ORIGINAL ARTICLES

Bridging the Knowledge Gap: Assessing Adolescents' Understanding of Sexually Transmitted Infections

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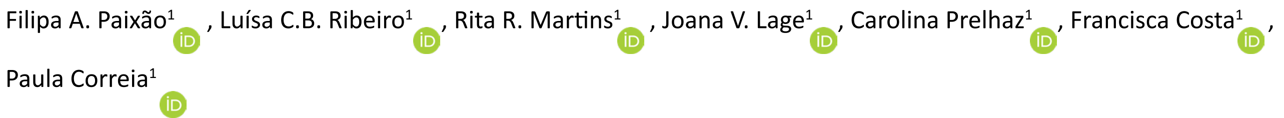

ABSTRACT

Background: Sexually transmitted infection (STI) rates are rising as condom use declines, and adolescents are particularly vulnerable due to risk-taking behaviors and low testing rates.

Aim: This study aimed to assess adolescents' knowledge of STIs and their condom use practices in Portugal.

Methods: A cross-sectional descriptive study was conducted at a level II hospital and a school in the Lisbon Metropolitan Area. Adolescents aged 13 to 18 years were invited to participate by anonymously completing a questionnaire. STI knowledge and attitudes were assessed according to sexual activity and gender using Chi-square or Fisher's Exact tests.

Results: 164 participants (mean age 16.1 years, ± 2.0 years), 54.3% female and 68.3% Portuguese, were included in the study. While most participants were familiar with the human immunodeficiency virus and herpes, knowledge of chlamydia, gonorrhea, trichomoniasis, and human papillomavirus was limited. Knowledge gaps included extragenital manifestations of STIs and their potential asymptomatic nature. Misconceptions involved transmission via shared bathrooms and the belief that the withdrawal method or contraceptive pills prevent STIs. Gaps were also identified in prevention in same-sex female relationships, oral sex, and the use of dental dams. Health professionals and digital platforms were the most frequently reported information sources. Among sexually active participants, 67.2% reported inconsistent condom use, citing discomfort and reduced pleasure as barriers. STI knowledge differed significantly by sexual activity and gender, with sexually non-active males being the most vulnerable to these knowledge gaps.

Conclusions: The identified knowledge gaps and barriers to condom use emphasize the need for targeted educational strategies to improve STI awareness and prevention among adolescents.

Keywords: adolescent; pediatrics; sexually transmitted infections; sexual health; public health

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INTRODUCTION

Adolescence is a pivotal stage of life, marked by significant physical, emotional, and social transitions. During this period, decision-making and impulse control are still developing, increasing the likelihood of risky behaviors such as early sexual activity, which is often unplanned and unprotected, and may occur without consent or under the influence of drugs. As a result, adolescents are at higher risk of contracting sexually transmitted infections (STIs).[1]

In Europe, a significant rise in cases of chlamydia and gonorrhea was detected in 2022, with these infections being particularly prevalent among young people aged 15–24, especially women.[2,3] Simultaneously, condom use has been declining in many European countries.[4] Reported barriers to consistent condom use include insufficient knowledge about proper usage, perceived reduction in sexual pleasure, engaging in sexual activity under the influence of drugs, and lack of planning for sexual encounters.[5]

Studies worldwide report that adolescents show limited literacy and low perceived risk of contracting STIs and rarely undergo testing.[5,6] Sexual health education in schools is widely used to promote condom use, reduce transmission of STIs, and encourage help-seeking behaviors, and should begin at a young age to improve knowledge before sexual debut.[6,7] This is crucial as the first sexual encounter is occurring earlier and is linked to poorer health outcomes.[8]

In Portugal, sexual education is compulsory in schools to help adolescents make informed choices about sexuality and reduce the negative consequences of high-risk sexual behaviors.[9] However, its implementation varies across schools, and several studies have shown that extracurricular sexual education classes can further improve students' knowledge, particularly regarding the transmission and prevention of STIs.[10]

A 2011 systematic review reported generally low levels of knowledge of STI pathogens, except for the human immunodeficiency virus (HIV).[11] More recent studies reinforce these findings, showing that adolescents have greater awareness of HIV and genital herpes compared to chlamydia, trichomoniasis, and gonorrhea.[8] Although awareness of condom use and its importance is high, this knowledge does not consistently translate into practice, as condom use remains relatively low among adolescents in Europe.[11] In addition, several studies have highlighted common misconceptions, such as the mistaken belief that oral contraceptive pills provide protection against STIs.[8]

