sexual health as a component of general health [18]. These findings emphasize the importance of understanding medical students' sexual knowledge, attitudes, and the current state of sexual education, to inform targeted policies that better support health professionals in overcoming these barriers [19].

Globally, studies from countries such as the United States, Austria, and Brazil have highlighted gaps in the implementation of sexual health education within medical schools. Findings consistently indicate that sexual health education for medical students remains inadequate, underscoring a pressing need for reform [20-22]. Strengthening sexual health education in medical curricula has emerged as an international priority, with evidence suggesting its potential to enhance medical students' competency in addressing patients' sexual health concerns [23, 24]. In recent years, China has increasingly recognized the positive impact of standardized sexual education on adolescent health outcomes. Existing research has explored the effects of sexual education on Chinese adolescents' sexual knowledge, attitudes, and behaviors, as well as its influence on university students' sexual health literacy [25, 26]. In the current KAP study on sexual health with medical students as the target population, their knowledge of the HIV/AIDS virus and its vaccine was analysed comparatively by dimensions such as nationality and grade [17, 27, 28], focusing more on the relationship between knowledge of the transmission process and willingness to be vaccinated against the human papillomavirus (HPV). Even with similar research questions there are limitations such as the small number of people studied and the length of time that has elapsed since the study was conducted [29, 30].

This study addresses this critical gap by investigating the knowledge, attitudes, and practices (KAP) of medical students from three leading medical schools in China. It aims to assess their sexual health knowledge and attitudes, as well as to the relationship between these factors and their sex behaviors. The findings will contribute to the evidence base necessary for developing targeted and effective sexual health education policies, ultimately improving the preparedness of future healthcare providers to address sexual health issues in clinical practice.

Materials and methods

Study settings and design

This study utilized a multicenter cross-sectional design conducted within medical colleges. Data collection took place through electronic questionnaires at three leading medical institutions in Beijing, China: Peking Union

Medical College of the Chinese Academy of Medical Sciences, Capital Medical University, and the School of Medicine at Peking University. Data were collected in June 2024. Taking advantage of the high internet usage among Chinese students, we distributed questionnaire QR codes during offline seminars organized by the Red Cross Societies at each institution. Red Cross Society members then shared the survey links within WeChat groups, targeting potential respondents. Participation was voluntary, and incentives were provided to those who completed the questionnaire. To minimize the risk of multiple submissions by the same individual, responses were restricted to one submission per unique Internet Protocol (IP) address. Additionally, attention-check questions were included in the survey to help filter out invalid responses.

Eligibility criteria

Ethical approval for this study was granted by the Institutional Review Board of Peking Union Medical College (CAMS&PUMC-ICE-2020–030). All participants provided written informed consent prior to completing the questionnaire.

Sample size calculation

The sample size calculation for this study is based on the proportion of students engaging in sexual activity, with the goal of achieving a specified level of precision and confidence. We aimed to estimate the prevalence of sexual behavior with a margin of error (ME) of 5% and a confidence level of 95%. The calculation was performed using the following formula for the sample size required for a proportion in a single sample:

$$n = \frac{\left(Z_{\alpha/2} + Z_{\beta}\right)^2 p(1-p)}{ME^2}$$

where:

 $Z_{\alpha/2}$ is the Z-score corresponding to the desired confidence level (95%), which is 1.96 for a two-tailed test.

 Z_{β} is the Z-score corresponding to the desired power (80%), which is 0.84.

p is the estimated prevalence of sexual behavior, which was 16.1% (0.161) based on a previous study conducted in 2019 by Zhao et al. [16].

ME is the margin of error, set at 5% (0.05) for this study. Substituting the values into the formula, we calculated the required sample size as follows:

$$n = \frac{(1.96 + 0.84)^2 \times 0.161 \times (1 - 0.161)}{0.05^2} = 423.608$$

Rounding up to the nearest whole number, the sample size required is 424 students.

