RESEARCH ARTICLE

Knowledge, attitude and prevention behavior related to HIV/AIDS among students of a college in Lao-PDR: a cross-sectional study [version 1; peer review: 1 approved, 1 approved with reservations]

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Abstract

Background: Inadequate knowledge, negative attitudes towards people living with HIV/AIDS and risky practices are related to the spread of HIV infection. This study aimed to explore and test associations between knowledge, attitude and AIDS prevention behavior among students in Kham Mouane Technical-Vocation College, Lao People's Democratic Republic.

Methods: A cross-sectional, self-report questionnaire study was conducted in May 2018. Pearson's Chi-squared test and binary logistic regression was used to test the association between variables.

Results: Of 939 participants, it was found that: 61.6% were women; the mean age was 20.7 years (range 18-28 years); 40.2% lived in the college dormitory; >80% drank alcoholic beverages; 31.9% drank until slightly intoxicated; 13.7% drank until drunk; and the average drinking rate was 1-2 times a month (50%). Knowledge levels about the route of HIV transmission and how it can be controlled were poor. Misunderstood issues included: HIV transmission can be controlled by having a single partner and using condoms while having sex was correctly understood by only 22.8%; 72% incorrectly reported that HIV can be transmitted through a mosquito bite; and 48.2% believed incorrectly that drinking alcohol can disinfect HIV. Attitudes towards HIV were at a moderate level: the participants believed that infected persons should not reveal themselves in public, at work or college, and that requesting a boyfriend use a condom showed mistrust. HIV prevention practices were reported at a better level: reducing opportunity for sex by not cohabiting or staying privately with a lover

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and wearing condoms regularly during sexual intercourse, although more than 70% still drank alcohol when visiting nightclubs, associated with an increased likelihood of unprotected sex.

Conclusions: Public and community stakeholders need to design HIV prevention classes suited to college environments to improve students' knowledge, attitudes and risky behavior practices related to HIV.

Keywords

Knowledge Attitude and Practice, Risk behavior, HIV, College Adolescents, Lao PDR

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Introduction

Lao People's Democratic Republic (PDR) is committed to the goal of the World Health Organization's global strategy for eradicating HIV by 2030 [WHO, 2019], with external budget funds available for addressing HIV in high risk groups. Although the Lao PDR HIV infection prevalence among individuals aged 15 years or older was relatively low at 0.3% (0.2–0.3) in 2017 [UNAIDS, 2018] and high rates of condom use were reported among sex workers (91.8%), there are many potentially serious challenges for HIV prevention action. In 2017, estimates of people living with HIV (PLHIV) over 15 years old increased significantly to 11,000 (9,900–13,000), but anti-retroviral (ART) coverage was estimated at less than half (47%) [HIV and AIDS Data HUB, 2018]. It is estimated that only one-in-four knew their HIV status, leading to delayed treatment and an increased risk of exposing others to HIV infection, long-term complications and deaths due to AIDS [Bowring *et al.*, 2015]. Further, continuing stigma and discrimination has created barriers for at-risk populations to access HIV screening, prevention, treatment and care [Bowring *et al.*, 2015]. It was found from behavior surveillance surveys in 2017 [UNAIDS, 2018] that prevention programs for female sex workers only achieved 50% coverage. In addition, condom use in men who have sex with men was only 25.7%, with only 10.2% of this population aware of their HIV status and only 7.8% accessing care programs [Lao Social Indicator Survey II 2017–18; UNFPA, 2017]. In addition, “kathoys” (biological males who self-identify as female) reported a 27.4% consistent condom use rate, and just 24.1% reported a consistent condom use rate with non-regular partners in the last three months [Phimphachanh & Sayabounthavong, 2004]. Many adolescents reported having sex before 15 years of age, and 6% reported having had anal sex [Sychareun *et al.*, 2013]. Furthermore, Lao PDR is surrounded by four countries (Thailand, Viet Nam, China and Myanmar) that have been reported to be the main contributors to the rising incidence rate of HIV in some provinces of Lao PDR, which together contribute 95% of new infections in the Asia-Pacific region [Silakoune, 2017].