To the best of our knowledge, only one study in Portugal has specifically examined STI knowledge among middle-school students, focusing on transmission, prevention, and sources of information.[8] However, several important aspects have been largely overlooked globally in current studies of awareness of STIs among adolescents, specifically knowledge of barrier methods beyond external condoms (e.g., dental dams) and the understanding of the need for protection in same-sex relationships and during oral sex. Additionally, common misconceptions about transmission, such as the belief that STIs can be transmitted through bathroom use or that using multiple condoms simultaneously provides better protection, have not been thoroughly investigated in Portugal. Furthermore, little is known about the adolescents' knowledge of human papillomavirus (HPV), despite the high vaccination rates seen in Portugal.

The objectives of this study were to assess adolescents' knowledge of STIs and to explore their sexual health behaviors in a major city in Portugal. Specifically, we aimed to evaluate knowledge of transmission and prevention, misconceptions as well as intended actions in the event of a suspected infection. Among adolescents who were sexually active, we also examined condom use, perceived barriers to use, and use of substances during sex.

MATERIALS AND METHODS

A cross-sectional descriptive study was conducted from July 2023 to July 2024 to assess adolescents' knowledge of STIs in Portugal. The inclusion criteria included age between 13 and 18 years and being a resident in Portugal, regardless of nationality. Parental and adolescent consent was obtained separately, and only participants who accepted the informed consent were included in the study.

Data collection: Data were collected through an online questionnaire, specifically developed for this study, which was administered to a convenience sample of adolescents recruited from a school in the Lisbon metropolitan area and its reference level II hospital. Participants anonymously completed the questionnaire written in Portuguese, which was divided into three sections. The first section collected demographic data (gender, age, nationality, and maternal educational level). The second section assessed knowledge of STIs through multiple-choice questions covering STI causes, symptoms, modes of transmission, prevention strategies (including HIV post-exposure prophylaxis [PEP] and less commonly discussed barrier methods like dental dams), importance of protection in same-sex relationships, common misconceptions regarding STIs, and potential complications. The third section was aimed exclusively at sexually active adolescents and inquired about condom use, age at first sexual intercourse, and use of substances such as alcohol and drugs during sex.

Sample size determination: The sample size was determined by the participants' availability and willingness to complete the questionnaire; no formal power calculation was performed.

Ethical considerations: The study was approved by the Ethics Committee of the Professor Doutor Fernando Fonseca Hospital prior to data collection (approval nº 59/2023).

Data management and analysis: Data were collected and recorded in an anonymized electronic database (Microsoft

Excel®) to ensure confidentiality. Continuous variables (e.g., age) were summarized using means and standard deviation (SD), while categorical variables were described using absolute frequencies and percentages. Associations between STI knowledge and sexual activity status (sexually active vs non-active), as well as gender differences (male, female, non-binary), were assessed using Chi-square tests of independence; Fisher's Exact test was applied when assumptions were not met. Effect sizes were estimated using Cramér's V, interpreted as small (≈0.10), medium (≈0.30), and large (≈0.50). A two-sided p-value <0.05 was considered statistically significant. All analyses were performed using IBM SPSS Statistics (version 29.0).

RESULTS

A total of 164 adolescents participated in the study. Of these, 54.3% were female, and 68.3% were Portuguese; mean age was 16.1 years (±2.0 years). The sociodemographic characteristics of the sample are summarized in **Table 1**.

Regarding knowledge of STIs (**Table 2**), awareness was highest for genital herpes (81.7%) and HIV (77.4%), while knowledge of other infections such as gonorrhea (56.1%), chlamydia (37.8%), and trichomoniasis (6.7%) was more limited. Only half of participants recognized that STIs can be asymptomatic, and more than one-third reported uncertainty. Misconceptions were frequent, including beliefs that STIs could be contracted from shared bathrooms (43.9%) or prevented by the withdrawal method (9.1%) or oral contraceptive pills (12.8%). Knowledge gaps extended to prevention in same-sex female relationships (only 39.6% considered condom use necessary) and during oral sex (55.5% reported condom use as necessary) and the role of dental dams (28% awareness).

