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Analysis of HIV/AIDS Knowledge Awareness and Influencing Factors among College Students at a University in a Border Region of Yunnan Province

Zi'ai Zhou[1*], Sitong Liu[2*], Lin Yang[3*], Fen Zhao[1], Xinyue Li[1], Dan Yu[4], Wanyu Qin[5], Yuhang Xiao[6], Mengdi Wang[7#], Yanfen Yang[8#], Yun Zhou[1#]

[1]School of Public Health, Dali University, Dali, China
[2]Qingdao Center for Disease Control and Prevention, Qingdao, China
[3]College of Pharmacy, Shaanxi University of Chinese Medicine, Xianyang, China
[4]Lijiang Center for Disease Control and Prevention, Lijiang, China
[5]Pediatrics Department, Tongchuan People's Hospital, Tongchuan, China
[6]Huashan School of Clinical Medicine, Fudan University, Shanghai, China
[7]Chang'an District Center for Disease Control and Prevention, Xi'an, China
[8]Xiangyun County Center for Disease Control and Prevention, Dali, China
Email: #534627623@qq.com, #15187201147@126.com, #dldyunzhou@163.com

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Abstract

Objective: To investigate HIV/AIDS knowledge levels and associated determinants among university students in a border region of Yunnan Province, providing evidence for targeted campus-based HIV prevention education programs. **Methods:** An anonymous online survey was conducted from November 2024 to February 2025 using a self-designed questionnaire distributed through the Wenjuanxing platform to 1017 university students at a border institution in Yunnan Province. Data were analyzed using R 4.3.0, employing chi-square tests, rank-sum tests, and binary logistic regression analysis. **Results:** Among 923 valid responses (response rate: 90.8%), the overall HIV/AIDS knowledge awareness rate was 65.9% (608/923), with only 0.9% achieving perfect scores. Critical knowledge gaps were identified in understanding "primary HIV transmission routes" (45.7%), "World AIDS Day date" (55.4%), "absence of curative treatments in China" (57.0%), and "kissing does not transmit HIV" (59.5%). Univariate analysis revealed significant associations ($P < 0.05$) between knowledge levels and gender, ethnicity, residence, academic year, major, active information-seeking behavior, prior HIV education, and sexual ex-

*These authors contributed equally to this work as co-first authors.
#Corresponding author.

perience. Multivariate logistic regression identified medical majors (*OR* = 1.35, 95% *CI*: 1.02 - 1.77) and active knowledge-seeking (*OR* = 4.48, 95% *CI*: 3.35 - 5.99) as facilitating factors, while sexual experience (*OR* = 0.43, 95% *CI*: 0.27 - 0.68) and first-year enrollment (*OR* = 0.65, 95% *CI*: 0.49 - 0.85) emerged as barriers to adequate knowledge. **Conclusions:** HIV/AIDS knowledge among students at this Yunnan border university remains suboptimal at 65.9%, with substantial deficits in critical areas. Enhanced HIV prevention and sexual health education should prioritize ethnic minority students, freshmen, and non-medical majors, focusing on transmission routes and prevention measures to improve cognitive levels and inform evidence-based campus health education initiatives.

Keywords

Border Regions, University Students, HIV/AIDS, Knowledge and Awareness, Influencing Factors

1. Introduction

Acquired immunodeficiency syndrome (AIDS), caused by human immunodeficiency virus (HIV) infection, represents a chronic infectious disease with high mortality [1] that poses sustained challenges to public health systems globally. In recent years, China has witnessed concerning trends in HIV infections among young students, with annual increases in infection rates. Inadequate sexual health knowledge and limited HIV awareness constitute primary risk factors for elevated transmission risks [2]. Contemporary Chinese university students demonstrate increased sexual activity [3] alongside insufficient sexual health literacy [4], resulting in widespread deficits in HIV/AIDS knowledge [5] [6].

Yunnan Province, designated as a priority region for HIV prevention and control in China, faces unique challenges in its border areas. Geographic remoteness, multicultural demographics, and inequitable health education resource distribution [7] render local university students particularly vulnerable populations in HIV prevention efforts. Previous research has documented low HIV knowledge awareness rates and weak risk prevention consciousness among this demographic [8], further intensifying regional prevention pressures. This study investigated HIV/AIDS knowledge and determinants among university students at a Yunnan border institution to establish current knowledge status and influencing factors, thereby providing scientific evidence for targeted HIV prevention education in border regions.