Khammouane Province is located in south-central Lao PDR and is close to the Thai border. In 2016, 271 PLHIV were reported, 92% of whom were in the over 15-year-old group, nearly half were new patients in that year, and 90% had access to ART. The latest figures reported January–August 2017 showed a 14% increase in PLHIV, and new patients increased by 22% [Lao Statistics Bureau, 2018]. The Lao Social Indicator Survey II: 2017 [Lao Statistics Bureau, 2018] reported that for men with multiple partners, 44.7% of 15–24 years (n=253) have had sex before, 61.0% of whom reported condom use during the last sexual intercourse with a non-spouse, non-cohabiting partner in the last 12 months. In total, 27% of 15–19-year-old women had sexual intercourse during the previous 12 months, and 6% had anal sex during the previous 12 months [Phrasisombath *et al.*, 2012], rising to 70% of women who had sex in previous 12 months for the 20–24-year-old group. Furthermore, alcohol consumption can lead to increased chance of unprotected risky sex and it was reported that 90% drank alcohol [Lao Statistics Bureau, 2018]. In addition, studies in high school students have found there was adequate knowledge about HIV, but negative attitudes towards HIV/AIDS and risky, unsafe sex practices [Kosay *et al.*, 2008; Thanavanh *et al.*, 2013].

This study was undertaken in a Lao PDR tertiary technical-vocational college. To the authors' knowledge, there has been no prior Lao PDR study of HIV at-risk groups in tertiary colleges. The study aimed to 1) identify student demographics, the level of knowledge of HIV/AIDS, attitudes towards HIV/AIDS and HIV prevention behavior and 2) test associations between the students' level of knowledge, attitudes and practices regarding HIV/AIDS and its prevention, in order to provide information for agencies to design HIV prevention interventions and evaluate future program operations in this population.

Methods

Study design and study site

The study used a cross-sectional self-report questionnaire survey design and was carried out in Kham Mouane Technical-Vocational College, based in Thakhek, the major town in Kham Mouane Province. This urban-based college has a yearly enrolment of around 3,000 students. It offers more than 21 vocational courses, including daytime and evening classes across three academic years.

Participants and data collection

An initial sample size of 750 participants was calculated, based on the total student population of 2734, with the confidence level set at 95%, and a variance value of 0.82 (Mayuree & Pannee, 2015). In case of a high non-participation rate due to the sensitivity of the issue, we included approximately 20% more participants, with a final sample size of 939 participants. A list of 2,734 student names was obtained and of these, participants were selected by simple random sampling (939 names were drawn), ensuring that the same proportion of each academic year was invited. All participants invited to the study volunteered to participate.

The researcher (SC) explained the purpose of the study to all potential participants, their rights to participate and assured them that their information would be kept confidential. Consent forms were handed out and signed by participants or the parents of those aged less than 18 years for participation in the study. Data collection was conducted using the self-report questionnaire and participants completed it individually during an hour break in their classes. All questionnaires were returned to the researchers the next day. Exclusion criterion was failure to give consent. All participants received a small souvenir (a pen) after data collection (participants were not aware they would receive this souvenir prior to participation). All recruitment and data collection took place between 15th–25th May 2018.

Questionnaire

The Knowledge, Attitude and Practice (KAP) survey questionnaire for HIV/AIDS prevention behavior was modified from previous research [Kosay *et al.*, 2008; Thanavanh *et al.*, 2013] and was initially developed in Thai. To assure content validity, it was checked by an expert in health behavior from Khon Kaen University, an expert in AIDS prevention and treatment from the Center for HIV/AIDS/ STIs of Khammouane Province and a teacher from Kham Mouane Technical-Vocational College. It was translated into Lao by the second author (SC), who is fluent in Thai and Lao, and then back-translated from Lao to Thai by another health worker at Khammouane Hospital. An assessment

of clarity, feasibility and appropriateness was carried out with 30 additional participants who studied cultivation in a college located 25 km from the study site. We pre-tested and edited three times and finally, it had a Cronbach's Alpha Reliability Coefficient of 0.75.

