

Awareness, Knowledge, Attitude, and Source of Information on HIV Infection Among College Students

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Objective: To evaluate the college students' awareness, knowledge, attitude, and source of information on human immunodeficiency virus (HIV).

Methods: This is a multicenter study with 490 college students participated in the questionnaire survey. Among them, 261 are medical students and 229 are non-medical students. A questionnaire was used to collect socio-demographic data and investigate the awareness of and knowledge about HIV infection, the practice of preventive measures, and sources of HIV-related information.

Results: There is no significantly different on self-report awareness of HIV infection between medical and non-medical students ($P = 0.919$). However, a higher proportion of non-medical students misunderstand the HIV transmission routes. For the sources of knowledge, non-medical students were more likely to obtain from the Internet ($P=0.029$), TV medias ($P=0.027$) and others ($P=0.032$). The proportion of medical students acquiring HIV-related knowledge from doctors was significantly higher ($P<0.001$). A higher percentage of non-medical students indicated a lack of HIV knowledge and expressed a need for more HIV related education ($P=0.002$). Non-medical students expressed a preference for HIV education that covers a broader spectrum of HIV-related knowledge ($P=0.046$), indicating a desire for more comprehensive understanding beyond basic HIV-related awareness. In contrast, medical students indicated a preference for more frequent sessions with longer durations ($P=0.038$).

Conclusion: Medical students were significantly more aware of HIV related knowledge than the non-medical students. Our research can provide relevant data support for further improving the methods and content of health education for young people.

Keywords: acquired immunodeficiency syndrome, human immunodeficiency virus, awareness, knowledge, attitude, source

Introduction

Acquired immunodeficiency syndrome (AIDS), resulting from HIV infection, poses a significant threat to human health and remains a critical public health concern. HIV mainly infected through blood transfusion, sexual contact, and mother-to-child transmission. In China, the HIV/AIDS epidemic has similarly become a major public health concern. According to an assessment by the Chinese Center for Disease Control and Prevention, as of 2018, approximately 1.25 million individuals had been infected with HIV across the country.¹ Notably, the Joint United Nations Program on HIV/AIDS (UNAIDS) reports suggested that global AIDS-related mortality and new infection rates have declined year by year.² However, the AIDS epidemic among young people is not optimistic. The AIDS-related mortality of male adolescents has risen against the trend,³ particularly among adolescent college students.⁴ Hence, there is a crucial need to raise awareness and enhance knowledge regarding HIV infection in this population.

Awareness of HIV infection refers to an individual's general understanding or consciousness of the existence of HIV, its modes of transmission, and its impact on society.⁵ While HIV-related knowledge encompasses a deeper understanding of HIV/AIDS, including its biology, epidemiology, prevention strategies, treatment options, and societal implications.⁶ It goes beyond mere awareness and delves into specifics such as the importance of viral load and CD4 count monitoring, strategies for reducing HIV transmission rates (like PrEP and PEP), and the social and cultural factors influencing HIV prevalence and stigma.⁷ Nowadays, the characteristics of adolescents in terms of health awareness and related behaviors may be significantly different from those of other groups, due to the change of traditional and modern media.⁸ However, most previous researches on adolescents' health perception and related behaviors investigation focused on men who have sex with men (MSM).^{9–11} To enhance awareness and knowledge of HIV infection, it's imperative to ascertain the current level of awareness and knowledge about HIV within this demographic. Although studies on HIV-related knowledge among university students exist,^{12,13} research specifically targeting medical students remains limited, particularly in China and similar sociocultural settings.

To address this gap, we conducted a study to assess awareness, knowledge, practices, and sources of information on HIV infection among college students. Our objective is to assess the HIV awareness and knowledge among young college students, categorized into medical and non-medical students. Thus, this study aims to provide valuable data on this specific population and to support improvements in medical education, especially for adolescent students who are increasingly at risk of HIV infection.