2. Subjects and Methods

2.1. Study Population

The survey was conducted between November 2024 and February 2025, enrolling 1017 undergraduate students from a university located in a border area of Yunnan

Province.

Inclusion criteria: 1) Full-time enrollment at the target university in Yunnan Province; 2) Capability for independent electronic questionnaire completion; 3) Voluntary participation with informed consent.

Exclusion criteria: 1) Incomplete or improperly completed questionnaires; 2) Refusal to participate; 3) Response time < 2 minutes.

2.2. Survey Methods

2.2.1. Survey Instrument and Content

An anonymous online survey was distributed via the Wenjuanxing platform in November 2024. The questionnaire was developed based on China's National Plan for HIV/AIDS Prevention and Control (2024-2030) [9] and the National AIDS Sentinel Surveillance Manual (Youth Students) [10], with adjustments to reflect university student demographics and contemporary HIV prevention evidence.

The instrument included three sections: 1) demographic characteristics (gender, ethnicity, residential origin); 2) HIV/AIDS knowledge (terminology, transmission/non-transmission routes); and 3) attitudes and behaviors (active information-seeking, prior HIV education exposure). The 20-item knowledge domain was scored out of 100 (5 points per correct response; 0 for incorrect/missing answers). Adequate knowledge awareness was defined as a score ≥75 points—consistent with the National AIDS Sentinel Surveillance Manual (Youth Students) [10], which specifies "correct responses to ≥75% of knowledge items" as the threshold for adequate awareness. This aligns with standard protocols for HIV surveillance and health education evaluation among young people in China.

2.2.2. Statistical Analysis

Statistical analysis was conducted using R version 4.3.0 on data obtained from the questionnaire. Descriptive statistics were generated for all variables, with continuous measures expressed as mean ± standard deviation and categorical measures reported as frequency counts with corresponding percentages [n (%)]. Between-group comparisons employed chi-square tests. Variables with $P < 0.05$ in univariate analysis were included in binary logistic regression models, with significance set at $\alpha = 0.05$.

2.2.3. Quality Control

The survey employed an anonymous completion method, requiring respondents to answer independently. Through the Questionnaire Star platform, each IP address was restricted to a single submission to prevent duplicate entries. A pre-survey was conducted from September to October 2024 to test the questionnaire's logical flow, item clarity, and content appropriateness. Based on pre-survey feedback, ambiguous or potentially misleading items were refined, and the survey tool was optimized. During the formal survey period, a dedicated quality control team monitored the progress of electronic questionnaire collection and data integrity in real time. After the survey concluded, all responses were reviewed individually

to exclude invalid questionnaires with logical inconsistencies, missing key information, or abnormally short completion times (<2 minutes), ensuring the authenticity and reliability of the data.

3. Results

3.1. Participant Characteristics

Of 1017 distributed questionnaires, 923 valid responses were obtained (validity rate: 90.8%). Participants included 424 males (45.9%) and 499 females (54.1%); 528 Han Chinese (57.2%) and 395 ethnic minorities (42.8%); 484 urban residents (52.4%) and 439 rural residents (47.6%); 364 first-year students (39.4%) and 559 second-year and above (60.6%); 470 medical students (50.9%) and 453 non-medical students (49.1%). Details are presented in Table 1.

Table 1. Sociodemographic characteristics of the study participants (N = 923).

Characteristic	n	Proportion (%)
Sex		
Male	424	45.9
Women	499	54.1
Ethnic group		
Han	528	57.2
National minority	395	42.8
Residence		
Urban	484	52.4
Rural	439	47.6
Grade		
Fresh year	364	39.4
Sophomore and above	559	60.6
Major		
Medicine	470	50.9
Others	453	49.1

3.2. HIV/AIDS Knowledge Awareness

The three items with highest awareness rates were: "Sexual contact with HIV patients does guarantee transmission" (85.9%), "Sharing injection equipment with HIV-infected individuals transmits HIV" (85.6%), and "Hugging or handshaking with HIV-infected individuals does not transmit HIV" (83.7%).Conversely, the three items with lowest awareness rates were: "Primary HIV transmission routes" (45.7%), "World AIDS Day date" (55.4%), and "Absence of curative HIV treatments in China" (57.0%). Complete results are shown in Table 2, Figure 1.