Participants

The study used a purposive sampling method to select participants with relevant professional expertise. Inclusion criteria were defined for medical students pursuing postgraduate studies (Bachelor's degree or higher) at the three medical colleges in Beijing. These students represented a range of disciplines, including Clinical Medicine, Nursing, and other health-related fields such as Public Health, Epidemiology, and Health Statistics. To be eligible, participants had to be full-time students enrolled in their respective medical institutions. The participant recruitment process is illustrated in the accompanying Fig. 1.

Additionally, a small pilot study was conducted at Peking Union Medical College, selecting a subset of medical students (n = 22), representing disciplines such as Clinical Medicine, Nursing, and other medical fields, corresponding to 5% of the calculated sample size. This pilot study aimed to assess the questionnaire's accessibility, readability, and clarity. Feedback from participants was reviewed and integrated into the final questionnaire, ensuring consistency with existing literature. After indepth discussions, the final version of the questionnaire was determined and distributed to participants for their responses.

Questionnaire design

The questionnaire used in this study consisted of four sections designed to collect information from medical students. The first section assessed the demographic and general characteristics of the students, including age, biological sex, gender identity, educational background, family's geographic location, family attitudes toward gender, and monthly living expenses. The second section focused on knowledge, comprising 15 items related to contraception, sexually transmitted diseases, and general sexual health knowledge. Each question had a binary response option (Yes/No), with correct answers scored as 1 and incorrect answers scored as 0. Previous studies have found that the awareness rate of sexual and reproductive health knowledge among Chinese medical and nursing students ranges from 60 to 80% [31-33]. Therefore, we defined a correct response rate of less than 80% as low, 80% to 90% as medium, and above 90% as high. Consequently, we classified respondents with scores of less than 20 as having low sexual knowledge, those with scores between 20 and 23 as having medium sexual knowledge, and those with scores above 23 as having high sexual knowledge.

The third section assessed attitudes through six questions regarding sexual attitudes, including students' perspectives on family values related to gender and sexual orientation. Responses were recorded on a 5-point Likert scale, ranging



Fig. 1 Flowchart of participant inclusion in the analytical sample

from Strongly Agree (1) to Strongly Disagree (5). A previous study found that positive sexual attitude is considered > 60%, thus based on a cutoff point of 60% of the maximum possible score for each attitude domain, each question on the scale was assigned a value of positive (1) or negative (0) [19]. These values were then summed to obtain an overall score for the scale, with total scores interpreted as follows: a score of < 3 indicates a negative sexual attitude, >4 indicates a positive sexual attitude, and others indicates the neutral sexual attitudes.

The final section gathered information on the occurrence of sexual behaviors among medical students, with responses recorded as Yes or No. For a detailed list of questions used to assess knowledge, attitudes, and practices, please refer to Supplementary File 1.

Patient and public involvement statement

The survey questionnaire was designed collaboratively by the authors, who are students and faculty members from medical colleges. YL and TB organized a pilot study involving 22 medical students from Peking Union Medical College, representing various medical disciplines. Group interviews were conducted to gather feedback, which was used to refine the questionnaire. This process ensured that the survey was relevant and accessible to the target audience, enhancing the quality and applicability of the research. The feedback from the pilot study participants, particularly regarding the clarity and relevance of the questions, was crucial in shaping the final version of the questionnaire.

Statistical analysis

Descriptive statistics were used to summarize demographic and study variables, providing a comprehensive overview of the data. Participants were categorized based on self-reported sexual experience (yes/no) to examine potential differences in sexual health knowledge and attitudes. This grouping decision was informed by prior evidence suggesting that personal sexual experiences may influence both knowledge acquisition (e.g., through practical engagement with contraception) and attitudinal shifts (e.g., reduced stigma toward premarital sex) [34]. A two-sample t-test was conducted to assess differences in sexual knowledge scores between students with and without sexual experience. Chi-square tests were performed to identify factors associated with medical students'attitudes and knowledge regarding sexual behavior. Binary logistic regression analysis was employed to examine potential correlates of sexual behavior, considering general demographic information, sexual knowledge, and attitudes. Variables that were significant at the p < 0.25 level in the univariate analysis were included in the multivariate logistic regression model. Odds Ratios (ORs) and their corresponding 95% confidence intervals (CIs) were calculated to estimate the strength and direction of these associations. All analyses and

graphical representations were conducted using R software, version 4.1.3, with two-tailed P < 0.05 considered to indicate statistical significance.

