ORIGINAL ARTICLE

Evaluating Knowledge, Risk Perception and Attitudes Towards Human Immunodeficiency Virus Infection among Thai Students from a Large Public University

Phusayam Anurakwongsri[1], Lanlalin Sojikul[1], Yanwadee Chitkoolsamphan[1], Thana Khawcharoenporn, MD, MSc[2]

[1] Medical student, Faculty of Medicine, Thammasat University, Pathum Thani, Thailand; [2] Infectious Diseases Unit, Department of Internal Medicine, Faculty of Medicine, Thammasat University, Pathum Thani, Thailand

Objective: To evaluate knowledge, risk perception, and attitudes towards human immunodeficiency virus (HIV) infection among Thai university students.

Materials and Methods: An anonymous online survey was conducted in February 2025 among Thammasat University students. Participants were categorized into high-risk, moderate-risk, and low-risk groups according to predefined HIV risk characteristics.

Results: Of the 379 included students, most were female (71%) and heterosexual (71%), and were categorized as low-risk (72%), moderate-risk (20%), and high-risk (9%) for HIV infection. A significantly larger proportion of male and homosexual participants were in the moderate- and high-risk groups. Rates of consistent condom use for vaginal, anal, and oral sex were 67%, 48%, and 29%, respectively. Most students (more than 80%) were knowledgeable about HIV risk behaviors and transmission routes, but less knowledgeable about antiretroviral drug use for treatment and prevention. Of the 379 students, 105 (28%) had a false perception of low HIV risk, while the rates were 99% and 97% among moderate- and high-risk participants, respectively. Most students agreed that they are able to live their daily life alongside people living with HIV (PLWH), and they are willing to offer advice to PLWH regarding treatment and prevention of transmission, while attitudes were diverse on preventive behaviors of PLWH.

Conclusion: The findings suggest the need to promote consistent condom use, improve knowledge on HIV treatment, prevention, and risk perception, and focus on risk behavior reduction among at-risk students, especially homosexual and male students.

Keywords: Human immunodeficiency virus; Knowledge; Risk perception; Attitudes; University students; Thailand

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Despite significant progress in the prevention and treatment of human immunodeficiency virus (HIV) infection, it remains a leading global health concern. As of 2023, there were 39.9 million people living with HIV and 630,000 deaths due to HIV-related causes[1]. In Thailand, it was estimated that 580,000 people were living with HIV (PLWH) in 2023. Men who have sex with men (MSM) had an HIV prevalence of 1.7%, transgender people had an HIV prevalence of 2.2%, and people who inject drugs had an HIV prevalence of 10.3%. Those are specific population groups that have a higher burden of HIV infection when compared to the Thai general population, which has an HIV prevalence of 1.1%[2].

According to the Joint United Nations Programme on HIV and AIDS (UNAIDS), an estimated 3.4 million young people worldwide were living with HIV in 2019[3]. In Thailand, the burden of HIV infection among young people remains substantial, with approximately 4,200 new infections reported among individuals aged 15 to 24 years in 2023[2]. This high incidence has been attributed to evolving sexual behaviors among Thai youth, including a declining age of sexual debut, increasing acceptance of premarital sexual activity, and a greater number of lifetime sexual partners, all of which contribute to heightened vulnerability to HIV infection[4]. Misconceptions regarding HIV/acquired immune deficiency syndrome (AIDS) that the conditions are deadly and highly contagious and cause a significant unpleasant appearance remain

Correspondence to:

Khawcharoenporn T.

Infectious Diseases Unit, Department of Internal Medicine, Faculty of Medicine, Thammasat University, Pathum Thani 10120, Thailand.

Phone: +66-81-8365576; Fax: +66-2-9269793

Email: kthana@tu.ac.th

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a significant obstacle to effective prevention and control efforts. Such misconceptions foster stigma and discriminatory attitudes toward PLWH, adversely affecting their physical and psychological well-being[5]. Dissemination of accurate and evidence-based information about HIV/AIDS is therefore a critical step in enhancing public awareness and positive attitudes and promoting preventive behaviors aimed at reducing new infections[6].

Previous studies among adolescents and young adults, including university students, have shown that rates of consistent condom use were low despite high levels of knowledge about HIV infection[7,8]. This low rate of consistent condom use was associated with a false perception of low HIV risk[7]. Another study conducted at a gay sauna in Thailand, in which 50% of the MSM participants were college or university students, found that youth MSM had a higher risk of HIV acquisition and infection compared to other MSM[9]. In addition, the youth MSM had a high rate of false perception of low HIV risk (63%), which was found to be associated with HIV infection[9]. These findings underscore the importance of evaluating HIV knowledge, HIV risk and risk perception, and attitudes toward HIV infection among university students. However, there is limited data on these topics, especially for the more recent data during the past decade, when there has been more accessibility of the students to social media and online information.