Healthcare professionals (46.3%) and digital platforms such as Google (39%) and social media (37.8%) were the most frequently reported sources of information, while school-based education was cited by one-third (34.1%) of participants.

Table 1 - Sociodemographic characteristics of the study Participants (n=164).

Variable	Category	*n* (%)
Gender	Female	89 (54.3)
	Male	70 (42.7)
	Non-binary	5 (3.0)
Age (years)	Mean age: 16.1 years (standard deviation ±2.0 years)	
Nationality	Portugal	112 (68.3)
	Brazil	27 (16.5)
	Portuguese-speaking African countries	19 (11.6) (7 Angola, 7 Guiné-Bissau, 4 Cape Verde, 1 São Tomé e Príncipe)
	Other	6 (3.7)
Maternal educational level	High school	58 (35.4)
	University degree	35 (21.3)
	Unknown	41 (25.0)
	Middle school	30 (18.3)

Table 2 - Summary of questions and responses from all adolescents regarding STI knowledge.

	Non-binary (*n* = 5)	Male (*n* = 70)	Female (*n* = 89)	Total (*n* = 164)
	n (%)	*n* (%)	*n* (%)	*n* (%)
Select the STI causative agents that you know about (multiple answers allowed):				
Genital herpes	5 (100.0)	51 (72.9)	78 (87.6)	134 (81.7)
HIV	5 (100.0)	52 (74.3)	70 (78.7)	127 (77.4)
Gonorrhea	4 (80.0)	48 (68.6)	40 (44.9)	92 (56.1)
HPV	4 (80.0)	33 (47.1)	42 (47.2)	79 (48.2)
Hepatitis B	3 (60.0)	32 (45.7)	40 (44.9)	75 (45.7)
Syphilis	3 (60.0)	36 (51.4)	32 (36.0)	71 (43.3)
Hepatitis C	4 (80.0)	31 (44.3)	33 (37.1)	68 (41.5)
Chlamydia	1 (20.0)	27 (38.6)	34 (38.2)	62 (37.8)
Trichomoniasis	0 (0.0)	4 (5.7)	7 (7.9)	11 (6.7)
I do not know	0 (0.0)	14 (20.0)	7 (7.9)	21 (12.8)
Do STIs cause symptoms?				
Not always symptomatic	1 (20.0)	31 (44.3)	50 (56.2)	82 (50.0)
Always symptomatic	1 (20.0)	9 (12.9)	11 (12.4)	21 (12.8)
Always asymptomatic	0 (0.0)	1 (1.4)	1 (1.1)	2 (1.2)
I do not know	3 (60.0)	29 (41.4)	27 (30.3)	59 (36.0)
Select the STI symptoms that you know about (multiple answers allowed):				
Painful intercourse	3 (60.0)	27 (38.6)	42 (47.2)	72 (43.9)
Genital sores	3 (60.0)	28 (40.0)	39 (43.8)	70 (42.7)
Abnormal genital discharge	0 (0.0)	21 (30.0)	36 (40.4)	57 (34.8)
Bleeding during/after intercourse	2 (40.0)	12 (17.1)	30 (33.7)	44 (26.8)
Mouth sores	1 (20.0)	20 (28.6)	33 (37.1)	54 (32.9)
Skin rash	2 (40.0)	16 (22.9)	22 (24.7)	40 (24.4)
Fever	1 (20.0)	10 (14.3)	22 (24.7)	33 (20.1)
Diarrhea	0 (0.0)	11 (15.7)	22 (24.7)	33 (20.1)
Ocular discharge	0 (0.0)	1 (1.4)	0 (0.0)	1 (0.6)
Tonsillitis/pharyngitis	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
I do not know	2 (40.0)	33 (47.1)	25 (28.1)	60 (36.6)
How can someone contract an STI? (multiple answers allowed)				
Genital contact	3 (60.0)	48 (68.6)	73 (82.0)	124 (75.6)
Sharing sex toys	3 (60.0)	37 (52.9)	53 (59.6)	93 (56.7)
Public bathrooms	1 (20.0)	14 (20.0)	26 (29.2)	41 (25.0)
Hugging	0 (0.0)	0 (0.0)	2 (2.2)	2 (1.2)