Subjects and Methods

Subjects

This multicenter study was conducted via an online survey at two universities in China, namely Xiamen University and Southern Medical University. A total of 490 college students were recruited using a convenience sampling method through online platforms, with all participation being entirely voluntary. Among the participants, 261 were medical students and 229 were non-medical students (Figure 1). The medical students were mainly enrolled in clinical medicine program and the program were required to complete coursework in infectious diseases, including content on HIV prevention and management. In contrast, the non-medical students, who majored in science, technology, engineering, and mathematics (STEM) fields, did not receive formal instruction on HIV-related topics as part of their curriculum. This

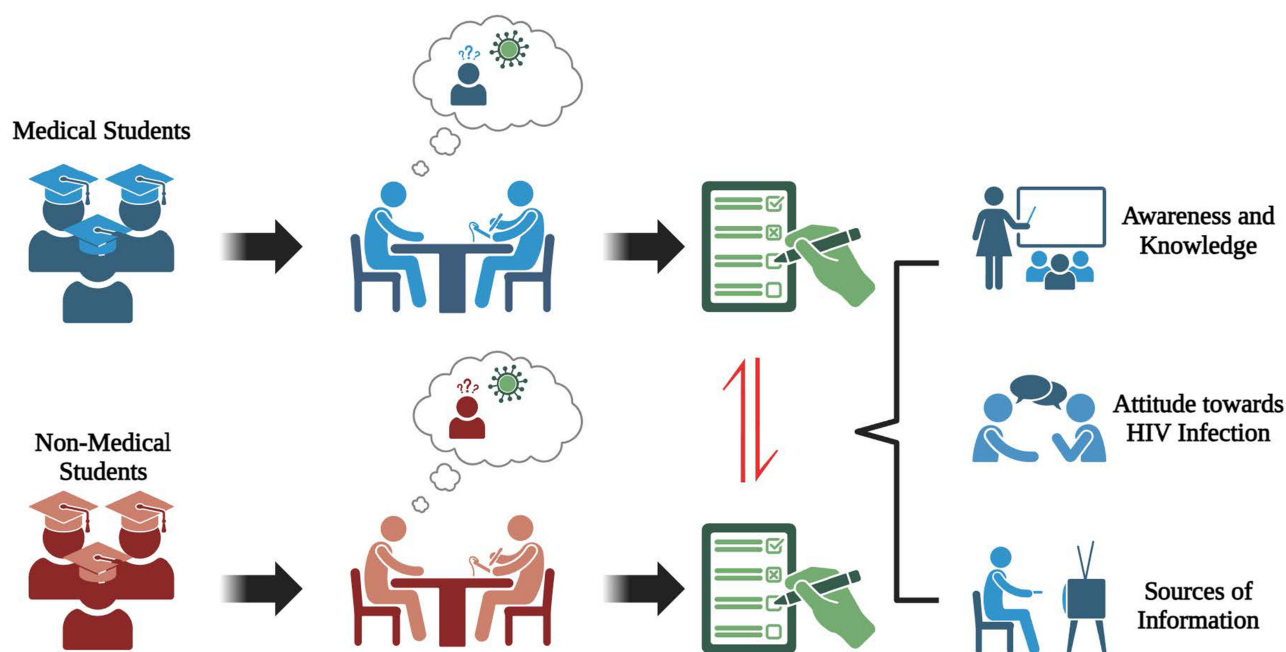


Figure 1 Flow diagram of the study. Created in BioRender. Zheng, C. (2025) <https://BioRender.com/pl1n566>.

educational difference was considered when interpreting their knowledge levels. Additionally, socio-demographic data of all participants enrolled were also recorded, including gender, age, education.

This questionnaire-based study was approved by the Ethics Committee of Nanfang Hospital, Southern Medical University (NFEC-2021-334). Informed consent was waived for all questionnaire participants, as all responses were collected anonymously. All procedures in our study were in accordance with the ethical standards of the responsible committee on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. Informed consent was obtained from all participants for inclusion in the study.

Questionnaire

The National AIDS Sentinel Surveillance Implementation Plan¹⁴ released by the National Center for STD and AIDS Prevention and Control of China identified eight key target populations, including youth and university students, and designed tailored questionnaires specifically for them. We adapted this questionnaire with specific modifications to better align with the objectives and target population of our study. We collected their socio-demographic data and investigate the awareness of and knowledge about HIV infection, the practice of preventive measures, and sources of HIV-related information. The questionnaire was divided into five sections and listed as followed:

- a. HIV awareness and knowledge: 1). Will HIV be transmitted by blood transfusion? 2). Will HIV be transmitted by sharing dishes? 3). Will HIV be transmitted through insect bites? 4). Will HIV be transmitted by sexual contact? 5). What is the window period for HIV antibody testing? 6). Does HIV mostly damage the immune system? 7). Can most AIDS patients be cured? 8) Does correct use of condoms can reduce the risk of HIV transmission? 9) Do you have awareness on risk of HIV infection? HIV awareness and knowledge were treated as a unified construct representing participants' overall understanding of HIV. This included concepts such as transmission routes, prevention methods, and treatment possibilities. A total of 9 questions were used to assess this knowledge level, with each question offering three response options: "Yes", "No", or "Don't know". Correct answers were coded as 1, and incorrect or "Don't know" responses as 0. Participants who answered all 9 questions correctly were classified into the group not lacking HIV-related knowledge.
- b. Sources of HIV-related information: 1). Friends; 2). Internet; 3). Schools; 4). TV medias; 5). Doctors; 6). Parents; 7). Others. (School Sources: Education through lectures, educational materials, and school-based programs; Internet Sources: Access to websites, online forums, and educational videos; Friends: Personal Experiences and Conversations; TV Media: Public service announcements, documentaries, and news coverage addressing HIV; Doctors: Medical advice, counseling, and participate in referrals for HIV testing, treatment options, and specialized care providers; Parents: Family discussions and parental guidance; Other Sources: Community resources and printed materials providing information about HIV, or sources other than those mentioned above.
- c. Attitude towards HIV: 1). Will you test HIV antibody if necessary 2). Have you ever been tested for HIV? 3). Are you afraid of HIV-infected patients? 4). Do you feel lack knowledge of HIV?
- d. Type of HIV knowledge most interested: 1). How to prevent HIV infection? 2). How to use condoms correctly? 3). More knowledge of reproductive health? 4). Types of high-risk behaviors? 5). Knowledge of HIV testing methods?
- e. Important part of a good HIV education should be: 1). Novelty of HIV related knowledge. 2). Types of HIV related knowledge. 3). Depth of HIV related knowledge. 4). Wider audience. 5). Numbers of HIV related education. 6) Tailor content to audience.

Statistical Analysis

Missing data accounted for less than 5% of the dataset and were handled using multiple imputation. Data were expressed as mean \pm standard deviation for continuous variables or numbers (percentages) for categorical variables. Prior to statistical testing, the normality of continuous variables was assessed using the Shapiro–Wilk test. Independent samples t-tests were used when normality assumptions were met; otherwise, nonparametric tests (Mann–Whitney U) were

applied. Chi-square tests were used to compare categorical variables. We also used univariate and multivariate logistic regression analysis to determine factors related to the lack of HIV-related knowledge. The significance level was set as $P < 0.05$ (two-tailed). Data analysis and quality control procedures were performed using SPSS 23.0 (Chicago, USA).

Results

Demographic Data

We enrolled 490 students. Of these, a total of 261 student were medical students and 229 were non-medical students. As shown in Table 1, the average age of medical students was 21.41 ± 1.71 years, while that of non-medical students was 20.15 ± 2.61 years. Among the medical students, 39.8% were male and 60.2% were female; in contrast, 54.6% of non-medical students were male and 45.4% were female. Regarding academic grade, most medical students were in their third (33.7%), fourth (27.6%), or postgraduate (33.0%) years. Non-medical students were primarily in their second year (46.7%) and third year (24.9%), with 10.0% being postgraduates.

HIV Awareness and Related Knowledge

Differences in HIV transmission knowledge between medical and non-medical students are shown in Figure 2A. There is no significantly different of self-report awareness on risk of HIV infection between medical students and non-medical students ($P = 0.919$). In terms of HIV transmission routes, compared with medical students, a higher proportion of non-medical students believed that HIV would be transmitted by shared dishes ($P=0.016$) and insects bites ($P=0.037$).

As shown in Figure 2B, while no significant difference was found in the knowledge of condom use for HIV prevention ($P = 0.197$), medical students demonstrated significantly better understanding in several other areas. These included awareness of the HIV antibody window period ($P < 0.001$), knowledge that HIV primarily damages the immune system ($P = 0.002$), and recognition that most HIV infections cannot be cured ($P = 0.015$).

Sources of HIV-Related Knowledge and Attitudes Towards HIV

As shown in Figure 2C, there were significant differences in the sources of HIV-related information between medical students and non-medical students. Non-medical students were more likely to obtain HIV-related knowledge from the Internet ($P=0.029$), TV medias ($P=0.027$) and others ($P=0.032$). The proportion of medical students acquiring HIV-related knowledge from doctors was higher than that of non-medical students ($P<0.001$).

Most of college students in both groups expressed no fear of HIV patients, with a relatively higher proportion among medical students ($P<0.001$). The testing rate for HIV among college students in both groups is relatively low, although both groups expressed their willingness to undergo HIV testing if necessary. Interestingly, a higher percentage of non-medical students indicated a lack of HIV knowledge and expressed a need for more education ($P=0.002$, Figure 2D).

