

BMJ Open Knowledge and attitudes towards contraception among undergraduate students: a multicentre, cross-sectional study in Vietnam

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To cite: Doan DA, Pham ST, Nguyen TTX, *et al.* Knowledge and attitudes towards contraception among undergraduate students: a multicentre, cross-sectional study in Vietnam. *BMJ Open* 2026;**16**:e113363. doi:10.1136/bmjopen-2025-113363

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<https://doi.org/10.1136/bmjopen-2025-113363>).

Received 04 November 2025
Accepted 06 March 2026



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ABSTRACT

Objective To investigate Vietnamese undergraduate students' knowledge and attitudes towards contraception and their associated factors.

Design Cross-sectional study.

Setting Six universities in Vietnam from April to May 2025.

Participants 1134 undergraduate students.

Primary outcome measures Students' knowledge and attitudes towards contraception were measured via an online survey, and a cut-off point of 50% was used to categorise their scores. Associations between students' knowledge and attitude scores and their sociodemographic characteristics, academic background, sexual and relationship experiences, contraceptive education and information sources were evaluated using multivariable linear regression. Independent variables were selected through Bayesian Model Averaging.

Results Students' average knowledge and attitude scores were 10.93 ± 2.86 (possible range: 0–22; actual range: 0–19) and 54.14 ± 6.57 (possible range: 15–75; actual range: 35–74), respectively. 62.1% demonstrated good knowledge, and 91.4% showed positive attitudes towards contraception. Higher knowledge was observed among older students (per 1 year increase, $\beta=0.33$, 95% CI 0.23 to 0.43), those from public universities ($\beta=1.32$, 95% CI 0.64 to 2.00), using mass media as a contraceptive information source ($\beta=0.58$, 95% CI 0.25 to 0.91) and having sexual experience ($\beta=1.16$, 95% CI 0.73 to 1.58). By contrast, students who were single and had never been in a romantic relationship ($\beta=-0.88$, 95% CI -1.23 to -0.52) and those enrolled in non-healthcare disciplines ($\beta=-1.06$, 95% CI -1.55 to -0.56) had significantly lower knowledge scores. Positive attitudes were more prevalent among female students (males vs females: $\beta=-2.07$, 95% CI -2.80 to -1.34), those using the Internet as a source of contraceptive information ($\beta=5.65$, 95% CI 4.29 to 7.01) and those with higher knowledge scores (per one-unit increase, $\beta=0.67$, 95% CI 0.55 to 0.79). All associations were statistically significant ($p<0.001$).

Conclusions In general, undergraduate students' knowledge of contraception was relatively low, while their attitudes were positive. Implementing education programmes focusing on correct usage and storage of condoms and the safety of emergency contraceptive

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ Employing Bayesian Model Averaging in multi-variable regression helps account for model uncertainty and reduces the risk of overfitting and multicollinearity when examining a large number of potential associated factors.
- ⇒ The relatively large sample size and the use of a conservative significance threshold ($p<0.001$) enhance the robustness and reproducibility of the statistical findings.
- ⇒ Due to the cross-sectional design, causal relationships between students' knowledge and attitudes towards contraception and independent variables cannot be established.
- ⇒ As the study relied on self-reported data, responses may be subject to social desirability and recall bias.
- ⇒ The use of a non-probability sampling method may limit the representativeness of the sample and reduce the generalisability of the findings.

pills may help improve their understanding and promote safer sexual practices, thereby contributing to reducing the risk of sexually transmitted infections and unintended pregnancies.

INTRODUCTION

During 2015–2019, there were an estimated 121 million unintended pregnancies each year worldwide. About 61% of unintended pregnancies and 29% of all pregnancies ended in induced abortion.¹ 45% of all induced abortions were considered unsafe. Among these unsafe procedures, a third took place under the least safe conditions (such as untrained individuals and hazardous, invasive techniques).² As per the Ministry of Health, Vietnam has recorded roughly 200 000 to 250 000 abortions annually (not including data from private medical facilities),³ and unwanted pregnancies constituted 53.6% of abortions.⁴

Various types of contraceptive methods can help avoid unintended pregnancies. Access to contraception is one fundamental human right.⁵ Of 1.1 billion women of reproductive age (15–49 years) who need family planning worldwide, 874 million are using modern contraceptive methods, while 164 million still lack access to contraception.^{5 6} Contraceptive methods include hormonal, non-hormonal and emergency contraception. Condoms, oral contraceptive pills and emergency contraceptives were reported as the methods most commonly known and frequently used, especially for young individuals.^{7–9}

Undergraduate students are one of the key target groups of reproductive health education, as they are at an age of increasing sexual activity and greater independence. A survey involving 351 female undergraduate students in Ethiopia found that 43.6% reported having experienced an unintended pregnancy.¹⁰ Another study in China showed that 19.5% of male undergraduate students had unintentionally gotten a partner pregnant, while 14.9% of female students became unintentionally pregnant.¹¹ Contraception helps prevent unintended pregnancies and associated health risks, enabling students to continue their education without disruption. Understanding their knowledge and attitudes towards contraception is crucial to promoting safe sexual practices and preventing unintended pregnancies. However, many previous studies indicated that undergraduate students' knowledge is limited,^{12–15} and many showed negative attitudes towards contraception.^{16–19} These findings illustrate that undergraduate populations may face significant reproductive health risks when contraceptive knowledge and practices are insufficient.