I do not know	2 (40.0)	21 (30.0)	12 (13.5)	35 (21.3)
Is it possible to contract an STI from using the same bathroom as someone who has an STI?				
Yes	1 (20.0)	26 (37.1)	45 (50.6)	72 (43.9)
No	2 (40.0)	21 (30.0)	19 (21.3)	42 (25.6)
I do not know	2 (40.0)	23 (32.9)	25 (28.1)	50 (30.5)
Is it possible to contract an STI after a single unprotected sexual encounter?				
Yes	5 (100.0)	60 (85.7)	74 (83.1)	139 (84.8)
No	0 (0.0)	1 (1.4)	5 (5.6)	6 (3.7)
I do not know	0 (0.0)	9 (12.9)	10 (11.2)	19 (11.6)
Is it possible to catch multiple STIs?				
Yes	2 (40.0)	42 (60.0)	45 (50.6)	89 (54.3)
No	0 (0.0)	6 (8.6)	10 (11.2)	16 (9.8)
I do not know	3 (60.0)	22 (31.4)	34 (38.2)	59 (36.0)
How can you avoid catching an STI? (multiple answers allowed)				
Condoms	3 (60.0)	52 (74.3)	80 (89.9)	135 (82.3)
Sexual abstinence	2 (40.0)	25 (35.7)	34 (38.2)	61 (37.2)
Contraceptive pills	0 (0.0)	5 (7.1)	16 (18.0)	21 (12.8)
Withdrawal method	1 (20.0)	2 (2.9)	12 (13.5)	15 (9.1)
I do not know	2 (40.0)	14 (20.0)	8 (9.0)	24 (14.6)
Select the STI barrier methods that you know about (multiple answers allowed):				
External condom	5 (100.0)	69 (98.6)	89 (100.0)	163 (99.4)
Internal condom	4 (80.0)	48 (68.6)	61 (68.5)	113 (68.9)
Dental dam	4 (80.0)	22 (31.4)	20 (22.5)	46 (28.0)
Are condoms necessary during oral sex?				
Yes	4 (80.0)	36 (51.4)	51 (57.3)	91 (55.5)
No	1 (20.0)	21 (30.0)	21 (23.6)	43 (26.2)
I do not know	0 (0.0)	13 (18.6)	17 (19.1)	30 (18.3)
Are condoms necessary in sexual encounters between male partners?				
Yes	5 (100.0)	40 (57.1)	61 (68.5)	106 (64.6)
No	0 (0.0)	13 (18.6)	15 (16.9)	28 (17.1)
I do not know	0 (0.0)	17 (24.3)	13 (14.6)	30 (18.3)
Are condoms necessary in sexual encounters between female partners?				
Yes	4 (80.0)	21 (30.0)	40 (44.9)	65 (39.6)
No	0 (0.0)	30 (42.9)	31 (34.8)	61 (37.2)
I do not know	1 (20.0)	19 (27.1)	18 (20.2)	38 (23.2)
Does using two condoms at the same time increase protection against STIs?				