Questionnaire scoring

The questionnaires were scored as follows: 1) responses to the knowledge of HIV/AIDS section was recorded through answers of true or false and the level of knowledge of HIV/AIDS was classified as 'low' for mean scores of less than 60% correct, 'medium' between 60–80%, and 'high' over 80% correct (Bloom *et al.*, 1971); 2) responses to the attitudes towards people living with HIV/AIDS section were recorded using a Likert scale of strongly agree (5) to strongly disagree (1) and the level of attitudes towards people living with HIV/AIDS was defined as 'low' when the mean score was less than 2.7, 'medium' when the mean score was between 2.71–3.7 and 'high' when the mean score was over 3.7 (Likert, 1961); 3) responses to the HIV/AIDS prevention practices section were recorded using a Likert scale of 5 (regularly) to 1 (never) and the level of practice was defined as 'safe' for mean score over 4.2 and 'risky' for those scoring less than 4.2 (Best, 1981). When testing the association between HIV knowledge and HIV attitudes and practices by binary logistic regression, Level of knowledge was defined as 'low' for scores up to 50% (0–9.0) and high for those more than 50% (9.1–18.0), level of attitudes was defined as 'positive' for those scoring above the mean, and 'negative' for those scoring below the mean and level of practice was defined as 'safe' for those scoring higher than the median and 'risky' for those scoring below the median.

Data analysis

All questionnaire data was checked, coded, rechecked and entered into Microsoft Excel (v2017), before being checked and double entered into Epi-Info (version 3.5.4). Missing data was removed from analysis by making listwise data deletion. The data were then transformed by converting to true values for terms that have a negative meaning and all data were analyzed using Stata (v 13.0). Descriptive statistics were used to describe demographic characteristics and KAPs about HIV/AIDS. Pearson's chi-squared test and binary logistic regression was used to test the association between factors.

Ethical approval

This research proposal was reviewed and approved by the Mahasarakham University Ethics Committee for Human Research (No.056/ 2561). Permission to collect data in the local area was obtained from the head of the Public Health Provincial Office (Kham Mouane province) in Laos.

Results

Social-demographic and risky behavior data

Of the 939 participants, 61.6% were women and the mean age was 20.7 years (range 18–28 years). Accounting (20.7%), IT (18.3%), and electrical (15.5%) were the major fields of study, and 49% were first year students. In total, 37.4% lived in their family home, 42.1% in private dormitories and 20.5% in a relative's house or with friends. For monthly income given to the

participants from their parents, 57.1% received more than 400,000 Lao Kip (LAK; USD \$46.59), 38.3% received 100,000–400,000 LAK (USD \$11.65–46.59) and 4.6% received less than 100,000 LAK (USD \$11.65). The majority of the money was spent on fees and food, with one fifth spent on alcohol. More than 80% reported drinking alcohol; 54% reported drinking only sips, 31.9% drinking until slightly intoxicated and 13.9% drinking until drunk. Of those that drank alcohol, 50% drank up to 1–2 times a month, 30% drank 1–2 times a week, and 10% drank every day. Free time was spent in employment (44%) and various entertainment; for example, television (44.1%), partying (37.7%), social media (22.4%), games (20%), and reading (30%). Table 1 presents this information.

HIV/AIDS prevention information sources

Although the college had never conducted specific HIV/AIDS intervention education, participants had heard of HIV/AIDS and some students reported, to the researchers in person, their peers previously dying of AIDS. Information about HIV came from various sources, such as the internet (76.6%), television (55.3%) or health personnel/teacher (see Table 2).

HIV knowledge, attitude and practices

Overall, the reported level of HIV/AIDS knowledge was low, with very poor/erroneous knowledge of HIV transmission routes: 22.8% correctly reported that HIV transmission could be controlled by having a single partner and using condoms while having sex; 27.9% indicated that HIV could not be transmitted through a mosquito bite; 27.2% incorrectly perceived that couples who are already infected with AIDS did not need to use condoms; 39.4% incorrectly perceived that HIV can be transmitted through sharing a toilet with a PLHIV and almost half (48.9%) incorrectly believed drinking alcohol could disinfect them from HIV infection (Table 3).