Several studies have been conducted in Vietnam, but have had certain limitations (such as small sample sizes, data collected from only a single university, a focus mainly on health-related students and the use of relatively basic tools to assess students' knowledge and attitudes).^{20 21} In addition, these studies primarily reported descriptive results on the proportions of correct responses or Likert-scale attitudes, without examining factors associated with students' knowledge and attitudes. Given the limited evidence on the determinants of contraceptive knowledge and attitudes among Vietnamese undergraduate students, this study was designed as an exploratory analysis to elucidate students' knowledge and attitudes towards contraception and to examine their potential associations with students' characteristics.

METHODS

Study design, setting and participants

This is a cross-sectional study conducted in Vietnam. This study was informed by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for reporting cross-sectional studies. As per data from the General Statistics Office (GSO), as of 2023, Vietnam had 243 universities, comprising 176 public and 67 non-public universities, with an estimated enrolment of

2.36 million students.²² Data were collected in six universities where the authors were working from April to May 2025 (north: Hanoi University of Pharmacy and Phenikaa University; central: Da Nang University of Medical Technology and Pharmacy and Hue University of Medicine and Pharmacy (Hue University); and south: University of Science (Vietnam National University Ho Chi Minh City) and Pham Ngoc Thach University of Medicine). At each university, a faculty member who was also a co-author coordinated the data collection process.

Our study population consisted of undergraduate students; hereafter, the term “students” refers to this group. Eligible participants were undergraduate students who agreed to participate in this study and could read and understand Vietnamese. The sample size was calculated to estimate the proportions of students with good knowledge of contraception and positive attitudes towards contraception, using the formula: $n = Z_{(1-\alpha/2)}^2 \cdot p \cdot (1-p) / d^2$. In the absence of prior proportion estimates, a conservative value of $p=0.5$ was assumed. Using $\alpha=0.01$ ($Z_{1-\alpha/2}=2.575$) and a margin of error of 0.05, the minimum required sample size was 664 students.

Patient and public involvement

Patients or the public were not involved in the initial design of the study or in defining the research questions and outcome measures. However, a pilot study involving forty undergraduate students was conducted to assess the clarity and comprehensibility of the questionnaire. Feedback from the pilot participants indicated that the items were clear and understandable; therefore, no modifications were made to the questionnaire. Patients and the public were not involved in the conduct, reporting or dissemination of the study results.

The questionnaire

The questionnaire included three main sections. The first section consisted of fifteen questions (independent variables), including (1) Year of birth, (2) Sex (male, female), (3) Region/current location (northern, central, southern), (4) Area/hometown (rural, urban), (5) Living arrangement (alone, with friends/in a dormitory, with family), (6) Self-reported average monthly income, including parental allowance (unit: million Vietnamese dong) (lower than 6, 6 to <9, 9 and higher), (7) Relationship status (single, never been in a romantic relationship; single, previously in a romantic relationship; single, currently in a romantic relationship; married), (8) Ever had sex (heterosexual intercourse) (yes, no), (9) University type (public, private), (10) Year of study (first, second, third, fourth, fifth, sixth), (11) Cumulative grade point average to date (scale: 0.0 to 4.0) (<2.0, from 2 to <2.5, from 2.5 to <3.0, from 3.0 to <3.5, from 3.5 to 4.0), (12) Field of study (medical, pharmacy, other healthcare fields, non-healthcare fields), (13) Received education about contraceptive methods in secondary or high school (yes, no/not remember), (14) Porn viewing frequency (never, rarely, sometimes, usually) and (15) Used sources

of contraceptive information (the Internet, mass media, printed materials, friends and family members, health-care professionals, websites of health organisations, scientific articles, courses or workshops on contraception).

The second section included 22 items evaluating students' contraceptive knowledge, primarily related to condoms (10 items) and emergency contraceptive pills (ECPs) (12 items). Previous studies have shown that condoms and ECPs are among the most commonly known and used contraceptive methods among undergraduate students.^{7 10 11 23} Therefore, this study focused on assessing students' knowledge of these two contraceptive methods. Students were also asked about other contraceptive methods they were aware of (a multiple-choice question allowing multiple selections). However, this question was not included in the knowledge scoring. The third section comprised 15 attitude items. Primary outcomes (dependent variables) were students' knowledge and attitude scores.

An initial version of the knowledge and attitude scales was developed based on a literature review.^{12 24-33} The scales were subsequently reviewed by three academic experts with research experience in community pharmacy, knowledge-attitude-practice studies, and/or contraception and reproductive health to ensure content relevance and clarity (face validity). A pilot study with 40 students was conducted to adapt the questions for this study and to assess the clarity of the items. Cronbach's alpha was 0.87 (knowledge scale) and 0.73 (attitude scale), indicating acceptable internal consistency. A pilot test-retest was conducted involving 35 students, with measurements taken 1 month apart. Good test-retest reliability was observed for both scales, with intraclass correlation coefficients exceeding 0.75 (knowledge scale: 0.751 (95% CI 0.504 to 0.875); attitude scale: 0.895 (95% CI 0.792 to 0.947)). The pilot data were not included in the final analytical sample.

In general, the questionnaire consisted primarily of multiple-choice questions, with only one response allowed per question. Some questions, such as those about sources used to search for contraception-related content, were designed as multiple-response questions and included an "Other" option with an open-text field to allow respondents to provide additional answers beyond the predefined choices. All questions were set as mandatory to minimise missing data. No branching or skip logic was used in the survey.

Sampling technique, procedures and data collection

To recruit participants, our study employed a non-probability sampling method, specifically a convenience sampling technique. In each selected university, one or several classes per academic year were selected based on the number of students per class. Students were approached during their breaks. We introduced the study to them by briefly explaining its name, objectives, procedures and assurances of anonymity and data confidentiality. Subsequently, the questionnaire, developed

using Google Forms, was distributed to students via a Quick Response code. Importantly, no personally identifiable information (such as name, phone number or email address) was collected. Participation in the survey was entirely voluntary, and this was clearly communicated to students at the outset. No incentives or compensation were provided for survey participation.