Materials and Methods

Study population and setting

This anonymous survey study was conducted among university students from Thammasat University, which is a large urban university in Bangkok and Pathum Thani, Thailand. The study period was from February first to 28th, 2025. The target population was students in both Health Sciences and non-Health Sciences faculties in all campuses of Thammasat University. This study was conducted in accordance with the amended Declaration of Helsinki and was approved by the Human Research Ethics Committee of Thammasat University (Medicine) (MTU-EC-SA-0-300/67). An informative statement was added at the beginning of this online survey, and a participant could consent to participate by doing the survey. Confidentiality and privacy of data were maintained during the study process. Information that could identify individual participants could not be accessed by the investigators during or after data collection.

Study protocol

The online survey was created by investigators who included three medical students and one infectious diseases specialist, after an extensive literature review. The survey was conducted using a convenience sample of students through online distribution platforms, including the Line application and the official Facebook page of Thammasat University. The investigators also contacted the students' affairs departments of each faculty to ask for their help in distributing the inviting electronic poster and the link for the online survey form through their online platforms. The questionnaire consisted of four sections, including demographic data, HIV knowledge, HIV risk characteristics and perception, and attitudes toward HIV infection. Knowledge was assessed through true-or-false questions, with points awarded only for correct responses. Attitudes were measured using a 5-point Likert scale (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree). In addition, participants were asked to self-identify their perceived risk of HIV infection, and investigators subsequently evaluated participants' actual risk based on pre-specified characteristics reported in the survey (Table 1). Participants classified as having moderate or high risk were considered to have a false perception of low HIV risk if they perceived their risk as no risk or low risk. The survey was pretested on 10 students to evaluate its internal consistency, and the calculated Cronbach's alpha was 0.79. Most of the responses in the survey were made mandatory to minimize data missing.

Statistical analysis

Based on the expected rate of students with moderate or high risk for HIV infection of 18%[7], an acceptable margin of error of 5%, and the level of confidence of 95%, the minimum required sample size was 227 students. Data analysis was performed separately for categorical and continuous variables. Categorical variables were presented as frequency and percentage, while continuous variables were expressed as median (interquartile range, IQR). Comparisons between groups were conducted using the chi-square test or Fisher's exact test, as appropriate, for categorical variables, and the Mann-Whitney U test for continuous variables. Statistical analyses were conducted using IBM SPSS Statistics, version 23.0 (IBM Corp., Armonk, NY, USA). A p-value of less than 0.05 was considered statistically significant.

Table 1. Human immunodeficiency virus (HIV) risk stratification according to the pre-specified reported characteristics and behaviors of the survey participants and their partners

Behaviors	HIV risk		
	Low	Moderate	High
Number of sexual partners in the past 1 month			
0 to 1	✓		
2 to 3		✓	
>3			✓
Number of new sexual partners in the past 1 month			
0 to 1	✓		
2 to 3		✓	
>3			✓
Use of condom(s) during vaginal sex			
Always (100%)	✓		
Most of the time (51% to 99%)	✓		
About half the time (50%)		✓	
Sometimes (1% to 49%)			✓
Never (0%)			✓
Use of condom(s) during oral sex			
Always (100%)	✓		
Most of the time (51% to 99%)	✓		
About half the time (50%)		✓	
Sometimes (1% to 49%)			✓
Never (0%)			✓
Use of condom(s) during anal sex			
Always (100%)	✓		
Most of the time (51% to 99%)	✓		
About half the time (50%)		✓	
Sometimes (1% to 49%)			✓
Never (0%)			✓
Engagement in sexual activity in exchange for payment in the past 1 month			
No	✓		
Yes			✓
Alcohol use during sex in the past 1 month			
Never (0%)	✓		
Sometimes (1% to 49%)		✓	
About half the time (50%)			✓
Most of the time (51% to 99%)			✓
Always (100%)			✓
Illicit drug use during sex in the past 1 month			
Never (0%)			
Sometimes (1% to 49%)		✓	
About half the time (50%)			✓
Most of the time (51% to 99%)			✓
Always (100%)			✓
Sharing of needles for intravenous drug use			
Never (0%)	✓		
Sometimes (1% to 49%)			✓
About half the time (50%)			✓
Most of the time (51% to 99%)			✓
Always (100%)			✓
History of sexually transmitted infections within the past 1 year			
No	✓		
Yes			✓
Sexual partner's history of engagement in sexual activity in exchange for payment in the past 1 month			
No	✓		
Yes			✓
Sexual partner's history of illicit drug use during sex in the past 1 month			
No	✓		
Yes			✓
Sexual partner's history of sharing of needles for intravenous drug use in the past 1 month			
No	✓		
Yes			✓
Sexual partner's history of sexually transmitted infections within the past 1 year			
No	✓		
Yes			✓