Table 1 Demographics of the Two Groups

Characteristic	Medical Student	Non-Medical Student
Sample size	261	229
Age, year	21.41 ± 1.71	20.15 ± 2.61
Gender		
Male	104 (39.8)	125 (54.6)
Female	157 (60.2)	104 (45.4)
Grade		
First	6 (2.3)	29 (12.7)
Second	6 (2.3)	107 (46.7)
Third	88 (33.7)	57 (24.9)
Forth	72 (27.6)	13 (5.7)
Fifth	3 (1.1)	0 (0)
Postgraduate	86 (33.0)	23 (10.0)

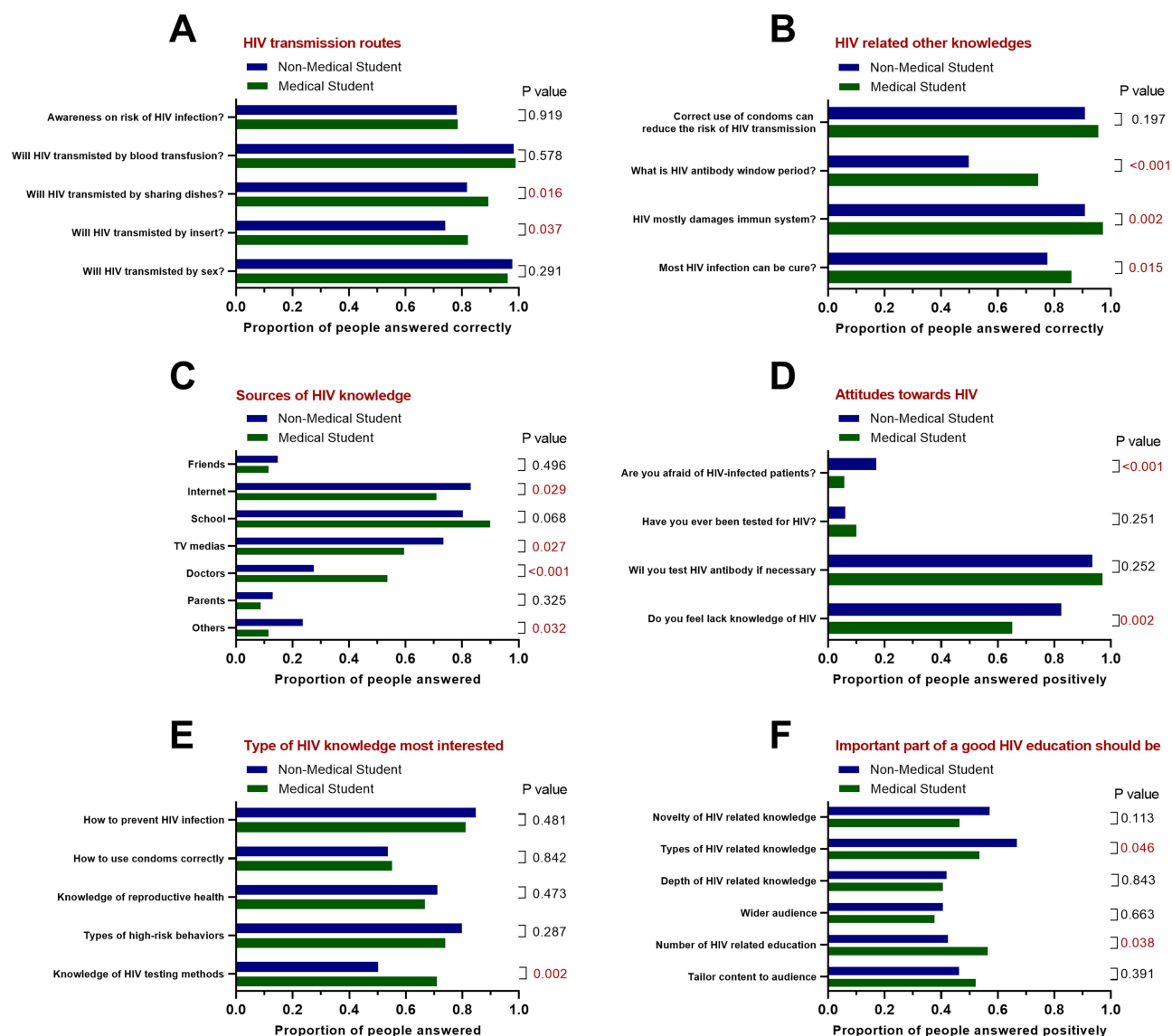


Figure 2 (A) Proportion of correct answers about knowledge of HIV transmission routes. (B) Proportion of correct answers about HIV knowledges. (C) Proportion of student with sources of HIV knowledge. (D) Attitudes towards HIV in students. (E) Types of HIV knowledges most interested in students. (F) The comments from students on important parts as a good HIV education.