Students completed the questionnaire within roughly fifteen minutes. During this process, data collectors (the authors) were available to address any questions that arose. The class representatives shared the Google Forms link in class group chats when necessary. Students could complete our questionnaire at home if they did not have enough time during their breaks.

Data analysis

R Console version V.4.5.0 was used to analyse data (used packages: *table1*, *BAS*, *ggplot2* and *gridExtra*). The knowledge and attitude sum scores were computed for each student. For knowledge items, 0 scores were given for incorrect and "I do not know" answers, while one was assigned for correct answers. The knowledge sum score for one student ranged from 0 to 22 (condoms: 0–10 and ECPs: 0–12). For each attitude item, responses were rated on a five-point Likert scale ranging from 1 to 5. For positively worded items, such as "Adolescents should have easy access to contraceptive methods", the response options "totally disagree", "disagree", "neutral", "agree" and "totally agree" were assigned scores of 1, 2, 3, 4 and 5, respectively. In contrast, for negatively worded items, such as "I feel embarrassed when buying contraceptive methods", the scoring was reversed, with corresponding scores of 5, 4, 3, 2 and 1. The attitude sum score of one student ranged from 15 to 75. Higher scores indicated better knowledge and more positive attitudes towards contraception. A 50% cut-off point was used to categorise knowledge and attitude scores (good/positive: $\geq 50\%$, poor/negative: $< 50\%$), in line with previous studies.^{13 34 35} The classification of students' knowledge and attitudes towards contraception based on Bloom's cut-off point was also provided to offer additional information and to facilitate comparison with other studies, as this approach has been widely used in prior research.^{34 36}

Categorical variables were described via numbers (percentages), while means $\pm$ SD and medians (IQRs) were employed to report numeric variables. Univariable and multivariable linear regression models were employed to determine factors associated with students' knowledge and attitudes towards contraception. Independent variables in the multivariable models were selected by using the Bayesian Model Averaging (BMA) method. Rather than relying on a single model with a fixed set of predictors, BMA evaluates many possible models with different combinations of variables and identifies those that receive the strongest statistical support from the data. By averaging results across these models, BMA helps account for uncertainty in model selection and highlights variables that show consistent associations with the outcomes.

This approach helps reduce reliance on a single data-driven model and limits the risk of overfitting in exploratory analyses. Given the exploratory nature of the study and the large number of potential factors examined, a conservative significance level of $p < 0.001$ was chosen to minimise the likelihood of false-positive findings due to multiple testing.^{37 38}

RESULTS

Characteristics of the participants

About 1154 students were approached, and 1134 agreed to participate in this research (98.3%). On average, the participants' age was 21.19 ± 1.64 years old. Females constituted 64.9% of the sample, while more than a third were males (35.1%). A majority were healthcare students (86.3%) and from public universities (93.2%). In terms of geographic distribution, the majority of students were from the central region (41.4%), followed by the northern (36.0%) and southern regions (22.7%). Additionally, more than half of the participants (55.1%) originated from rural areas, whereas 44.9% were from urban areas. Only nine students got married (0.8%). The single group can be divided into three subgroups, including "never been in a romantic relationship" (29.2%), "previously in a romantic relationship" (34.6%) and "currently in a romantic relationship" (35.4%). About 19.2% had heterosexual experiences. Two-thirds received education about contraceptive methods in secondary/high schools (66.5%). The common sources of contraceptive information included the Internet (92.9%), mass media (66.0%) and printed materials (63.8%) (table 1).

Students' knowledge and attitudes towards contraception

In general, students' knowledge of contraception was relatively low, while their attitudes were positive. With a 50% cut-off point, 62.1% had good knowledge and 91.4% showed positive attitudes towards contraception (table 2). These figures sharply decreased when Bloom's cut-off point was used to classify scores (online supplemental table S1). Despite similar levels of contraception knowledge ($p = 0.592$), males demonstrated less positive attitudes than females ($p < 0.001$) (figure 1).

Regarding knowledge of condoms, students were generally able to recognise and reject misconceptions about condom effectiveness, reuse and disposal. However, they struggled with questions involving correct usage, storage and their role in preventing sexually transmitted infections (STIs) through skin-to-skin contact. Besides, students had a good understanding of when and how ECPs should be used, especially recognising their effectiveness when taken promptly after unprotected sex. Sadly, many students still held significant misconceptions about the safety and long-term effects of ECPs, including false beliefs that ECPs cause abortion, cannot be used more than once in a single menstrual cycle or harm fertility (table 3). Besides condoms and ECPs, numerous students also reported being aware of intrauterine devices (92.2%), vasectomy

(83.8%), contraceptive implants (77.7%), daily birth control pills (75.2%) and tubal ligation (71.5%). Other contraceptive methods that were less commonly known among students included the withdrawal method (coitus interruptus) (57.8%), the calendar method (54.8%), the contraceptive patch (40.4%), the spermicide (28.5%) and the injectable contraceptives (27.3%).

Students showed positive attitudes towards contraception, especially in the context of sex education, parental guidance, contraception accessibility and open communication between partners. However, many students had concerns about the potential misuse of contraceptive methods, a link between easier access and irresponsible sexual behaviour, and feelings of embarrassment when purchasing these methods (table 4).