Table 2. Characteristics of the study participants stratified by human immunodeficiency virus risk

Characteristics	ALL (n=379)	Risk			p-value[a]
		Low (n=271)	Moderate (n=74)	High (n=34)	
Age (years); median (IQR)	20 (19 to 22)	20 (19 to 22)	21 (20 to 22)	21 (20 to 22)	0.06
Sex; n (%)					<0.001
Male	108 (29)	59 (22)	36 (49)	13 (38)	
Female	270 (71)	212 (78)	38 (51)	20 (59)	
Transgender	1 (0.3)	0 (0)	0 (0)	1 (3)	
Sexual orientation; n (%)					<0.001
Heterosexual	268 (71)	198 (73)	51 (69)	19 (56)	
Homosexual	35 (9)	13 (5)	12 (16)	10 (29)	
Bisexual	76 (20)	60 (22)	11 (15)	5 (15)	
Domicile; n (%)					0.61
Bangkok metropolitan region	165 (44)	118 (44)	32 (43)	15 (44)	
Central/Western/Eastern Thailand	81 (21)	62 (23)	16 (22)	3 (9)	
Southern Thailand	47 (12)	35 (13)	7 (10)	5 (15)	
Northeastern Thailand	53 (14)	33 (12)	13 (18)	7 (21)	
Northern Thailand	33 (9)	23 (9)	6 (8)	4 (12)	
Marital status; n (%)					0.005
Single	332 (88)	247 (92)	56 (76)	29 (85)	
Married	1 (0.3)	1 (0.4)	0 (0)	0 (0)	
Living with domestic partner	45 (12)	22 (8)	18 (24)	5 (15)	
Education level; n (%)					0.58
High school	296 (78)	210 (78)	59 (80)	27 (79)	
Bachelor's degree	80 (21)	59 (22)	15 (20)	6 (18)	
Master's degree	3 (0.8)	2 (0.7)	0 (0)	1 (2.9)	
Household income; n (%)					0.58
<10,000 Baht/month	54 (14)	34 (13)	15 (20)	5 (15)	
15,000 to <60,000 Baht/month	139 (37)	100 (37)	24 (32)	15 (44)	
60,000 to 150,000 Baht/month	108 (29)	2 (30)	18 (24)	8 (24)	
>150,000 Baht/month	77 (21)	55 (20)	17 (23)	6 (18)	

IQR=interquartile range

(a) Compare between participants with low, moderate, and high risk for HIV acquisition

Results

Demographic characteristics of the participants

Of 381 students who accessed the survey link, 379 (99%) agreed to participate in and completed the survey. None of the participants were excluded. Reported characteristics of 379 participants are shown in Table 2. There were 271 (72%) low-risk participants and 108 (28%) participants with moderate or high risk of HIV infection. The majority of participants were female (71%), heterosexual (71%), single (88%), and from Bangkok (44%). Comparing between the risk groups, a significantly larger proportion of students in moderate- and high-risk groups were male, homosexual, and lived with domestic partners compared to the low-risk group (Table 2).

Sexual and social HIV risk behaviors and risk perception

Sexual and social risk behaviors of the 379 participants are summarized in Table 3. Consistent condom use was reported 67%, 48%, and 29% for vaginal sex, anal sex, and oral sex, respectively. Significantly higher proportion of participants categorized as having moderate or high risk (108 participants) reported prior experience of sexual intercourse, inconsistent condom use for vaginal, anal, and oral sex, prior exchanging sex for money, using substances with sex, prior having sexually transmitted infections (STIs), and having at-risk sexual partners compared to the low-risk group. Among 379 participants, 105 (28%) had a false perception of low HIV risk. Of the 108 participants in the moderate- and high-risk groups, 105 (97%)

Table 3. Sexual and social risk behaviors of the study participants stratified by human immunodeficiency virus (HIV) risk

