

Analysis of HIV/AIDS Knowledge and Awareness and Health Intervention Effectiveness among University Students in a Borderland University

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Abstract

Objective: To understand the current status of HIV/AIDS knowledge among freshmen in a frontier university and analyze the effectiveness of health interventions, providing references for formulating HIV/AIDS health education strategies. **Methods:** Using random sampling, 111 students from a university in the Dianxi region were selected as study subjects. Data before and after the HIV/AIDS health intervention were collected through questionnaires. **Results:** The study included 111 university students (69.4% female, 81.1% Han ethnicity). After the intervention, students' awareness of key HIV/AIDS knowledge significantly improved ($P < 0.001$), including transmission routes and treatment status. Discriminatory attitudes toward HIV/AIDS patients decreased significantly ($P < 0.05$), and support for privacy protection strengthened ($P < 0.001$). At the behavioral level, heterosexual intercourse experience significantly reduced ($P = 0.036$), while other behaviors showed no significant changes. **Conclusion:** The health intervention effectively enhanced students' HIV/AIDS knowledge, improved attitudes, and reduced heterosexual intercourse behavior, demonstrating positive effects on HIV prevention. This intervention model provides a reference for HIV/AIDS education in frontier universities and aids in developing more effective prevention strategies.

Keywords

Frontier Regions, University Students, HIV/AIDS, Health Intervention

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1. Introduction

Acquired Immunodeficiency Syndrome (AIDS) is a global public health concern that poses a significant threat to human health, thereby impacting social stability and economic development. According to worldwide prevention and treatment data, the proportion of newly infected adolescents aged 15-24 years is 32.7%, of whom 91.5% are infected through sexual transmission [1]. China's AIDS epidemic is marked by a notable increase in cases among the youth demographic. From 2017 to 2022, the average annual growth rate of AIDS cases in the student population was 13.4%, accompanied by the emergence of issues such as early sexual debut and inadequate condom use [2]. The western border region of Yunnan, due to its unique geographic location, experiences an average daily cross-border flow of 28,000 people [3]. This context, characterized by multicultural intertwining, poses a risk of high-risk sexual behaviors, particularly in light of the local ethnic minority characteristics of social activities, such as group gatherings and festive socializing [4]. Furthermore, students from cross-border families constitute a proportion of the university student population in the region. Some of these students are influenced by multicultural practices and differences in the acceptance of sexual health knowledge, which further exacerbates the risk of HIV transmission.

The health of university students is a significant factor in the broader context of national development, as they represent the core talent pool. However, the findings of this study indicate that the physiological and psychological development of this group is not yet fully mature, the knowledge system of sexual health is insufficient, and the awareness of self-protection is weak. This combination of factors renders them vulnerable to the threat of AIDS. The emergence of HIV cases within higher education institutions has been shown to have a significant impact on individuals, families, and public health and safety measures on campus [5]-[7]. Despite the explicit emphasis in the "Healthy China 2030" Planning Outline on the imperative to strengthen HIV prevention interventions for key populations [8], the practice of HIV prevention in institutions of higher education is beset by numerous challenges. These include the limited efficacy of conventional lecture-based education, the inadequacy of new media resources regarding educational effectiveness [9], an absence of sufficient collaboration between on-campus and off-campus prevention and control resources, and the ineffectiveness of the HIV testing and referral mechanism [10]. In this context, an in-depth analysis of the characteristics of the student population in colleges and universities in the western border of Yunnan Province is imperative. This analysis should include the influence of demographic characteristics such as ethnic composition (e.g., the percentage of Dai and Jingpo minority students) and family residence on health behaviours. It should also include targeted AIDS health education and the evaluation of its effectiveness. This will optimise the strategy for the prevention and control of HIV in regional colleges and universities, improve the prevention and control ability of students, and prevent the spread of AIDS on campuses. It is imperative that the prevention strategy of regional col-

leges and universities is optimised in order to address the pressing issue of HIV/AIDS on campus. This necessitates enhancing students' competencies in the prevention and control of HIV/AIDS, thereby disrupting the transmission chain within educational institutions.

2. Objects and Methods

2.1. Research Subjects

A total of 111 university students were selected from a higher education institution in Western Yunnan as study participants.

2.2. Research Methodology, Content

The cluster sampling method was used to randomly select 2 classes of preventive medicine majors in the School of Public Health of a university in West Yunnan Province as the research objects. The field investigation was carried out using the online system of Questionstar, and professionally trained staff provided on-site guidance during the whole process. Strict confidentiality of the survey and anonymity of the responses were ensured before and after the health intervention. Based on the "Eight National AIDS Guidelines", the expert consultation method and literature research method were adopted, and the Core Information of Propaganda and Education on AIDS Prevention for Young Freshmen (2021 edition) was referred to and other literature [11] [12], and the questionnaire was designed in combination with the characteristics of college students. The contents of the questionnaire mainly include the basic information of the survey subjects, basic knowledge of AIDS and related attitudes. Among them, a total of 20 questions (total of 20 points) were set in the part of AIDS-related knowledge, covering the disease stages of AIDS, transmission routes, prevention and detection; A total of 24 questions were set in the AIDS-related attitudes section, including whether there is discrimination, whether they are willing to interact with AIDS patients, and whether they support schools to carry out AIDS education.