Exploring College Students' Interest in HIV Knowledge and Attitudes Towards Related Education

We investigated which aspects of HIV-related knowledge students were most interested in, as shown in Figure 2E. We noted that medical students were more interested in HIV testing methods than non-medical students ($P=0.002$).

We also evaluate among two groups of college students to identify the characteristics of effective HIV education. Interestingly, non-medical students believe that good HIV education should encompass a wider range of HIV knowledge in different fields ($P=0.046$), whereas medical students think it should involve more frequent sessions with longer durations, rather than just covering the basics ($P=0.038$, Figure 2F).

The Understanding of HIV Transmission Routes and Knowledge Sources Among College Students

The source of HIV-related information was also a key factor affecting the lack of HIV knowledge. As a result, we assessed the percentage of students who accurately answered questions across different sources of knowledge. In medical

students, a higher percentage of those who answered all HIV transmission route questions correctly reported that their knowledge originated from school ($P=0.013$, [Figure 3A](#)).

Similarly, among non-medical students, we observed a parallel trend. A greater number of non-medical students who answered correctly indicated that their knowledge was acquired from school ($P=0.001$). Concurrently, non-medical students who did not fully comprehend HIV transmission mentioned that their knowledge came from TV and other medias ($p=0.022$) and other sources ($P<0.001$, [Figure 3B](#)).

Risk Factors for Lack of HIV-Related Knowledge

We conducted a multivariate logistic regression analysis, as shown in [Table 2](#). After adjusting for gender, age, grade, and various sources of HIV knowledge (including doctors, TV/media, school, internet, friends, parents, and other sources),