Results

Sample characteristics

Among the 765 participants, 177 (23.1%) were from Peking University, 363 (47.5%) were from Peking Union Medical College, and 225 (29.4%) were from Capital Medical University. The majority of participants were majoring in Clinical Medicine (289, 37.8%) and Nursing (210, 27.5%). A total of 481 participants (62.9%) were under 22 years old, while 284 (37.1%) were 22 years or older. In terms of biological sex, 515 participants (67.3%) were female and 250 (32.7%) were male. Regarding psychological gender, 10 participants (1.3%) identified as third gender. The largest proportion of participants were undergraduates (586, 76.6%), lived in urban areas (549, 71.8%), and came from nuclear families (679, 88.8%). Regarding family values on sex, 461 participants (60.3%) considered their family values traditional, 162 (21.2%) considered them neutral, and 142 (18.6%) considered them open-minded. Approximately 81.4% had expenses between 1000 and 3000 CNY. The majority of participants identified as heterosexual (609, 79.6%). Regarding sexual attitudes, 416 participants (54.4%) had a positive sexual attitude, 291 (38.0%) had a neutral attitude, and 58 (7.6%) had a negative attitude. Regarding sexual knowledge, 419 participants (54.8%) had high sexual knowledge, 215 (28.1%) had medium sexual knowledge, and 131 (17.1%) had low sexual knowledge. Moreover, our survey found that as of the survey date, 216 of students (28.24%) had previous sexual experience, and 549 of students (71.76%) had no sexual experience (Table 1).

Sexual knowledge

The mean (SD) score for sexual knowledge among participants was 22.62 (2.73), with an overall awareness rate of 87% (22.62/26). The mean scores for each dimension of sexual knowledge were as follows: 4.50 (0.82) for correct contraceptive measures, 3.92 (0.36) for correct sexual transmission disease prevention, 4.68 (0.76) for correct sexual activity knowledge, 4.52 (0.64) for knowledge of sexually transmitted diseases, and 4.99 (1.99) for correct HIV prevention. Regarding knowledge of contraceptive measures, students with sexual experience scored significantly higher than those without sexual experience (4.68 vs. 4.43, P < 0.001) (Table 2).

Specifically, the results revealed that among correct contraceptive measures, 568 students (74.2%) did not believe that calculating the safe period effectively prevents pregnancy. Notably, 83.9% of students with sexual experience and 70.5% of those without sexual experience recognized that calculating the safe period is not a reliable contraceptive method, a difference that was statistically significant (P < 0.001); 651 students (85.1%) understood that pulling out before ejaculation is not an effective contraceptive measure. Among these, 198 students (91.7%) with sexual experience and 453 students (82.5%) without sexual experience shared this understanding, with a statistically significant difference between the groups (P = 0.001). In terms of sexually transmitted disease (STD) prevention, only 21 students (2.7%) knew that HPV vaccination does not fully prevent cervical cancer. Meanwhile, 733 students (95.8%) were aware that males can also contract HPV. A significant difference was observed between students with and without sexual experience on this topic (98.1% vs. 95.8%, P= 0.043). Concerning sexual activity knowledge, 725 students (94.8%) correctly understood that females who have not engaged in sexual intercourse do not have a completely intact hymen. A greater proportion of students with sexual experience were aware of this compared to those without sexual experience (97.7% vs. 93.6%, *P* = 0.023). Additionally, only 75.4% of students correctly identified that candidiasis is not transmitted through sexual activity. Similarly, 82.1% of students knew that dining with an HIV carrier does not result in HIV transmission, while 78.6% were aware that sharing razors or toothbrushes with an HIV carrier poses a risk of HIV transmission. For further details, please refer to Table S1 in the supplementary materials.