Table 2. The awareness rate of knowledge related to AIDS.

AIDS-related knowledge	Number of people who know	Awareness rate/%
You can't get HIV from eating with someone who has it.	745	80.7
It is not possible to be infected with HIV by studying in the same classroom for a long time with someone who has HIV.	771	83.5
Sharing syringes with people infected with AIDS can lead to HIV infection.	791	85.6
Hugging or shaking hands with an AIDS patient will not lead to the transmission of AIDS.	773	83.7
Having sexual relations with an AIDS patient will not lead to the transmission of AIDS.	793	85.9
China has not successfully developed a drug for treating AIDS.	527	57.0
The main mode of transmission of AIDS	422	45.7
The date of "World AIDS Day"	512	55.4
Kissing an AIDS patient will not lead to the transmission of AIDS.	550	59.5
Being bitten by mosquitoes will not lead to the transmission of AIDS.	680	73.6
Knowledge of AIDS	608	65.9

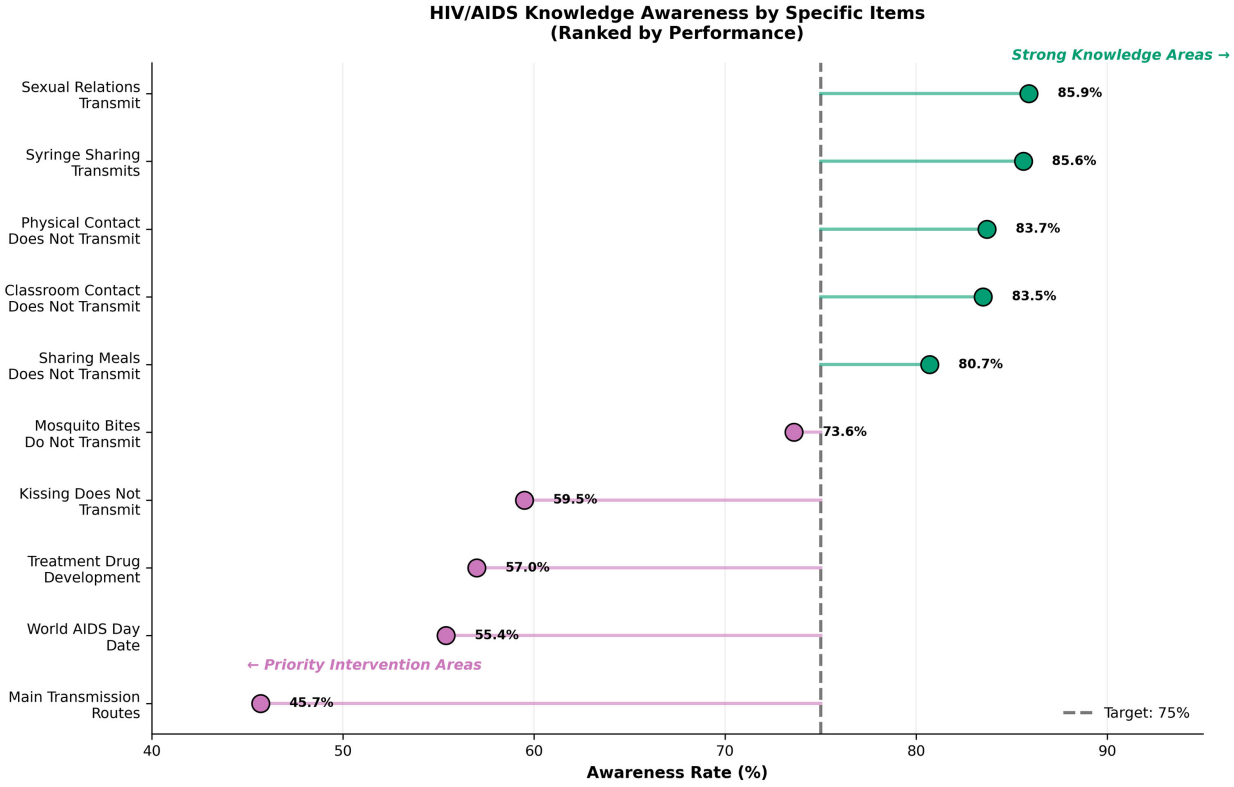

Figure 1. HIV/AIDS knowledge awareness across specific items, ranked by performance.

