



**Cross-sectional survey: Smoking among medical, pharmacy, dental and nursing students, University of Health Sciences, Lao PDR**

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3 **Cross-sectional survey: Smoking among medical, pharmacy, dental and nursing**  
4 **students, University of Health Sciences, Lao PDR**  
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## Article summary

### Article focus

- Investigates the prevalence of smoking and exposure to secondhand smoke among medical, pharmacy, dentistry and nursing students in their third year in the University of Health Sciences, Lao PDR
- Investigates knowledge and attitudes about tobacco use and training received regarding patient counseling on smoking cessation techniques in this student cohort.

### Key Messages

- This is the first survey which investigates smoking prevalence and attitudes among health professional students in Lao PDR
- Most students supported tobacco control measures but formal training in tobacco cessation counseling was variable
- Health education and skills building to provide effective counseling on quitting smoking to patients should be part of the curricula for health professional students in Lao PDR

### Strengths and Limitations

- The survey used a previously validated questionnaire and had a high response rate for each type of health professional (97.1% to 98.5%)
- Survey results cannot be extrapolated to practicing health professionals in Lao PDR or to allied health professionals.
- As a cross-sectional survey causality cannot be tested

There is no additional data available

## Abstract

**Objectives:** The objective of this study was to investigate the prevalence of and attitudes to smoking among medical, pharmacy, dentistry and nursing students in their third year in Lao PDR.

**Design:** A cross-sectional survey conducted among 3rd year health professional students of the University of Health Sciences using a self-administered questionnaire. The questionnaire was originally developed by WHO, modified to suit the local setting.

**Setting:** The setting was a health sciences university in Vientiane capital of Lao PDR. Participants were recruited from the Faculties of Medicine, Pharmacy, Dentistry, Nursing, Medical Technology, and Basic Sciences.

**Primary and secondary outcome measures:** The primary outcome measure was prevalence of cigarette smoking and other tobacco use and the secondary outcome was factors associated with smoking status among health professional students. Smoking status was categorized as: current smoker, ex-smoker and nonsmoker. Current cigarette smokers were defined as those who had smoked cigarettes on one or more days during the previous 30 days.

**Results:** The overall smoking prevalence was 5.07% (95% CI 3.2-7.1). This is lower than previously reported national prevalence rates. More men smoked than women ( $p = 0.003$ ). The majority of students strongly supported tobacco control measures. The number of people who reported receiving formal training in tobacco cessation counseling ranged from 10.9% (95% CI: 5.3-19.1) among nursing students to 51.1% (95% CI: 40.4-61.7) among medical students.

**Conclusion:** Health professional students should be provided health education to discourage tobacco use and introduce the tobacco cessation program into the curriculum. Skills building to enable these new health professionals to provide effective counseling on quitting smoking to patients should also be part of the curricula. The study offers valuable information in prioritizing tobacco control among Lao health professional students. These students are future health professional, and their smoking behaviours will influence their patients and the public.

## Introduction

Tobacco is a leading cause of preventable mortality and morbidity in the majority of high-income countries, and it is becoming increasingly prevalent in low-income countries.<sup>1</sup> Almost 1 billion men and about 250 million women in the world are daily smokers; in particular, 35% and 50% of men and 22% and 9% of women in developed and developing countries, respectively, smoke.<sup>2</sup> While cigarette consumption has been declining in high income countries, it is rising in low and middle-income countries.<sup>3</sup> The number of deaths attributable to smoking worldwide for example, is expected to exceed 8 million by 2030, with approximately 70% of these deaths occurring in developing countries.<sup>1</sup> The negative health consequences of smoking are considerable and have been well-documented.<sup>4,5</sup> In its preamble, the World Health Organization Framework Convention on Tobacco Control (FCTC) emphasizes the vital contribution of participation of health professional bodies and academic and healthcare institutions in tobacco control efforts.<sup>6</sup> Health professionals who smoke also send an ambiguous message to patients whom they have encouraged to cease smoking.<sup>6,7</sup>

One of the strategies to reduce smoking related morbidity and mortality is to encourage the involvement of health professionals in tobacco-use prevention and cessation counselling. As the future health professional community, medical students have an important role to play in these efforts.<sup>8</sup> Research has found that medical professionals who smoke are more likely to hold attitudes that prevent them from providing patients with anti-smoking advice.<sup>9</sup> Given their attitudes to smoking and preventative measures are likely to be influenced during their medical training, to be effective tobacco control measures should begin during their training.<sup>10</sup> As such, researchers have been interested in investigating attitudes to tobacco smoking in the health profession population.<sup>8</sup> As a consequence, there have been several studies which have collected information from health profession students in different contexts about their tobacco use.<sup>11,12</sup>

The prevalence of smoking among medical students varies widely from country to country. In a systematic review of the literature for example, Smith and Leggat<sup>8</sup> concluded that the prevalence of smoking among smoking rates among male medical students ranged between 3% in the United States<sup>13</sup> and 58% in Japan<sup>7</sup>. They observed marked differences in smoking rates between males and females with male students generally having the higher rates.<sup>8</sup> Medical

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3 students in the United States, Australia, China and India were the least likely to smoke.<sup>8</sup> A cross-  
4 sectional study at Charité medical school in Berlin found the prevalence of tobacco use was  
5 22.1% among women and 32.4% among men in fifth year medical students attending a course in  
6 occupational medicine.<sup>10</sup> A cross-sectional study carried out in Malta at the Malta Medical  
7 School and the Institute of Health Care, found that more than a quarter of health professional  
8 students were daily or occasional smokers.<sup>14</sup> This was slightly higher than that (19.3%) found in  
9 the corresponding adult Maltese population of the same age.<sup>14</sup> High levels of smoking  
10 prevalence have been reported among physicians in several low-middle income countries. In  
11 China, one study found 58% of male and 19% of female physicians being current cigarette  
12 smokers.<sup>15</sup>

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22 A national survey in the Lao People's Democratic Republic (PDR) in 2003 reported 40.3% of  
23 the population was smokers with males reporting smoking over four times those of females  
24 (67.7% vs 16%).<sup>16</sup> This large disparity by sex has been reported found in neighboring countries,  
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17 and reflects gender norms that encourage male smoking and condone female smoking.<sup>18</sup> Also  
in 2003, a study of smoking prevalence in male doctors at Mahosot University Hospital in the  
Lao capital, Vientiane, in 2003 reported a smoking prevalence rate of 35%.<sup>19</sup> A more recent  
national survey of the prevalence of current smoking among Lao doctors reported a prevalence  
rate of 9.3%.<sup>20</sup> Previous studies in Lao PDR have also shown that people often start smoking at  
earlier age than entering medical schools.<sup>20</sup> Data related to the smoking habits of Lao People's  
Democratic Republic (PDR) health professionals/students however, are scarce.

In 2005, the World Health Organization (WHO) and the U.S. Centre for Disease Control and  
Prevention, developed and administered the Global Health Professions Student Survey (GHPSS)  
in ten countries.<sup>6</sup> The survey is an international school-based survey of third year students  
undertaking advanced degrees in dentistry, medicine, pharmacy, and nursing. The objectives of  
the study reported here, were firstly to assess prevalence of smoking, understanding and attitudes  
regarding participation towards smoking cessation among the students of the University of  
Health Sciences; Lao People's Democratic Republic (PDR), to using the GHPSS. The second  
objective was to determine factors associated with smoking amongst these health professional  
students. The findings reported in this study are important because it is the first such survey of

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3 health professional students in the Lao PDR and provides insight into the smoking prevalence  
4 among health professional students in Lao PDR.  
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## 7 8 **Methods**

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10 The GHPSS has a standardized methodology for selecting participating schools and classes and  
11 uniform data processing procedures and these were followed in the present study.  
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### 14 ***Study setting***

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16 Participants were recruited and the data was collected in March 2009 in the University of Health  
17 Sciences, located in Vientiane Capital City, Lao PDR and the only medical university in the  
18 country. The University consists of seven faculties: Medicine, Pharmacy, Dentistry, Nursing,  
19 Medical Technology, Basic Sciences and Postgraduate Studies and Research. At the time of the  
20 study, the Faculty of Medical Technology was in the process of gaining approval for an  
21 undergraduate curriculum and offered only a higher Diploma. The Faculty of Basic Sciences  
22 provides the basic medical knowledge to all health professional students from year 1 to year 2. In  
23 Lao PDR the medical, dental and pharmacy, undergraduate courses last five to six years, whereas  
24 nursing students engage in an undergraduate course of years.  
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### 33 ***Participants and sampling***

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35 This cross sectional, GHPS survey was a medical school-based survey of third-year students in  
36 dentistry, medicine, nursing, and pharmacy programs. Inclusion criteria were all male and female  
37 third year medical, dental, pharmacy and nursing students registered for the 2008/2009 academic  
38 session in the University of Health Sciences. A census of eligible students was undertaken of all  
39 medical, dental, pharmacy and nursing faculties and all students within all faculties surveyed.  
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41 The structured, self-administered questionnaire was handed to the students during their regular  
42 lecture sessions. Prior to questionnaire distribution, all students were informed about the main  
43 objectives of the study, were assured of anonymity and confidentiality and provided consent for  
44 their voluntary participation. At the time of data collection, the total population of enrolled  
45 students in the 3<sup>rd</sup> year of nursing in both departments was 506 students.  
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### 54 ***Variables***

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3 We used the standard questionnaire of GHPS which consisted of core questionnaire on  
4 demographics, prevalence of cigarette smoking and other tobacco use, knowledge and attitudes  
5 about tobacco use, exposure to secondhand smoke, desire for smoking cessation, and training  
6 received regarding patient counseling on smoking cessation techniques. The outcome variable  
7 was smoking status, classified into three categories: current smoker, ex-smoker and nonsmoker.  
8 Current cigarette smokers were defined as those who had smoked cigarettes on one or more days  
9 during the previous 30 days. Those who had been smokers before, but had stopped smoking at  
10 the time of survey were considered ex-smokers and those who had never smoked in his/her  
11 lifetime were never smokers. The predictor variable was attitude towards smoking. This was  
12 measured by summation of scores on attitude items; each item was scored with one for each  
13 “against smoking” and zero point for “favorable to smoking” attitudes respectively. A maximum  
14 of eleven potential points was obtained if a respondent answered all attitude questions. With a  
15 total of eleven questions, the possible total attitude score ranged from 0 to 11. The other  
16 predictor variables were gender, age and receiving training on the danger of smoking. Table 1  
17 provides the definition of the variables.  
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31 *Insert Table 1*  
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### 34 **Data collection**