Yes	1 (20.0)	13 (18.6)	16 (18.0)	30 (18.3)
No	3 (60.0)	36 (51.4)	43 (48.3)	82 (50.0)
I do not know	1 (20.0)	21 (30.0)	30 (33.7)	52 (31.7)
Is it possible to obtain condoms for free at healthcare centers?				
Yes	3 (60.0)	49 (70.0)	63 (70.8)	115 (70.1)
No	0 (0.0)	10 (14.3)	9 (10.1)	19 (11.6)
I do not know	2 (40.0)	11 (15.7)	17 (19.1)	30 (18.3)
What would you do if you suspected you had an STI? (multiple answers allowed)				
Visit a healthcare center	2 (40.0)	39 (55.7)	54 (60.7)	95 (57.9)
Visit a hospital emergency room	1 (20.0)	30 (42.9)	55 (61.8)	86 (52.4)
Ask parents for advice	0 (0.0)	21 (30.0)	40 (44.9)	61 (37.2)
Ask friends for advice	1 (20.0)	2 (2.9)	8 (9.0)	11 (6.7)
I do not know	2 (40.0)	16 (22.9)	10 (11.2)	28 (17.1)
Can STIs cause infertility?				
Yes	1 (20.0)	43 (61.4)	41 (46.1)	85 (51.8)
No	0 (0.0)	7 (10.0)	5 (5.6)	12 (7.3)
I do not know	4 (80.0)	20 (28.6)	43 (48.3)	67 (40.9)
Is there medication to take after exposure to HIV to reduce the risk of infection?				
Yes	1 (20.0)	43 (61.4)	41 (46.1)	57 (34.8)
No	0 (0.0)	7 (10.0)	5 (5.6)	24 (14.6)
I do not know	4 (80.0)	20 (28.6)	43 (48.3)	83 (50.6)
Which sources of information about STIs do you use? (multiple answers allowed)				
Health professionals	1 (20.0)	36 (51.4)	39 (43.8)	76 (46.3)
Google	2 (40.0)	23 (32.9)	39 (43.8)	64 (39.0)
Social media platforms (Instagram, TikTok, etc.)	2 (40.0)	20 (28.6)	40 (44.9)	62 (37.8)
School	0 (0.0)	26 (37.1)	30 (33.7)	56 (34.1)
Family members	0 (0.0)	21 (30.0)	32 (36.0)	53 (32.3)
Friends	1 (20.0)	14 (20.0)	27 (30.3)	42 (25.6)
YouTube	1 (20.0)	11 (15.7)	16 (18.0)	28 (17.1)
I do not know any sources	2 (40.0)	16 (22.9)	20 (22.5)	38 (23.2)
Have you engaged in sexual activity?				
Yes	3 (60.0)	29 (41.4)	29 (32.6)	61 (37.2)
No	2 (40.0)	41 (58.6)	60 (67.4)	103 (62.8)

Abbreviations: STIs, sexually transmitted infections; HIV, human immunodeficiency virus; HPV, human papillomavirus.

Regarding sexual behaviors (**Table 3**), among the total sample, 37.2% reported being sexually active, with a mean age for the first sexual encounter of 14.7 years (SD ± 1,86). Condom use was inconsistent in 67.2% of these participants, most frequently due to discomfort and reduced sexual pleasure.

Sexually active adolescents were more likely to correctly recognize herpes as an STI (p = 0.031, *Cramér's V* = 0.168) and to identify genital contact as a mode of transmission (p = 0.021, *Cramér's V* = 0.180) (**Table 4**). Non-significant trends suggested greater awareness among sexually active adolescents of gonorrhea and hepatitis C, the availability of free condoms at health centers, and the existence of internal condoms. Regarding gender, male adolescents showed greater recognition of gonorrhea (p = 0.006, *Cramér's V* = 0.248), but overall tended to select 'I don't know' more frequently across all questions. Females exhibited superior knowledge in several domains, including herpes (p = 0.032, *Cramér's V* = 0.205), condoms as a strategy for STI prevention (p = 0.042, *Cramér's V* = 0.197), awareness of dental dams (p = 0.015, *Cramér's V* = 0.227), and the importance of condom use in female–female sexual activity (p = 0.028, *Cramér's V* = 0.209). However, they were also more likely to incorrectly consider withdrawal as an effective prevention method (**Table 5**).

Many variables did not show significant differences between groups, such as recognition of chlamydia, syphilis, HIV, and HPV as STIs, knowledge of common symptoms or general attitudes toward seeking healthcare services for STIs.

Table 3 - Summary of questions and responses from adolescents who have engaged in sexual activity.

	Non-Binary (*n* = 3)	Male (*n* = 29)	Female (*n* = 29)	Total (*n* = 61)
	n (%)	*n* (%)	*n* (%)	*n* (%)
How often do you use condoms?				
Always	1 (33.3)	13 (44.8)	6 (20.7)	20 (32.8)
Not always	2 (66.7)	12 (41.4)	19 (65.5)	33 (54.1)
Never	0 (0.0)	4 (13.8)	4 (13.8)	8 (13.1)
Barriers to condom use (open-ended question):				
Perception of decreased sexual pleasure	1 (33.3)	10 (34.5)	7 (24.1)	18 (29.5)
Discomfort during use	2 (66.7)	7 (24.1)	6 (20.7)	15 (24.6)
Partner asked to remove the condom	0 (0.0)	3 (10.3)	5 (17.2)	8 (13.1)
Unaware of the need to use condoms	0 (0.0)	1 (3.4)	6 (20.7)	7 (11.5)
Inconvenience	0 (0.0)	2 (6.9)	2 (6.9)	4 (6.6)
Lack of availability	0 (0.0)	0 (0.0)	2 (6.9)	2 (3.3)
Both partners with negative STI testing results	0 (0.0)	2 (6.9)	2 (6.9)	4 (6.6)
Have you had sex under the influence of drugs?				
Yes, marijuana	0 (0.0)	5 (17.2)	3 (10.3)	8 (13.1)
Yes, cocaine	0 (0.0)	0 (0.0)	1 (3.4)	1 (1.6)
Yes, other drugs	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
No	3 (60.0)	24 (82.8)	25 (86.2)	52 (85.3)