HIV risk	All (n=379)	Risk			p-value[a]
		Low (n=271)	Moderate (n=74)	High (n=34)	
Ever had sex (including vaginal, oral, and anal sex); n (%)					<0.001
Yes	164 (43)	56 (21)	74 (100)	34 (100)	
No	215 (57)	215 (79)	0 (0)	0 (0)	
Number of sexual partners in the past 1 month; median (IQR)	0 (0 to 1)	0 (0 to 0)	1 (0 to 1)	1 (0 to 1)	<0.001
Number of new sexual partners in the past 1 month; median (IQR)	0 (0 to 0)	0 (0 to 0)	0 (0 to 0)	0 (0 to 1)	<0.001
Ever had vaginal sex; n (%)					<0.001
Yes	135 (36)	53 (20)	54 (73)	28 (82)	
No	29 (8)	3 (1)	20 (27)	6 (18)	
Never had sex	215 (57)	215 (79)	0 (0)	0 (0)	
Use of condom(s) during vaginal sex; n (%)					<0.001
Always (100%)	90/135 (67)	48/53 (91)	34/54 (63)	8/28 (29)	
Most of the time (51% to 99%)	21/135 (16)	5/53 (9)	11/54 (20)	5/28 (18)	
About half the time (50%)	9/135 (7)	0/53 (0)	9/54 (17)	0/28 (0)	
Sometimes (1% to 49%)	9/135 (7)	0/53 (0)	0/54 (0)	9/28 (32)	
Never (0%)	6/135 (4)	0/53 (0)	0/54 (0)	6/28 (21)	
Ever had oral sex; n (%)					<0.001
Yes	136 (36)	38 (14)	70 (95)	28 (82)	
No	28 (7)	18 (7)	4 (5)	6 (18)	
Never had sex	214 (57)	215 (79)	0 (0)	0 (0)	
Use of condom(s) during oral sex; n (%)					<0.001
Always (100%)	40/136 (29)	29/38 (76)	7/70 (10)	4/28 (14)	
Most of the time (51% to 99%)	12/136 (9)	6/38 (16)	3/70 (4)	3/28 (11)	
About half the time (50%)	6/136 (4)	0/38 (0)	5/70 (7)	1/28 (4)	
Sometimes (1% to 49%)	8/136 (6)	1/38 (3)	3/70 (4)	4/28 (14)	
Never (0%)	70/136 (52)	2/38 (5)	52/70 (74)	16/28(57)	
Ever had anal sex; n (%)					<0.001
Yes	29 (8)	5 (2)	12 (16)	12 (35)	
No	133 (35)	51 (19)	62 (84)	22 (65)	
Never had sex	215 (57)	215 (79)	0 (0)	0 (0)	
Use of condom(s) during anal sex; n (%)					0.53
Always (100%)	14/29 (48)	3/5 (60)	8/12 (67)	3/12 (25)	
Most of the time (51% to 99%)	5/29 (17)	2/5 (40)	2/12 (17)	1/12 (8)	
About half the time (50%)	3/29 (10)	0/5 (0)	2/12 (17)	1/12 (8)	
Sometimes (1% to 49%)	3/29 (10)	0/5 (0)	0/12 (0)	3/12 (25)	
Never (0%)	4/29 (14)	0/5 (0)	0/12 (0)	4/12 (33)	
Engagement in sexual activity in exchange for payment in the past 1 month; n (%)					<0.001
Yes	4 (1)	1 (0)	0 (0)	3 (9)	
No	375 (99)	270 (100)	74 (100)	31 (91)	
Number of alcohol drinking days within the past 1 month; median (IQR)	0 (0 to 1)	0 (0 to 0)	1 (1 to 1)	1 (1 to 2)	<0.001
Number of drinks per day within the past 1 month; median (IQR)	0 (0 to 3)	0 (0 to 2)	2 (0 to 5)	2 (0 to 10)	<0.001
Alcohol use during sex in the past 1 month; n (%)					<0.001
Never had sex	215 (57)	215 (79)	0 (0)	0 (0)	
Never (0%)	135 (36)	55 (20)	57 (77)	23 (68)	
Sometimes (1% to 49%)	23 (6)	1 (0)	17 (13)	5 (25)	
About half the time (50%)	3 (1)	0 (0)	0 (0)	3 (9)	
Most of the time (51% to 99%)	1 (0)	0 (0)	0 (0)	1 (3)	
Always (100%)	2 (0)	0 (0)	0 (0)	2 (6)	

IQR=interquartile range

(a) Compare between participants with low, moderate, and high risk for HIV acquisition

Table 3. (continued)