35 The GHPS collects information on demographics, prevalence of cigarette smoking and other  
36 tobacco use, knowledge and attitudes about tobacco use, exposure to secondhand smoke, desire  
37 for smoking cessation, and training received regarding patient counseling on smoking cessation  
38 techniques. The English language questionnaires were translated into Lao and back translation  
39 was performed and checked by an independent third person for validity.  
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46 The survey was conducted during May and June, 2009 at the University of Health Sciences,  
47 Lao PDR. Prior to the survey, training was provided for the research supervisors and assistants.  
48 The translated instrument was then piloted tested with second year medical students. Based on  
49 this some of the wording was modified on the translated version to enhance clarity but these  
50 revisions did not change the intended meaning of the questions. These steps alongside the  
51 translation and back translation helped to reduce the risk of information bias. Prior to  
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3 administration, the purpose of the research was explained to the relevant facilities and the  
4 students. To minimize loss of sample size due to absenteeism, we administered the questionnaire  
5 on the day of an examination. Students who agreed to partake in the study were asked to remain  
6 behind to complete the questionnaire. The self-administered questionnaire took students 30 to 40  
7 minutes to complete. After completing questionnaires, the students left their questionnaires on  
8 the tables and the instructors or research assistants collected the questionnaires.  
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### 14 15 16 17 18 *Data analysis* 19

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22 The software package STATA version 10.1 was utilized for statistical analysis. Frequency  
23 distributions with mean and standard deviation were used to describe respondents' demographic  
24 characteristics, smoking behaviors, and other variables. After checking the data did not violate  
25 assumptions, univariate analysis was carried out using chi-square testing for categorical  
26 variables, with a  $p$  value of  $<0.05$  taken as the threshold for statistical significance. All results  
27 have a margin of error of  $\pm 5\%$  (95% confidence interval [CI]). Differences in rates for these  
28 indicators were considered statistically significant at the  $p = 0.05$  level. Logistic regression  
29 analysis was used for determining the factors associated with smoking among the health  
30 professional students by controlling for gender and age. Cases with missing data were excluded  
31 from the analysis.  
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### 41 *Ethics* 42 43

44 This research was approved by the research ethics committee of the University of Health  
45 Sciences, Lao PDR. The researchers in charge of the survey explained the objectives of the  
46 research to the students and emphasized that participation was voluntary. Written consent was  
47 obtained from each respondent and anonymity assured.  
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## Results

A total of 506 health professional students present in the classrooms completed the questionnaires. For each type of health professional, the response rate ranged from 97.1% to 98.5% (Table 2). The high response rate minimized the risk of bias due to the population not being representative of target population of third year health professional students at the University of Health Sciences.

*Insert Table 2*

The majority of participants were male (59.5%,  $n = 296$  and  $n$  missing=7) and were aged between 19 and 24 (78.1%,  $n = 395$ ,  $n$  missing=). The overall prevalence of tobacco use among the third-year health profession students in this sample was 5.1% ( $n$  missing=13). Prevalence was highest among dental students, with rates 7.9% ( $n$  missing=1); the lowest current smoking prevalence was reported among pharmacy students (1.5%) ( $n$  missing=4). A total of 35.2% were ex-smokers ( $n$  missing = 17). Information about prevalence of smoking in the present study is presented in Table 3. Of the respondents who had ever smoked, 30.4% has smoked other tobacco products such as chewing tobacco, snuff, bidis, cigars or pipes.

*Insert Table 3*

A chi-square test for independence (with Yates continuity Correction) indicated a significant association between gender and smoking status but with a very small effect size, chi-square = (1,  $n = 486$ ) = 24,  $p = <.001$ ,  $\phi = <-.23$ ).

### ***Tobacco Policy Awareness***

About half of the students (51.6%) were aware of the existence of a non-smoking policy within the school buildings and the hospital grounds, while 22.6% perceived that there was a no smoking policy only in the school buildings. There was a statically difference between health professional programs on awareness of smoking policy within the school buildings and hospitals

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with dental students were aware about the smoking policy compared to students from other faculties ( $p = .002$ ). Of those who aware of the smoking policy, 78.3% believed that the policy was enforced, while 6.8% disagreed with this view. Only 14.9% of all students surveyed were unaware of the school policy. There was no significant difference between the responses of smokers versus non-smokers with regards to knowledge of the non-smoking policy (25% versus 22.3%,  $p = .814$ ) or perception of its enforcement (79.2% versus 78.1%,  $p = .845$ ). Information about awareness of the smoking policy is presented in Table 4.

*Insert Table 4*

### ***Home Environment and Smoking Status***

Among the respondents 7.3% reported that they had been exposed to SHS in their home on each of the past seven days. There was a significant difference between smokers and nonsmokers about the reporting of exposure second hand within their home (OR=3.25, 95%CI=1.4-7.7,  $p=.007$ ) and outside the home environment (OR=2.6, 95%CI=1.1-6.6,  $p=.046$ ).

### ***Attitudes Towards Smoking by Smoking Status***

Most of the health professional students in the present study expressed positive attitudes towards tobacco control irrespective of their own smoking status. Overall, the mean score on the eleven attitude questions was  $12.34 \pm 1.45$ . There was no significant difference in attitudes between males and females or between smokers and non-smokers. The majority of health professionals for example, agreed with the statement “Should tobacco sales to adolescents be banned?” and “Smoking ban in discos/bars/pubs?” Non-smokers were more likely than smokers to agree that health professionals should be the role model (98.3% versus 88%,  $p=.015$ ). In relation to perceptions of the role of health professionals, both smokers and non-smokers concurred that health professionals acted as role models for the community (88% and 98.3 respectively) and that health professionals have a role in supporting patients in smoking cessation. Further information about attitudes to tobacco control is found in Table 5.

*Insert Table 5*

### *Perception on Medical Training*

The students who had received formal training in tobacco cessation counseling ranged from 10.9% among nursing students to 51.1% among medical students. Medical students (51.1%) were significantly more likely than pharmacy students (25%) or dental students (13.0%) to have received such training but not significantly more likely than nursing students (10.9%).

Information related to the perception of health professional students about smoking education is shown in Table 6. There was no statistically significant difference between smokers and nonsmokers about the perception formal training on the danger of smoking for health professionals ( $p = 0.104$ ) or the importance of providing educational quitting materials ( $p = 0.834$ ).

*Insert Table 6*

A multivariate analysis of factors related to smoking among health professional students was carried out in order to control the confounding factors such as sex and age. A statistically significant difference was found between males and females and current smoking. No significant difference was found between age group, attitudes to smoking cessation or receiving training on the danger of smoking. More information is provided in Table 7.

*Insert Table 7*

### **Discussion**

The aim of this study was to evaluate the University of Health Sciences, Lao PDR's professional health students' smoking habits, knowledge about smoking and attitudes towards smoking cessation counselling. Our study highlighted several important results which warrant further discussion. Particularly noteworthy is that the prevalence of smoking in this sample is lower than previously reported national prevalence rates<sup>16</sup> and lower than reported in a national survey of Lao medical doctors.<sup>20</sup> Compared with prevalence rates among health professionals from other countries including China,<sup>12</sup> Italy,<sup>21</sup> and Vietnam,<sup>22</sup> the students in this sample demonstrate a lower smoking rate. The study indicated a significant difference between males and females and

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3 smoking status but the effect size was very small. This suggests males and females should be  
4 equally targeted in tobacco control efforts. The study indicated that exposure to second-hand  
5 smoking from within the household was a smoking predictor. Other studies have highlighted the  
6 impact of this exposure.<sup>22, 23</sup> This indicates it is important to not only target students but to also  
7 focus intervention impacts on students' surrounding environments through broader programmes  
8 raising awareness of the hazards of smoking.<sup>22</sup>  
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15 This study found that Lao health professional students are generally very supportive of  
16 tobacco control efforts including a smoke-free policy. They generally endorsed tobacco control  
17 training, including counselling and agreed that in the curricula health professionals can play an  
18 important role in assisting smokers cease smoking and that they could provide good role models  
19 for a smoke-free lifestyle. This reflects other recent findings in Lao PDR.<sup>20</sup> A regulation on non-  
20 smoking in health facilities including the in the University of Health Sciences was issued in  
21 2007. Knowledge of the no-smoking policy however and its perceived implementation was  
22 variable. The benefits of smoking restrictions as one of the component of a comprehensive  
23 tobacco control program on smoking behaviors have been well documented and information  
24 about the non-smoking regulations needs to be more widely disseminated and enforced.  
25 Leadership and demonstrated participation and commitment of senior faculty staff in promoting  
26 tobacco control is also needed to successfully establish anti-smoking and tobacco control  
27 policies.  
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39 The number of people in the present study who reported receiving formal training in tobacco  
40 cessation counseling ranged from 10.9% among nursing students to 51.1% among medical  
41 students. Educators are encouraged to include information on tobacco in the undergraduate  
42 curricula of future health professionals.<sup>24</sup> It has been found that health care providers, who  
43 receive formal smoking cessation training, are more likely to intervene with patients who use  
44 tobacco than those who are not formally trained.<sup>25</sup> Provision of formal education is therefore an  
45 important strategy in promoting cessation and shifting professional and societal norms away  
46 from tobacco use.<sup>26</sup> A Cochrane review found that simple advice from doctors during routine  
47 care primary care, hospital wards, outpatient clinics, and industrial clinics significantly increased  
48 the smoking cessation rate.<sup>27</sup> Nurses providing individual counselling were also found to be  
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3 effective.<sup>28</sup> Our study suggests that more emphasis should be given on providing knowledge and  
4 counselling skills to all health professional students at the University in Vientiane as one  
5 component of a broader tobacco control and smoking cessation strategy. This should include  
6 training on tobacco control advocacy programs<sup>29</sup> and smoking cessation skills.<sup>30</sup> As part of this  
7 tobacco control strategy, students' awareness of their role as model in smoking prevention and  
8 cessation also needs to be highlighted. A study in Lao PDR found that policymakers were  
9 supportive for integration of anti-smoking lessons in the training curricula.<sup>31</sup> This study  
10 underscores the need to explore effective ways of doing this.  
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18 As with all research, our study does have some limitations. Firstly, the GHPS respondents in  
19 this survey are third-year health professional students who have not had substantial interaction  
20 with patients, survey results should not be extrapolated to account for practicing health  
21 professionals in Lao PDR. Secondly, our study only included the health professionals  
22 represented at the University of Health Sciences and thus excluded some of the allied health  
23 professionals who provide front-line services. Further as a cross-sectional survey, causality  
24 cannot be tested. Finally, as a self-administered questionnaire, students may not always have  
25 provided accurate responses.<sup>32</sup>  
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### 33 **Conclusion**

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35 This study contributes to our knowledge of tobacco use among health professionals in Lao PDR.  
36 It is the first study to our knowledge which has investigated smoking prevalence and attitudes  
37 within health professional students in Lao PDR. Its findings in relation to health professional  
38 students' smoking prevalence, knowledge, attitudes and exposure to training in the hazards of  
39 smoking provides an opportunity to engage with students in tobacco control, potentially  
40 providing an important contribution to reducing tobacco use. It also points to possible further  
41 areas of research. This includes how to effectively disseminate no-smoking policies and provide  
42 education and skills training in this context as well as how exposure to education about tobacco  
43 use and skills training in tobacco cessation counseling transfer to practice in the workplace.  
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### **Author's Contribution**

SV developed the research proposal, translated the instrument, and collected data in the field sites, analyzed and wrote the draft manuscript. MC and SN contributed to the study design, collected data and commented on the manuscript. VH and KC assisted in the collection data, analyzed data and contributed to the final version of the manuscript. All authors read and approved the final manuscript.