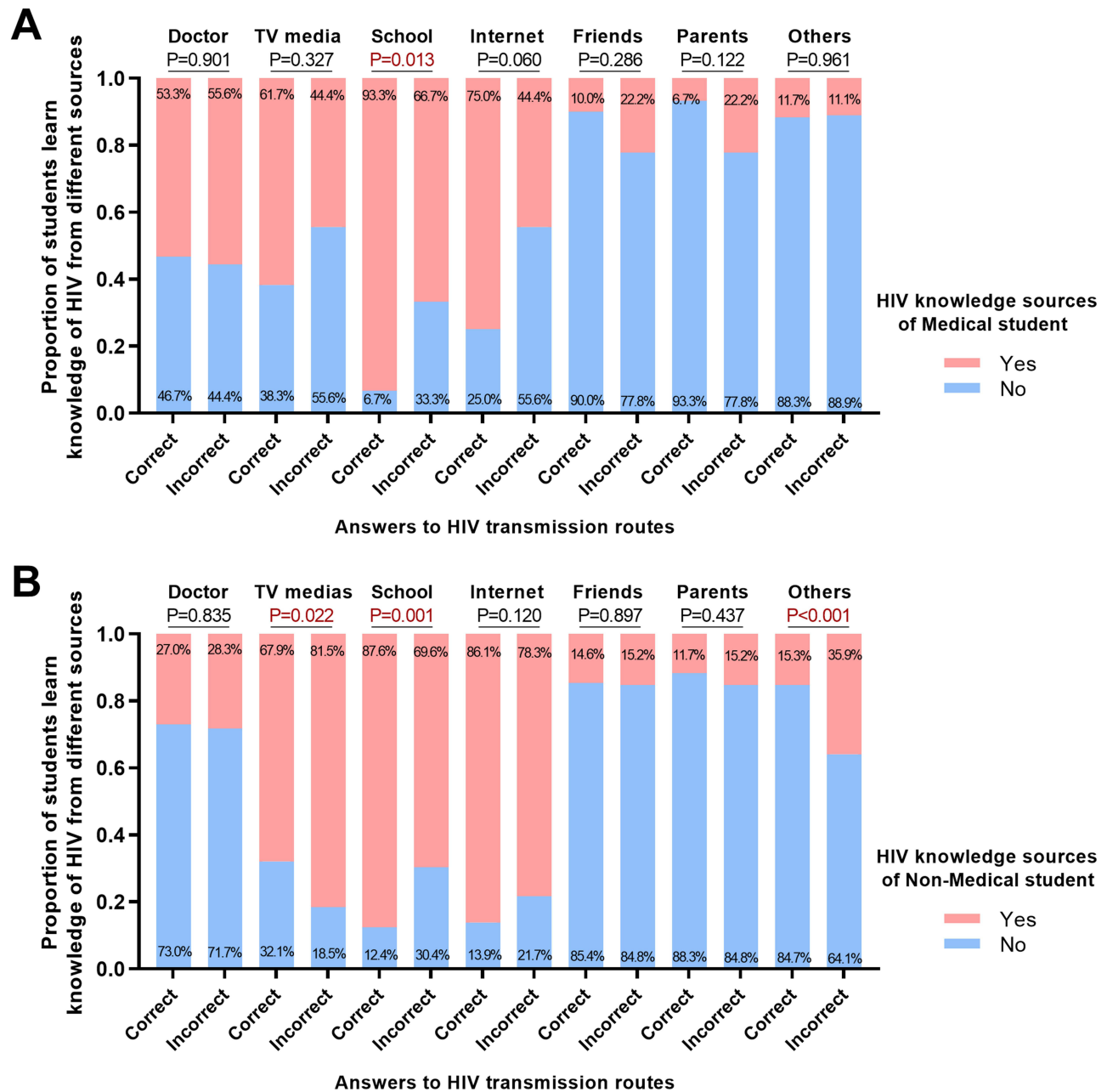


Figure 3 (A) Proportion of medical students lacking HIV transmission knowledge among different sources. (B) Proportion of non-medical students lacking HIV transmission knowledge among different sources.

Table 2 Multivariable Analysis for HIV Related Knowledges and Awareness

Variables	Univariate Analysis			Multivariate Analysis		
	OR	95% CI	P	OR	95% CI	P
Gender	1.245	0.839–1.848	0.277	0.855	0.472–1.551	0.607
Age	1.056	0.949–1.175	0.316	1.063	0.934–1.211	0.354
Grade	1.238	1.056–1.452	0.008	0.943	0.681–1.307	0.726
Medical student	0.374	0.246–0.567	<0.001	0.421	0.195–0.912	0.028
Knowledge from						
Doctor	0.987	0.548–1.780	0.966	0.636	0.308–1.316	0.223
TV medias	1.324	0.704–2.488	0.384	1.317	0.655–2.651	0.440
School	1.895	0.810–4.434	0.141	1.896	0.770–4.667	0.164
Internet	1.396	0.663–2.942	0.380	1.594	0.691–3.678	0.274
Friends	1.020	0.460–2.261	0.961	1.929	0.332–2.599	0.888
Parents	1.075	0.464–2.491	0.865	1.540	0.504–4.707	0.449
Other sources	0.763	0.371–1.569	0.462	0.797	0.370–1.719	0.563

we found that being a non-medical student was an independent risk factor for insufficient HIV-related knowledge (OR = 0.421, 95% CI: 0.195–0.912, P = 0.028). This indicates that medical students were approximately 58% less likely than non-medical students to lack adequate HIV knowledge.

Impact of Clinical Practice in HIV Wards on HIV Knowledge

A total of 192 medical students (192/229) participated in clinical practice in HIV wards. We compared the HIV related knowledge and behavior before and after the clinical practice. We observe an enhancement in HIV knowledge and awareness, as shown in Figure 4A and B. There is also a notable increase in the proportion of student familiar with PEP