HIV risk	All (n=379)	Risk			p-value[a]
		Low (n=271)	Moderate (n=74)	High (n=34)	
Illicit drug use within the past 1 month; n (%)					0.001
Marijuana	3 (3)	0 (0)	2 (3)	1 (3)	
• 1-15 days	2/3 (67)	-	2/2 (100)	-	
• 6-10 days	1/3 (33)	-	-	1/1 (100)	
Illicit drug use during sex within the past 1 month; n (%)					
Sometimes	3/3 (100)	-	2/2 (100)	1/1 (100)	<0.001
Ever had intravenous drug use; n (%)					0.006
Yes	1 (0)	0 (0)	0 (0)	1 (3)	
No	378 (100)	271 (100)	74 (100)	33 (97)	
Sharing of needles for intravenous drug use; n (%)					
Never (0%)	1 (100)	0 (0)	0 (0)	1 (100)	-
Has history of sexually-transmitted infections (STIs) within the past 1 year; n (%)					<0.001
Yes	4 (1)	0 (0)	0 (0)	4 (12)	
No	369 (97)	270 (100)	71 (96)	28 (82)	
Not sure	6 (2)	1 (0)	3 (4)	2 (6)	
Type of STIs; n (%)					-
Gonorrhea	3/4 (75)	-	-	3/4 (75)	
Molluscum contagiosum	1/4 (25)	-	-	1/4 (25)	
Sexual partner has history of engagement in sexual activity in exchange for payment in the past 1 month; n (%)					<0.001
Yes	1 (0)	0 (0)	0 (0)	1 (3)	
No	153 (40)	55 (20)	67 (91)	31 (91)	
Not sure	10 (3)	1 (0)	7 (10)	2 (6)	
Never had sex	215 (57)	215 (79)	0 (0)	0 (0)	
Sexual partner has history of illicit drug use during sex in the past 1 month; n (%)					<0.001
Yes	3 (1)	0 (0)	0 (0)	3 (9)	
No	153 (40)	55 (20)	68 (92)	30 (88)	
Not sure	8 (2)	1 (0)	6 (8)	1 (3)	
Never had sex	215 (57)	215 (79)	0 (0)	0 (0)	
Sexual partner has history of sharing of needles for intravenous drug use in the past 1 month; n (%)					<0.001
Yes	1 (0)	0 (0)	0 (0)	1 (3)	
No	154 (41)	55 (20)	68 (92)	31 (91)	
Not sure	9 (2)	1 (0)	6 (8)	2 (6)	
Never had sex	215 (57)	215 (79)	0 (0)	0 (0)	
Sexual partner has history of STIs within the past 1 year; n (%)					<0.001
Yes	2 (0)	0 (0)	0 (0)	2 (6)	
No	142 (38)	52 (19)	64 (87)	26 (77)	
Not sure	19 (5)	4 (2)	10 (14)	5 (15)	
Never had sex	216 (57)	215 (79)	0 (0)	1 (3)	
Type of STIs in sexual partner; n (%)					
Gonorrhea	2/2 (100)	-	-	2/2 (100)	-
Risk of HIV infection perceived by the study participants; n (%)					<0.001
Have no risk	348 (92)	260 (96)	63 (85)	25 (74)	
Have risk	31 (8)	11 (4)	11 (15)	9 (27)	
Low risk	25/31 (81)	8/11 (73)	10/11 (91)	8/9 (89)	
Moderate risk	6/31 (19)	3/11 (27)	1/11 (9)	1/9 (11)	
False perception of low HIV risk; n (%)	105 (28)	0 (0)	73 (99)	33 (97)	<0.001

IQR=interquartile range

(a) Compare between participants with low, moderate, and high risk for HIV acquisition

Table 4. Responses to statements about human immunodeficiency virus (HIV) transmission, treatment and prevention among the study participants stratified by gender

Statements	Male (n=108) n (%)	Female (n=270) n (%)	Transgender (n=1) n (%)	p-value[a]
Answer for 'You can get HIV infection from vaginal sex'				0.334
True (correct)	100 (93)	255 (94)	1 (100)	
False	6 (6)	5 (2)	0 (0)	
Do not know	2 (2)	10 (4)	0 (0)	
Answer for 'You can get HIV infection from anal sex'				0.689
True (correct)	100 (93)	238 (88)	1 (100)	
False	4 (4)	11 (4)	0 (0)	
Do not know	4 (4)	21 (8)	0 (0)	
Answer for 'You can get HIV infection from oral sex'				0.863
True (correct)	86 (80)	216 (80)	1 (100)	
False	13 (12)	25 (9)	0 (0)	
Do not know	9 (8)	29 (11)	0 (0)	
Answer for 'Having multiple sexual partners increases the risk of HIV infection'				0.931
True (correct)	105 (97)	257 (95)	1 (100)	
False	1 (1)	5 (2)	0 (0)	
Do not know	2 (2)	8 (3)	0 (0)	
Answer for 'Using condoms during sex decreases the risk of HIV infection'				0.571
True (correct)	104 (96)	253 (94)	1 (100)	
False	0 (0)	7 (3)	0 (0)	
Do not know	4 (4)	10 (4)	0 (0)	
Answer for 'Engagement in sexual activity in exchange for payment increases the risk of HIV infection'				0.495
True (correct)	104 (96)	251 (93)	1 (100)	
False	0 (0)	8 (3)	0 (0)	
Do not know	4 (4)	11 (4)	0 (0)	
Answer for 'Illicit drug use during sex increases the risk of HIV infection'				0.438
True (correct)	71 (66)	181 (67)	1 (100)	
False	15 (14)	22 (8)	0 (0)	
Do not know	22 (20)	67 (25)	0 (0)	
Answer for 'You can get HIV infection from getting tattooed'				0.987
True (correct)	93 (86)	228 (84)	1 (100)	
False	4 (4)	11 (4)	0 (0)	
Do not know	11 (10)	31 (12)	0 (0)	
Answer for 'Sharing needles for intravenous drug use increases the risk of HIV infection'				0.749
True (correct)	104 (96)	253 (94)	1 (100)	
False	0 (0)	4 (2)	0 (0)	
Do not know	4 (4)	13 (5)	0 (0)	
Answer for 'HIV infection can be completely cured with treatment'				0.619
True	30 (28)	84 (31)	0 (0)	
False (correct)	61 (57)	133 (49)	1 (100)	
Do not know	17 (16)	53 (20)	0 (0)	
Answer for 'Antiretroviral drugs are efficacious in preventing HIV infection'				0.738
True (correct)	68 (63)	155 (57)	1 (100)	
False	17 (16)	43 (16)	0 (0)	
Do not know	23 (21)	72 (27)	0 (0)	
Answer for 'The antiretroviral drug currently recommended in Thailand for preventing HIV infection is injectable'				0.149
True	34 (32)	91 (34)	0 (0)	
False (correct)	28 (26)	49 (18)	1 (100)	
Do not know	46 (43)	130 (48)	0 (0)	