3.3. Univariate Analysis of Factors Influencing HIV/AIDS Knowledge

Univariate analysis (Table 3) revealed significant differences in HIV/AIDS knowledge awareness across various student characteristics. Statistically significant differences

($P < 0.05$) were observed for gender, ethnicity, academic year, major, active HIV knowledge-seeking, prior HIV education, and sexual experience.

Figure 2 visually illustrates the distribution of HIV/AIDS knowledge status (aware vs. unaware) across these subgroups.

Specifically: females showed higher awareness (69.3%) than males (61.8%); Han students (69.5%) exceeded ethnic minorities (61.0%); second-year and above students (69.8%) surpassed freshmen (59.9%); medical students (69.1%) outperformed non-medical students (62.5%); active knowledge seekers (78.2%) significantly exceeded passive recipients (44.5%); those with prior HIV education (68.5%) surpassed those without (60.3%); sexually experienced students showed lower awareness (63.5%) than inexperienced peers (80.2%).

No significant differences were observed for residence, HIV testing/counseling experience at medical facilities, or unprotected sexual intercourse history ($P > 0.05$).

Table 3. Univariate analysis of factors affecting college students' awareness of AIDS-related knowledge.

Projects	n	known	unknown	χ^2 value	*P* value
Sex				5.806	0.016
Male	424	262	162		
Women	499	346	153		
Ethnic group				7.253	0.007
Han	528	367	161		
National minority	395	241	154		
Residence				1.864	0.172
Urban	484	309	175		
Rural	439	299	140		
Grade				9.567	0.002
Fresh year	364	218	146		
Sophomore and above	559	390	169		
Major				4.574	0.032
Medicine	470	325	145		
Others	453	283	170		
Have you ever actively sought out information related to AIDS?				108.426	<0.001
yes	584	457	127		
no	339	151	188		
Have you received any education related to AIDS?				5.954	0.015
yes	631	432	199		
no	292	176	116		

Continued

Have there been any instances where medical and health institutions have conducted HIV testing or provided counseling?				0.432	0.511
yes	414	268	146		
no	509	340	169		
Have you ever engaged in sexual intercourse without using a condom?				5.986	0.050
yes	413	266	147		
no	233	144	89		
no sexual experience	277	198	79		
Have you ever had sexual intercourse?				13.849	<0.001
yes	792	503	289		
no	131	105	26		