Attitudes towards PLHIV

Overall, the level of attitude towards PLHIV was moderate (Table 4). There were many negative stigma issues: more than 80% believed that people who were HIV positive should not reveal themselves to society; and not be allowed to continue his/her teaching or studies. Between 60–70% believed that: requesting a boyfriend to use a condom indicated mistrust; and if someone has AIDS, he/she needn't maintain their health because it is an incurable disease. In addition, 50–59% felt that: people should not buy from a shopkeeper or food seller who is HIV positive; buying condoms was disgusting and embarrassing; relatives who had progressed to the AIDS stage should be separated from their families due to the disgust of other people; sex education is shameful and shouldn't be in school programs as it does not need to be taught or instructed; and HIV testing is not necessary as it does not cure disease. Finally, 50.8% believed that healthy-looking men are unlikely to have HIV, so if they are having sex, they shouldn't have to wear condoms. Table 4 presents fuller details.

Practices regarding HIV/AIDS

Table 5 reveals that 60.2% reported behaviors to prevent HIV/AIDS through avoidance of risky behaviors such as: using condoms regularly during sex with casual partners; 75.2% don't

Table 1. Participants' demographics (n=939).

Characteristics	n	%
Total participants (of a total student body of 2,734)	939	100
<i>Gender</i>		
Female	578	61.6
Male	361	38.4
<i>Level of study</i>		
Grade 1	460	49.0
Grade 2	331	35.3
Grade 3	148	15.8
Mean age (years) 20.7; Range 17-28; SD 1.9		
<i>Subject area</i>		
Accountant	194	20.7
Information technology	172	18.3
Secretary	98	10.4
Sewing	95	10.2
Electricity	146	15.5
Other	234	24.9
<i>Type of residence</i>		
Dormitory	395	42.1
Family house	351	37.4
Relative's house	193	20.5
<i>Occupancy</i>		
Friends	413	44.0
Parents	311	33.1
Relatives	169	18.0
Partner	11	1.2
Alone	35	3.7

Characteristics	n	%
<i>Monthly income from parents (LAK)</i>		
More than 400,000	536	57.1
100,000–400,000	360	38.3
Less than 100,000	43	4.5
<i>Expenses (more than one choice allowed)</i>		
School fee	805	85.8
Food	675	71.9
Partying	247	26.3
<i>Alcohol consumption</i>		
Drank alcohol	764	81.4
Drank until drunk	106	13.9
Drank until slightly intoxicated	244	31.9
Drank only sips	414	54.2
<i>Frequency of drinking</i>		
Daily	11	1.4
Every second day	57	7.5
1–2 times per month	419	54.9
1–2 times per week	215	28.1
1–2 times per year	62	8.1
<i>Hobby/Free time (more than one choice allowed)</i>		
Employment	414	44.1
Watching television	395	42.0
Chat/MSN/Twitter	210	22.4
Partying	260	37.7
Exercising	256	27.3
Playing a game	188	20.0
Reading a book	354	37.7

Table 2. Sources of HIV/AIDS information (N=939).

Sources	N	%
<i>Learning about HIV/AIDS (more than one choice allowed)</i>		
Internet	719	76.6
Television	519	55.3
Signboard	208	22.2
Newspaper/Magazine	307	32.7
Radio	171	18.2
Video	99	10.5
Brochures	82	8.7
<i>Information for HIV/AIDS prevention (more than one choice allowed)</i>		
Health worker	650	69.3
Teacher	420	44.7
Friends	355	37.8
Parents	137	14.6
Health volunteers	85	9.1

Table 3. Knowledge of HIV/AIDS transmission and prevention (N=939).