2.3. Intervention Methods

Comprehensive online and offline forms are used to provide students with health education on the theme of AIDS. Among them, offline health education is mainly carried out in the form of traditional lectures, while online education is carried out in the form of graphics and videos by relying on new media platforms such as WeChat public number and Beily. The first questionnaire survey was conducted at the beginning of the semester before the start of the course to collect data on students' knowledge of AIDS before they received health education, followed by a semester-long health education campaign, which included not only classroom lectures, but also activities such as infiltration of AIDS health knowledge science and technology outside of the classroom, and finally a second questionnaire survey was conducted at the end of the semester to evaluate the effectiveness of the health education.

2.4. Quality Control

Uniform training for panelists prior to the survey emphasized the prohibition of leading questions. The survey respondents will be teaching classes as a unit, a unified, centralized explanation of the notes and requirements for filling out the questionnaire, and filling out the questionnaire anonymously on their own with the informed consent of the survey respondents. After questionnaire collection through the Questionnaire Star system, the raw survey data were handed over to the subject team members who were not involved in the questionnaire design and survey for collation and quality control, and unqualified questionnaires, such as those with logical problems were eliminated.

2.5. Statistical Methods

Data were statistically analyzed using R4.4.2 software. Measurement data were expressed as ($\bar{x} \pm s$) and count data were expressed as the number of cases and percentage.

3. Results

3.1. General Information

This study enrolled 111 undergraduate students from a borderland university. The cohort comprised 69.4% females ($n = 77$) and 30.6% males ($n = 34$). Ethnic composition was predominantly Han Chinese (81.1%, $n = 90$), with minority groups including Yi (5.4%, $n = 6$), Bai (4.5%, $n = 5$), Hui (3.6%, $n = 4$), Dai (1.8%, $n = 2$), and other ethnicities (3.6%, $n = 4$). Regarding residential background, 37.8% ($n = 42$) originated from urban areas versus 62.2% ($n = 69$) from rural regions. Medical majors constituted the overwhelming majority (91.0%, $n = 101$), with only 9.0% ($n = 10$) in non-medical disciplines. Academic year distribution showed limited first-year representation (2.7%, $n = 3$), while 97.3% ($n = 108$) were non-first-year students (Details shown in **Table 1**).

Table 1. Demographic characteristics of university students.

Demographic Variables	Number ($n = 111$)	Percentage (%)
Gender		
Male	34	30.6
Female	77	69.4
Ethnicity		
Han	90	81.1
Yi	6	5.4
Bai	5	4.5
Hui	4	3.6
Dai	2	1.8

Continued

Other Ethnic Minorities	4	3.6
Residential Origin		
Urban	42	37.8
Rural	69	62.2
Medical Major		
Yes	101	91.0
No	10	9.0
Freshman Status		
Yes	3	2.7
No	108	97.3
Education Level		
Undergraduate	111	100.0
Graduate	0	0
Total	111	100.0

3.2. Differences in Demographic Characteristics of AIDS Knowledge Scores among College Students before Health Intervention

The health intervention significantly improved HIV/AIDS knowledge among students at a borderland university. Statistically significant differences (all $P < 0.05$) were observed in HIV/AIDS knowledge scores pre- and post-health intervention, particularly regarding awareness that “HIV/AIDS is an incurable severe infectious disease”. Specifically: Post-intervention, students recognizing “HIV infection cannot be identified by appearance” increased from 81.6% to 97.3% ($P < 0.001$). Understanding “HIV cannot spread through sharing toilets/bathrooms with PLHIV” rose from 79.2% to 97.3% ($P < 0.001$). Awareness that “mosquito bites do not transmit HIV” improved from 65.6% to 89.2% ($P < 0.001$). Additionally, the intervention increased: Knowledge that “no cure for HIV has been developed in China” from 80.8% to 96.4% ($P = 0.018$). Recognition of “male-male sexual contact as the primary transmission mode driving HIV spread among youth students” from 21.6% to 68.5% ($P = 0.003$) (Details shown in **Table 2**).

