

# HIV and Sexual Health Awareness Among University Students: Findings from a World AIDS Day Survey in Milan

Angelo Roberto Raccagni<sup>1</sup>, Camilla Abello<sup>1</sup>, Vincenzo Stabile<sup>1</sup>, Nicolò Capra<sup>2</sup>, Riccardo Lolatto<sup>2</sup>, Giuliana Uslenghi<sup>2</sup>, Sonia Levi<sup>1,2</sup>, Andrea Fossati<sup>1,2</sup>, Massimo Reichlin<sup>1,2</sup>, Francesco De Cobelli<sup>1,2</sup>, Silvia Nozza<sup>1,2</sup>, Antonella Castagna<sup>1,2</sup>

<sup>1</sup>Vita-Salute San Raffaele University, Milan, Italy;

<sup>2</sup>IRCCS San Raffaele Scientific Institute, Milan, Italy

## SUMMARY

This study assessed HIV and sexual health knowledge among undergraduate medical students in Milan, Italy. An anonymous online survey with nine multiple-choice questions was distributed by email to students at Vita-Salute San Raffaele University in November 2024. Of 1004 respondents, 48% reported comprehensive and 44% partial knowledge of HIV. Awareness of PrEP, PEP, and “U=U” was 47%, 45%, and 46%, respectively. HIV stigma persisted, with 36% considering it a taboo subject. Knowledge was significantly associated with prior sexual health education, highlighting the need for strengthened sexual health training to address gaps and reduce stigma.

Received September 15, 2025

Accepted September 24, 2025

## BACKGROUND

HIV and sexually transmitted infections (STIs) continue to pose a major public health challenge worldwide, despite significant advancements in prevention, treatment, and education (Gökengin *et al.*, 2023; Zhang *et al.*, 2022). While efforts have focused primarily on raising awareness among at-risk populations, it is equally crucial to assess the general level of knowledge, particularly in academic settings where future healthcare professionals are trained (Gökengin *et al.*, 2023). These individuals will inevitably interact - directly or indirectly - with key populations and people living with HIV (PLWH), making their understanding of the subject essential (Gökengin *et al.*, 2023). Universities serve as an ideal platform for disseminating sexual health education, not only through traditional lectures but also through local initiatives, testing campaigns, and awareness events (Di Gennaro *et al.*, 2024). However, previous studies have shown varying levels of awareness and understanding of HIV and prevention methods, such as pre-exposure prophylaxis (PrEP) and post-exposure prophylaxis (PEP)

(Di Gennaro *et al.*, 2024; Loconsole *et al.*, 2020; Mereu *et al.*, 2022; De Vito *et al.*, 2022). Alarming, even medical students often demonstrate only a superficial understanding of these topics (Di Gennaro *et al.*, 2024; Loconsole *et al.*, 2020). Beyond their future professional roles, university students also represent a key population when it comes to sexual health risks. According to the latest data, Italy recorded 2,349 new HIV diagnoses in 2023, with an incidence rate of 4.0 per 100,000 population (Istituto Superiore di Sanità, 2024). Sexual transmission remains the dominant mode of HIV acquisition, and notably, 160 new cases were reported in 2023 among individuals under 25 years old (Istituto Superiore di Sanità, 2024). Overall in 2023 in Italy, HIV sexual transmission was observed among MSM in 38.6% of cases, heterosexual males in 26.6%, and heterosexual females in 21.1%; only 3.4% cases of new HIV diagnoses were related to intravenous drug use (IDU). Additionally, STIs are widespread among younger populations. In response to the growing HIV epidemic, in 2023 Italy approved reimbursement for HIV PrEP to all people reporting sexual behaviour at risk of acquiring HIV, expanding access to this preventive measure (Nozza *et al.*, 2025). A survey conducted among 62 Italian PrEP centres found that 11,675 individuals had initiated PrEP, marking an important step in HIV prevention efforts (Nozza *et al.*, 2025; Raccagni *et al.*, 2022, 2025). Moreover, HIV PEP is available to all after at-risk sexual or occupational exposure.