Questions	Correct response, n (%)
HIV can be transmitted through a mosquito bite (<i>correct response: false</i>)	262 (27.9)
Couples living with HIV do not need to using condoms while having sex because they are already infected (<i>correct response: false</i>)	255 (27.2)
HIV can be transmitted by sharing a toilet with an HIV-positive person (<i>correct response: false</i>)	370 (39.4)
HIV transmission can be controlled by having a single partner and using condoms while having sex (<i>correct response: true</i>)	214 (22.8)
Children who were born from mothers with AIDS are at risk of having HIV (<i>correct response: true</i>)	370 (39.4)
HIV can be transmitted by eating and drinking from the same plate or glass of an HIV-positive person (<i>correct response: false</i>)	422 (44.9)
Drinking alcohol can disinfect HIV (<i>correct response: false</i>)	459 (48.9)

Level was defined as "Low" for scores of less than 60%, 'medium' between 60–80% and 'high' over 80 [Bloom *et al.*, 1971]

Table 4. Attitudes towards PLHIV (n=939).

Questions	$\bar{X}$ (S.D)	Level of attitude ^a	Number of participants with this attitude level (%)
People living with HIV should reveal themselves to society for disease control	2.4 (1.2)	Low	761 (81.0)
If a teacher is living with HIV, she/he should be allowed to continue to teach in school	2.6 (1.1)	Low	777 (82.7)
Requesting a boyfriend to use condoms during sex shows mistrust	2.8 (1.2)	Medium	688 (73.3)
If someone has AIDS, he/she needn't maintain their health because it is an incurable disease	2.9 (1.2)	Medium	643 (68.5)
If a shopkeeper or food seller is HIV positive, should you buy items from them?	3.2 (1.2)	Medium	573 (59.0)
Buying condoms is disgusting and embarrassing	3.1 (1.3)	Medium	540 (57.5)
If a relative has AIDS, they should be separated from their family due to the disgust of other people	3.4 (1.1)	Medium	519 (55.3)
Sex education is shameful and shouldn't be taught in the school program. It doesn't need to be taught or instructed.	3.4 (1.1)	Medium	492 (52.4)
HIV testing is not necessary because it does not cure disease	3.4 (1.1)	Medium	484 (51.5)
Healthy-looking men are not likely to have HIV, and should not wear condoms during sex	3.4 (1.2)	Medium	477 (50.8)
Total score; Max=4.7, Min=1.7	3.03(0.5)	Medium	

^a Level of attitude was defined as 'low' when mean score less than 2.7, 'medium' when mean score was between 2.71-3.7 and 'high' when mean score was over 3.71 [Likert, 1961]

co-habit with boy/girlfriends, which can increase opportunity for sex or watching porn videos; 77% don't share needles and syringes; 61% don't have sex with girl/boyfriends who they are just dating; and 52.3% don't have sex when under the influence of alcohol. When visiting nightclubs, 73.4% of them reported drinking alcohol.

Association between knowledge about HIV and attitudes and practices related to HIV

The binary logistic regression reveals that participants with low levels of knowledge were likely to have proportionately higher negative attitudes (OR=1.80; CI=1.07, 1.89; P value <0.001) and risky practices relating to HIV/ AIDS (OR=1.51;

Table 5. Knowledge of HIV/AIDS prevention practices (n=939).

Question	Practices level		Number of participants with this knowledge level (%)
	$\bar{X}$ (S.D)	Level ^a	
Wear condom regularly during having sex with casual partner	4.2(1.2)	Safe	565(60.2)
Don't live with boy/girlfriend and watch porn videos.	4.6(1.0)	Safe	705(75.2)
Don't share needles and syringes with other people.	4.5(1.1)	Safe	723(77.0)
Not had sex with girl/boyfriends who are just dating	4.3(1.0)	Safe	573(61.0)
Not have sex when under the influence of alcohol.	4.2(1.1)	Safe	491(52.3)
Drinking alcohol when visiting nightclubs.	3.4(1.2)	Risky	698(73.4)
$\bar{X}$	4.19(0.78)	Safe	

^aLevel of practice was also defined as 'safe' for those scoring mean over 4.2), 'risky' for those scoring mean less than 4.2 (Best, 1981)

Table 6. Association between HIV knowledge and HIV attitudes and practices by Binary Logistic Regression (n=939).