Factors associated with students' knowledge and attitudes towards contraception

Higher total knowledge scores were observed among older students (per 1 year increase, $\beta = 0.33$, 95% CI 0.23 to 0.43) and those who had heterosexual intercourse before ($\beta = 1.16$, 95% CI 0.73 to 1.58). Moreover, compared with students from private universities, those attending public universities demonstrated significantly higher knowledge levels ($\beta = 1.32$, 95% CI 0.64 to 2.00). Using mass media as a source of contraceptive information was also associated with students' knowledge ($\beta = 0.58$, 95% CI 0.25 to 0.91). In contrast, students who were single and had never been in a romantic relationship ($\beta = -0.88$, 95% CI -1.23 to -0.52) and those enrolled in non-healthcare disciplines ($\beta = -1.06$, 95% CI -1.55 to -0.56) had significantly lower knowledge scores. Factors associated with students' knowledge of condoms and ECPs are shown in table 5.

Three factors significantly associated with students' attitudes towards contraception comprised sex, using the Internet to have contraceptive information, and their knowledge of contraception. Notably, female students showed more positive attitudes than males ($\beta = -2.07$, 95% CI -2.80 to -1.34). Students using the Internet as a source of contraceptive information ($\beta = 5.65$, 95% CI 4.29 to 7.01) had higher attitude scores than those who did not use it. In addition, there was a positive correlation between students' attitude and knowledge scores (per one-unit knowledge increase, $\beta = 0.67$, 95% CI 0.55 to 0.79) (table 5). Univariable analyses were performed in online supplemental table S2.

DISCUSSION

To our knowledge, this is the first study in Vietnam to collect data from multiple universities to investigate undergraduate students' knowledge and attitudes towards contraception. Our findings indicated that undergraduate students' knowledge of contraception was relatively low, while their attitudes were positive. Many students had notable gaps in their understanding of contraceptive use (such as correct usage and storage of condoms and the safety of ECPs). They also had concerns about

Table 1 Main characteristics of the participants (n=1134 undergraduate students)

Main characteristics		Male (n=398)		Female (n=736)		Total (n=1134)	
		n	%	n	%	n	%
Region (current location)	Northern	128	32.2	280	38.0	408	36.0
	Central	146	36.7	323	43.9	469	41.4
	Southern	124	31.2	133	18.1	257	22.7
Area (hometown)	Rural	202	50.8	423	57.5	625	55.1
	Urban	196	49.2	313	42.5	509	44.9
Living arrangement	Living alone	106	26.6	130	17.7	236	20.8
	Living with friends/in a dormitory	135	33.9	343	46.6	478	42.2
	Living with family (eg, parents, siblings...)	157	39.4	263	35.7	420	37.0
Self-reported average monthly income and allowance (mVND)*	Lower than 6	287	72.1	610	82.9	897	79.1
	6 to <9	64	16.1	75	10.2	139	12.3
	9 and higher	47	11.8	51	6.9	98	8.6
Relationship status	Single, never been in a romantic relationship	106	26.6	225	30.6	331	29.2
	Single, previously in a romantic relationship	150	37.7	242	32.9	392	34.6
	Single, currently in a romantic relationship	140	35.2	262	35.6	402	35.4
	Married	2	0.5	7	1.0	9	0.8
Ever had heterosexual intercourse	Yes	107	26.9	111	15.1	218	19.2
	No	291	73.1	625	84.9	916	80.8
University type	Public	369	92.7	688	93.5	1057	93.2
	Private	29	7.3	48	6.5	77	6.8
Year of study	First	96	24.1	185	25.1	281	24.8
	Second	45	11.3	113	15.4	158	13.9
	Third	73	18.3	146	19.8	219	19.3
	Fourth	69	17.3	139	18.9	208	18.3
	Fifth/sixth	115	28.9	153	20.8	268	23.6
Cumulative grade point average to date (scale: 0.0 to 4.0)	<2.0	23	5.8	46	6.3	69	6.1
	From 2 to <2.5	69	17.3	166	22.6	235	20.7
	From 2.5 to <3.0	166	41.7	285	38.7	451	39.8
	From 3.0 to <3.5	106	26.6	164	22.3	270	23.8
	From 3.5 to 4.0	34	8.5	75	10.2	109	9.6
Field of study	Medical	167	42.0	193	26.2	360	31.7
	Pharmacy	147	36.9	394	53.5	541	47.7
	Other healthcare fields	10	2.5	68	9.2	78	6.9
	Non-healthcare fields	74	18.6	81	11.0	155	13.7
Received education about contraceptive methods in secondary or high school	Yes	260	65.3	494	67.1	754	66.5
	No/not remember	138	34.7	242	32.9	380	33.5
Porn viewing frequency	Never/rarely	174	43.7	658	89.4	832	73.4
	Sometimes	144	36.2	56	7.6	200	17.6
	Usually	80	20.1	22	3.0	102	9.0

Continued

Table 1 Continued

Main characteristics		Male (n=398)		Female (n=736)		Total (n=1134)	
		n	%	n	%	n	%
Common sources of contraceptive information	The Internet (eg, social media...)	356	89.4	697	94.7	1053	92.9
	Mass media (eg, television, radio)	241	60.6	507	68.9	748	66.0
	Printed materials (eg, books, newspapers)	255	64.1	468	63.6	723	63.8
	Friends and family members	207	52.0	452	61.4	659	58.1
	Healthcare professionals (eg, doctors, nurses, pharmacists)	192	48.2	389	52.9	581	51.2
	Websites of health organisations (eg, WHO...)	157	39.4	345	46.9	502	44.3
	Scientific articles	122	30.7	216	29.3	338	29.8
	Courses or workshops on contraception	86	21.6	225	30.6	311	27.4

mVND, million Vietnam dong (exchange rate: 1 mVND=39.01 US\$).

the potential misuse of contraceptive methods, a link between easier access and irresponsible sexual behaviour, and the feeling of embarrassment when purchasing these methods. In the exploratory multivariable analyses, factors significantly associated with students' knowledge

included age, relationship status, field of study, university type, contraceptive information sources and having sexual experience. Their attitudes towards contraception were significantly associated with sex, sources of contraceptive information and knowledge.