(a) Compare between male, female and transgender participants

Table 4. (continued)

Statements	Male (n=108) n (%)	Female (n=270) n (%)	Transgender (n=1) n (%)	p-value[a]
Answer for 'Antiretroviral drugs can prevent STIs other than HIV infection'				0.237
True	42 (39)	96 (36)	0 (0)	
False (correct)	26 (24)	54 (20)	1 (100)	
Do not know	40 (37)	120 (44)	0 (0)	
Answer for 'Dizziness is a common side effect of antiretroviral drugs'				0.899
True (correct)	44 (41)	116 (43)	0 (0)	
False	5 (5)	13 (5)	0 (0)	
Do not know	59 (55)	141 (52)	1 (100)	
Answer for 'There is currently a vaccine that prevents HIV infection'				0.049
True	38 (35)	111 (41)	0 (0)	
False (correct)	38 (35)	58 (22)	0 (0)	
Do not know	32 (30)	101 (37)	1 (100)	
Median score for correct response (for the total of 15 statements)	11	10	13	0.053

(a) Compare between male, female and transgender participants

perceived themselves as having no or low HIV risk. According to the study definition, 97% of the high-risk group and 99% of the moderate-risk group demonstrated a false perception of low HIV risk.

Knowledge about HIV infection, transmission, treatment, and prevention

Responses to statements about HIV infection among the students are shown in Table 4. Most of the participants (more than 80%) were knowledgeable about HIV risk behaviors and transmission routes, except for the statement "Illicit drug use during sex increases the risk of HIV infection", for which only 66% responded correctly. Overall, the participants were less knowledgeable about antiretroviral drug use for treatment and prevention. Comparing between genders, there was a trend toward significance that male participants had a higher HIV knowledge score than female participants (11 versus 10, p=0.05). Significantly higher proportion of male participants than female participants responded correctly to the statement "There is currently a vaccine that prevents HIV infection", while there were no differences in the rates of correct response to other statements among each gender group.

Attitudes toward HIV infection and people living with HIV.

Table 5 demonstrates attitudes toward HIV infection and PLWH among the students. Most participants expressed positive attitudes toward HIV stigmatization, societal perspective on HIV infection, PLWH, and how to live with and support PLWH, while attitudes were diverse on preventive behaviors of PLWH. Across all genders, there were no significant differences in attitudes toward HIV infection and PLWH.

Discussion

In the present study, the proportion of university students who had moderate or high risk for HIV infection was 29%, which increased from 18% in the authors' previous study conducted 10 years ago[7]. This may reflect the increase in risk behaviors among the students in the era in which the connection between humans and travel is easier, faster, and facilitated by advances in social media platforms and artificial intelligence. However, the difference in the proportion of at-risk students between the previous and present studies may also be due to the differences in the sampled population and the recruitment process.

Contrary to expectations of prevention awareness in university students, the present study found that the rates of consistent condom use during vaginal, anal, and oral sex remained low despite high levels of knowledge regarding HIV risk behaviors and transmission routes among the students. The findings did not align with positive associations between HIV-related knowledge and consistent condom use among African American college students[10] and university students in Sudan[11]. The difference may be due to: 1) the inability of the students to translate the knowledge into consistent preventive practices in their real lives, 2) their false perception of low HIV risk leading to no interest of HIV preventive measures, 3) being bored or unsatisfied with condom use during sexual activity, and 4) the availability

Table 5. Attitudes of the study participants toward human immunodeficiency virus (HIV) infection and individuals living with HIV stratified by gender