Sexual attitude

The findings show that 91.8% of Chinese medical students accept LGB friends, 67.6% accept their partner's prior sexual relationships, 83.3% accept premarital sex, and 87.1% do not believe that sex education is related to early sexual activity. A majority of students agree that sexual activity should only occur between sex partners (74.4%) and that discussing sexual topics should not be avoided (83.7%). In summary, more than half (54.4%) of the students had a positive sexual attitude, 38.0% had a neutral attitude, and 7.6% had a negative attitude. Students with sexual experience were more likely to accept their partner's prior sexual relations (75.9% vs. 64.3%, P = 0.008) and premarital sex (96.3% vs. 78.1%, P < 0.001) than those without sexual experience. Overall, students with sexual experience displayed a more positive sexual attitude (p = 0.039) (Table 3).

Table 1 Sample characteristics by sex behavior

	Have sex	No sex	Overall	P-value	Chi-square
	(N=216)	(N = 549)	(N = 765)		•
School					
Peking University	66 (30.6%)	111 (20.2%)	177 (23.1%)	0.0238*	11.2582
Peking Union Medical College	100 (46.3%)	263 (47.9%)	363 (47.5%)		
Capital Medical University	50 (23.1%)	175 (31.9%)	225 (29.4%)		
Maior					
Nursing	33 (15.3%)	177 (32.2%)	210 (27.5%)	< 0.001***	33.0492
Clinical Medicine	78 (36.1%)	211 (38.4%)	289 (37.8%)		
Other Majors	105 (48.6%)	161 (29.3%)	266 (34.8%)		
Academic Level					
Undergraduate	119 (55.1%)	467 (85.1%)	586 (76.6%)	< 0.001***	77.6862
Graduate	97 (44.9%)	82 (14.9%)	179 (23.4%)		
Age					
< 22	86 (39.8%)	395 (71.9%)	481 (62.9%)	< 0.001***	68.5739
>=22	130 (60.2%)	154 (28.1%)	284 (37.1%)		
Biological Sex					
Male	93 (43.1%)	157 (28.6%)	250 (32.7%)	< 0.001***	14.7287
Female	123 (56.9%)	392 (71.4%)	515 (67.3%)		
Psychological Gender					
Male	92 (42.6%)	157 (28.6%)	249 (32.5%)	0.00727*	14.0084
Female	121 (56.0%)	385 (70.1%)	506 (66.1%)		
Other	3 (1.4%)	7 (1.3%)	10 (1.3%)		
Region	- (,	(112)-1)			
Urban Area	150 (69.4%)	399 (72 7%)	549 (71.8%)	0.286	5 0102
Town	35 (16 2%)	101 (18.4%)	136 (17.8%)	0.200	5.0102
Bural Area	31 (14 4%)	49 (8 9%)	80 (10 5%)		
Family Type	31 (1	15 (01570)	00 (10.070)		
Nuclear Family	193 (89 4%)	486 (88 5%)	679 (88.8%)	0.998	1 0994
Skip-Generation Family	4 (1.9%)	17 (3.1%)	21 (2.7%)	0.520	
Single-Parent Family	13 (6 0%)	29 (5 3%)	42 (5 5%)		
Remarried Family	4 (1 9%)	11 (2 0%)	15 (2.0%)		
Other	2 (0.9%)	6 (1.1%)	8 (1.0%)		
Family Values	_ ((), (),	- (,-,	- (,		
Traditional	121 (56.0%)	340 (61 9%)	461 (60 3%)	0.656	2 4 3 4 9
Neutral	49 (22 7%)	113 (20.6%)	162 (21.2%)	0.000	2.1017
Open-Minded	46 (21 3%)	96 (17 5%)	142 (18.6%)		
Monthly Living Expenses (CNY)					
1000 and Below	3 (1 4%)	19 (3 5%)	22 (2 9%)	< 0.001***	65 0563
1000-1500	17 (7 9%)	117 (21 3%)	134 (17 5%)		00.0000
1500-2000	43 (19 9%)	171 (31.1%)	214 (28.0%)		
2000-2500	50 (23.1%)	123 (22.4%)	173 (22.6%)		
2500-3000	41 (19.0%)	61 (11 1%)	102 (13 3%)		
Above 3000	62 (28 7%)	58 (10.6%)	102 (15.3%)		
Sexual Orientation	02 (20.770)	56 (10.070)	120 (13.770)		
Pansavual Assavual and Othors	1 (1 0%)	10 (7 30%)	11 (5 804)	< 0.001***	27 2697
Hotorosovual	+ (1.270) 174 (20 604)	40 (7.370) 125 (70 204)	44 (J.070) 600 (70 604)		27.2007
	10 (8 20%)	11 (2 00%)	30 (3 00%)		
Pisovual	1 7 (0.070)	62 (11 E0/)	JU (J. 770)		
DISEXUAI	19 (8.8%)	(11.5%)	ŏZ (10.7%)		