Table 2 Descriptive statistics of knowledge and attitudes towards contraception among undergraduate students in Vietnam

Measure	Male (n=398)	Female (n=736)	Overall (n=1134)
1. Knowledge of condoms			
Mean (SD)	5.15 (1.69)	5.11 (1.51)	5.12 (1.57)
Median (IQR)	5 (4 to 6)	5 (4 to 6)	5 (4 to 6)
Condom knowledge score ≥ 5 (n (%))	273 (68.6)	506 (68.8)	779 (68.7)
Condom knowledge score < 5 (n (%))	125 (31.4)	230 (31.3)	355 (31.3)
2. Knowledge of ECPs			
Mean (SD)	5.64 (1.91)	5.90 (1.62)	5.81 (1.73)
Median (IQR)	6 (5 to 7)	6 (5 to 7)	6 (5 to 7)
ECP knowledge score ≥ 6 (n (%))	236 (59.3)	480 (65.2)	716 (63.1)
ECP knowledge score < 6 (n (%))	162 (40.7)	256 (34.8)	418 (36.9)
3. Knowledge of contraception			
Mean (SD)	10.78 (3.13)	11.00 (2.71)	10.93 (2.86)
Median (IQR)	11 (9 to 13)	11 (10 to 13)	11 (9.25 to 13)
Total knowledge score ≥ 11 (n (%))	241 (60.6)	463 (62.9)	704 (62.1)
Total knowledge score < 11 (n (%))	157 (39.4)	273 (37.1)	430 (37.9)
4. Attitudes towards contraception			
Mean (SD)	52.50 (6.96)	55.02 (6.18)	54.14 (6.57)
Median (IQR)	53 (47 to 57)	55 (51 to 59)	54 (50 to 59)
Total attitude score ≥ 45 (n (%))	343 (86.2)	694 (94.3)	1037 (91.4)
Total attitude score < 45 (n (%))	55 (13.8)	42 (5.7)	97 (8.6)

The bold entries indicate the main results of this table.
ECP, emergency contraceptive pill.

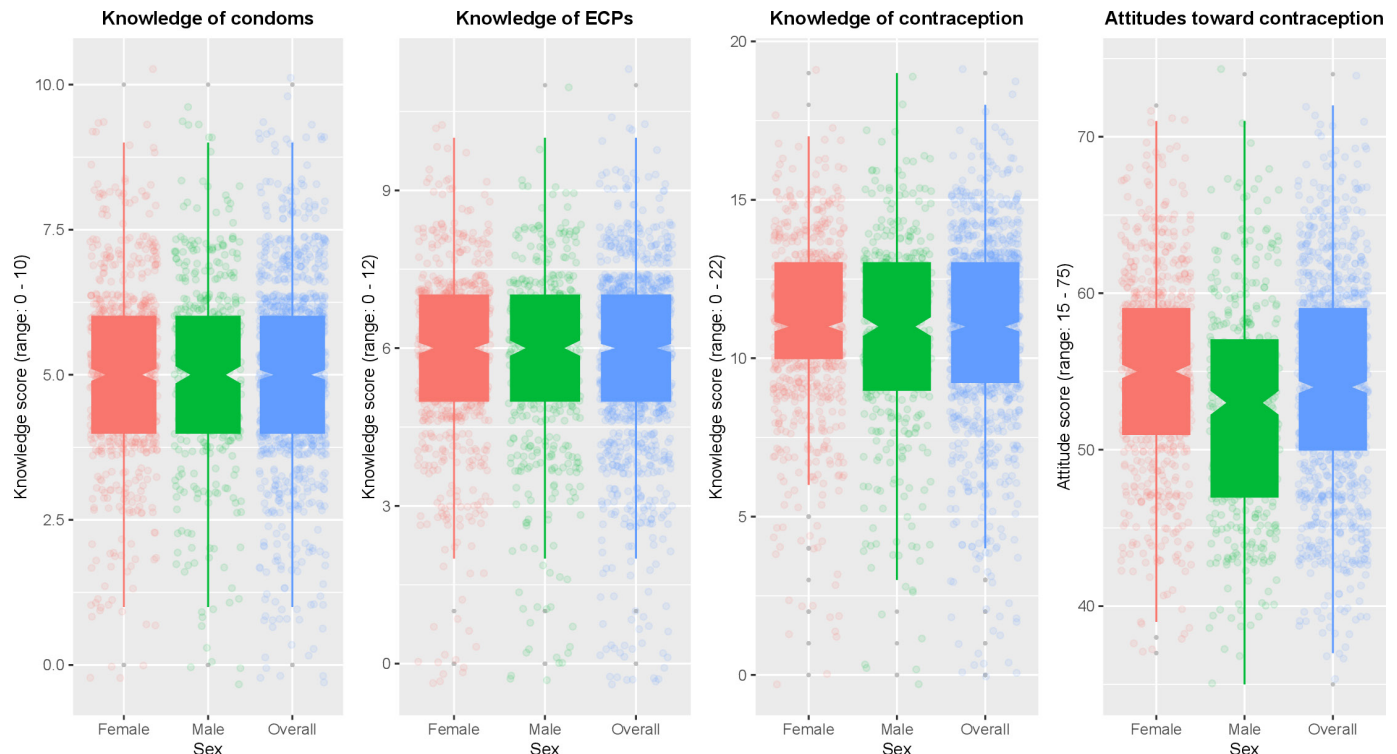


Figure 1 Boxplots of students' knowledge and attitude scores regarding contraception by sex (male, female and overall). ECPs, emergency contraceptive pills.