Attitudes	Male (n=108) n (%)	Female (n=270) n (%)	Transgender (n=1) n (%)	p-value[a]
'The prevention of HIV infection is an important public health agenda for Thailand'				0.560
Strongly disagree	2 (2)	4 (2)	0 (0)	
Disagree	3 (3)	2 (1)	0 (0)	
Neutral	10 (9)	14 (5)	0 (0)	
Agree	37 (34)	108 (40)	1 (100)	
Strongly agree	56 (52)	142 (53)	0 (0)	
'HIV infection is something to be shameful about in society'				0.284
Strongly disagree	53 (49)	161 (60)	1 (100)	
Disagree	32 (30)	79 (29)	0 (0)	
Neutral	12 (11)	20 (7)	0 (0)	
Agree	9 (8)	9 (3)	0 (0)	
Strongly agree	2 (2)	1 (0.4)	0 (0)	
'The majority of individuals living with HIV are not concerned about preventing the transmission of the infection to others'				0.384
Strongly disagree	23 (21)	45 (17)	0 (0)	
Disagree	19 (18)	69 (26)	0 (0)	
Neutral	35 (32)	102 (38)	1 (100)	
Agree	28 (26)	46 (17)	0 (0)	
Strongly agree	3 (3)	8 (3)	0 (0)	
'Individuals living with HIV should feel ashamed of their infection'				0.890
Strongly disagree	33 (31)	86 (32)	0 (0)	
Disagree	25 (23)	70 (26)	1 (100)	
Neutral	28 (26)	62 (23)	0 (0)	
Agree	17 (16)	39 (14)	0 (0)	
Strongly agree	5 (5)	13 (5)	0 (0)	
'HIV infection is caused by inappropriate behaviors'				0.150
Strongly disagree	15 (14)	47 (17)	0 (0)	
Disagree	22 (20)	62 (23)	0 (0)	
Neutral	22 (20)	70 (26)	1 (100)	
Agree	36 (33)	79 (29)	0 (0)	
Strongly agree	13 (12)	12 (4)	0 (0)	
'You are able to live your daily life alongside individuals living with HIV, such as sharing meals or attending classes together'				0.713
Strongly disagree	10 (9)	22 (8)	0 (0)	
Disagree	11 (10)	15 (6)	0 (0)	
Neutral	16 (15)	55 (20)	0 (0)	
Agree	41 (38)	103 (38)	1 (100)	
Strongly agree	30 (28)	75 (28)	0 (0)	
'You are willing to offer advice to individuals living with HIV regarding treatment and prevention of transmission'				0.404
Strongly disagree	10 (9)	13 (5)	0 (0)	
Disagree	10 (9)	12 (4)	0 (0)	
Neutral	13 (12)	37 (14)	0 (0)	
Agree	37 (34)	112 (42)	1 (100)	
Strongly agree	38 (35)	96 (36)	0 (0)	
'Individuals who are good-looking and healthy will not get infected with HIV'				0.309
Strongly disagree	87 (81)	225 (83)	1 (100)	
Disagree	10 (9)	20 (7)	0 (0)	
Neutral	5 (5)	17 (6)	0 (0)	
Agree	6 (6)	3 (1)	0 (0)	
Strongly agree	0 (0)	5 (2)	0 (0)	

(a) Compare between male, female, and transgender participants

of other preventive methods, such as pre-exposure prophylaxis, to use instead of condoms. Previous studies also identified factors associated with condom use that include male gender, positive attitudes towards condom use, social norms favoring condom use, and having multiple sexual partners[10-12]. Altogether, these findings should be considered for implementing strategies for increasing condom use among university students.

Although the students were knowledgeable about HIV risk behaviors and transmission routes, the present study revealed that a sizable proportion of them incorrectly estimated their risk of HIV infection, with 28% of overall, 99% of moderate-risk students, and 97% of high-risk students having a false perception of low HIV risk. These high rates of false perception of low HIV risk were comparable to the authors' study conducted in 2013[7], suggesting the false perception remains a persistent issue requiring attention. The underlying mechanisms of having a false perception of low HIV risk despite having good HIV knowledge could be beliefs that associate HIV risk with only particular groups, e.g., MSM and drug users among heterosexual individuals. For MSM students, despite engaging in behaviors perceived as normative, their risk may still be elevated due to higher HIV infection rates within their sexual networks and partner pools[13]. Studies have demonstrated that accurate assessment of HIV risk was associated with condom use[8], while false perception of low HIV risk is associated with lower rates of consistent condom use[7]. Other studies also found that individuals who use condoms tend to have a higher perceived susceptibility to HIV infection[11,14]. Studies have reported that male gender and having a high level of knowledge about HIV infection were associated with a higher risk perception of being infected with HIV[15]. Factors associated with false perception of low HIV risk identified in previous studies include homosexuality, male gender, living with domestic partners, studying in non-medicine faculties, having more sexual partners, and older age[7,16,17]. These findings suggest the need to explore reasons for having a false perception of low HIV risk. In addition, evaluating and correcting HIV risk perception among university students could play a key role in promoting consistent condom use and their acceptance of using HIV preventive measures.