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### **Competing Interests**

None

### **Data sharing**

There was no any additional data available.

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Table 1: Definition of variables

Variable	Definition
Current cigarette smoking	Students who smoked cigarettes on at least one day during the month preceding the survey
Exposure to second-hand smoke (SHS) and support ban on smoking in public places	<ul style="list-style-type: none"><li>- Students who reported being exposed to SHS at home during the seven days preceding the survey.</li><li>- Students who reported being exposed to SHS in public spaces during the seven days preceding the survey.</li><li>- Students who reported that they support a ban on smoking in public places.</li></ul>
Attitude and knowledge	Opinions of students towards smoking a cigarette, their

	knowledge on the harmful effects of smoking, and on the roles and responsibilities of health professionals
Tobacco education	Students who responded "yes" to having been taught about the dangers of smoking in the year preceding the survey.
Tobacco lessons	Students who received formal training on cessation counseling and services during their medical training

Table 2: Response rate of the participants from each program

Discipline	Dental	Medical	Nursing	Pharmacy	Total
Students (n)	65	285	35	136	521
Respondents	64	276	34	132	506
Response rate (%)	98.5	97.2	97.1	97.8	97.6
% of total sample population	12.6%	54.5%	6.7%	26.1%	100%

Table 3: Health professional student response rate and smoking prevalence (95% CI)

Categories	Dental (n=64)	Medical (n=276)	Nursing (n=34)	Pharmacy (n=132)	Total (N=506)
% current smokers (95% CI)	7.9 (7.1-8.8)	6 (5.5-6.5)	6.1 (4.8-7.7)	1.5 (1.0-1.9)	5.1 (3.2-7.1)
Missing n=	1	7	1	4	13
% never smokers	55.6 (54.0 -57.1)	66.2 (65.1-67.2)	76.5 (73.8-78.9)	78.7 (77.6-80.0)	68.8 (64.4-72.9)
Missing n=	1	13	0	5	19
% ever smokers	44.4 (42.9-46.0)	39.3 (38.2-40.3)	26.5 (23.9-29.2)	24.2 (23.0-25.6)	35.2 (30.9-39.6)
Missing n=	1	11	0	5	17

Table 4: Awareness of smoking policy by program

	Dental (%)	Medical (%)	Nursing (%)	Pharmacy (%)	Total (%)
Does your school have an official policy banning smoking in school buildings and clinics?					
Yes, for school buildings only	25.0	17.9	44.1	25.8	22.6
Yes, for clinics only	1.6	3.3	8.8	1.5	3.0
Yes, for both school buildings and clinics	59.4	52.2	23.5	53.8	51.6
No official policy	14.1	26.6	23.5	18.9	22.8
Is your school's official smoking ban for school buildings and clinics enforced?					
Yes, policy is enforced	82.8	75.9	69.7	83.2	78.3
No, policy is not enforced	9.4	5.5	12.1	6.9	6.8
School has no official policy	7.8	18.6	18.2	9.9	14.9

Table 5: Attitudes towards tobacco control among health professional students, University of Health Sciences, Lao PDR

Respondents who answered yes to the question...	Total	Smokers	Non-smokers	<i>p</i> value (2-sided)
	% (n)	% (n)	% (n)	
Should tobacco sales to adolescents be banned?	94.9 (466)	95.7 (22)	94.9 (444)	1.000
Should advertising be completely banned?	78.2 (383)	65.2 (15)	78.8 (368)	0.127
Do you agree with smoking ban in restaurants?	90.7	80.0	91.2	<b>0.072</b>

Respondents who answered yes to the question...	Total	Smokers	Non-smokers	<i>p</i> value (2-sided)
	% (n)	% (n)	% (n)	
	(447)	(20)	(427)	
	70.5	70.8	70.5	
Do you agree with smoking ban in discos/bars/pubs?	(347)	(17)	(330)	1.000
Do you think that smoking in all public spaces should be banned?	83.1 (409)	72.0 (18)	83.7 (391)	0.165
	94.1	92.0	94.2	
Should health professionals get cessation training?	(463)	(23)	(440)	0.652
	97.8	88.0	98.3	
Are health professionals role models?	(481)	(22)	(459)	0.015
Should health professionals give quitting advice routinely?	95.3 (466)	95.8 (23)	95.3 (443)	1.000
Should health professionals routinely advise their patients who use other tobacco products to quit using these products?	70.0 (345)	72.0 (18)	69.9 (327)	1.000
Do health professionals have a role in giving advice about smoking cessation to patients?	98.0 (482)	96.0 (24)	98.1 (458)	0.409
Do chances of quitting improve if health professional gives advice?	92.4 (451)	95.8 (23)	92.2 (428)	1.000

Table 6: Perception of health professional students, University of Health Sciences, Lao PDR on Tobacco Education

Respondents who answered yes to the question...	Total	Smokers	Non-smokers	<i>p</i> value
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	% (n)	% (n)	% (n)	(2-sided)
During classes, were you taught about dangers of smoking?	77.0 (359)	80.0 (20)	77.0 (359)	1.000
During classes, were you taught about reasons why people smoke?	62.8 (309)	56.0 (14)	63.2 (295)	0.526
Did you learn that it is important to record tobacco use history?	35.7 (176)	32.0 (8)	35.9 (168)	0.831
Have you ever received formal training in smoking cessation?	18.2 (88)	32.0 (8)	17.5 (80)	0.104
Did you learn it is important to provide educational quitting materials?	38.0 (186)	41.7 (10)	37.8 (176)	0.830
Have you ever heard of nicotine replacement therapies?	37.1 (182)	44.0 (11)	36.7 (171)	0.525
Have you heard of antidepressant use in cessation programs?	24.3 (118)	37.5 (9)	23.6 (109)	0.143

Table 7: Factors Associated with Smoking among health professional students, University of Health Sciences, Lao PDR

	N	%	Adjusted OR	95% CI	p value
Sex			.056	.013-.242	<.001
Male	22	11.5			
Female	3	1.0			

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Age			.729	.203-2.615	.628
=< 24 years	20	4.9			
>= 25 years	4	5.2			
Attitudes towards smoking (X+SD)	23	12.69+1.55	1.147	.855-1.513	.377
Receiving training on the danger of smoking	20	5.3%	.806	.255-2.545	.713

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For peer review only



STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	x
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	x
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	x
Objectives	3	State specific objectives, including any prespecified hypotheses	x
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	x
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	x
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	x
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	x
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	x
Bias	9	Describe any efforts to address potential sources of bias	
Study size	10	Explain how the study size was arrived at	x
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	x
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	x
		(b) Describe any methods used to examine subgroups and interactions	x
		(c) Explain how missing data were addressed	x
		(d) If applicable, describe analytical methods taking account of sampling strategy	NA
		(e) Describe any sensitivity analyses	NA
<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	x
		(b) Give reasons for non-participation at each stage	x
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	x
		(b) Indicate number of participants with missing data for each variable of interest	x
Outcome data	15*	Report numbers of outcome events or summary measures	x
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	x

		(b) Report category boundaries when continuous variables were categorized	NA
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	x
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	x
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	x
Generalisability	21	Discuss the generalisability (external validity) of the study results	x
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	X

\*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).



**Cross-sectional survey: Smoking among medical, pharmacy, dental and nursing students, University of Health Sciences, Lao PDR**

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<b>Primary Subject Heading</b>:	Public health
Secondary Subject Heading:	Global health, Epidemiology, Smoking and tobacco
Keywords:	EPIDEMIOLOGY, PUBLIC HEALTH, SOCIAL MEDICINE

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Manuscripts

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3 **Cross-sectional survey: Smoking among medical, pharmacy, dental and nursing students,**  
4 **University of Health Sciences, Lao PDR**  
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8 **Article summary**  
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10 **Article focus**  
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- 13 • Investigates the prevalence of smoking and exposure to secondhand smoke among  
14 medical, pharmacy, dentistry and nursing students in their third year in the University of  
15 Health Sciences, Lao PDR  
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  - 17 • Investigates knowledge and attitudes about tobacco use and training received regarding  
18 patient counseling on smoking cessation techniques in this student cohort.  
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22 **Key Messages**  
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- 25 • This is the first survey which investigates smoking prevalence and attitudes among health  
26 professional students in Lao PDR  
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  - 28 • Most students supported tobacco control measures but formal training in tobacco  
29 cessation counseling was variable  
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  - 31 • Health education and skills building to provide effective counseling on quitting smoking  
32 to patients should be part of the curricula for health professional students in Lao PDR  
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37 **Strengths and Limitations**  
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- 40 • The survey used a previously validated questionnaire and had a high response rate for  
41 each type of health professional (97.1% to 98.5%)  
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  - 43 • Survey results cannot be extrapolated to practicing health professionals in Lao PDR or to  
44 allied health professionals.  
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  - 46 • As a cross-sectional survey causality cannot be tested  
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3 **Cross-sectional survey: Smoking among medical, pharmacy, dental and nursing students,**  
4 **University of Health Sciences, Lao PDR**  
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7 **Abstract**  
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10 **Objectives:** To investigate the prevalence of and attitudes to smoking among third year medical,  
11 pharmacy, dentistry and nursing students in Lao PDR.  
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14 **Design:** A cross-sectional survey conducted among third year university level, health  
15 professional students. The survey used a self-administered questionnaire which was originally  
16 developed by WHO, and modified to suit the setting.  
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20 **Setting:** The setting was the University of Health Sciences in Vientiane, the capital of Lao PDR.  
21 Participants were recruited from the Faculties of Medicine, Pharmacy, Dentistry and Nursing. At  
22 the time of the survey, 521 third year students were enrolled.  
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26 **Primary and secondary outcome measures:** The primary outcome measure was prevalence of  
27 current cigarette smoking and other tobacco use. Smoking status was categorized as: current  
28 smoker, ex-smoker and nonsmoker with current smokers defined as those who had smoked  
29 cigarettes or used other tobacco on one or more days during the previous 30 days.  
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33 **Results:** In total, 506 respondents completed the questionnaire, giving a response rate of 97.1% -  
34 98.5% across the different faculties. Overall smoking prevalence was 5.07% (95% CI 3.2-7.1)  
35 which is lower than previously reported national prevalence rates. Women reported smoking less  
36 than men (OR=.056, 95% CI=.013-.242,  $p = 0.003$ ). The majority of students supported tobacco  
37 control measures. The number of people who reported receiving formal training in tobacco  
38 cessation counseling ranged from 10.9% (95% CI: 5.3-19.1) among nursing students to 51.1%  
39 (95% CI: 40.4-61.7) among medical students.  
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43 **Conclusion:** Smoking prevalence amongst this cohort was relatively low. Students were  
44 supportive of tobacco control policies. Further research is needed to understand what is working  
45 in this context, in order to apply lessons learned in similar settings. In the meantime, health  
46 professional students should be provided health education to discourage tobacco use. Information  
47 on tobacco control policies needs to be more widely disseminated.  
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## Cross-sectional survey: Smoking among medical, pharmacy, dental and nursing students, University of Health Sciences, Lao PDR