### Keywords:

HIV, PrEP, U=U; Sexual Health, University; Students.

### Corresponding author:

Angelo Roberto Raccagni  
E-mail: raccagni.angelo@hsr.it

The ECDC has reported a sharp rise in STI cases across Europe, including Italy (Gökengin *et al.*, 2023). Worryingly, the highest proportion of chlamydia cases in 2022 were among people aged 20-24 years (Gökengin *et al.*, 2023).

In this context, this survey aims to evaluate the level of knowledge regarding HIV, sexual health, and prevention methods among undergraduate students enrolled in the Faculty of Medicine (including Human Medicine, Dentistry, Nursing, etc.) at Vita-Salute San Raffaele University in Milan, Italy. Conducted in conjunction with a local HIV and syphilis testing campaign during the World AIDS Day, the results of this survey could provide insights into existing gaps in sexual health education.

## METHODS

This is a survey conducted among undergraduate students enrolled at Vita-Salute San Raffaele University in Milan, Italy. The study aimed to assess students' self-reported knowledge and perceptions about HIV/STIs through an anonymous electronic survey, administered in October 2024 via Microsoft Forms (Office®). The survey consisted of nine multiple-choice questions, each with a single correct answer (questions in *Table 1*). Undergraduate students enrolled in the Faculty of Medicine of the Vita-Salute San Raffaele University in Milan, Italy, were asked to participate. Students enrolled in Human Medicine are taught Microbiology in their 3<sup>rd</sup> year and Infectious Diseases in their 4<sup>th</sup> year, with additional options for elective courses on HIV and STIs later.

After Ethics approval, the University Secretariat distributed the survey via email to all students enrolled in the Faculty of Medicine on November 20, 2024, and it remained active until November 25, 2024 (freeze date). Survey responses were presented as frequencies and percentages for each answer option. The association between the self-reported level of sexual education and the other questions in the survey were assessed using a Pearson chi-square test. Adjusted Pearson residuals were then estimated and used in a post hoc analysis to identify the responses that contributed most to the association. An absolute residual value of 2 or higher was considered an indication of significant deviation from expectations. The "I prefer not to answer" option was excluded from the association analysis because it was used infrequently compared to the size of the overall sample. All analyses were performed using SAS version 9.4 (SAS Institute, Cary, North Carolina).

The completion of the survey by the students and the publication of the data collected were approved and granted by Vita-Salute San Raffaele University, Milan, Italy, according to local requirements. The data collected were anonymised and managed according to good clinical practice. The study findings were presented locally as part of the World AIDS Day 2024

initiatives led by the Infectious Diseases Unit on December 2, 2024 to healthcare professionals, university students, community members, and the public attending the event.

## RESULTS

A total of 1004 students from Vita-Salute San Raffaele University, Milan, Italy, participated in the survey. A total of 5125 undergraduate students were enrolled at the Faculty of Medicine at the time of the survey. Of these students, 3378 (66%) were female and 4585 (89%) were under 25 years old. Hence, the survey received a 20% response rate. The survey assessed knowledge of HIV, sexual health, and prevention methods, including PrEP and PEP. Detailed survey responses are presented in *Table 1*.

Regarding sexual health education received outside the university, only 22.4% (225/1004) reported in-depth education. Comprehensive HIV infection knowledge was reported by only 48.3% (485/1004). Overall, 45.9% (461/1004) were aware of "undetectable=untransmittable" (U=U) meaning and full awareness of PrEP was reported by 46.6% (468/1004) of participants. Regarding stigma, 36.2% (363/1004) recognized HIV as a taboo topic.

A significant association was found between self-reported sexual health education and all considered survey items, except for students' awareness on condom use, which showed only a marginal association ( $p=0.053$ ) (*Table 1*).