	Have sex	No sex	No sex Overall		Chi-square
	(N=216)	(N = 549)	(N = 765)		
Sexual Attitude					
Positive	137 (63.4%)	279 (50.8%)	416 (54.4%)	0.0394*	10.0599
Neutral	67 (31.0%)	224 (40.8%)	291 (38.0%)		
Negative	12 (5.6%)	46 (8.4%)	58 (7.6%)		
Sexual Knowledge Level					
High (> 23)	130 (60.2%)	289 (52.6%)	419 (54.8%)	0.14	6.9165
Medium (20–23)	46 (21.3%)	169 (30.8%)	215 (28.1%)		
Low (< 20)	40 (18.5%)	91 (16.6%)	131 (17.1%)		

Values are denoted as Number (%)

 Table 2
 Sexual knowledge among Chinese medical students by sex behavior

	Have sex	No sex	Overall	P-value	t-statistic
	(N=216)	(N=549)	(N=765)		
Correct contraceptive measures	4.68 (0.75)	4.43 (0.83)	4.50 (0.82)	< 0.001***	3.8003
Sexual transmission disease prevention	3.95 (0.33)	3.91 (0.37)	3.92 (0.36)	0.152	1.4339
Sexually activity	4.73 (0.79)	4.67 (0.75)	4.68 (0.76)	0.339	0.9563
Sexually transmitted diseases	4.52 (0.67)	4.52 (0.63)	4.52 (0.64)	0.909	0.4548
HIV prevention	4.83 (2.09)	5.05 (1.95)	4.99 (1.99)	0.177	-1.3513
Total sexual knowledge	22.72 (2.85)	22.58 (2.69)	22.62 (2.73)	0.534	0.6218

Values are denoted as Mean (SD). The differences were tested for exact significance (two-sided) by t-test

Logistic regression analysis of factors associated with sexual behavior

In the results of our binary logistic regression analysis, as depicted in the forest plot (Fig. 2), several key variables were identified as significantly associated with sexual behavior among medical students. Notably, undergraduate students exhibited a reduced likelihood of engaging in sexual behavior compared to their graduate counterparts (OR = 0.39, 95% CI: 0.20–0.76, P = 0.006). Female students were also found to have a lower probability of sexual activity than males (OR = 0.57, 95% CI: 0.38-0.86, P = 0.007). Additionally, students residing in rural areas showed a significantly higher odds of sexual behavior than those in urban areas (OR = 2.68, 95% CI: 1.45-4.98, P = 0.002). Economic status, as indicated by monthly living expenses, played a substantial role, with students spending more than 2500 CNY per month demonstrating a markedly increased odds of sexual behavior (OR = 5.78, 95% CI: 3.14-11.09, P< 0.001). Furthermore, students with monthly expenses ranging from 2000 to 2500 CNY also presented higher odds (OR = 2.96, 95% CI: 1.56-5.80, P = 0.001). Sexual orientation was also associated with heterosexual (OR = 3.87, 95% CI: 1.39-14.03, P= 0.019), LGB (OR = 15.02, 95% CI: 3.92–69.46, P < 0.001), and bisexual (OR = 3.71, 95% CI: 1.15–14.79, P = 0.040) students all exhibiting higher odds of sexual behavior compared to those identifying as heterosexual, asexual, or other. Conversely, academic level (undergraduate vs. graduate), age, and other variables including school affiliation, major, and region (specifically town vs. urban comparison) did not demonstrate statistically significant associations with sexual behavior in the multivariate analysis. Notably, neither positive sexual attitudes nor higher sexual knowledge scores showed significant predictive value for sexual activity in the adjusted model.