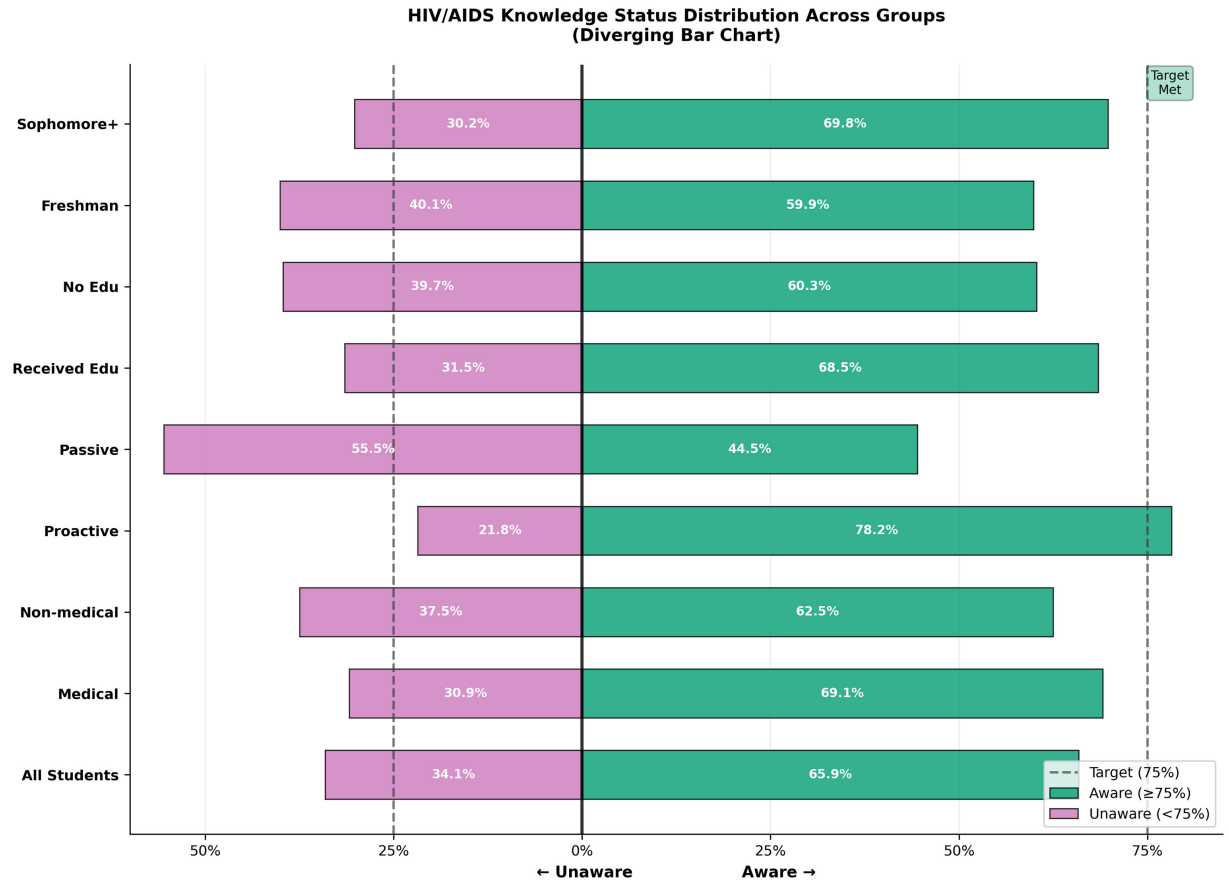

Figure 2. HIV/AIDS knowledge status distribution across student groups (diverging bar chart).

3.4. Multivariate Analysis of Factors Influencing HIV/AIDS Knowledge

Binary logistic regression analysis incorporating significant univariate variables

(Table 4) identified active HIV knowledge-seeking, sexual experience, academic year, and major as independent influencing factors ($P < 0.05$).

Specifically, proactive acquisition of AIDS-related knowledge is significantly associated with enhanced AIDS knowledge awareness ($OR = 4.48$, 95% CI: 3.35 - 5.99, $P < 0.001$), indicating that individuals who actively seek such knowledge have a 4.48-fold higher probability of awareness compared to those who do not. Likewise, a medical background constitutes a positive factor ($OR = 1.35$, 95% CI: 1.02 - 1.77, $P = 0.033$), with medical students demonstrating a 1.35-fold greater awareness probability than non-medical students. Conversely, first-year student status is a negative factor ($OR = 0.65$, 95% CI: 0.49 - 0.85, $P = 0.002$), as their awareness probability is only 0.65 times that of students in their second year or above.

Table 4. Multivariate analysis of factors affecting college students' knowledge of AIDS.

Projects	β	SE	χ^2	P	OR	95% CI
Have you ever engaged in sexual activity?						
no					1.00	
yes	−0.84	0.23	11.70	<0.001	0.43	0.27 - 0.68
Major						
Non-medical field					1.00	
Medicine	0.30	0.14	8.12	0.033	1.35	1.02 - 1.77
Grade						
Sophomore and above					1.00	
Fresh year	−0.44	0.14	4.82	0.002	0.65	0.49 - 0.85
Have you ever actively sought out information related to AIDS?						
no					1.00	
yes	1.50	0.15	99.80	<0.001	4.48	3.35 - 5.99

4. Discussion

As a major global public health challenge, HIV/AIDS prevention effectiveness directly impacts population health and social stability, requiring coordinated societal participation. Our findings reveal that HIV/AIDS knowledge awareness among university students at this Yunnan border institution was 65.9%, with only 0.9% achieving perfect scores. This level falls below findings reported by Sun *et al.* [11]. and substantially short of requirements outlined in the "Implementation Plan for Curbing HIV Transmission (2019-2022)" [12], highlighting persistent educational gaps in border region universities requiring targeted enhancement.