In our study, undergraduate students' knowledge of contraception was relatively limited. Studies in Thailand, Botswana, Nigeria, Tanzania and Egypt showed similar findings.^{8 12 14 15 17 19} However, high proportions of undergraduate students with good contraception knowledge were reported in Ghana, Ethiopia and Congo.^{35 39 40} Comparisons with previous studies are necessarily relative due to differences in contraceptive methods assessed, measurement instruments, study settings, periods and sample characteristics. For example, some studies were limited to students in health-related disciplines, examined knowledge of only one contraceptive method or restricted their samples to female participants.^{12 40} In contrast, our study included both health and non-health students, as well as both male and female participants. The questionnaire covered both condoms and ECPs. This may explain why our study's proportion of students with good knowledge was relatively low.

Similar to students in Thailand and Ethiopia,^{12 13 16} our undergraduate students had notable gaps in their knowledge of contraceptive use, particularly regarding correct condom practices and the safety of ECPs. These deficiencies highlighted key areas that should be prioritised in sexual and reproductive health education. International evidence suggests that programmes (such as structured face-to-face sexual health education or peer-educated sexual and reproductive health programmes) could help improve students' knowledge and promote safer sexual practices, thereby reducing the risk of unintended pregnancies and STIs.^{41 42}

Despite limited knowledge, undergraduate students' attitudes towards contraception were generally positive. Similar findings were reported in studies from Thailand, Ghana and Congo.^{8 35 40} However, in Botswana, Ethiopia, Tanzania and Egypt, many students showed negative attitudes towards contraception.^{14 16–19} Feelings of embarrassment and moral concerns may reflect the influence of social norms and personal values on students' perceptions. Encouraging open discussion and reducing stigma can help them develop more comfortable and responsible attitudes towards contraception.

The Internet, mass media, printed materials, friends/family members and healthcare professionals were common sources of contraceptive information among Vietnamese undergraduate students, consistent with findings from many previous studies.^{13 15 18 35 40 43} In the exploratory models, students who reported using information sources such as mass media, healthcare professionals and the Internet tended to have higher knowledge and/or more positive attitudes towards contraception. Access to trustworthy Internet-based information may enhance students' understanding of contraceptive methods, increase their self-confidence in decision-making and reduce stigma surrounding contraception, all of which contribute to more positive attitudes towards its use. This emphasised the crucial role of diverse communication channels in disseminating accurate information about contraception. Leveraging these channels may enrich students' understanding and cultivate more responsible, positive attitudes towards contraception. However, the

Table 3 Vietnamese undergraduate students' knowledge of contraception (n=1134 students)

No	Knowledge item	Mean (SD)		
		Male (n=398)	Female (n=736)	Overall (n=1134)
1	Knowledge of condoms			
1.1	Condoms are the only method that can simultaneously prevent both STIs and unintended pregnancies.	0.43 (0.50)	0.43 (0.50)	0.43 (0.50)
1.2	Condoms can prevent STIs transmitted through skin-to-skin contact, such as herpes or syphilis.	0.15 (0.36)	0.16 (0.36)	0.15 (0.36)
1.3	Condoms are 100% effective in preventing pregnancy.	0.83 (0.37)	0.90 (0.30)	0.87 (0.33)
1.4	It is recommended to use both male and female condoms at the same time or to use multiple layers of condoms.	0.67 (0.47)	0.57 (0.49)	0.61 (0.49)
1.5	Using lubricant with condoms does not improve contraceptive effectiveness and does not reduce STI transmission.	0.25 (0.43)	0.23 (0.42)	0.23 (0.42)
1.6	After checking the expiration date and carefully opening the package, putting the condom on the penis and unrolling it to cover the entire penis is enough to begin sexual intercourse.	0.16 (0.36)	0.11 (0.31)	0.13 (0.33)
1.7	Using a condom only before ejaculation is sufficient to prevent unintended pregnancy.	0.69 (0.46)	0.74 (0.44)	0.72 (0.45)
1.8	After intercourse, condoms should be disposed of by flushing them down the toilet.	0.85 (0.35)	0.87 (0.34)	0.86 (0.34)
1.9	Reusing condoms is acceptable as it saves money and reduces environmental waste.	0.91 (0.28)	0.94 (0.24)	0.93 (0.25)
1.10	Men should keep condoms in their wallets for use when needed.	0.20 (0.40)	0.16 (0.36)	0.17 (0.38)
2	Knowledge of ECPs			
2.1	All types of ECPs can be purchased without a doctor's prescription.	0.59 (0.49)	0.61 (0.49)	0.60 (0.49)
2.2	ECPs are 100% effective in preventing pregnancy.	0.76 (0.43)	0.87 (0.34)	0.83 (0.38)
2.3	ECPs are used in cases such as unprotected sex, sexual assault or when a condom slips off during intercourse.	0.87 (0.33)	0.88 (0.32)	0.88 (0.33)
2.4	ECPs can protect users from STIs such as HIV or syphilis.	0.83 (0.37)	0.86 (0.34)	0.85 (0.35)
2.5	ECPs can be used as a substitute for regular (daily) contraceptive pills.	0.80 (0.40)	0.85 (0.36)	0.83 (0.37)
2.6	The sooner ECPs are taken after unprotected sex, the more effective they are.	0.69 (0.46)	0.73 (0.45)	0.72 (0.45)
2.7	ECPs can be taken at any time within 1 week after unprotected sex.	0.65 (0.48)	0.75 (0.43)	0.71 (0.45)
2.8	ECPs can be used on any day of the menstrual cycle.	0.19 (0.39)	0.14 (0.34)	0.15 (0.36)
2.9	ECPs cannot be used more than once in a single menstrual cycle.	0.06 (0.24)	0.05 (0.22)	0.06 (0.23)
2.10	Frequent use of ECPs can seriously affect a woman's future fertility.	0.03 (0.18)	0.02 (0.15)	0.03 (0.16)
2.11	ECPs can cause abortion.	0.12 (0.32)	0.11 (0.31)	0.11 (0.31)
2.12	ECPs are contraindicated for pregnant women as they may harm the developing fetus or cause miscarriage.	0.04 (0.20)	0.03 (0.17)	0.03 (0.18)