Abbreviations: STI, sexually transmitted infection.

Table 4 - STI knowledge according to sexual activity (active vs non-active).

Characteristic	Total (n=164)	Active (n=61)	Non-active (n=103)	*p*	*Cramér's V*
	n (%)	*n* (%)	*n* (%)		
Knowledge of gonorrhea	No 72 (43.9) Yes 92 (56.1)	No 21 (34.4) Yes 40 (65.6)	No 51 (49.5) Yes 52 (50.5)	0.060	0.147
Knowledge of hepatitis C	No 96 (58.5) Yes 68 (41.5)	No 30 (49.2) Yes 31 (50.8)	No 66 (64.1) Yes 37 (35.9)	0.061	0.146
Knowledge of herpes	No 30 (18.3) Yes 134 (81.7)	No 6 (9.9) Yes 55 (90.1)	No 24 (23.3) Yes 79 (76.7)	0.031	0.168
Genital contact as a route of STI transmission	No 40 (24.4) Yes 124 (75.6)	No 21 (34.4) Yes 40 (65.6)	No 19 (18.4) Yes 84 (81.6)	0.021	0.180
Free condoms available at health centers	Incorrect 49 (29.9) Correct 115 (70.1)	Incorrect 13 (21.3) Correct 48 (78.7)	Incorrect 36 (35.0) Correct 67 (65.0)	0.065	0.144
Internal condom awareness	No 52 (31.7) Yes 112 (68.3)	No 14 (23.0) Yes 47 (77.0)	No 38 (36.9) Yes 65 (63.1)	0.064	0.145

Abbreviations: STI, sexually transmitted infection.

Table 5 - Gender differences in STI knowledge.

Characteristic	Total (n=164)	Male (n=70)	Female (n=89)	Non-binary (n=5)	*p*	*Cramér's V*
	n (%)	*n* (%)	*n* (%)	*n* (%)		
Knowledge of gonorrhea	No 72 (43.9) Yes 92 (56.1)	No 22 (31.4) Yes 48 (68.6)	No 49 (55.1) Yes 40 (44.9)	No 1 (20.0) Yes 4 (80.0)	0.006	0.248
Knowledge of herpes	No 30 (18.3) Yes 134 (81.7)	No 19 (27.1) Yes 51 (72.9)	No 11 (12.4) Yes 78 (87.6)	No 0 (0.0) Yes 5 (100.0)	0.032	0.205
Condoms as an STI prevention strategy	No 29 (17.7) Yes 135 (82.3)	No 17 (24.3) Yes 53 (75.7)	No 10 (11.2) Yes 79 (88.8)	No 2 (40.0) Yes 3 (60.0)	0.042	0.197
Withdrawal method as an STI prevention strategy	No 149 (90.9) Yes 15 (9.1)	No 68 (97.1) Yes 2 (2.9)	No 77 (86.5) Yes 12 (13.5)	No 4 (80.0) Yes 1 (20.0)	0.048	0.192
Dental dam awareness	No 118 (72.0) Yes 46 (28.0)	No 48 (68.6) Yes 22 (31.4)	No 69 (77.5) Yes 20 (22.5)	No 1 (20.0) Yes 4 (80.0)	0.015	0.227
Importance of condoms in sexual encounters between female partners	Incorrect 99 (60.4) Correct 65 (39.6)	Incorrect 49 (70.0) Correct 21 (30.0)	Incorrect 49 (55.1) Correct 40 (44.9)	Incorrect 1 (20.0) Correct 4 (80.0)	0.028	0.209

Abbreviations: STI, sexually transmitted infection.