Examining knowledge details, students demonstrated incomplete understanding of non-transmission routes, with only 73.6% awareness that "mosquito bites do not transmit HIV," consistent with findings by Zhang *et al.* [13]. More concerning, awareness rates for critical items including "primary HIV transmission routes", "World AIDS Day date", and "absence of curative treatments in China"

were merely 45.7%, 55.4%, and 57.0% respectively, revealing cognitive gaps in transmission mechanisms, prevention measures, and disease awareness. These findings suggest border universities should focus on these weak areas, optimizing educational priorities to enhance knowledge dissemination precision.

Univariate and multivariate analyses revealed key determinants of HIV/AIDS knowledge. Medical students' higher awareness (69.1%) compared to non-medical students (62.5%) aligns with Tang's findings [14], confirming the importance of professional background in disease knowledge acquisition. Second-year and above students' significantly higher awareness (69.8%) versus freshmen (59.9%) likely reflects progressive HIV education enhancement through diverse educational formats [15], confirming university as a critical period for HIV health education providing systematic scientific knowledge support. Active HIV knowledge-seeking emerged as the strongest facilitating factor (*OR* = 4.48, 95% *CI*: 3.35 - 5.99). However, our study found only a minority of students obtained relevant knowledge through school channels, despite school education's central role in HIV awareness enhancement [16] [17], reflecting insufficient educational provision in border universities. Based on existing practices, schools could normalize HIV prevention education through promotional materials, classroom instruction, thematic activities, and peer education [18] [19], providing knowledge support for students. Notably, multivariate analysis identified sexual experience as a barrier to knowledge (*OR* = 0.43, 95% *CI*: 0.27 - 0.68). This finding may stem from three factors: first, some students develop complacency after sexual debut, subconsciously believing HIV is irrelevant to them, losing motivation for active learning; second, insufficient pre-sexual HIV education without subsequent knowledge supplementation leads to cognitive lag; third, some students may deliberately avoid HIV knowledge due to guilt or wishful thinking regarding sexual behavior, unwilling to confront potential risks. These findings suggest targeted educational interventions are needed for sexually active students to break psychological barriers and strengthen risk awareness. To further elucidate the psychological mechanisms linking sexual behavior to knowledge awareness, future studies could utilize qualitative interviews or focus group discussions. This approach would enable a comprehensive examination of the population's knowledge needs following sexual activity, attitudes towards information access, psychological defense mechanisms, and willingness to engage with education. The insights gained will inform the development of more targeted educational interventions, facilitating the overcoming of psychological barriers and enhancing risk prevention awareness.

In summary, college students in Yunnan's border regions exhibit low awareness of HIV/AIDS knowledge [20], insufficient mastery of core concepts [21] [22], and weak prevention awareness, indicating that related prevention and control efforts still face significant challenges [23]. Based on research findings and practical experience, three optimization measures are recommended: First, implement targeted knowledge dissemination by focusing on weak knowledge areas such as transmission routes [24] and preventive measures; Second, establish an educa-

tional model featuring "multi-party collaboration, multi-course co-education, and multi-teacher co-guidance" [25]. "Multi-party collaboration" should encompass internal university departments (e.g., Student Affairs Office, University Health Center, Youth League Committee, Mental Health Center) and external institutions (e.g., local CDC, community health centers, NGOs like AIDS prevention associations) to form a synergistic educational force; Prioritize key populations including non-medical majors, first-year students, and ethnic minority students. Third, refine the integrated prevention system encompassing "school-society-nation" [26] [27], pooling on- and off-campus resources to stimulate students' intrinsic motivation for knowledge acquisition through diverse approaches. This will comprehensively enhance HIV prevention awareness and self-protection capabilities among university students in border regions.

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Conflicts of Interest

All authors declare that they have no conflicts of interest.

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