The bold entries indicate the main results of this table (the items with the highest and lowest mean scores).
ECP, emergency contraceptive pill; STI, sexually transmitted infections.

quality of information varies widely across mass media and online platforms, potentially exposing students to misinformation. This underscores the need to guide students toward credible, evidence-based sources of contraceptive information.⁴⁴

Besides information sources, our findings highlighted several demographic and experiential factors associated

with students' contraceptive knowledge. In the exploratory analysis, older students and those with sexual experience were more likely to have higher knowledge scores. Older individuals may have greater life experience and longer exposure to sexual and reproductive health information. They are also more likely to have had romantic or sexual experiences, which may increase the perceived

Table 4 Vietnamese undergraduate students' attitudes towards contraception (n=1134 students)

No	Attitude item	Mean (SD)		
		Male (n=398)	Female (n=736)	Overall (n=1134)
1	Information about contraceptive methods should be included in sex education at schools and in the community.	4.02 (1.36)	4.38 (1.12)	4.26 (1.22)
2	Adolescents should have easy access to contraceptive methods.	3.95 (1.20)	4.21 (1.04)	4.12 (1.10)
3	Parents should proactively introduce and guide their children on contraceptive methods.	3.94 (1.18)	4.20 (1.01)	4.11 (1.08)
4	Emergency contraceptive pills should be as widely promoted and recognised as condoms.	3.40 (1.23)	3.39 (1.26)	3.40 (1.25)
5	Increasing access to contraceptive methods leads to irresponsible sexual behaviour or promiscuity.	3.00 (1.31)	3.22 (1.28)	3.15 (1.30)
6	The availability of over-the-counter emergency contraceptive pills leads to misuse and overuse.	2.33 (1.16)	2.21 (1.09)	2.25 (1.12)
7	Stocking contraceptive methods at home is good and positive.	3.76 (1.09)	3.74 (0.98)	3.74 (1.02)
8	The responsibility for buying and using emergency contraceptive pills lies with women.	3.88 (1.12)	4.25 (0.96)	4.12 (1.03)
9	The responsibility for buying and keeping condoms lies with men.	3.49 (1.24)	3.74 (1.12)	3.66 (1.17)
10	Contraceptive methods should only be sold to people aged 18 and older.	3.22 (1.22)	3.28 (1.21)	3.26 (1.21)
11	I feel embarrassed when buying contraceptive methods.	3.16 (1.13)	3.01 (1.02)	3.06 (1.06)
12	Couples should discuss contraceptive methods before having sex.	4.15 (1.01)	4.33 (0.90)	4.27 (0.95)
13	I feel uncomfortable bringing up the use of contraception if my partner does not want to.	3.22 (1.10)	3.76 (1.04)	3.57 (1.10)
14	I will use contraceptive methods even if my partner refuses.	3.53 (1.10)	3.99 (1.01)	3.83 (1.06)
15	Men are less likely to use condoms when they know about emergency contraceptive pills.	3.45 (1.14)	3.31 (1.13)	3.36 (1.14)
The bold entries indicate the main results of this table (the items with the highest and lowest mean scores).				

Table 5 Multivariable linear regression coefficients (β) and 95% CIs for factors associated with knowledge and attitudes towards contraception among undergraduate students in Vietnam

Independent variable	Knowledge of condoms		Knowledge of ECPs		Total knowledge score		Total attitude score	
	β (95% CI)	P value	β (95% CI)	P value	β (95% CI)	P value	β (95% CI)	P value
Age (1 year)	0.12 (0.06 to 0.17)	<0.001	0.20 (0.14 to 0.26)	<0.001	0.33 (0.23 to 0.43)	<0.001		
Sex (ref: Female)								
Male			-0.33 (-0.54 to -0.13)	0.001			-2.07 (-2.80 to -1.34)	<0.001
Relationship status: (ref: Other groups)*								
Single, never been in a romantic relationship	-0.45 (-0.65 to -0.25)	<0.001	-0.42 (-0.63 to -0.20)	<0.001	-0.88 (-1.23 to -0.52)	<0.001		
Field of study (ref: Healthcare)								
Non-healthcare	-0.48 (-0.75 to -0.20)	<0.001	-0.65 (-0.94 to -0.37)	<0.001	-1.06 (-1.55 to -0.56)	<0.001		
University type (ref: Private)								
Public	0.77 (0.39 to 1.15)	<0.001			1.32 (0.64 to 2.00)	<0.001		
Sources of contraceptive information								
The Internet							5.65 (4.29 to 7.01)	<0.001
Mass media	0.30 (0.12 to 0.49)	0.001			0.58 (0.25 to 0.91)	<0.001		
Healthcare professionals			0.38 (0.19 to 0.57)	<0.001				
Ever had heterosexual intercourse	0.62 (0.38 to 0.86)	<0.001	0.51 (0.25 to 0.77)	<0.001	1.16 (0.73 to 1.58)	<0.001		
Knowledge (one point)							0.67 (0.55 to 0.79)	<0.001
Adjusted R-squared	0.1028		0.1258		0.1441		0.1788	

Independent variables in multivariable models were selected by using the Bayesian Model Averaging method. In all four models, the VIF values of the independent variables were all below 1.3, indicating no significant multicollinearity.