### Introduction

Tobacco is a leading cause of preventable mortality and morbidity in the majority of high-income countries, and it is becoming increasingly prevalent in low-income countries.<sup>1</sup> Almost 1 billion men and about 250 million women in the world are daily smokers; in particular, 35% and 50% of men and 22% and 9% of women in developed and developing countries, respectively, smoke.<sup>2</sup> While cigarette consumption has been declining in high income countries, it is rising in low and middle-income countries.<sup>3</sup> By 2030, approximately 70% of deaths attributable to smoking worldwide are expected to occur in developing countries.<sup>1</sup> The negative health consequences of smoking are considerable and have been well-documented.<sup>4,5</sup> In its preamble, the World Health Organization Framework Convention on Tobacco Control (FCTC) emphasizes the vital contribution of participation of health professional bodies, training and healthcare institutions in tobacco control efforts.<sup>6</sup> Health professionals who smoke also send an ambiguous message to patients whom they have encouraged to cease smoking.<sup>6,7</sup>

One of the strategies to reduce smoking related morbidity and mortality is to encourage the involvement of health professionals in tobacco-use prevention and cessation counselling.<sup>8</sup> Medical professionals who smoke, are more likely to hold attitudes that prevent them from providing patients with anti-smoking advice.<sup>9</sup> Thus it is suggested that healthcare students be exposed to tobacco control policies and education from the outset of their training.<sup>10</sup> As a consequence, there have been several studies which have collected information from health profession students in different contexts about their tobacco use.<sup>11,12</sup> The prevalence of smoking among medical students has been found to vary widely from country to country. In a systematic review of the literature, Smith and Leggat<sup>8</sup> concluded that the prevalence of smoking among male medical students ranged between 3% in the United States<sup>13</sup> and 58% in Japan<sup>7</sup>. Smith and Leggat<sup>8</sup> also observed marked differences in smoking rates between males and females, with male students generally having higher rates.<sup>8</sup> A cross-sectional study at Charité medical school in Berlin found the prevalence of tobacco use was 22.1% among women and 32.4% among men in fifth year medical students studying occupational medicine.<sup>10</sup> A cross-sectional study carried out

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at the Malta Medical School and the Institute of Health Care, found that more than a quarter of health professional students were daily or occasional smokers.<sup>14</sup> This was slightly higher than that found in the corresponding adult Maltese population of the same age.<sup>14</sup> High levels of smoking prevalence have been reported among physicians in several low-middle income countries. In China, one study found 58% of male and 19% of female physicians reported being current cigarette smokers.<sup>15</sup>

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A national survey in the Lao People's Democratic Republic (PDR) in 2003 reported 40.3% of the population was smokers. Males were over four times more likely females (67.7% vs 16%) to smoke.<sup>16</sup> This large disparity by sex has also been reported in neighboring countries,<sup>17</sup> and reflects gender norms that encourage male smoking and condone female smoking.<sup>18</sup> A 2003 study of smoking prevalence in male doctors at Mahosot University Hospital in the Lao capital, Vientiane, reported a smoking prevalence rate of 35% .<sup>19</sup> A more recent national survey of the prevalence of current smoking among Lao doctors reported a prevalence rate of 9.3%.<sup>20</sup> Studies have also shown that young people in Lao often start smoking at earlier age than that which is typical for entry into tertiary education and medical schools.<sup>20</sup> While there is some data available on smoking prevalence rates, data on the smoking habits of health professional students in Lao PDR is scarce.

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In 2005, the World Health Organization (WHO) and the U.S. Centre for Disease Control and Prevention, developed and administered the Global Health Professions Student Survey (GHPSS) in ten countries.<sup>6</sup> The present study used the GHPSS to assess prevalence of smoking amongst third year dentistry, medicine, pharmacy and nursing university students. It also investigated attitudes towards smoking cessation policies and programs and factors associated with smoking. The findings are important because this is the first such survey of health professional students in the Lao PDR and provides insight into the smoking prevalence and habits amongst these future health professionals.

## 50 51 52 53 54 55 56 57 58 59 60 **Methods**

The present study followed the GHPSS standardized methodology including data processing procedures.

### *Study setting*

The study setting was the University of Health Sciences, located in Vientiane Capital City, Lao PDR. The University consists of seven faculties: Medicine, Pharmacy, Dentistry, Nursing, Medical Technology, Basic Sciences and Postgraduate Studies and Research and is the only health university in the country. This study included students from the third years of Medicine, Pharmacy, Dentistry and Nursing. At the time of the study, the Faculty of Medical Technology was in the process of gaining approval for an undergraduate curriculum and offered only a higher Diploma, and thus did not have third year students. Similarly, the Faculty of Basic Sciences did not have third year students and thus students from these two faculties were excluded from the study.

### *Participants and sampling*

This cross sectional, GHPS survey was a medical school-based survey of third-year students in dentistry, medicine, nursing, and pharmacy programs. The sample size was calculated to be 482, (the proportion of smoking among health professional students was unknown so we used 50%) with 95% confidence interval and 5% precision. Inclusion criteria were all male and female third year medical, dental, pharmacy and nursing students registered for the 2008/2009 academic session in the University of Health Sciences. A list of eligible students from the medical, dental, pharmacy and nursing faculties was obtained from the office of Academic Affairs at the University of Health Sciences. This established that at the time of data collection, the total number of enrolled third year students across the four faculties was 521. Of these, 506 consented to participate.

### *Variables*

The GHPS collects information on demographics, prevalence of cigarette smoking and other tobacco use, knowledge and attitudes about tobacco use, exposure to secondhand smoke, desire for smoking cessation, and training received regarding patient counseling on smoking cessation techniques. The outcome variable was smoking status, classified into three categories: current smoker, ex-smoker and nonsmoker. Current cigarette smokers were defined as those who had smoked cigarettes on one or more days during the previous 30 days. Those who had been



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3 smokers before, but had stopped smoking at the time of survey, were defined as ex-smokers/ever  
4 smoked. Those who had never smoked in his/her lifetime were defined as never smokers. The  
5 predictor variable was attitude towards smoking. This was measured by summation of scores on  
6 attitude items; each item was scored with one for each “against smoking” and zero for “favorable  
7 to smoking”. A maximum of eleven potential points was obtained if a respondent answered all  
8 attitude questions, thus the possible score on the attitude scale ranged from 0 to 11. The other  
9 predictor variables were gender, age and receiving training on the danger of smoking. Table 1  
10 provides the variables and definitions.  
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19 *Insert Table 1*  
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### 21 **Data collection**

22 The survey was conducted during May and June, 2009. Prior to the survey, training was provided  
23 for the research supervisors and assistants. The English language questionnaire was translated  
24 into Lao, back translation performed and followed by an independent third person checking the  
25 translation. The translated instrument was then piloted tested with second year medical students.  
26 Based on this, some of the wording was modified on the translated version but these revisions  
27 did not change the intended meaning of the questions.  
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34 To minimize loss of sample size due to absenteeism, we administered the questionnaire on the  
35 day of an examination. To reduce the risk of response bias or students feeling pressured to stay,  
36 the teachers were asked to leave the classroom and it was emphasized that students were free to  
37 leave or not complete the questionnaire without any reprisals. The purpose of the study was  
38 explained and students given time to ask questions. Students who agreed to partake in the study  
39 were asked to remain behind to complete the questionnaire. The self-administered questionnaire  
40 took students 30 to 40 minutes to complete. After completing questionnaires, the students left  
41 their questionnaires on the tables and the instructors or research assistants collected the  
42 questionnaires.  
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### ***Data analysis***

The software package STATA version 10.1 was utilized for statistical analysis. Frequency distributions with mean and standard deviation were used to describe respondents' demographic characteristics, smoking behaviors, and other variables. After checking the data did not violate assumptions, univariate analysis was carried out using chi-square testing for categorical variables, with a  $p$  value of  $< 0.05$  taken as the threshold for statistical significance. All results have a margin of error of  $\pm 5\%$  (95% confidence interval (CI)). Differences in rates for these indicators were considered statistically significant at the  $p = 0.05$  level. Logistic regression analysis was used for determining the factors associated with smoking among the health professional students by controlling for gender and age. We used the backward stepwise model by excluding the non-significant variables and retaining only significant variables. Cases with missing data were excluded from the analysis.

### ***Ethics***

This research was approved by the research ethics committee of the University of Health Sciences, Lao PDR. The researchers in charge of the survey explained the objectives of the research to the students and emphasized that participation was voluntary. Care was taken to communicate information about the research accurately and in an understandable way to enable a genuine choice to be made. Nevertheless, given the classroom setting, it is possible that some respondents felt pressured to stay. Written consent was obtained from each respondent and anonymity assured.

### ***Results***

In total, 506 respondents completed the questionnaire, giving a response rate of 97.1% - 98.5% across the different faculties. For each type of health professional, the response rate ranged from 97.1% to 98.5% (Table 2). The high response rate minimized the risk of bias due to the population not being representative of the target population.

*Insert Table 2*

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3 The majority of participants were male (59.5%,  $n = 296$  and  $n$  missing = 7) and were aged  
4 between 19 and 24 (78.1%,  $n = 395$ ,  $n$  missing =5).