DISCUSSION

Unprotected sexual activity is closely linked to the transmission of various infectious agents.[1] Adolescents and young adults are a primary focus of STI research due to their heightened vulnerability and higher STI incidence rates, making them a critical target audience for public health interventions.[6] This study identified strengths in the participants' knowledge of STIs while also revealing notable gaps, underscoring the need for targeted interventions and further development in this area.

Our study found strong awareness of key STI-causing agents, with most adolescents correctly identifying genital herpes and HIV, consistent with findings from other studies in adolescent populations.[12,13] The high recognition of HIV is likely due to extensive awareness campaigns over the years.[13] Among the curable STIs, gonorrhea was identified more frequently than chlamydia or trichomoniasis, an interesting result given that trichomoniasis is actually the most common STI of the three, followed by chlamydia and gonorrhea.[14] A possible explanation is that gonorrhea's characteristic symptoms may make it more recognizable, although this was not directly assessed in our study.

Moreover, only 48.2% demonstrated awareness of HPV. When analyzing only those eligible for vaccination under the Portuguese national vaccination program (boys aged ≥ 15 years and girls of all ages), knowledge remained similarly low, with only 46.2% of girls and 47.5% of boys reporting awareness. Since Portugal's HPV vaccination rates are among the highest in Europe, adolescents may not have selected this pathogen because vaccination reduces its perceived relevance, although this was not directly assessed in our study and should, therefore, be considered with caution.[15] Nonetheless, HPV vaccination represents an important opportunity to educate adolescents about HPV transmission and the value of vaccination.

Regarding symptomatology, it is notable that only half of the participants were aware that STIs can be asymptomatic, which may lead adolescents to seek help only when symptoms appear. It is also concerning that over one-third could not identify any symptoms associated with STIs, which may reduce the likelihood of disclosing them to partners, as they may not perceive them as the consequence of a transmissible infection. Among those identifying symptoms, most selected genital symptoms. However, only 34.8% selected abnormal genital discharge, which may reflect limited knowledge about what constitutes vaginal discharge and how changes in its characteristics can sometimes indicate an STI. Fewer than half of the participants identified extragenital symptoms, underscoring the need to strengthen awareness in this area.

Regarding STI transmission, gaps that warrant attention include the misconception that bathrooms are a mode of transmission and the limited awareness of the possibility of STI coinfection (both reported by half of participants). In addition, only about half recognized that STIs can cause infertility, and such misconceptions about their long-term implications may contribute to underestimating consequences, reducing perceived vulnerability, and delaying care-seeking. Conversely, most participants correctly acknowledged that a single unprotected encounter can result in infection, reflecting an awareness of immediate risks.

Regarding prevention methods, nearly all participants selected the external condom, while the internal condom was chosen by about two-thirds, consistent with the literature and possibly reflecting widespread marketing[11]. However, greater emphasis is needed on STI prevention with dental dams (28.0% awareness), between female partners (39.6%), and during oral sex (55.5%), given the low knowledge in these areas. It could be beneficial to provide STI prevention guidance that is inclusive of all sexual orientations, helping adolescents protect themselves with any partner.

Additional findings revealed gaps in STI prevention knowledge, particularly concerning the effectiveness of the contraceptive pill, the withdrawal method, and multiple condom use. Furthermore, with only one-third of participants aware of PEP for HIV, prioritizing education on PEP could enhance harm reduction and help prevent new HIV cases. However, as many adolescents may not perceive themselves to be at risk for HIV, discussions of HIV and PEP should also address this low perceived vulnerability.[16]

Our results highlighted healthcare professionals as the primary source of STI information for participants. When asked how they would respond to a suspected STI, 57.9% of participants said they would visit a healthcare center, while 52.4% would go to the emergency room. Given that STI diagnosis and treatment rarely constitute true medical emergencies, the high reliance on emergency services is concerning. This highlights the potential overburdening of already strained emergency departments and the underuse of primary healthcare, emphasizing the need for public education on appropriate care pathways. Notably, only about half of participants reported they would seek care in formal health services, which suggests that barriers such as limited accessibility, lack of discretion or concerns about confidentiality might partly explain this pattern. Strengthening these aspects is essential to create safe environments for adolescents to seek timely and appropriate STI-related care. Overall, these percentages could likely be improved with a better understanding of the barriers to healthcare access faced by the participants.