The bold entries indicate the main results of this table.

*: including (1) Single, previously in a romantic relationship, (2) Single, currently in a romantic relationship and (3) Married.

ECPs, emergency contraceptive pills.

need for contraception and encourage information-seeking behaviours related to contraceptive use.⁴⁵ Similar findings were also reported in previous studies.^{9 17}

The multivariable model also suggested that undergraduate students who were single and had never been in a romantic relationship had lower knowledge scores than those who were married and those who had or currently have a romantic partner. This may be because the latter are more likely to care about sexual and reproductive health and to seek accurate information for practical use due to greater sexual activity and related needs, which can help increase their knowledge.⁴⁶ In contrast, the former may consider such topics less immediately applicable to their lives, thereby having lower interest and limited exposure to related information. Additionally, as in some studies,^{9 17} undergraduate students from healthcare-related fields demonstrated higher knowledge scores than those from non-healthcare disciplines. This difference can be attributed to their greater exposure to reproductive health topics through formal education/coursework. Healthcare students may have many subjects involving sexual and reproductive health in their curriculum, fostering more informed and open attitudes towards contraception.⁴⁷

Our exploratory findings indicate that students with higher knowledge showed more positive attitudes towards contraception, consistent with studies in Thailand, Botswana and Tanzania.^{8 14 17} These students may understand the benefits and importance of safe sexual practices, thereby increasing confidence in contraception use. Having adequate knowledge may help students reduce misconceptions and fears, make correct decisions and develop responsible, proactive attitudes towards reproductive health. Besides, our findings suggest that female students showed more positive attitudes towards contraception compared with males. The consequences of unprotected sex, such as unintended pregnancy, usually affect women more than men, which makes women more aware of the importance of contraceptive use. Cultural norms may be another reason. Women often care about health and family planning, whereas men may perceive contraception as less directly relevant to themselves or rely more on their partners for contraceptive decisions.⁴⁸

Our study has some strengths, including having a large sample size, using a p value cut-off of 0.001, and employing BMA in multivariable regression to reduce model complexity and prevent multicollinearity and overfitting. However, several limitations should be mentioned. First, causal relationships between students' knowledge or attitudes towards contraception and the examined variables cannot be established, as this study relied on cross-sectional data and an exploratory analytical approach. Therefore, the identified associations should be interpreted with caution, as they primarily describe relationships within the current study population and may serve to generate hypotheses for future research rather than establish causal relationships. Second, although BMA and multivariable linear regression were employed to

address model uncertainty and adjust for multiple covariates, residual confounding from unmeasured or imperfectly measured factors cannot be ruled out. Third, the assessment of students' contraceptive knowledge was limited to condoms and ECPs and did not include other methods. Future research could cover a broader range of contraceptive methods. Fourth, as the study relied on self-reported data, responses may be subject to social desirability and recall bias. In addition, the use of an electronic survey may have introduced self-selection and non-response bias. However, the large sample size achieved helps mitigate concerns related to insufficient statistical power. Finally, the use of convenience sampling (a non-probability sampling method) and the predominance of healthcare students in the sample (with a relatively small proportion of non-healthcare students) may limit the external validity of the findings and, therefore, the results may not be fully generalisable to the overall university student population in Vietnam.

CONCLUSIONS

Students' knowledge of contraception was relatively low, while their attitudes were positive. Poor knowledge remains a matter of concern, particularly regarding the correct use and storage of condoms and common misconceptions about ECPs. Factors significantly associated with students' knowledge included age, relationship status, field of study, university type, contraceptive information sources and having sexual experience. Their attitudes towards contraception were significantly associated with sex, sources of contraceptive information and knowledge.

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Acknowledgements The authors want to express their gratitude to all students who voluntarily and enthusiastically participated in this survey. We also want to thank our colleagues for their warm-hearted support while developing the questionnaire and data collection.

Contributors DAD: Conceptualisation, Methodology, Investigation, Data curation, Writing – Review and Editing. STP: Conceptualisation, Methodology, Investigation, Formal analysis, Data curation, Writing – Review and Editing. TTXN: Methodology, Investigation, Data curation, Writing – Review and Editing. TNNL: Methodology, Investigation, Data curation, Writing – Review and Editing. TTPN: Methodology, Investigation, Data curation, Writing – Review and Editing. GBL: Methodology, Investigation, Data curation, Writing – Review and Editing. DXD: Conceptualisation, Methodology, Investigation, Software, Formal analysis, Data curation, Visualisation, Supervision, Project administration, Validation, Writing – Original Draft, Writing – Review and Editing. All authors read and approved the final manuscript. DXD: guarantor of work.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by the ethics committee of the Nam Dinh University of Nursing (No: 1017/GCN-HĐĐĐ). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. The datasets used and/or analysed during the current study are available from the corresponding author upon reasonable request.

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