### 7 *Prevalence of smoking*

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10 The overall prevalence of current smoking among the third-year health professional students in  
11 this sample was 5.1% ( $n$  missing = 13). Prevalence was highest among dental students, with rates  
12 7.9% ( $n$  missing=1); the lowest current smoking prevalence was reported among pharmacy  
13 students (1.5%) ( $n$  missing = 4). Of the respondents, 35.2% were ex-smokers ( $n$  missing = 17).  
14 Information about prevalence of smoking in the present study is presented in Table 3. Of the  
15 respondents who had ever smoked, 30.4% also reported having smoked other tobacco products  
16 such as chewing tobacco, snuff, bidis, cigars or pipes.  
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### 23 *Insert Table 3*

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26 A chi-square test for independence (with Yates continuity Correction) indicated a significant  
27 association between gender and smoking status but with a very small effect size, chi-square = (1,  
28  $n = 486$ ) = 24,  $p = <.001$ ,  $\phi = <-.23$ ).  
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### 32 *Attitudes towards tobacco control*

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34 Most of respondents expressed positive attitudes towards tobacco control irrespective of their  
35 own smoking status. The mean score on the eleven attitude questions was  $12.34 \pm 1.45$  with no  
36 significant difference between males and females or between smokers and non-smokers. The  
37 majority of students agreed for example, that tobacco sales to adolescents should be banned and  
38 that smoking should be banned in public places including discos and bars. While non-smokers  
39 were more likely than smokers to agree that health professionals should be role models (98.3%  
40 versus 88%,  $p = .015$ ), both smokers and non-smokers strongly agreed that health professionals  
41 should give advice about quitting smoking (95.3% and 95.8 respectively). Respondents also  
42 agreed that health professionals have a role in giving advice to patients about smoking cessation  
43 (98.1%) and that such advice would enhance the possibility of someone quitting (92.2%). Further  
44 information about attitudes to tobacco control is found in Table 4.  
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### 54 *Insert Table 4*

### ***Knowledge of smoking policy and training***

Just over half of the students (51.6%) reported being aware of the university's non-smoking policy within the school buildings and hospital grounds. Some (22.6%) however, thought the policy only applied to the school buildings, while 14.9% were unaware of the policy. There was no statically significant difference between the responses of smokers and non-smokers in terms of knowledge of the policy (25% versus 22.3%,  $p = .814$ ). There was however, a statically significant difference between health professional programs on awareness of smoking policy within the school buildings and hospitals with dental students (59.4%) more aware of the smoking policy compared to students from pharmacy (53.8%), medicine (52.2%) and nursing faculties (23.5%) ( $p = .002$ ). Of those who were aware of the smoking policy, 78.3% believed that the policy was enforced, while 6.8% disagreed with this view. There was no statically significant difference between the responses of smokers and non-smokers regarding perceptions of the extent to which the non-smoking policy was enforced (79.2% versus 78.1%,  $p = .845$ ). Information about awareness of the smoking policy is presented in Table 5.

#### *Insert Table 5*

The students who had received formal training in tobacco cessation counseling ranged from 10.9% among nursing students to 51.1% among medical students. Medical students (51.1%) were significantly more likely than pharmacy students (25%) or dental students (13.0%) to have received such training but not significantly more likely than nursing students (10.9%) to have received training (data not shown). There was no statistically significant difference between smokers and nonsmokers about what they recalled being taught in the tobacco cessation counseling training. Information related to the provision of tobacco education to respondents is shown in Table 6.

#### *Insert Table 6*

### ***Factors associated with smoking***

When asked about exposure to SHS, 7.3% of respondents reported being exposed to SHS on each of the seven days prior to the survey, with a significant difference between smokers and

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3 nonsmokers. Smokers were more likely to have been exposed to SHS either within their home  
4 (unadjusted OR=3.25, 95% CI=1.4-7.7, p=.007) or outside of the home environment (unadjusted  
5 OR=2.6, 95%CI=1.1-6.6, p=.046) in the bivariate analysis. A multivariate analysis of factors  
6 related to current smoking among health professional students controlling for confounding  
7 factors of sex and age revealed a statistically significant difference between males and females  
8 and current smoking (OR=0.56, 95% CI=.013-.242, p<.001). No significant difference was  
9 found however between age group, attitudes to smoking cessation or receiving training on the  
10 risks of smoking. Further, in the multivariate logistic regression no statistically significant  
11 association was found between exposure to SHS and current smoking status. More information is  
12 provided in Table 7.  
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21 *Insert Table 7*  
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## 26 **Discussion**

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28 The aim of this study was to evaluate the University of Health Sciences, Lao PDR's professional  
29 health students' smoking habits, knowledge about smoking and attitudes towards smoking  
30 cessation counselling. Our study highlighted several important results including relatively low  
31 prevalence of smoking, positive attitudes towards tobacco control irrespective of own smoking  
32 status and a reasonable level of awareness of the university's non-smoking policy. The study  
33 indicated that exposure to SHS from within the household was a smoking predictor in the  
34 bivariate analysis. Other studies have highlighted the impact of this exposure.<sup>22, 23</sup> In our study  
35 however, after controlling for confounding factors of sex and age, in the multivariate analysis the  
36 significance of exposure to SHS was lost with only gender being a predictor of current smoking.  
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45 Particularly noteworthy in the present study is that the prevalence of smoking is lower than  
46 previously reported national prevalence rates<sup>16</sup> and lower than reported in a national survey of  
47 Lao medical doctors.<sup>20</sup> Compared with prevalence rates among health professionals from other  
48 countries including China,<sup>12</sup> Italy,<sup>21</sup> and Vietnam,<sup>22</sup> the students in this sample also demonstrate  
49 a lower smoking rate. Also of note were the overall positive attitudes to smoking control  
50 expressed by both smokers and non-smokers. Respondents generally endorsed tobacco control  
51 training, including counselling and agreed that in the curricula health professionals can play an  
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3 important role in assisting smokers cease smoking. This reflects other recent findings in Lao  
4 PDR.<sup>20</sup> Despite these positive attitudes, knowledge of the university's no-smoking policy, which  
5 has been in existence since 2007, and its perceived enforcement, was variable. Given the benefits  
6 of smoking restrictions as a component of comprehensive tobacco control programs has been  
7 well documented, information about the non-smoking regulations needs to be more widely  
8 disseminated.  
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15 The literature encourages the inclusion of information on tobacco control and counselling in  
16 the undergraduate curricula of future health professionals.<sup>24</sup> It has been found for example, that  
17 health care providers, who receive formal smoking cessation training, are more likely to  
18 intervene with patients who use tobacco than those who are not formally trained.<sup>25, 26</sup> Research  
19 suggests that simple advice from doctors or nurses during routine care primary care, hospital  
20 wards, outpatient clinics, and industrial clinics can significantly increase smoking cessation  
21 rates.<sup>27, 28</sup> The number of people in the present study who reported receiving formal training in  
22 tobacco cessation counseling varied substantially, ranging from 10.9% among nursing students  
23 to 51.1% among medical students. Nevertheless, the overall smoking rates were low suggesting  
24 the need for further research, including qualitative research to understand what is working in this  
25 context and if lessons learned could be applied other similar contexts. In the meantime, given  
26 provision of formal education is an important strategy in promoting cessation,<sup>26</sup> more emphasis  
27 should be given on providing knowledge and counselling skills to all health professional students  
28 at the University in Vientiane. This should include training on tobacco control advocacy  
29 programs<sup>29</sup> and smoking cessation skills.<sup>30</sup> A study in Lao PDR found that policymakers were  
30 supportive for integration of anti-smoking lessons in the training curricula<sup>31</sup> and this study  
31 underscores the need to explore effective ways of doing this.  
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46 As with all research, our study does have some limitations. Firstly, the GHPS respondents in  
47 this survey are third-year health professional students who have not had substantial interaction  
48 with patients, survey results should not be extrapolated to account for practicing health  
49 professionals in Lao PDR. Secondly, our study only included the health professionals  
50 represented at the University of Health Sciences and thus excluded some of the allied health  
51 professionals who provide front-line services. Further, as a cross-sectional survey, causality  
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3 cannot be tested. Finally, as a self-administered questionnaire, students may not always have  
4 provided accurate responses.<sup>32</sup>  
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## 7 8 **Conclusion**

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10 This study contributes to our knowledge of tobacco use among health professionals in Lao PDR.  
11 It is the first study to our knowledge which has investigated smoking prevalence and attitudes  
12 within health professional students in Lao PDR. It suggests that smoking prevalence amongst  
13 this cohort is low and that these health professional students are supportive of tobacco control  
14 policies. Further qualitative research is needed to understand what is working and why in this  
15 context in order to apply lessons learned in similar settings.  
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## 20 21 **Author's Contribution**

22  
23 SV developed the research proposal, translated the instrument, and collected data in the field  
24 sites, analyzed and wrote the draft manuscript. MC and SN contributed to the study design,  
25 collected data and commented on the manuscript. VH and KC assisted in the collection data,  
26 analyzed data and contributed to the final version of the manuscript. JD contributed to the  
27 analysis, interpretation and preparation of the manuscript. All authors read and approved the  
28 final manuscript.  
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41 any influence on this paper.  
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**Table 1: Definition of variables**

Variable	Definition
Current cigarette smoking	Students who smoked cigarettes on at least one day during the month preceding the survey
Ex-smoker/Ever smokers	Those who had been smokers before, but had stopped smoking at the time of survey were considered ex-smokers
Exposure to second-hand smoke (SHS) and support ban on smoking in public places	<ul style="list-style-type: none"> <li>- Students who reported being exposed to SHS at home during the seven days preceding the survey.</li> <li>- Students who reported being exposed to SHS in public spaces during the seven days preceding the survey.</li> <li>- Students who reported that they support a ban on smoking in public places.</li> </ul>
Attitude and knowledge	Opinions of students towards smoking a cigarette, their knowledge on the harmful effects of smoking, and on the roles and responsibilities of health professionals
Tobacco education	Students who responded "yes" to having been taught about the dangers of smoking in the year preceding the survey.
Tobacco lessons	Students who received formal training on cessation counseling and services during their medical training

**Table 2: Response rate of the participants from each program**

Discipline	Dental	Medical	Nursing	Pharmacy	Total
Students (n)	65	285	35	136	521
Respondents	64	276	34	132	506
Response rate (%)	98.5	97.2	97.1	97.8	97.6
% of total sample population	12.6%	54.5%	6.7%	26.1%	100%

**Table 3: Health professional student response rate and smoking prevalence (95% CI)**

Categories	Dental (n=64)	Medical (n=276)	Nursing (n=34)	Pharmacy (n=132)	Total (N=506)
% current smokers (95% CI)	7.9 (7.1-8.8)	6 (5.5-6.5)	6.1 (4.8-7.7)	1.5 (1.0-1.9)	5.1 (3.2-7.1)
Missing n=	1	7	1	4	13
% never smokers	55.6 (54.0 -57.1)	66.2 (65.1-67.2)	76.5 (73.8-78.9)	78.7 (77.6-80.0)	68.8 (64.4-72.9)
Missing n=	1	13	0	5	19
% ever smokers/ex-smokers	44.4 (42.9-46.0)	39.3 (38.2-40.3)	26.5 (23.9-29.2)	24.2 (23.0-25.6)	35.2 (30.9-39.6)
Missing n=	1	11	0	5	17

**Table 4: Attitudes towards tobacco control among health professional students, University of Health Sciences, Lao PDR**

Respondents who answered yes to the question...	Total (N=493)* % (n)	Smokers (n=26) % (n)	Non- smokers (n=468) % (n)	<i>p</i> value (2-sided)
Should tobacco sales to adolescents be banned?	94.9 (466)	95.7 (22)	94.9 (444)	1.000
Should advertising be completely banned?	78.2 (383)	65.2 (15)	78.8 (368)	0.127
Do you agree with smoking ban in restaurants?	90.7 (447)	80.0 (20)	91.2 (427)	<b>0.072</b>
Do you agree with smoking ban in discos/bars/pubs?	70.5 (347)	70.8 (17)	70.5 (330)	<b>1.000</b>
Do you think that smoking in all public spaces should be banned?	83.1 (409)	72.0 (18)	83.7 (391)	0.165
Should health professionals get cessation training?	94.1 (463)	92.0 (23)	94.2 (440)	0.652
Are health professionals role models?	97.8 (481)	88.0 (22)	98.3 (459)	0.015
Should health professionals give quitting advice routinely?	95.3 (466)	95.8 (23)	95.3 (443)	<b>1.000</b>
Should health professionals routinely advise their patients who use other tobacco products to quit using these products?	70.0 (345)	72.0 (18)	69.9 (327)	<b>1.000</b>
Do health professionals have a role in giving advice about smoking cessation to patients?	98.0 (482)	96.0 (24)	98.1 (458)	<b>0.409</b>
Do chances of quitting improve if health professional gives advice?	92.4 (451)	95.8 (23)	92.2 (428)	<b>1.000</b>

Note: \*-The total sample size for each question is not the same due to missing value.