Only 34.1% of participants identified schools as a source of information on STIs, likely reflecting the variations in sexual education programs across the country, despite it being legally required in Portugal from middle school onward. Studies also suggest that time constraints often prevent teachers from fully addressing sexual health topics, which may further explain these findings.[17]

Additionally, the adolescents in our study reported using Google and social media platforms such as TikTok and Instagram to gather sexual health information. With social

media playing such a central role in our daily lives, it would be beneficial for trusted organizations to adapt sexual health content to these digital platforms. Comprehensive sexual education should perhaps draw from a mix of sources, including health professionals, schools, family, and trusted online content, ensuring a well-rounded and engaging approach to learning.

Among the sexually active adolescents, more than two-thirds reported inconsistent condom use. While most participants are aware of the importance of condoms and that they are available for free at healthcare centers, factors beyond affordability appear to influence condom adherence. The main reported barriers were perceived reduction in pleasure and discomfort, which is consistent with the existing literature.[5] To address these issues, sexual education programs should focus on dispelling misconceptions about condom use and, importantly, frame condoms as part of positive and enjoyable sexual experiences. Additionally, 13.1% reported that their partners had asked them to remove the condom, and 14.7% reported taking drugs during sex, highlighting the need for discussions surrounding safe and consensual sexual practices.

Sexually active adolescents were more likely to recognize herpes and identify genital contact as a mode of transmission compared with their non-sexually active peers. Non-significant trends indicated that sexually active adolescents also showed greater awareness of other STIs (gonorrhea and hepatitis C), the availability of free condoms at health centers, and the existence of internal condoms. These findings suggest that sexual experience may be associated with slightly greater STI knowledge in these areas, although the effect sizes were generally small.

Gender-related differences were more pronounced. Males demonstrated greater recognition of gonorrhea but were more likely to select “I don’t know” across multiple questions, which may reflect uncertainty rather than outright misconceptions. Females showed greater knowledge regarding herpes, condom use as an STI prevention strategy, dental dam awareness, and the importance of protection in female–female sexual activity, yet they were more likely to misidentify withdrawal as an effective preventive method. While the reasons for these gender differences remain unclear, addressing such misconceptions is crucial to bridging knowledge gaps and preventing the consequences of unprotected sex driven by false beliefs. Effect sizes for gender differences were small to medium, indicating that gender was a stronger determinant of STI knowledge than sexual activity status.

No significant group differences were observed for recognition of chlamydia, syphilis, HIV, and HPV as STIs, knowledge of common symptoms, or general attitudes toward seeking healthcare services. This suggests that baseline understanding of core facts regarding STIs is relatively similar across groups, though the modest sample size may have limited the ability to detect subtle associations.

Overall, sexually non-active males demonstrated the lowest STI knowledge levels and greater uncertainty across key items, whereas sexually active females exhibited the most comprehensive knowledge, despite persisting misconceptions in certain areas.

Several limitations of this study must be acknowledged. First, the use of an unvalidated questionnaire may have affected the reliability and validity of the data collected. The multiple-choice format, chosen to reduce respondent fatigue, may also have limited the depth of responses and introduced response bias. Additionally, as the study relied on self-reported data, some participants may have provided socially desirable answers or withheld sensitive information, particularly regarding sexual behaviors. Second, the use of a convenience sample and the study’s restriction to a specific geographical area may limit the generalizability of the findings to the wider adolescent population in Portugal. Finally, a significant proportion of participants reported not having an active sex life, which could have influenced their STI knowledge; future studies could focus on sexually active adolescents to better assess knowledge within this subgroup.

CONCLUSIONS

STIs remain a major public health concern, with rising incidence rates and declining condom use. This study identified both strengths and gaps in adolescents’ knowledge of STIs, notably regarding prevention during oral sex, the use of dental dams, and awareness of HIV PEP, topics that are often underrepresented in the literature. Significant differences in knowledge were observed by sexual activity status and gender, with sexually non-active males appearing to be the most vulnerable to these knowledge gaps. Inconsistent condom use and related barriers were also noted. Overall, these results emphasize the need for comprehensive, inclusive, and early sexual health education programs that foster informed, confident, and preventive behaviors among adolescents.

AUTHORSHIP

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