Discussion

Using data from a multicenter survey, we analyzed sexual knowledge, attitude and practice among medical students in China. Considering that medical students are future healthcare providers, whose knowledge, behavior, and attitudes toward sexuality may influence their future clinical practices [22], schools, families, and governments should collaborate to improve the sexual health of medical students.

Our study revealed that 79.6% of medical students reported as heterosexual, a figure comparable to the 76.3% reported in the UK Millennium Cohort [35]. Besides, 28.2% of medical students reported having engaged in sexual activity, a rate significantly higher than the 12.6% reported by the general population of

	Have sex	No sex	Overall	P-value	Chi-square
	(N = 216)	(N = 549)	(N=765)		
Acceptance of	of LGB friends				
Positive	195 (90.3%)	507 (92.3%)	702 (91.8%)	0.644	0.8806
Negative	21 (9.7%)	42 (7.7%)	63 (8.2%)		
Non-accepta	nce of partner	's prior sexual	relations		
Positive	164 (75.9%)	353 (64.3%)	517 (67.6%)	0.00837**	9.5652
Negative	52 (24.1%)	196 (35.7%)	248 (32.4%)		
Acceptance of	of premarital s	ex			
Positive	208 (96.3%)	429 (78.1%)	637 (83.3%)	< 0.001***	36.6685
Negative	8 (3.7%)	120 (21.9%)	128 (16.7%)		
Sex education	n and early se	kual activity			
Positive	183 (84.7%)	483 (88.0%)	666 (87.1%)	0.482	1.4586
Negative	33 (15.3%)	66 (12.0%)	99 (12.9%)		
Sexual activity	y limited to pa	irtners			
Positive	63 (29.2%)	133 (24.2%)	196 (25.6%)	0.371	1.9857
Negative	153 (70.8%)	416 (75.8%)	569 (74.4%)		
Avoidance of	sexual topic c	liscussions			
Positive	184 (85.2%)	456 (83.1%)	640 (83.7%)	0.774	0.5121
Negative	32 (14.8%)	93 (16.9%)	125 (16.3%)		
Total Sexual Attitude					
Positive	137 (63.4%)	279 (50.8%)	416 (54.4%)	0.0394*	10.0599
Neutral	67 (31.0%)	224 (40.8%)	291 (38.0%)		
Negative	12 (5.6%)	46 (8.4%)	58 (7.6%)		

Chinese university students [36, 37]. This discrepancy may be attributed to the fact that medical students often hold more liberal views on sexuality and are more likely to self-report sexual activity. However, the prevalence of sexual activity among Chinese medical students remains lower than that in Western countries, such as U.S., where studies indicate that 80% of male and 73% of female university students have engaged in sexual activity [38]. This difference may reflect the influence of Confucian value in China, which traditionally emphasize sexual propriety, where men and women are expected to maintain emotional distance and avoid premarital sexual contact [39].

Our findings indicate significant gaps in sexual and contraceptive knowledge among medical students, highlighting a need for improved sexual health education. For example, 25.8% of medical students incorrectly believed that engaging in sexual activity during the safe period would not lead to pregnancy, and 14.9% thought that withdrawal before ejaculation is an effective contraceptive method. These misconceptions contribute to the risk of unintended pregnancies, as previous studies have shown that the lack of accurate contraceptive knowledge correlates strongly with higher rates of unintended pregnancy [40, 41]. Although sex education has been included in the formal curriculum of secondary schools