**Table 5: Awareness of smoking policy by program**

	<b>Dental</b> <b>(n=64)</b> <b>(%)</b>	<b>Medical</b> <b>(n=276)</b> <b>(%)</b>	<b>Nursing</b> <b>(n=34)</b> <b>(%)</b>	<b>Pharmacy</b> <b>(n=132)</b> <b>(%)</b>	<b>Total</b> <b>(N=506)</b> <b>(%)</b>
Does your school have an official policy banning smoking in school buildings and clinics?					
Yes, for school buildings only	25.0	17.9	44.1	25.8	22.6
Yes, for clinics only	1.6	3.3	8.8	1.5	3.0
Yes, for both school buildings and clinics	59.4	52.2	23.5	53.8	51.6
No official policy	14.1	26.6	23.5	18.9	22.8
Is your school's official smoking ban for school buildings and clinics enforced?					
Yes, policy is enforced	82.8	75.9	69.7	83.2	78.3
No, policy is not enforced	9.4	5.5	12.1	6.9	6.8
School has no official policy	7.8	18.6	18.2	9.9	14.9

**Table 6: Provision of tobacco education to health professional students, University of Health Sciences, Lao PDR**

Respondents who answered yes to the question...	Total (N=493)*	Smokers (n=26)	Non- smokers (n=468)	<i>p</i> value
	% (n)	% (n)	% (n)	(2- sided)
During classes, were you taught about dangers of smoking?	77.0 (359)	80.0 (20)	77.0 (359)	1.000
During classes, were you taught about reasons why people smoke?	62.8 (309)	56.0 (14)	63.2 (295)	0.526
Did you learn that it is important to record tobacco use history?	35.7 (176)	32.0 (8)	35.9 (168)	0.831
Have you ever received formal training in smoking cessation?	18.2 (88)	32.0 (8)	17.5 (80)	0.104
Did you learn it is important to provide educational quitting materials?	38.0 (186)	41.7 (10)	37.8 (176)	0.830
Have you ever heard of nicotine replacement therapies?	37.1 (182)	44.0 (11)	36.7 (171)	0.525
Have you heard of antidepressant use in cessation programs?	24.3 (118)	37.5 (9)	23.6 (109)	0.143

Note: \*-The total sample size for each question is not the same due to missing value.



**Table 7: Factors associated with current smoking among health professional students, University of Health Sciences, Lao PDR**

	N	%	Adjusted OR	95% CI	p value
Sex					<.001
Male	22	11.5	1	.013-.242	
Female	3	1.0	.056		
Age					
=< 24 years	20	4.9	1	.203-2.615	.628
>= 25 years	4	5.2	.729		
Attitudes towards smoking (X+SD)	23	12.69+1.55	1.147	.855-1.513	.377
Receiving training on the danger of smoking					
No	5	4.5	1		
Yes	20	5.3	.806	.255-2.545	.713
Exposure to SES in the home during past 7 days					
No	8	2.7	1	.96-1.86	.084
Yes	17	8.4	1.34		

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3 **Cross-sectional survey: Smoking among medical, pharmacy, dental and nursing students,**  
4 **University of Health Sciences, Lao PDR**  
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8 **Article summary**  
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10 **Article focus**  
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- 13 • Investigates the prevalence of smoking and exposure to secondhand smoke among  
14 medical, pharmacy, dentistry and nursing students in their third year in the University of  
15 Health Sciences, Lao PDR  
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  - 17 • Investigates knowledge and attitudes about tobacco use and training received regarding  
18 patient counseling on smoking cessation techniques in this student cohort.  
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22 **Key Messages**  
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- 25 • This is the first survey which investigates smoking prevalence and attitudes among health  
26 professional students in Lao PDR  
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  - 28 • Most students supported tobacco control measures but formal training in tobacco  
29 cessation counseling was variable  
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  - 31 • Health education and skills building to provide effective counseling on quitting smoking  
32 to patients should be part of the curricula for health professional students in Lao PDR  
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37 **Strengths and Limitations**  
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- 40 • The survey used a previously validated questionnaire and had a high response rate for  
41 each type of health professional (97.1% to 98.5%)  
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  - 43 • Survey results cannot be extrapolated to practicing health professionals in Lao PDR or to  
44 allied health professionals.  
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  - 46 • As a cross-sectional survey causality cannot be tested  
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49 There is no additional data available  
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## Cross-sectional survey: Smoking among medical, pharmacy, dental and nursing students, University of Health Sciences, Lao PDR

### Abstract

**Objectives:** To investigate the prevalence of and attitudes to smoking among third year medical, pharmacy, dentistry and nursing students in Lao PDR.

**Design:** A cross-sectional survey conducted among third year university level, health professional students. The survey used a self-administered questionnaire which was originally developed by WHO, and modified to suit the setting.

**Setting:** The setting was the University of Health Sciences in Vientiane, the capital of Lao PDR. Participants were recruited from the Faculties of Medicine, Pharmacy, Dentistry and Nursing. At the time of the survey, 521 third year students were enrolled.

**Primary and secondary outcome measures:** The primary outcome measure was prevalence of current cigarette smoking and other tobacco use. Smoking status was categorized as: current smoker, ex-smoker and nonsmoker with current smokers defined as those who had smoked cigarettes or used other tobacco on one or more days during the previous 30 days.

**Results:** In total, 506 respondents completed the questionnaire, giving a response rate of 97.1% - 98.5% across the different faculties. Overall smoking prevalence was 5.07% (95% CI 3.2-7.1) which is lower than previously reported national prevalence rates. Women reported smoking less than men (OR=.056, 95% CI=.013-.242,  $p = 0.003$ ). The majority of students supported tobacco control measures. The number of people who reported receiving formal training in tobacco cessation counseling ranged from 10.9% (95% CI: 5.3-19.1) among nursing students to 51.1% (95% CI: 40.4-61.7) among medical students.

**Conclusion:** Smoking prevalence amongst this cohort was relatively low. Students were supportive of tobacco control policies. Further research is needed to understand what is working in this context, in order to apply lessons learned in similar settings. In the meantime, health professional students should be provided health education to discourage tobacco use. Information on tobacco control policies needs to be more widely disseminated.

## Cross-sectional survey: Smoking among medical, pharmacy, dental and nursing students, University of Health Sciences, Lao PDR

### Introduction

Tobacco is a leading cause of preventable mortality and morbidity in the majority of high-income countries, and it is becoming increasingly prevalent in low-income countries.<sup>1</sup> Almost 1 billion men and about 250 million women in the world are daily smokers; in particular, 35% and 50% of men and 22% and 9% of women in developed and developing countries, respectively, smoke.<sup>2</sup> While cigarette consumption has been declining in high income countries, it is rising in low and middle-income countries.<sup>3</sup> By 2030, approximately 70% of deaths attributable to smoking worldwide are expected to occur in developing countries.<sup>1</sup> The negative health consequences of smoking are considerable and have been well-documented.<sup>4,5</sup> In its preamble, the World Health Organization Framework Convention on Tobacco Control (FCTC) emphasizes the vital contribution of participation of health professional bodies, training and healthcare institutions in tobacco control efforts.<sup>6</sup> Health professionals who smoke also send an ambiguous message to patients whom they have encouraged to cease smoking.<sup>6,7</sup>

One of the strategies to reduce smoking related morbidity and mortality is to encourage the involvement of health professionals in tobacco-use prevention and cessation counselling.<sup>8</sup> Medical professionals who smoke, are more likely to hold attitudes that prevent them from providing patients with anti-smoking advice.<sup>9</sup> Thus it is suggested that healthcare students be exposed to tobacco control policies and education from the outset of their training.<sup>10</sup> As a consequence, there have been several studies which have collected information from health profession students in different contexts about their tobacco use.<sup>11,12</sup> The prevalence of smoking among medical students has been found to vary widely from country to country. In a systematic review of the literature, Smith and Leggat<sup>8</sup> concluded that the prevalence of smoking among male medical students ranged between 3% in the United States<sup>13</sup> and 58% in Japan<sup>7</sup>. Smith and Leggat<sup>8</sup> also observed marked differences in smoking rates between males and females, with male students generally having higher rates.<sup>8</sup> A cross-sectional study at Charité medical school in Berlin found the prevalence of tobacco use was 22.1% among women and 32.4% among men in fifth year medical students studying occupational medicine.<sup>10</sup> A cross-sectional study carried out

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3 at the Malta Medical School and the Institute of Health Care, found that more than a quarter of  
4 health professional students were daily or occasional smokers.<sup>14</sup> This was slightly higher than  
5 that found in the corresponding adult Maltese population of the same age.<sup>14</sup> High levels of  
6 smoking prevalence have been reported among physicians in several low-middle income  
7 countries. In China, one study found 58% of male and 19% of female physicians reported being  
8 current cigarette smokers.<sup>15</sup>

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15 A national survey in the Lao People's Democratic Republic (PDR) in 2003 reported 40.3% of  
16 the population was smokers. Males were over four times more likely females (67.7% vs 16%) to  
17 smoke.<sup>16</sup> This large disparity by sex has also been reported in neighboring countries,<sup>17</sup> and  
18 reflects gender norms that encourage male smoking and condone female smoking.<sup>18</sup> A 2003  
19 study of smoking prevalence in male doctors at Mahosot University Hospital in the Lao capital,  
20 Vientiane, reported a smoking prevalence rate of 35% .<sup>19</sup> A more recent national survey of the  
21 prevalence of current smoking among Lao doctors reported a prevalence rate of 9.3%.<sup>20</sup> Studies  
22 have also shown that young people in Lao often start smoking at earlier age than that which is  
23 typical for entry into tertiary education and medical schools.<sup>20</sup> While there is some data available  
24 on smoking prevalence rates, data on the smoking habits of health professional students in Lao  
25 PDR is scarce.

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35 In 2005, the World Health Organization (WHO) and the U.S. Centre for Disease Control and  
36 Prevention, developed and administered the Global Health Professions Student Survey (GHPSS)  
37 in ten countries.<sup>6</sup> The present study used the GHPSS to assess prevalence of smoking amongst  
38 third year dentistry, medicine, pharmacy and nursing university students. It also investigated  
39 attitudes towards smoking cessation policies and programs and factors associated with smoking.  
40 The findings are important because this is the first such survey of health professional students in  
41 the Lao PDR and provides insight into the smoking prevalence and habits amongst these future  
42 health professionals.