	Attitude ^b					Practice ^c				
	Negative (number)	Positive (number)	OR ^d	95% ^e	p^f	Risky (number)	Safe (number)	OR ^d	95%	p^f
Knowledge^a (n=939)										
Low	198	145	1.80	1.07,1.89	<0.001*	174	142	1.51	0.99,2.30	0.014
High	257	339				344	197			
Attitude (n=857)										
Low	-	-	-	-	-	185	240	1.39	1.06,1.83	0.018*
High						154	278			
Age (years; n=939)										
<20.6	236	289	0.73	0.56,0.94	0.016	174	313	0.69	0.52,0.91	0.009
>=20.6	219	195				165	205			
Gender (n=857)										
Male	182	180	1.13	0.87,1.47	0.377	170	159	2.27	1.71,3.02	<0.001
Female	273	304				169	359			
Alcohol drinking (n=939)										
Ever	83	92	0.95	0.68,1.32	0.802	52	106	0.70	0.49,1.01	0.059
Never	372	392				287	412			

^a Level of knowledge (K) was defined as 'low' for mean scores for less than 50% correct and 'high' for over 50% correct. ^b Level of attitude (A) was defined as 'positive' for those scoring $\geq$ mean, and 'negative' for those scoring $<$ mean. ^c Level of practice (P) was defined as 'safe' for those scoring $\geq$ median and 'risky' for those scoring $<$ median. ^d OR=Odds ratio. ^e CI=Confidence interval of OR. ^f Significance statistic ≤ 0.05 . * Fisher's exact test.

Note: n=857 for 'Attitude' and 'Gender' as some participants did not include a response to these items.

CI: 1.07, 1.89; P value=0.014). Demographic factors associated with attitudes and practices include: aged less than 20.6 years was related more significantly to negative attitudes (OR=0.73; CI: 0.56, 0.94; P value=0.016 and OR=0.69; CI: 0.52, 0.91; P value 0.009); being male was associated with proportionately higher risk behaviors (OR=2.27; CI: 1.71, 3.02; P value <0.001); and there was a non-significant association between alcohol

drinking and negative attitudes and risky behaviors. Table 6 presents fuller details.

Discussion

This study investigated the association between KAPs and risk factors relating to HIV/AIDs among Kham Mouane Technical-Vocation College students in Lao PDR. Kham Mouane has

lower HIV rates than other Lao PDR provinces [Lao Statistics Bureau, 2018]; however, it is slightly increasing among adolescents, with several likely enabling factors. Namely, the college is the only major school in the province with young students, is located in an urban setting and nearly 50% live in private dormitories with restaurants, liquor stores and entertainment venues nearby, increasing opportunities to engage in risky behavior. Furthermore, it is close to cross-border areas like the Mukdahan Province of Thailand, Cambodia and China, which have higher HIV-prevalence [Phimphachanh & Sayabounthavong, 2004]. Furthermore, a key point is that alcohol consumption is associated with increased chances of having unprotected risky sex (AIDsInfo, 2018). We found that more than 80% of the students drink alcohol, half of them drink monthly, 13% drink until drunk and 30% drink until slightly intoxicated. Furthermore, there was no HIV prevention program in their school or community, but it was reported accessible from social media, television or friends by more than 50% of the students.