in China since 1988, sex education for Chinese teens or young adults still be limited in practice. A previous study reported that more than the half of Chinese university students access contraceptive knowledge from the internet [42]. Misconceptions about contraception among medical students may lead to an inability to rule out the possibility of pregnancy during clinical practice, potentially resulting in missed optimal treatment options. Therefore, education on contraceptive knowledge for medical students should be strengthened. Additionally, students without sexual experience demonstrated significantly lower scores on contraceptive knowledge than those with such experience, emphasizing the importance of providing comprehensive sexual education to all students, regardless of their sexual activity history. Moreover, only 2.7% of students knew that HPV vaccines can prevent 70%–90% of the HPV-related cancers, can't fully prevent cervical cancer[[43]]. Some previous studies found that HPV vaccination knowledge among students and health professionals was frequently incomplete, which suggests that sex education for medical students needs to strengthen the dissemination of knowledge about HPV and the HPV vaccine to prevent spreading misinformation and causing confusion among patients in their future practice [44, 45]. Additionally, students with no sexual experience often lacked understanding that an intact hymen is not a definitive marker of virginity. These misconceptions contribute to the stigmatization of female sexual behavior and reinforce harmful stereotypes. Therefore, sex education for medical students should include more comprehensive information about the hymen to prevent the stigmatization of female patients in future clinical practice.

Besides, most students held positive attitudes toward sexual health, with those reporting sexual experience showing greater acceptance of premarital sex and prior sexual relationships. Specifically, 83.3% of students expressed acceptance of premarital sex, which is higher than the 65.8% reported in a 2020 study of Chinese university students [46]. At the same time, a majority of students agree that sexual activity should only occur between committed partners, which suggested that despite the more liberal views on certain aspects of sexuality, many students still held traditional attitudes when it comes to issues such as sexual activity within committed partners.

Our analysis identified several key factors for sexual behavior among medical students. Graduate students had higher odds of reporting sexual activity compared to undergraduates, potentially related to differences in age and maturity. Previous studies have shown that as adolescents mature, their attitudes toward sex tend to become more permissive [47]. Additionally, male students were

Variable	Number	Odds ratio	OR (95%CI)	p-value
School		1		
Capital Medical University	225	•	Reference	
Peking Union Medical College	363		0.95 (0.57, 1.59)	0.846
Peking University	177		1.29 (0.75, 2.25)	0.358
Major				
Clinical Medicine	289	•	Reference	
Nursing	210		0.92 (0.52, 1.63)	0.787
Other Majors	266	H e -I	1.35 (0.87, 2.09)	0.182
Academic				
Graduate	179	÷	Reference	
Undergraduate	586		0.39 (0.20, 0.76)	0.006
Age		1		
<22	481	•	Reference	
>=22	284	÷.	1.48 (0.83, 2.64)	0.183
Sex				
Male	250		Reference	
Female	515	H H H	0.57 (0.38, 0.86)	0.007
Region				-
Urban Area	549	•	Reference	
Town	136		1.21 (0.73, 1.98)	0.452
Rural Area	80		2.68 (1.45, 4.98)	0.002
Monthly Living Expenses (CNY)				
<1500	156	4	Reference	
1500-2000	214		1.79 (0.95, 3.46)	0.077
2000-2500	173		2.96 (1.56, 5.80)	0.001
>2500	222		5.78 (3.14, 11.09)	<0.001
Sexual Orientation		i i		
Heterosexual, Asexual and Others	44	•	Reference	
Heterosexual	609	·•	3.87 (1.39, 14.03)	0.019
LGB	30		15.02 (3.92, 69.46)	<0.001
Bisexual	82		3.71 (1.15, 14.79)	0.040
Sexual Attitude Score		1		
positive	416	•	Reference	
neutral	291	Here in the second seco	0.81 (0.54, 1.19)	0.284
negative	58		0.66 (0.30, 1.36)	0.275
Sexual Knowledge Score		1		
high(>23)	419	•	Reference	
medium(20-23)	215	Here in the second seco	0.79 (0.50, 1.23)	0.296
low(<20)	131	H B -1	1.29 (0.78, 2.12)	0.313

0.5 1 2 5 10 20 50

Fig. 2 Forest plot of logistic regression analysis results for sexual behavior among medical students. OR = Odds ratio, CI = Confdence interval

more likely to report sexual activity than female students, which may reflect societal gender norms that tolerate premarital sexual behavior in men but stigmatize it in women [38, 48, 49]. Cultural differences in gender may result in female medical students discussing sexual matters less frequently with patients, particularly male patients, in their future clinical practice. Therefore, sex education for medical students should specifically address issues of sexual behavior shaming for female students.