## 43 44 45 46 47 48 49 50 **Methods**

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52 The present study followed the GHPSS standardized methodology including data processing  
53 procedures.  
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### ***Study setting***

The study setting was the University of Health Sciences, located in Vientiane Capital City, Lao PDR. The University consists of seven faculties: Medicine, Pharmacy, Dentistry, Nursing, Medical Technology, Basic Sciences and Postgraduate Studies and Research and is the only health university in the country. This study included students from the third years of Medicine, Pharmacy, Dentistry and Nursing. At the time of the study, the Faculty of Medical Technology was in the process of gaining approval for an undergraduate curriculum and offered only a higher Diploma, and thus did not have third year students. Similarly, the Faculty of Basic Sciences did not have third year students and thus students from these two faculties were excluded from the study.

### ***Participants and sampling***

This cross sectional, GHPS survey was a medical school-based survey of third-year students in dentistry, medicine, nursing, and pharmacy programs. The sample size was calculated to be 482, (the proportion of smoking among health professional students was unknown so we used 50%) with 95% confidence interval and 5% precision. Inclusion criteria were all male and female third year medical, dental, pharmacy and nursing students registered for the 2008/2009 academic session in the University of Health Sciences. A list of eligible students from the medical, dental, pharmacy and nursing faculties was obtained from the office of Academic Affairs at the University of Health Sciences. This established that at the time of data collection, the total number of enrolled third year students across the four faculties was 521. Of these, 506 consented to participate.

### ***Variables***

The GHPS collects information on demographics, prevalence of cigarette smoking and other tobacco use, knowledge and attitudes about tobacco use, exposure to secondhand smoke, desire for smoking cessation, and training received regarding patient counseling on smoking cessation techniques. The outcome variable was smoking status, classified into three categories: current smoker, ex-smoker and nonsmoker. Current cigarette smokers were defined as those who had smoked cigarettes on one or more days during the previous 30 days. Those who had been

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3 smokers before, but had stopped smoking at the time of survey, were defined as ex-smokers/ever  
4 smoked. Those who had never smoked in his/her lifetime were defined as never smokers. The  
5 predictor variable was attitude towards smoking. This was measured by summation of scores on  
6 attitude items; each item was scored with one for each “against smoking” and zero for “favorable  
7 to smoking”. A maximum of eleven potential points was obtained if a respondent answered all  
8 attitude questions, thus the possible score on the attitude scale ranged from 0 to 11. The other  
9 predictor variables were gender, age and receiving training on the danger of smoking. Table 1  
10 provides the variables and definitions.  
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19 *Insert Table 1*  
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### 21 **Data collection**

22 The survey was conducted during May and June, 2009. Prior to the survey, training was provided  
23 for the research supervisors and assistants. The English language questionnaire was translated  
24 into Lao, back translation performed and followed by an independent third person checking the  
25 translation. The translated instrument was then piloted tested with second year medical students.  
26 Based on this, some of the wording was modified on the translated version but these revisions  
27 did not change the intended meaning of the questions.  
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34 To minimize loss of sample size due to absenteeism, we administered the questionnaire on the  
35 day of an examination. To reduce the risk of response bias or students feeling pressured to stay,  
36 the teachers were asked to leave the classroom and it was emphasized that students were free to  
37 leave or not complete the questionnaire without any reprisals. The purpose of the study was  
38 explained and students given time to ask questions. Students who agreed to partake in the study  
39 were asked to remain behind to complete the questionnaire. The self-administered questionnaire  
40 took students 30 to 40 minutes to complete. After completing questionnaires, the students left  
41 their questionnaires on the tables and the instructors or research assistants collected the  
42 questionnaires.  
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### ***Data analysis***

The software package STATA version 10.1 was utilized for statistical analysis. Frequency distributions with mean and standard deviation were used to describe respondents' demographic characteristics, smoking behaviors, and other variables. After checking the data did not violate assumptions, univariate analysis was carried out using chi-square testing for categorical variables, with a  $p$  value of  $< 0.05$  taken as the threshold for statistical significance. All results have a margin of error of  $\pm 5\%$  (95% confidence interval (CI)). Differences in rates for these indicators were considered statistically significant at the  $p = 0.05$  level. Logistic regression analysis was used for determining the factors associated with smoking among the health professional students by controlling for gender and age. We used the backward stepwise model by excluding the non-significant variables and retaining only significant variables. Cases with missing data were excluded from the analysis.

### ***Ethics***

This research was approved by the research ethics committee of the University of Health Sciences, Lao PDR. The researchers in charge of the survey explained the objectives of the research to the students and emphasized that participation was voluntary. Care was taken to communicate information about the research accurately and in an understandable way to enable a genuine choice to be made. Nevertheless, given the classroom setting, it is possible that some respondents felt pressured to stay. Written consent was obtained from each respondent and anonymity assured.

### ***Results***

In total, 506 respondents completed the questionnaire, giving a response rate of 97.1% - 98.5% across the different faculties. For each type of health professional, the response rate ranged from 97.1% to 98.5% (Table 2). The high response rate minimized the risk of bias due to the population not being representative of the target population.

*Insert Table 2*



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3 The majority of participants were male (59.5%,  $n = 296$  and  $n$  missing = 7) and were aged  
4 between 19 and 24 (78.1%,  $n = 395$ ,  $n$  missing =5).

### 7 *Prevalence of smoking*

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10 The overall prevalence of **current** smoking among the third-year health professional students in  
11 this sample was 5.1% ( $n$  missing = 13). Prevalence was highest among dental students, with rates  
12 7.9% ( $n$  missing=1); the lowest current smoking prevalence was reported among pharmacy  
13 students (1.5%) ( $n$  missing = 4). Of the respondents, 35.2% were ex-smokers ( $n$  missing = 17).  
14 Information about prevalence of smoking in the present study is presented in Table 3. Of the  
15 respondents who had ever smoked, 30.4% also reported having smoked other tobacco products  
16 such as chewing tobacco, snuff, bidis, cigars or pipes.  
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#### 24 *Insert Table 3*

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26 A chi-square test for independence (with Yates continuity Correction) indicated a significant  
27 association between gender and smoking status but with a very small effect size, chi-square = (1,  
28  $n = 486$ ) = 24,  $p = <.001$ ,  $\phi = <-.23$ ).  
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### 32 *Attitudes towards tobacco control*

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34 Most of respondents expressed positive attitudes towards tobacco control irrespective of their  
35 own smoking status. The mean score on the eleven attitude questions was  $12.34 \pm 1.45$  with no  
36 significant difference between males and females or between smokers and non-smokers. The  
37 majority of students agreed for example, that tobacco sales to adolescents should be banned and  
38 that smoking should be banned in public places including discos and bars. While non-smokers  
39 were more likely than smokers to agree that health professionals should be role models (98.3%  
40 versus 88%,  $p = .015$ ), both smokers and non-smokers strongly agreed that health professionals  
41 should give advice about quitting smoking (95.3% and 95.8 respectively). Respondents also  
42 agreed that health professionals have a role in giving advice to patients about smoking cessation  
43 (98.1%) and that such advice would enhance the possibility of someone quitting (92.2%). Further  
44 information about attitudes to tobacco control is found in Table 4.  
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#### 54 *Insert Table 4*

### *Knowledge of smoking policy and training*

Just over half of the students (51.6%) reported being aware of the university's non-smoking policy within the school buildings and hospital grounds. Some (22.6%) however, thought the policy only applied to the school buildings, while 14.9% were unaware of the policy. There was no statically significant difference between the responses of smokers and non-smokers in terms of knowledge of the policy (25% versus 22.3%,  $p = .814$ ). There was however, a statically significant difference between health professional programs on awareness of smoking policy within the school buildings and hospitals with dental students (59.4%) more aware of the smoking policy compared to students from pharmacy (53.8%), medicine (52.2%) and nursing faculties (23.5%) ( $p = .002$ ). Of those who were aware of the smoking policy, 78.3% believed that the policy was enforced, while 6.8% disagreed with this view. There was no statically significant difference between the responses of smokers and non-smokers regarding perceptions of the extent to which the non-smoking policy was enforced (79.2% versus 78.1%,  $p = .845$ ). Information about awareness of the smoking policy is presented in Table 5.

#### *Insert Table 5*

The students who had received formal training in tobacco cessation counseling ranged from 10.9% among nursing students to 51.1% among medical students. Medical students (51.1%) were significantly more likely than pharmacy students (25%) or dental students (13.0%) to have received such training but not significantly more likely than nursing students (10.9%) to have received training (data not shown). There was no statistically significant difference between smokers and nonsmokers about what they recalled being taught in the tobacco cessation counseling training. Information related to the provision of tobacco education to respondents is shown in Table 6.

#### *Insert Table 6*

### *Factors associated with smoking*

When asked about exposure to SHS, 7.3% of respondents reported being exposed to SHS on each of the seven days prior to the survey, with a significant difference between smokers and

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3 nonsmokers. Smokers were more likely to have been exposed to SHS either within their home  
4 (unadjusted OR=3.25, 95% CI=1.4-7.7, p=.007) or outside of the home environment (unadjusted  
5 OR=2.6, 95%CI=1.1-6.6, p=.046) in the bivariate analysis. A multivariate analysis of factors  
6 related to current smoking among health professional students controlling for confounding  
7 factors of sex and age revealed a statistically significant difference between males and females  
8 and current smoking (OR=0.56, 95% CI=.013-.242, p<.001). No significant difference was  
9 found however between age group, attitudes to smoking cessation or receiving training on the  
10 risks of smoking. Further, in the multivariate logistic regression no statistically significant  
11 association was found between exposure to SHS and current smoking status. More information is  
12 provided in Table 7.  
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21 *Insert Table 7*  
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## 26 **Discussion**