To the best of our knowledge, this is the first known study of its type in a vocational technical college in Lao PDR, though it has some similarities with other studies on KAP and HIV prevention among Lao PDR high school students [Boonluane *et al.*; Kosay *et al.*, 2008] and the Lao PDR survey of risk behaviors in Kham Muane Province [Lao Statistics Bureau, 2018]. There were some differences: 1) overall, these studies [Hansson *et al.*, 2008; Koksai *et al.*, 2005; Mansoor *et al.*, 2008; Tan *et al.*, 2007; Thanavanh *et al.*, 2013] found moderate and high levels of knowledge and attitudes relating to HIV and risky behaviors, whereas our study found low knowledge, and moderate attitude levels but higher safe levels of HIV prevention practice. However, we found concerning amounts of incorrect knowledge, namely; there were misconceptions about HIV transmission, for example, beliefs that HIV can be transmitted through a mosquito bite, or sharing a toilet with an HIV positive person and, significantly, half believed that 'Alcohol can disinfect HIV'. This indicates that students need much more information and education about the true routes of HIV transmission. About 64.6% of participants displayed more negative attitudes than high school students [Hansson *et al.*, 2008; Koksai *et al.*, 2005; Kosay *et al.*, 2008; Lao PDR Progress Report, 2016; Mansoor *et al.*, 2008; Tan *et al.*, 2007; Thanavanh *et al.*, 2013]. They mainly believed that PLHIV should not be allowed to continue working /studying or cohabiting in their community, because of fear of catching the disease. They believed it was shameful to buy or carry a condom, and it suggests mistrust if a woman requests that her partner uses a condom during sex. Regarding HIV/AIDs prevention behaviors, although the results of this study do not agree with other studies [Hansson *et al.*, 2008; Koksai *et al.*, 2005; Mansoor *et al.*, 2008; Tan *et al.*, 2007; Thanavanh *et al.*, 2013], there were some similarities between this study and Thanavanh *et al.* (2013). Namely, the percentage of those who drink alcohol (81.4% in the current study versus 91.5%), the percentage of those having sex when under the influence of alcohol (47.4% versus 30.1%), and the percentage of those using condoms when having sex (39.8% versus 43.9%). In the current study, more than 60% of participants were female and there was a higher risk of unsafe sex after drinking alcohol and more misconceptions about condom usage.

These results suggest the need to for effective participatory education strategies within students' networks (family, school/college, public sector, media organizations etc.) to develop proficient and effective HIV awareness, knowledge and practice programs [Kosay *et al.*, 2008; Thanavanh *et al.*, 2013; UNAIDS: PDR Progress report, 2016]. These should involve suitable media sources of information, voluntary counseling, extensive health care, prevention programs, treatment and rehabilitation services, strengthened surveillance capacity and reduction of social stigmatization. Finally, health worker community networks should research and evaluate intervention programs to inform future HIV policy.

There were some limitations of the study. The study was restricted to only one province, which might limit the generalizability of the findings to other provinces with different contexts. Despite this limitation, we believe these findings offer useful information for researchers and policymakers.

Conclusion

In summary, the students surveyed in this Lao PDR Technical-Vocation College had moderate levels of knowledge about and attitudes towards HIV/AIDS prevention. However, misconceptions about HIV transmission, discriminatory attitudes and stigma towards PLHIV were particularly noticeable. Although, most of them had safe HIV behaviors, they also had risky practices, particularly around drinking alcohol, associated with increased likelihood of unsafe sex. Therefore, we recommend that public sector and community networks need to address HIV/AIDS-related education programs with specific interventions for these college contexts to direct practices, knowledge and attitudes in a positive direction and contribute to substantial improvements in HIV/AIDS prevention.

Data availability

Underlying data

Raw datasets have not been made available at the request of the Mahasarakham University Ethics Committee in order to maintain participant confidentiality. Access to the raw data can be obtained upon request after seeking permission from the Mahasarakham University Ethics Committee. Anyone wishing to access the data should first contact the corresponding author, who will facilitate contact with the Ethics Committee (contact email: research@msu.ac.th). Access will be granted under the conditions that the person or organization seeking access provides sufficient rationale, highlighting the benefits for use of this data, and are operating under appropriate research ethics.

Extended data

Figshare: Knowledge, attitude and prevention behavior related to HIV/AIDS among students of a college in Lao-PDR: a cross-sectional study, <https://doi.org/10.6084/m9.figshare.11846097.v1> [Wongkongdech, 2020].

This project contains the following extended data:

- Questionnaire

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](#) (CC-BY 4.0).

Acknowledgements

We acknowledge the contribution and cooperation of the all participating students and teachers of Kham Mouane Technical-Vocation College who made the study possible. We also

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Ivan Marbaniang

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I commend the authors for their work, which remains a crucial area that has not been fully addressed in South East Asia, sparing a few countries.