Students who reported receiving in-depth sexual health education were more likely to self-report in-depth knowledge of HIV (63.6%; residual = +5.16) and less likely to be unaware of the U=U concept (15.6%; residual = -3.29). They were also more likely to feel comfortable discussing sexual health with family or friends (66.5%; residual = +3.21). Awareness of prevention strategies was also higher in this group: 56.3% knew what PEP was (residual = +3.85), while 58.0% were aware of PrEP (residual = +3.81). Full results are reported in *Table 2*.

## DISCUSSION

The results of this survey reveal significant gaps in knowledge about HIV and sexual health among university students enrolled in the Faculty of Medicine, similarly to other previous studies conducted in Italy (Di Gennaro *et al.*, 2024; Loconsole *et al.*, 2020; Mereu *et al.*, 2022; De Vito *et al.*, 2022). There were significant gaps in students' understanding of key HIV prevention methods and the concept of U=U. This suggests that although sexual health education is available, it may not be sufficiently comprehensive or equally accessible. While awareness of HIV prevention methods such as PrEP and PEP was relatively high, many students reported that their knowledge was superficial. This sug-

**Table 1** - Survey results and association between self-reported sexual health education (Answer to “Have you received sexual health education outside the university setting?”) and survey items among undergraduate university students in Milan, Italy.

Survey question	Answer	Question: Have you received sexual health education outside the university setting? (n=1002)			p-value
		No (n=219)	Superficially (n=558)	Deeply (n=225)	
How would you define your knowledge about HIV infection? (n=1002) *2	In-depth 485 (48.4%)	101 (46.1%)	241 (43.2%)	143 (63.6%)	<0.001
	Partial 438 (43.6%)	85 (38.8%)	277 (49.6%)	75 (33.3%)	
	Scarce 81 (8.0%)	33 (15.1%)	40 (7.2%)	7 (3.1%)	
Do you think students are more aware of condom use and screening for HIV and STI in general? (n=999) *5	Yes, because they are better informed on this issue 247 (24.7%)	57 (26.0%)	141 (25.4%)	49 (21.9%)	0.053
	Perhaps, they should be more aware of this issue 602 (60.1%)	118 (53.9%)	333 (59.9%)	149 (66.5%)	
	No 152 (15.2%)	44 (20.1%)	82 (14.7%)	26 (11.6%)	
Do you know what is meant by the term U=U (undetectable=untransmittable)? (n=1001) *3	Yes 461 (45.9%)	100 (45.7%)	247 (44.3%)	113 (50.4%)	0.027
	I am not sure of its meaning 302 (30.2%)	63 (28.8%)	163 (29.2%)	76 (33.9%)	
	No 240 (23.9%)	56 (25.6%)	148 (26.5%)	35 (15.6%)	
Do you know what PEP (post-exposure prophylaxis) is? (n=998) *6	Yes 449 (45.0%)	101 (46.3%)	222 (39.9%)	126 (56.3%)	<0.001
	Yes, in a superficial way 248 (24.8%)	41 (18.8%)	153 (27.5%)	54 (24.1%)	
	No 303 (30.2%)	76 (34.9%)	181 (32.6%)	44 (19.6%)	
Do you know what PrEP (pre-exposure prophylaxis) is? (n=998) *6	Yes 468 (46.9%)	106 (48.6%)	232 (41.7%)	130 (58.0%)	<0.001
	Yes, in a superficial way 235 (23.5%)	41 (18.8%)	140 (25.1%)	54 (24.1%)	
	No 298 (29.6%)	71 (32.6%)	185 (33.2%)	40 (17.9%)	
Do you think there is a stigma associated with HIV infection? (n=996) *8	Yes, it is taboo 363 (36.5%)	83 (38.2%)	194 (34.9%)	86 (38.6%)	0.026
	Partially, it is a little discussed topic 572 (57.2%)	126 (58.1%)	330 (59.4%)	114 (51.1%)	
	No, it is freely discussed 63 (6.3%)	8 (3.7%)	32 (5.8%)	23 (10.3%)	
Have you found it difficult to talk about this issue with friends or family members? (n=981) *23	Yes, it is taboo 65 (6.6%)	17 (8.0%)	32 (5.9%)	16 (7.1%)	0.009
	Sometimes, it is difficult to talk about 355 (35.2%)	83 (39.0%)	213 (39.2%)	59 (26.3%)	
	No, it is freely discussed 563 (57.2%)	113 (53.1%)	299 (55.0%)	149 (66.5%)	