3.3. Impact of Health Intervention on HIV-Related Attitudes

This study evaluated HIV-related attitudes before and after intervention. Results indicated significant attitudinal changes among 111 students from a frontier university following health intervention. Specifically, within the positive attitude domain of non-discrimination toward people living with HIV, two items showed statistical significance (all $P < 0.05$): the proportion of students opposing “disclosure of information about HIV-infected individuals” decreased from 24.3% (pre-intervention) to 9.0% (post-intervention, $P < 0.001$); the proportion supporting

Table 2. Comparison of HIV knowledge scores among university students' pre- vs post-health intervention (n = 111).

Item*	Statistic	<i>P</i> **	Conf.low	Conf.high
Pre-Post Intervention Total HIV Knowledge Score**	2.192	0.03	0.050	0.995
Knowledge: Can HIV infection be identified by appearance?	<0.001	0.277	<0.001	0.037
Knowledge: Full name of HIV/AIDS (Pre-Post Intervention)	1.421	0.158	<0.001	0.043
Knowledge: HIV is a non-curable severe infectious disease	4.304	<0.001	0.078	0.211
Knowledge: HIV cannot spread through sharing toilets/bathrooms with PLHIV	<0.001	0.004	<0.001	<0.001
Knowledge: Mosquito bites do not transmit HIV	<0.001	1	<0.001	0.108
Knowledge: No cure for HIV has been developed in China	<0.001	0.018	<0.001	<0.001
Knowledge: Male-male sexual contact is the primary transmission mode driving rapid HIV spread among Chinese youth students	<0.001	0.003	<0.001	<0.001
Knowledge: HIV infection cannot be identified by appearance	<0.001	0.277	<0.001	0.037
Knowledge: Full name of HIV/AIDS (Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome)	1.421	0.158	<0.001	0.043

Notes: *Items represent pre-post health intervention comparisons; **Knowledge items were assessed using true/false questions (1 point per correct answer, total score range 0 - 20); ***Pre-post comparisons were analyzed using McNemar's test for paired nominal data (two-tailed $\alpha = 0.05$).

“delayed reporting of HIV-infected individuals' information to schools by disease control centers upon diagnosis” increased from 21.6% to 37.0% ($P < 0.001$). Other items without statistical significance ($P > 0.05$) still demonstrated improvement trends: an agreement that HIV-infected individuals could continue studying or working rose from 94.6% to 95.5%; willingness to maintain friendships with HIV-infected peers increased from 64.9% to 82.0%; intention to use condoms during sexual activity rose from 97.3% to 98.2%; approval of anonymous HIV testing channels in schools increased from 96.4% to 97.3%; and the proportion willing to serve as AIDS prevention volunteers remained stable at 95.5% (Details shown in **Table 3**).

3.4. Comparative Analysis of HIV/AIDS-Related Behaviors among University Students before and after Health Intervention

Analysis of HIV-related behaviors before and after health intervention revealed that among 111 students from a university, only a “history of heterosexual intercourse” demonstrated a statistically significant difference ($P = 0.036$) between the pre-intervention and post-intervention phases. The proportion of students with a history of heterosexual intercourse decreased from 18.9% (21 cases) pre-intervention to 8.1% (9 cases) post-intervention. For other behavioral items—including voluntary blood donation in the past three years, experiences of ear piercing, tattooing, or eyebrow tattooing at street-side shops, proactive requests for disposable syringes during injections, sharing razors with others, accessing pornographic books or websites, willingness to engage in sexual relations when peers/teachers/family were unaware, and history of same-sex intercourse—no statistically sig-

nificant differences were observed before and after the intervention (all $P > 0.05$) (Details shown in **Table 4**).

Table 3. Comparative analysis of HIV/AIDS-related attitudes among university students before and after health education intervention (N = 111).

Item	Pre-intervention	Post-intervention	<i>P</i>
Opposition to disclosure of HIV/AIDS patients' personal information	27 (24.3)	10 (9.0)	<0.001*
Support for continued education/employment of HIV/AIDS carriers	105 (94.6)	106 (95.5)	1.000
Objection to immediate notification of HIV-positive status to academic institutions by CDC	24 (21.6)	41 (37.0)	<0.001*
Willingness to maintain social contact with HIV-positive friends	72 (64.9)	91 (82.0)	0.362
Perception of HIV/AIDS patients as innocent victims	55 (49.5)	53 (47.7)	0.542
Intention to use condoms during sexual intercourse	108 (97.3)	109 (98.2)	1.000
Advocacy for anonymous HIV testing services on campus	107 (96.4)	108 (97.3)	1.000
Willingness to engage in HIV prevention volunteering and advocacy	106 (95.5)	106 (95.5)	1.000

Note: In the table, the data outside the brackets for the enumeration data are the case numbers, and the data inside the brackets are the constituent ratios (%); *The difference is statistically significant.

Table 4. Comparative analysis of HIV/AIDS-related behaviors among university students before and after health intervention (n = 111).