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28 The aim of this study was to evaluate the University of Health Sciences, Lao PDR's professional  
29 health students' smoking habits, knowledge about smoking and attitudes towards smoking  
30 cessation counselling. Our study highlighted several important results including relatively low  
31 prevalence of smoking, positive attitudes towards tobacco control irrespective of own smoking  
32 status and a reasonable level of awareness of the university's non-smoking policy. The study  
33 indicated that exposure to SHS from within the household was a smoking predictor in the  
34 bivariate analysis. Other studies have highlighted the impact of this exposure.<sup>22, 23</sup> In our study  
35 however, after controlling for confounding factors of sex and age, in the multivariate analysis the  
36 significance of exposure to SHS was lost with only gender being a predictor of current smoking.  
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45 Particularly noteworthy in the present study is that the prevalence of smoking is lower than  
46 previously reported national prevalence rates<sup>16</sup> and lower than reported in a national survey of  
47 Lao medical doctors.<sup>20</sup> Compared with prevalence rates among health professionals from other  
48 countries including China,<sup>12</sup> Italy,<sup>21</sup> and Vietnam,<sup>22</sup> the students in this sample also demonstrate  
49 a lower smoking rate. Also of note were the overall positive attitudes to smoking control  
50 expressed by both smokers and non-smokers. Respondents generally endorsed tobacco control  
51 training, including counselling and agreed that in the curricula health professionals can play an  
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3 important role in assisting smokers cease smoking. This reflects other recent findings in Lao  
4 PDR.<sup>20</sup> Despite these positive attitudes, knowledge of the university's no-smoking policy, which  
5 has been in existence since 2007, and its perceived enforcement, was variable. Given the benefits  
6 of smoking restrictions as a component of comprehensive tobacco control programs has been  
7 well documented, information about the non-smoking regulations needs to be more widely  
8 disseminated.  
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15 The literature encourages the inclusion of information on tobacco control and counselling in  
16 the undergraduate curricula of future health professionals.<sup>24</sup> It has been found for example, that  
17 health care providers, who receive formal smoking cessation training, are more likely to  
18 intervene with patients who use tobacco than those who are not formally trained.<sup>25, 26</sup> Research  
19 suggests that simple advice from doctors or nurses during routine care primary care, hospital  
20 wards, outpatient clinics, and industrial clinics can significantly increase smoking cessation  
21 rates.<sup>27, 28</sup> The number of people in the present study who reported receiving formal training in  
22 tobacco cessation counseling varied substantially, ranging from 10.9% among nursing students  
23 to 51.1% among medical students. Nevertheless, the overall smoking rates were low suggesting  
24 the need for further research, including qualitative research to understand what is working in this  
25 context and if lessons learned could be applied other similar contexts. In the meantime, given  
26 provision of formal education is an important strategy in promoting cessation,<sup>26</sup> more emphasis  
27 should be given on providing knowledge and counselling skills to all health professional students  
28 at the University in Vientiane. This should include training on tobacco control advocacy  
29 programs<sup>29</sup> and smoking cessation skills.<sup>30</sup> A study in Lao PDR found that policymakers were  
30 supportive for integration of anti-smoking lessons in the training curricula<sup>31</sup> and this study  
31 underscores the need to explore effective ways of doing this.  
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46 As with all research, our study does have some limitations. Firstly, the GHPS respondents in  
47 this survey are third-year health professional students who have not had substantial interaction  
48 with patients, survey results should not be extrapolated to account for practicing health  
49 professionals in Lao PDR. Secondly, our study only included the health professionals  
50 represented at the University of Health Sciences and thus excluded some of the allied health  
51 professionals who provide front-line services. Further, as a cross-sectional survey, causality  
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cannot be tested. Finally, as a self-administered questionnaire, students may not always have provided accurate responses.<sup>32</sup>

## Conclusion

This study contributes to our knowledge of tobacco use among health professionals in Lao PDR. It is the first study to our knowledge which has investigated smoking prevalence and attitudes within health professional students in Lao PDR. It suggests that smoking prevalence amongst this cohort is low and that these health professional students are supportive of tobacco control policies. Further qualitative research is needed to understand what is working and why in this context in order to apply lessons learned in similar settings.

## Author's Contribution

SV developed the research proposal, translated the instrument, and collected data in the field sites, analyzed and wrote the draft manuscript. MC and SN contributed to the study design, collected data and commented on the manuscript. VH and KC assisted in the collection data, analyzed data and contributed to the final version of the manuscript. JD contributed to the analysis, interpretation and preparation of the manuscript. All authors read and approved the final manuscript.

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**Table 1: Definition of variables**

Variable	Definition
Current cigarette smoking	Students who smoked cigarettes on at least one day during the month preceding the survey
Ex-smoker/Ever smokers	Those who had been smokers before, but had stopped smoking at the time of survey were considered ex-smokers
Exposure to second-hand smoke (SHS) and support ban on smoking in public places	<ul style="list-style-type: none"> <li>- Students who reported being exposed to SHS at home during the seven days preceding the survey.</li> <li>- Students who reported being exposed to SHS in public spaces during the seven days preceding the survey.</li> <li>- Students who reported that they support a ban on smoking in public places.</li> </ul>
Attitude and knowledge	Opinions of students towards smoking a cigarette, their knowledge on the harmful effects of smoking, and on the roles and responsibilities of health professionals
Tobacco education	Students who responded "yes" to having been taught about the dangers of smoking in the year preceding the survey.
Tobacco lessons	Students who received formal training on cessation counseling and services during their medical training

**Table 2: Response rate of the participants from each program**

Discipline	Dental	Medical	Nursing	Pharmacy	Total
Students (n)	65	285	35	136	521
Respondents	64	276	34	132	506
Response rate (%)	98.5	97.2	97.1	97.8	97.6
% of total sample population	12.6%	54.5%	6.7%	26.1%	100%

**Table 3: Health professional student response rate and smoking prevalence (95% CI)**

Categories	Dental (n=64)	Medical (n=276)	Nursing (n=34)	Pharmacy (n=132)	Total (N=506)
% current smokers (95% CI)	7.9 (7.1-8.8)	6 (5.5-6.5)	6.1 (4.8-7.7)	1.5 (1.0-1.9)	5.1 (3.2-7.1)
Missing n=	1	7	1	4	13
% never smokers	55.6 (54.0 -57.1)	66.2 (65.1-67.2)	76.5 (73.8-78.9)	78.7 (77.6-80.0)	68.8 (64.4-72.9)
Missing n=	1	13	0	5	19
% ever smokers/ex-smokers	44.4 (42.9-46.0)	39.3 (38.2-40.3)	26.5 (23.9-29.2)	24.2 (23.0-25.6)	35.2 (30.9-39.6)
Missing n=	1	11	0	5	17

**Table 4: Attitudes towards tobacco control among health professional students, University of Health Sciences, Lao PDR**

Respondents who answered yes to the question...	Total (N=493)* % (n)	Smokers (n=26) % (n)	Non- smokers (n=468) % (n)	<i>p</i> value (2-sided)
Should tobacco sales to adolescents be banned?	94.9 (466)	95.7 (22)	94.9 (444)	1.000
Should advertising be completely banned?	78.2 (383)	65.2 (15)	78.8 (368)	0.127
Do you agree with smoking ban in restaurants?	90.7 (447)	80.0 (20)	91.2 (427)	<b>0.072</b>
Do you agree with smoking ban in discos/bars/pubs?	70.5 (347)	70.8 (17)	70.5 (330)	1.000
Do you think that smoking in all public spaces should be banned?	83.1 (409)	72.0 (18)	83.7 (391)	0.165
Should health professionals get cessation training?	94.1 (463)	92.0 (23)	94.2 (440)	0.652
Are health professionals role models?	97.8 (481)	88.0 (22)	98.3 (459)	0.015
Should health professionals give quitting advice routinely?	95.3 (466)	95.8 (23)	95.3 (443)	1.000
Should health professionals routinely advise their patients who use other tobacco products to quit using these products?	70.0 (345)	72.0 (18)	69.9 (327)	1.000
Do health professionals have a role in giving advice about smoking cessation to patients?	98.0 (482)	96.0 (24)	98.1 (458)	<b>0.409</b>
Do chances of quitting improve if health professional gives advice?	92.4 (451)	95.8 (23)	92.2 (428)	1.000

Note: \*-The total sample size for each question is not the same due to missing value.

**Table 5: Awareness of smoking policy by program**

	<b>Dental (n=64) (%)</b>	<b>Medical (n=276) (%)</b>	<b>Nursing (n=34) (%)</b>	<b>Pharmacy (n=132) (%)</b>	<b>Total (N=506) (%)</b>
Does your school have an official policy banning smoking in school buildings and clinics?					
Yes, for school buildings only	25.0	17.9	44.1	25.8	22.6
Yes, for clinics only	1.6	3.3	8.8	1.5	3.0
Yes, for both school buildings and clinics	59.4	52.2	23.5	53.8	51.6
No official policy	14.1	26.6	23.5	18.9	22.8
Is your school's official smoking ban for school buildings and clinics enforced?					
Yes, policy is enforced	82.8	75.9	69.7	83.2	78.3
No, policy is not enforced	9.4	5.5	12.1	6.9	6.8
School has no official policy	7.8	18.6	18.2	9.9	14.9

**Table 6: Provision of tobacco education to health professional students, University of Health Sciences, Lao PDR**

Respondents who answered yes to the question...	Total (N=493)*	Smokers (n=26)	Non- smokers (n=468)	<i>p</i> value
	% (n)	% (n)	% (n)	(2- sided)
During classes, were you taught about dangers of smoking?	77.0 (359)	80.0 (20)	77.0 (359)	1.000
During classes, were you taught about reasons why people smoke?	62.8 (309)	56.0 (14)	63.2 (295)	0.526
Did you learn that it is important to record tobacco use history?	35.7 (176)	32.0 (8)	35.9 (168)	0.831
Have you ever received formal training in smoking cessation?	18.2 (88)	32.0 (8)	17.5 (80)	0.104
Did you learn it is important to provide educational quitting materials?	38.0 (186)	41.7 (10)	37.8 (176)	0.830
Have you ever heard of nicotine replacement therapies?	37.1 (182)	44.0 (11)	36.7 (171)	0.525
Have you heard of antidepressant use in cessation programs?	24.3 (118)	37.5 (9)	23.6 (109)	0.143

Note: \*-The total sample size for each question is not the same due to missing value.

**Table 7: Factors associated with current smoking among health professional students, University of Health Sciences, Lao PDR**

	N	%	Adjusted OR	95% CI	p value
Sex					<.001
Male	22	11.5	1	.013-.242	
Female	3	1.0	.056		
Age					
=< 24 years	20	4.9	1	.203-2.615	.628
>= 25 years	4	5.2	.729		
Attitudes towards smoking (X+SD)	23	12.69+1.55	1.147	.855-1.513	.377
Receiving training on the danger of smoking					
No	5	4.5	1		
Yes	20	5.3	.806	.255-2.545	.713
Exposure to SES in the home during past 7 days					
No	8	2.7	1	.96-1.86	.084
Yes	17	8.4	1.34		

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	x
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	x
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	x
Objectives	3	State specific objectives, including any prespecified hypotheses	x
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	x
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	x
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	x
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	x
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	x
Bias	9	Describe any efforts to address potential sources of bias	
Study size	10	Explain how the study size was arrived at	x
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	x
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	x
		(b) Describe any methods used to examine subgroups and interactions	x
		(c) Explain how missing data were addressed	x
		(d) If applicable, describe analytical methods taking account of sampling strategy	NA
		(e) Describe any sensitivity analyses	NA
<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	x
		(b) Give reasons for non-participation at each stage	x
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	x
		(b) Indicate number of participants with missing data for each variable of interest	x
Outcome data	15*	Report numbers of outcome events or summary measures	x
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	x



		(b) Report category boundaries when continuous variables were categorized	NA
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	x
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	x
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	x
Generalisability	21	Discuss the generalisability (external validity) of the study results	x
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	X

\*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).