We also found that students residing in rural areas had higher odds of engaging in sexual activity compared to their urban counterparts. This finding is consistent with a study conducted in U.S., where rural teens (24.0%) reported higher rates of sexual activity than urban teens (19.7%) [50]. This discrepancy may be related to multifaceted factors, including reduced access to sexual health education and services in rural regions [51], as well as differences in family dynamics. Specifically, rural adolescents are more likely to experience diminished parental monitoring due to longer parental working hours in agricultural occupations and increased peer-based socialization patterns [52]. Lower parental supervision has been empirically linked to earlier sexual initiation across multiple cultural contexts [53].

Conversely, students with monthly living expenses exceeding 2500 CNY had higher odds of reporting sexual activity. This association may reflect two interrelated mechanisms: (1) greater economic independence enabling access to social environments conducive to sexual exploration, and (2) exposure to urbanized media and social networks that normalize sexual experimentation among affluent youth [54]. Notably, this "urbanized norms"hypothesis does not contradict the rural-urban dichotomy but rather highlights distinct pathways through which socioeconomic status mediates sexual behavior. Higher-income rural students often experience accelerated acculturation to urban sexual scripts through digital media consumption, as evidenced by studies showing that exposure to sexualized digital content predicts earlier sexual debut [55]. These findings collectively underscore the complex interplay between geographic context, resource availability, and socioeconomic stratification in shaping adolescent sexual practices.

Strength and limitations

While this study provides valuable insights into the sexual knowledge, behavior, and attitudes of Chinese medical students, there has several limitations. First, the data were collected through an online survey conducted at three medical universities in Beijing, which limits the representativeness of our study population and the generalizability of our findings to broader groups, such as adolescents in rural areas or those without internet access. Second, our data were self-reported and may be subject to bias due to respondents' inaccurate recall, underreporting or overreporting. Third, The study did not assess participants' prior sexual health education, which may confound knowledge scores. Last, our study is cross-sectional. Thus, our findings should be interpreted as associations rather than causal relationships. For future research, we recommend analyzing the association between sexual knowledge, attitudes and practices in a nationwide representative sample.

In conclusion, this study described the sexual health KAP of Chinese medical students, highlights several demographic, socio-economic, and cultural factors that associated with sexual behavior of Chinese medical students. The findings suggest that sexual health education for medical students should include information about HPV (and the HPV vaccine), contraception, and sexual shame. It should also place particular emphasis on the education of female students and those from rural areas or with higher living expenses. This approach is critical to improving both sexual health and overall health literacy. Given that medical students are future healthcare providers, improving their sexual knowledge and attitudes can have far-reaching implications for their clinical practice and for the sexual health of their future patients. Collaboration between schools, families, and government institutions is essential to foster an environment that promotes comprehensive sexual education and healthy sexual practices among students.

Supplementary Information

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Supplementary Material 1.

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Authors' contribution

HY: Conceptualization, Methodology, Software, Visualization, Writing—Original Draft, Writing—Review & Editing. RM: Methodology, Software, Writing—Original Draft, Writing—Review & Editing. QS: Resources, Writing—Original Draft, Writing—Review & Editing. JZ: Conceptualization, Methodology, Resources. YL: Resources, Data Curation. TB: Resources, Data Curation. TL: Conceptualization, Formal Analysis, Funding Acquisition, Supervision. All authors reviewed and approved the final manuscript.

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Data availability

All data and materials relevant to the study are included in the article or uploaded as supplementary information.

Declarations

Ethics approval and consent to participate

This study was conducted in accordance with the ethical standards of the Declaration of Helsinki, and approval was obtained from the ethics committee of the Institutional Review Board of Peking Union Medical College (CAMS&PUMC-ICE-2020–030). Informed consent was obtained from all participants included in the study.

Consent for publication

The results/data/figures in this manuscript have not been published elsewhere, nor are they under consideration (from you or one of your Contributing Authors) by another publisher.

Competing interests

The authors declare no competing interests.

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