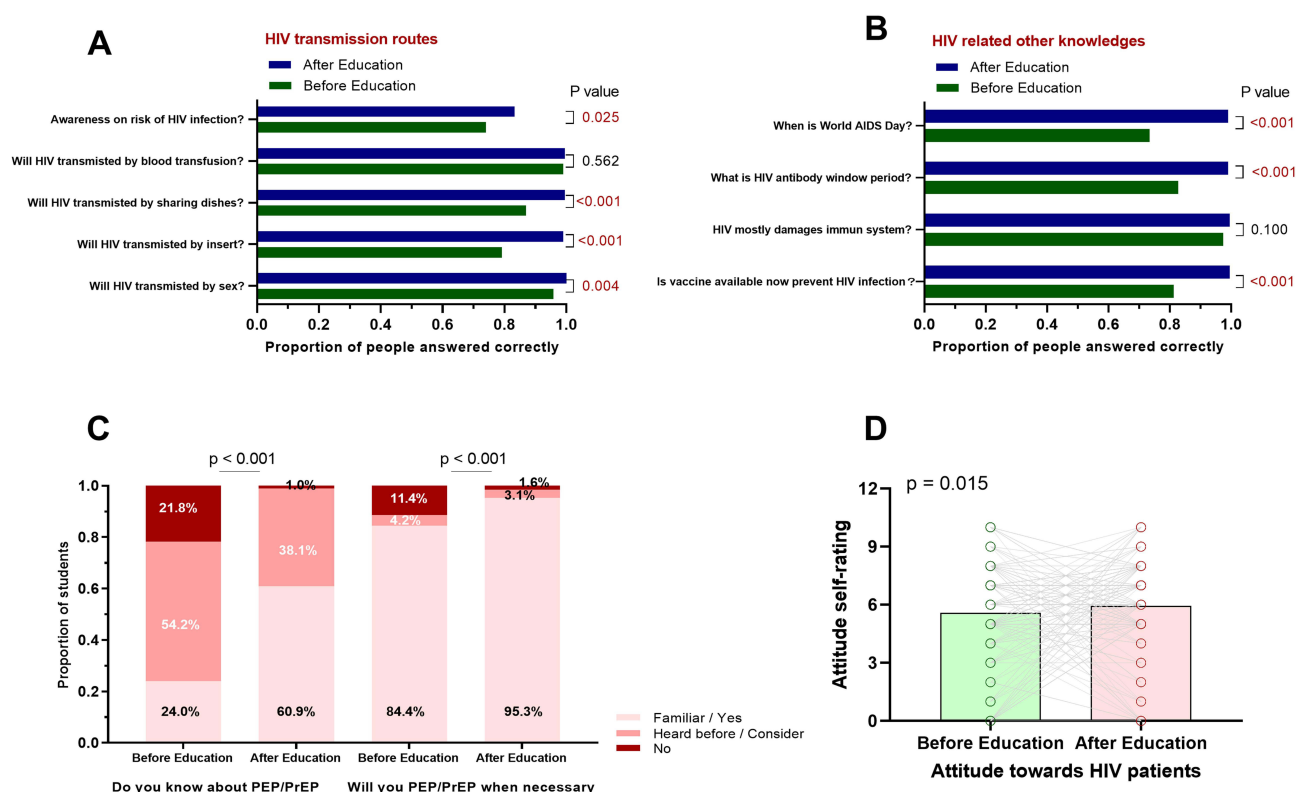


Figure 4 (A) Difference of HIV awareness after education and clinical practice in HIV wards. (B) Difference of HIV knowledges after education and clinical practice in HIV wards. (C) Difference of attitudes on PEP/PrEP after education and clinical practice in HIV wards. (D) Difference of attitudes on HIV infected patients after education and clinical practice in HIV wards.

and PrEP ($P < 0.001$), and a greater willingness to utilize PEP and PrEP when necessary ($P < 0.001$, Figure 4C). Elevated self-rating scores indicate that more student expressed their enthusiasm for helping HIV-infected people ($P = 0.015$, Figure 4D).

Discussion

In 2014, The Joint United Nations Programme on HIV/AIDS (UNAIDS) launched the 95–95–95 targets. The aim was to diagnose 95% of all HIV-positive individuals, provide antiretroviral therapy (ART) for 95% of those diagnosed and achieve viral suppression for 95% of those treated by 2030. To accomplish this objective, enhancing awareness and knowledge concerning HIV infection among college students is paramount, especially considering the gradual rise in HIV infection rates in this population. Currently, the extent of awareness and knowledge regarding HIV infection among college students remains uncertain. Therefore, to achieve this goal of the WHO, it is important to analyze the level of awareness and knowledge about HIV among this population.

This study suggested that there were indeed more students who wanted to learn more HIV related knowledge. For the source of HIV-related knowledge, more non-medical students obtained HIV-related knowledge from the Internet and TV media, while the proportion of medical students acquiring knowledge from doctors was higher than that of non-medical students. Particularly, medical students were more interested in HIV testing methods than non-medical students. Our research can provide data support for further improving the methods and contents of health education for young people.