\*Refers to the number of students who answered, “I prefer not to answer” for both the specific item and the question “Have you received sexual health education outside the university setting?”.

gests that while students are aware of the existence of these prevention methods, they may lack a deeper understanding of how and when to use them effectively. The concept of U=U was not widely understood, reflecting a wider gap in knowledge about HIV treatment and its impact on transmission. This is worrying, as understanding the science behind antiretroviral therapy is crucial to reducing stigma and encouraging PWH to engage in regular treatment and care. Stigma surrounding HIV remains a prominent issue, even among university students, with many participants acknowledging that HIV is still perceived by others as a taboo subject (Galipò *et al.*, 2024). Although the majority of students reported feeling comfortable discussing HIV with their peers, a significant proportion still found it difficult to discuss with friends or family. This suggests that while academic environments may provide more space for open dialogue, wider societal stigma about HIV continues to influence personal discussions (Di Gennaro *et al.*, 2024; Loconsole *et al.*, 2020).

Our findings align with those of previous Italian studies, confirming persistent gaps in HIV knowledge among young people. As in similar studies, we found that awareness of PrEP, PEP and U=U was limited, even among healthcare students (Loconsole *et al.*, 2020; Mereu *et al.*, 2022). Although this was higher

than that reported among high school students, substantial deficiencies remained (Di Gennaro *et al.*, 2024). Compared to the general population, our cohort showed better awareness of HIV prevention strategies; however, significant gaps in comprehensive knowledge and persistent stigma were still evident (De Vito *et al.*, 2022).

This study has some limitations due to its single university nature, although students from all over Italy are enrolled, and the limited time period over which the survey was conducted. Moreover, the results of the study may not be generalizable to other regional settings or different university faculties, and no specific demographic data were analysed. The results regarding knowledge and perception were self-reported by students, so there was a possibility of social desirability bias, although the anonymous survey likely mitigated this issue. Furthermore, no validated scales on HIV-related issues were employed; only self-reported knowledge of key aspects of HIV/STIs was assessed. Lastly, there was some missing data, though the percentage was very low.

In light of the latest Italian data indicating cases among people under 25 years old, universities serve as an optimal platform to convey HIV prevention messages. Incorporating detailed sexual health and HIV education into the curriculum will ensure that all

**Table 2** - Analysis of adjusted Pearson residuals assessing the association between self-reported sexual health education and survey items among undergraduate university students.

Survey question	Answer	Question: Have you received sexual health education outside the university setting? (n=1002)		
		No (n=219)	Superficially (n=558)	Deeply (n=225)
How would you define your knowledge about HIV infection? (n=1002)	In-depth	-0.77	-3.70	5.16
	Partial	-1.62	4.31	-3.53
	Scarce	4.38	-1.07	-3.06
Do you know what is meant by the term U=U (undetectable=untransmittable)? (n=1001)	Yes	-0.10	-1.20	1.53
	I am not sure of its meaning	-0.51	-0.74	1.39
	No	0.67	2.20	-3.29
Do you know what PEP (post-exposure prophylaxis) is? (n=998)	Yes	0.45	-3.61	3.85
	Yes, in a superficial way	-2.34	2.19	-0.29
	No	1.71	1.85	-3.89
Do you know what PrEP (pre-exposure prophylaxis) is? (n=998)	Yes	0.59	-3.69	3.81
	Yes, in a superficial way	-1.86	1.35	0.23
	No	1.07	2.78	-4.38
Do you think there is a stigma associated with HIV infection? (n=996)	Yes, it is taboo	0.62	-1.15	0.75
	Partially, it is a little discussed topic	0.28	1.52	-2.09
	No, it is freely discussed	-1.81	-0.83	2.78
Have you found it difficult to talk about this issue with friends or family members? (n=981)	Yes, it is taboo	0.90	-1.04	0.35
	Sometimes, it is difficult to talk about	0.95	2.16	-3.49
	No, it is freely discussed	-1.38	1.57	3.21

students gain a more comprehensive understanding of the virus and prevention strategies. Reducing the stigma surrounding HIV and increasing awareness of prevention methods such as PrEP, PEP and U=U could have a significant public health impact, both within the university environment and in the wider community.