Item	Pre-intervention	Post-intervention	<i>P</i>
Unpaid blood donation within the past three years	9 (8.1)	6 (5.4)	0.581
Dermal penetration practices at unlicensed street vendors (e.g., ear piercing, tattooing, eyebrow embroidery)	22 (19.8)	21 (18.9)	1.000
Proactive request for disposable syringes during injections	60 (54.1)	54 (48.7)	0.480
Sharing razors with others	8 (7.2)	4 (3.6)	0.344
Pornography consumption (books/websites)	35 (31.53)	30 (27.03)	0.533
Covert sexual intention (engaging in sexual relations without disclosure to peers/teachers/family members)	27 (24.3)	24 (21.6)	0.749
History of same sexual intercourse	3 (2.7)	2 (1.8)	1.000
History of heterosexual intercourse	21 (18.9)	9 (8.1)	0.036*

Note: In the table, the data outside the brackets for the enumeration data are the case numbers, and the data inside the brackets are the constituent ratios (%); *The difference is statistically significant.

4. Discussion

AIDS health education has significantly enhanced the knowledge level of students in colleges and universities in western Yunnan. By comparing the knowledge rate of students, it is found that the students' mastery of key knowledge about the transmission channels and preventive measures of AIDS has increased significantly after the intervention, such as the proportion of students who know that

“it is impossible to judge whether a person is infected with AIDS by his/her appearance”, “sharing toilets and baths with HIV-infected people does not spread AIDS”, etc. This is in agreement with the findings of Zhang Wanqing and Jiang Feng [13] [14], whose study showed that health education conducted by different dominant actors had a positive impact on the change of newborns’ HIV knowledge acquisition. This shows that health education plays an important role in increasing students’ knowledge of AIDS, helping them to understand AIDS more accurately, and laying the foundation for them to form a scientific concept of prevention and treatment. However, despite significant progress, further efforts are needed to ensure that all students achieve the desired level of cognition.

Health education effectively improved positive attitudes toward HIV among students in colleges and universities in western Yunnan. The results of the study showed that students’ attitudes toward people living with HIV were more positive and tolerant, such as an increase in the percentage of those who were willing to continue to associate with people living with HIV and live on the same campus, and a change in the support for the idea of disclosing information about people living with HIV and schools refusing to enroll people living with HIV, which was similar to the results of the study conducted by Schengenzler [15]. This shows that health education not only improves students’ knowledge, but also eliminates, to a certain extent, their discrimination and prejudice against AIDS patients, promotes their understanding and acceptance of the AIDS community, and is conducive to the creation of a more harmonious and inclusive campus environment. However, attitude change is a long-term process that requires continuous education and guidance. Differences in HIV knowledge and attitudes among students with different characteristics suggest the need for targeted health education. It was found [16] that there were some differences in HIV knowledge and attitudes among students of different genders, places of residence, majors, and grades, such as freshmen’s knowledge enhancement and attitudinal change were more obvious after the intervention. Cao Xuang [17] [18] also pointed out that the knowledge of AIDS-related knowledge of new students in colleges and universities in border areas still needs to be improved, and there are differences in knowledge and health education needs among students with different characteristics. This suggests that when carrying out AIDS health education, students’ individual characteristics and differences in needs should be fully considered, and more targeted education strategies and contents should be developed to improve the effectiveness and coverage of health education, to ensure that all students can benefit from health education, and that they can jointly enhance their awareness and ability to prevent and control AIDS [19]. Future research and practice should further explore how to better meet the needs of different student groups.

5. Study Limitations

This study has several methodological and design constraints. First, the sample was predominantly from a single medical school (91.0% medical majors) with an

overrepresentation of Han Chinese students (81.1%), potentially limiting the generalizability of findings to non-medical institutions and ethnic minority populations in borderland multi-ethnic communities. Second, the single-group pretest-posttest design and short-term intervention evaluation (one semester) cannot fully exclude confounding factors or verify long-term effect sustainability. Third, the questionnaire lacked systematic integration of culturally sensitive indicators, such as the moderating role of cross-border family backgrounds (present in a proportion of students) on sexual health knowledge acquisition, nor did it examine correlations between ethnic-specific social activities (e.g., festival gatherings) and high-risk behaviors, potentially limiting the applicability of intervention strategies in unique borderland cultural contexts. Finally, the study did not elucidate the mediating mechanisms underlying attitude-behavior transformation nor quantify the synergistic effects between new media and traditional educational approaches, restricting the precise optimization of intervention strategies.

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Authors' Contributions

Kena Liu: Writing—original draft, Design questionnaire, Funding. **Xuang Cao:** Writing—original draft. **Siliu Dai:** Writing—original draft. **Yixuan Huang:** Completing the on-site questionnaire. **Yun Zhou:** Writing—review & editing, Writing—original draft, Formal analysis, Data curation.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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