Previous studies have suggested that HIV-infected adolescents in Africa generally have sexual and reproductive health needs.^{15,16} Nevertheless, due to insufficient resources of the health system and limited skills among health workers, there is still a huge gap between the services adolescents received and their actual health needs.^{15,17} Among non-HIV adolescents, it is necessary to raise their awareness of HIV infection to avoid HIV infection due to high-risk sexual contact. Although in our data, self-report HIV infection awareness of medical students and non-medical students were similar. It is still important to the popularization of adolescent health and increase HIV infection awareness among young people. At the stage of adolescence, the demand for sexual and reproductive health will gradually arise. Popularizing health knowledge helps prevent HIV infection. In this study, we found that non-medical students' knowledge of HIV transmission is still not satisfactory. Some non-medical students believe that share dishes and insects bite will cause the spread of HIV. Popularizing HIV-related knowledge among non-medical students still needs to continue.

In our study, we noticed a higher percentage of non-medical students lacking HIV knowledge. The discrepancy in HIV knowledge between medical and non-medical students could indeed be attributed to the absence of specialized HIV education among non-medical students. Perhaps several methods can be used, including but not limited to increasing HIV-related lectures, interdisciplinary collaboration, or opening some online education resources of medical students to non-medical students, etc. By these strategies, educational institutions can thereby promote better understanding and awareness of this important public health issue among non-medical students.

The study showed that the essential way for non-medical students to acquire HIV-related knowledge were the Internet and TV medias. Medical students have also increased the access to HIV knowledge at school and doctors. Other studies have also shown that the Internet is playing an increasingly important role in obtaining health information.^{18–20} The Internet is the important way for college students to obtain relevant knowledge.²¹ Malaysian research suggests that up to 57.1% of young Malaysians have searched for information about sexually transmitted diseases on the Internet.²² The most important sources for Iranian teenagers to obtain health information related to high-risk behaviors are the Internet and virtual social media.^{23,24} According to the results of this study, medical students who obtained the knowledge from school have a more adequate understanding of HIV-related knowledge. HIV-related knowledge education requires high accuracy and professionalism. However, the reality is that the quality of information on the Internet is currently uneven.^{25–27} In addition, the results of this study also suggest that for non-medical students, schools should enhance the publicity of HIV-related knowledge in order to raise students' awareness and knowledge of HIV.

In this study, we also found medical students and non-medical students are also different in the content of interest of HIV-related knowledge. For medical students, the professional knowledge of HIV testing can be increased to better suit

their interests. We also observed that non-medical students expressed a greater need for additional HIV knowledge and education. However, regarding the characteristics of good HIV education, the two groups of college students held different perspectives. Non-medical students expressed the need for more comprehensive HIV knowledge, while medical students emphasized the necessity for more in-depth and extensive hours of HIV education.

The discrepancy in HIV knowledge acquisition between medical and non-medical students, with medical students receiving more information from doctors, underscores the importance of targeted educational interventions. Medical students, due to their exposure to clinical settings, have access to healthcare professionals who can provide firsthand knowledge and guidance on HIV-related topics. In contrast, non-medical students may lack similar access to healthcare environments, resulting in a gap in their HIV knowledge. To address this issue, educational institutions could consider implementing initiatives to bridge this gap, such as providing non-medical students with opportunities to interact with healthcare professionals or offering specialized HIV education programs tailored to their needs. Such efforts could contribute to promoting a more comprehensive understanding of HIV across diverse student populations.

To the best of our knowledge, this study is the first to investigate the acquisition of HIV-related knowledge among medical students and non-medical students. At the same time, we investigated the accuracy and preferences of their HIV-related knowledge. The current situation provides basic reference materials for the popularization of youth health. However, our study has some limitations. First, the small sample size of our study may induce bias. Second, due to resource constraints, we refrained from conducting a before-and-after comparison among students with HIV knowledge popularization. Third, whether young people in other regions have similar conditions requires further verification. Extent to which health education has improved students' attitudes towards HIV-related knowledge and behaviors remains to be further studied. In addition, medical students are expected to perform better in HIV-related knowledge, future studies should consider including students from more closely related fields or stratifying by academic year to reduce baseline knowledge gaps and enhance comparability.

Conclusions

In our study, we found that the medical students were more aware of HIV related knowledge than the non-medical students. Our research can provide relevant data support for further improving the methods and content of health education for young people.

Abbreviations

AIDS, Acquired immunodeficiency syndrome; HIV, human immunodeficiency virus; MSM, men who have sex with men.

Data Sharing Statement

The data used in the current study are available from the corresponding author upon reasonable request.

Ethical Approval and Consent to Participate

This retrospective study was approved by the Ethics Committee of Nanfang Hospital, Southern Medical University (NFEC-2021-334). Informed consent was waived for all questionnaire participants, as all responses were collected anonymously.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare no conflicts of interest in this work.

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