There are however a number of methodological issues and issues with interpretation which makes these findings less valid.

1. The authors mention that, "A list of 2,734 student names was obtained and of these, participants were selected by simple random sampling (939 names were drawn), *ensuring that the same proportion of each academic year was invited.*"

This statement is not clear, do the authors mean an equal proportion of students from each year (which is clearly not true, since 49% of the participants belong to Grade I) or do they mean an equal proportion relative to the number of students in each Grade?

2. It is also unclear if the categorization of low, medium, high based for both attitude and risky behavior was based off cut-offs specified by Likert and Best? If so, do the authors think that these are appropriate for their setting?
3. The authors change the definition of low knowledge from 60% to 50% when they use it in the logistic regression model, what is the justification for this?
4. Did the authors consider using an ordinal logistic regression so that they did not need to change their definitions? Please see the link for ordered logistic regression below:
<https://stats.idre.ucla.edu/stata/dae/ordered-logistic-regression/>
5. Why did the authors use the mean to describe a cut-off for the attitude, but the median to

describe a cut-off for risky behavior? How robust are the authors' estimates to the specification of these cut-offs? Did they consider conducting any sensitivity analyses?

6. In the Results section, it is unclear if the authors are describing *practices as practiced by these students* (as the subheading indicates in the Results section) *or knowledge about these practices* (as indicated by Table 5)? The authors switch between the two and what they intend to describe becomes ambiguous.

Moreover, in the results there are a number of inconsistencies which the authors have not explained:

Example 1: "60.2% reported behaviors to prevent HIV/AIDS through avoidance of risky behaviors such as: using condoms regularly during sex with casual partners" **AND** "61% don't have sex with girl/boyfriends who they are just dating".

Since people can use condoms only when having sex (conventionally), if 61% of them are not having sex then it is not possible that 60.2% of them are using a condom.

Example 2: "52.3% don't have sex when under the influence of alcohol" **AND** "73.4% of them reported drinking alcohol"

These statements taken together would imply, *contrary* to what the authors state in their discussion, that alcohol may cause risky sexual behavior. In fact these two statements taken together would imply that students were less likely to indulge in high risk behavior after consuming alcohol.

7. I would suggest that the authors try stratifying their analysis by gender, to see if they see a heterogeneity of effects based on gender.
8. The authors should consider using a language editing service, if it is available to them to make their language a lot more clearer.

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Mental health, HIV, sexual minorities, health services, adolescent mental health, Epidemiology, Causal analysis

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 23 March 2020

<https://doi.org/10.5256/f1000research.24605.r61203>

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Roger Chun-Man Ho

Institute for Health Innovation and Technology (iHealthtech), National University of Singapore, Singapore, Singapore

This study studies knowledge, attitude and prevention behavior related to HIV/AIDS among college students in Lao and there are a number of misunderstandings by respondents. I have the following recommendations:

1. Under the methods, the authors need to explain how they got a 95% CI of the population. There must be a measurement outcome. 750 is one quarter of 2734, how did the authors get 95% CI? The authors need to explain more.

2. The authors should compare their findings with other ASEAN countries. Please add the following statement at the end of the first paragraph:

".... more than 50% of the students. In this study, only 22.8% respondents correctly indicated that using condoms while having sex. This figure is lower than in other ASEAN countries. In contrast, 48.1% of young Vietnamese used condoms at their latest sexual intercourse (Ngoc *et al.*, 2020¹)."

3. The authors should mention education strategies in other ASEAN countries. Please add the following statement:

"Other ASEAN countries adopted mobile health apps or interventions for disease prevention (Do *et al.*, 2018²). This strategy could be feasible to proliferate the benefits of HIV prevention in youths and adolescents in Laos."

4. Please add one additional limitation:

".... other provinces with different contexts. This study did not explore other knowledge on HIV which was assessed in other ASEAN countries. For example, 98.2% of Vietnamese believed that HIV could be transmitted from mother to child (Hoang *et al.*, 2019³) but it would be important to assess the knowledge of young people in Lao."

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Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Depression, HIV, meta-analysis

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

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