### Acknowledgements

A.C. designed the study and contributed to the writing of the article. A.R.R. contributed to the design of the survey and to the drafting of the study. R.L. contributed to data management. N.C. performed statistical analyses. S.N. contributed to the revision of the manuscript. C.A. and V.S. contributed to data interpretation and dissemination and to the revision of the manuscript. G.U. coordinated survey dissemination. S.L., A.F., F.D.C. and M.R. endorsed the survey and contributed to the review of the manuscript. All authors read and approved the published version of the manuscript.

### Competing interests

All authors have no conflicts of interest to disclose.

### Funding

None.

### Ethical statement

The conducting of the survey and the publication of the data were approved and granted by Vita-Salute San Raffaele University, Milan, Italy. The data collected were anonymised and managed in accordance with good clinical practice.

## References

- De Vito A., Colpani A., Zauli B., Meloni M.C., Fois M., et al. (2022). How little do we know about HIV and STIs prevention? Results from a web-based survey among the general population. *Healthcare (Basel)*. **10** (6), 1059.
- Di Gennaro F., Segala F.V., Guido G., Polisenio M., De Santis L., et al. (2024). Knowledge, attitudes, and practices about HIV and other sexually transmitted infections among high school students in Southern Italy: A cross-sectional survey. *PLoS One*. **19** (4), e0301297.
- Galipò R., Bolletta M., Campanella M., et al. (2024). P-143 Stigma and HIV: Perceptions in young people from Anlaids School. *Sex Transm Infect*. **100**, A229.
- Gökengin D., Noori T., Alemany A., Bienkowski C., Liegion G., et al. (2023). Prevention strategies for sexually transmitted infections, HIV, and viral hepatitis in Europe. *Lancet Reg Health Eur*. **34**, 100738.
- Istituto Superiore di Sanità. (2024). Notiziario dell'ISS (volume 37 - n. 11, novembre 2024). Available at: <https://www.epicentro.iss.it/aids/notiziario-coa>. Accessed 15 September 2025.
- Loconsole D., Metallo A., Bruno V., De Robertis A.L., Morea A., et al. (2020). HIV awareness: a KAP study among students in Italy reveals that preventive campaigns still represent a public health priority. *Ann Ig*. **32** (1), 56-64.
- Mereu A., Liori A., Fadda L., Puddu M., Chessa L., et al. (2022). What do young people know about HIV? Results of a cross-sectional study on 18-24-year-old students. *J Prev Med Hyg*. **63** (4), E541-E548.
- Nozza S., Mazzotta V., Masoero T., et al. (2024). OC-50 Implementation of PrEP in Italy: results of PrIDE survey. *Sex Transm Infect*. **100**, A50-A51.
- Raccagni AR, Passini F, Diotallevi S, Lolatto R, Bruzzesi E, et al. (2025). Brief report: gaps in HIV preexposure prophylaxis acceptance: findings from an outpatient HIV testing service in Italy. *J Acquir Immune Defic Syndr*. **98** (1):37-40.
- Raccagni A.R., Soldini L., Nozza S., Negri S., Vidoni G.M., et al. (2022). Early diagnosis and linkage to care: an experience over 14 years of point of care rapid HIV testing. *New Microbiol*. **45** (4), 320-323.
- Zhang J., Ma B., Han X., Ding S., Li Y. (2022). Global, regional, and national burdens of HIV and other sexually transmitted infections in adolescents and young adults aged 10-24 years from 1990 to 2019: a trend analysis based on the Global Burden of Disease Study 2019. *Lancet Child Adolesc Health*. **6** (11), 763-776.