Most of the students in the present study (more than 80%) were knowledgeable about HIV risk behaviors and transmission routes. On the other hand, the students were less knowledgeable about antiretroviral drug use for treatment and prevention of HIV infection. Only 63% and 57% of male and female students, respectively, were aware of the preventive role of antiretroviral therapy. Since there are currently available antiretroviral drugs for prevention (pre- and post-exposure prophylaxis) and ongoing development of more convenient regimens for HIV prevention, the present study findings underscore a gap in HIV-related education among university students and suggest incorporating targeted educational campaigns on antiretroviral drug use for HIV prevention among the students.

In regard to attitudes toward HIV infection and PLWH, the findings of the present study suggest an overall relatively low level of stigma associated with HIV infection, PLWH, and how to support and live with PLWH. However, when asked whether PLWH should feel ashamed of their condition or whether PLWH are not concerned about preventing the transmission of the infection to others, the responses were more divided. These findings indicated that internalized stigma or moral judgment still exists among the students and were consistent with previous reports[18,19]. Targeted educational interventions are needed to reduce HIV stigmatization, especially for the stigmatized aspects identified in the present study.

Although the present study has strengths, including the use of a validated risk categorization tool to assess HIV risk and evaluation of risk perception along with HIV-related knowledge and attitudes toward the infection and PLWH, the authors acknowledge limitations. First, the study was conducted in a single center; the results may not be generalizable to all university students in Thailand. Second, the recruitment was done by convenience sampling, which may further limit the representativeness of the results. Third, given the inquiry of personal and sensitive issues related to sexuality in the survey, there is a possibility of underreporting of sexual and social risk behaviors by the students. Lastly, the responses may be subject to recall and misclassification biases due to the nature of the anonymous survey.

Conclusion

In conclusion, despite university students demonstrating a high level of knowledge regarding HIV risk behaviors and transmission routes, the rates of consistent condom use across all forms of sexual activity remained low. The discrepancy between knowledge and preventive practices should be investigated further to identify the underlying

factors influencing this gap. Most students were able to accurately assess their risk of HIV infection. However, the rates of false perception of low HIV risk were high among those with moderate or high risk for HIV infection. These findings suggest the need to promote consistent condom use, risk perception assessment and correction, focus on reduction of risk behaviors among at-risk students, especially homosexual and male students, and improve knowledge on the role of antiretroviral drugs in treating and preventing HIV infection.

What is already known about this topic?

HIV infection has been a major public health problem in Thailand. Young adults and adolescents, including university students, are groups at risk for HIV infection. While knowledge, risk perception, and attitudes toward HIV infection could influence individual HIV preventive measures, limited data exist among Thai university students.

What does this study add?

Twenty-nine percent of the university students had moderate-risk or high-risk for HIV infection. While most students were knowledgeable about HIV risk behaviors and transmission routes and had correct attitudes toward HIV, 28% had a false perception of low HIV risk. The findings suggest the need to promote HIV preventive measures, improve risk perception, and reduce risk behaviors among at-risk students, especially homosexual and male students.

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Authors' contributions

PA, YC, and LS contributed to the study conception and design, data acquisition, data analysis and interpretation, and drafting of the manuscript. TK served as an advisor for the study concept and design and critically revised the manuscript. All authors read and approved the final manuscript and agree to be accountable for all aspects of the study.

Data availability statement

The dataset from this study contains no direct identifiers. Upon reasonable request and with appropriate ethics approval, the dataset from this study will be available from the authors after indirect identifiers are modified and generalized. Public data sharing is restricted in accordance with the requirements of the Human Research Ethics Committee of Thammasat University (Medicine).

Ethics approval and consent to participate

This study was conducted in accordance with the amended Declaration of Helsinki and was approved by the Human Research Ethics Committee of Thammasat University (Medicine) (registration number of clinical trial: MTU-EC-SA-0-300/67; approved February 17, 2025). An informative statement was added at the beginning of the online survey, and a participant could consent to participate by completing the survey.

Clinical trial registration

Not applicable. This study was not a clinical trial.

Use of artificial intelligence

Artificial intelligence (AI) tools, namely ChatGPT and Grammarly, were used during the revision of the manuscript. These tools were primarily used for correcting grammar errors, checking for repetition, and refining sentences. The authors acknowledge full responsibility for the intellectual content of this work and ensure that all AI-assisted parts of the manuscript have been reviewed and validated for relevance, appropriateness, and accuracy before incorporation into the final document to maintain the scholarly integrity of this study.

Conflicts of interest

The authors declare no conflicts of interest.

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