

**General population's knowledge, beliefs, and care-seeking behavior about antibiotics:
a cross-sectional survey in Lao People's Democratic Republic**

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Abstract

Objective: To explore the knowledge and understanding of antibiotics among people in Vientiane capital, Lao People's Democratic Republic (Lao PDR). **Methods:** A cross-sectional survey was performed using a self-administered questionnaire in 384 samples conveniently selected from residents of 3 districts of Vientiane capital including Sisattanak, Xaythany, and Sangthong. The questionnaires included the questions on knowledge and perception on antibiotics, behaviors on antibiotic uses, and their information sources of antibiotics. **Results:** About sixty-six percent of the participants misunderstood on the conditions that could be rationally treated with antibiotics. Seventy-four percent of them were aware that antibiotics could only be prescribed by physicians. In the past 3 months, approximately 85% of respondents self-medicated by obtaining drugs from pharmacy and 76% had been prescribed antibiotics to treat illnesses mainly common cold, sore throat and cough. Forty-two percent of them had completed antibiotics prescribed. Around 18% of participants were aware of the adverse drug reactions. Ninety-one percent and 92.6% of those in the urban and suburban districts, respectively, reported healthcare providers as the most common source of antibiotic information, while 94.9% of those in rural area reported their relatives or acquaintances as a common source of information. **Conclusions:** Misconception of antibiotic use is still highly prevalent in Lao PDR. Although people know the appropriate indications for antibiotics use, they do not comply to legal regulations when buying the drug, nor do they follow the instructions on the label. However, strict adherence to prescribed medication and knowledge on appropriate drug use need to be improved in order to prevent and reduce the incidence of antibiotic resistance.

Keywords: antibiotics, rational use of drugs, Lao People's Democratic Republic, patient behaviors, antibiotic resistance

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ความรู้ ความเชื่อ และพฤติกรรมการรักษาด้วยยาปฏิชีวนะของประชาชน: การสำรวจภาคตัดขวางในสาธารณรัฐประชาธิปไตยประชาชนลาว

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บทคัดย่อ

วัตถุประสงค์: เพื่อศึกษาความรู้และความเข้าใจเกี่ยวกับยาปฏิชีวนะของประชาชนในเมืองหลวงเวียงจันทน์ สาธารณรัฐประชาธิปไตยประชาชนลาว (สปป. ลาว) **วิธีการ:** การสำรวจแบบภาคตัดขวางใช้แบบสอบถามชนิดตอบด้วยตนเองในตัวอย่างจำนวน 384 ตัวอย่างที่คัดเลือกแบบตามสะดวกมาจากประชาชนในเขต 3 อำเภอของเมืองหลวงเวียงจันทน์ ได้แก่ สีสุตนาคน ไชยธานี และสังทอง แบบสอบถามประกอบด้วยคำถามเกี่ยวกับความรู้และความรู้เกี่ยวกับยาปฏิชีวนะ พฤติกรรมการใช้ยาปฏิชีวนะ และแหล่งข้อมูลยาปฏิชีวนะ **ผลการวิจัย:** ผู้เข้าร่วมประมาณร้อยละ 66 เข้าใจผิดเกี่ยวกับอาการที่สามารถรักษาด้วยยาปฏิชีวนะอย่างสมเหตุผล ร้อยละ 74 ทราบว่า ยาปฏิชีวนะสามารถส่งจ่ายได้โดยแพทย์เท่านั้น ในช่วง 3 เดือนที่ผ่านมา ผู้ตอบประมาณร้อยละ 85 ซื้อยาจากร้านขายยาเพื่อรักษาตนเอง ร้อยละ 76 ได้รับยาปฏิชีวนะเพื่อรักษาอาการป่วยซึ่งส่วนใหญ่เป็นไข้หวัด เจ็บคอ และไอ ตัวอย่างร้อยละ 42 ใช้ยาปฏิชีวนะที่ได้รับจนหมด ตัวอย่างประมาณร้อยละ 18 ทราบถึงอาการไม่พึงประสงค์จากยา ร้อยละ 91 และ 92.6 ของผู้ที่อยู่ในเขตเมืองและชานเมืองรายงานว่า ผู้ให้บริการด้านการดูแลสุขภาพเป็นแหล่งข้อมูลยาปฏิชีวนะที่พบได้บ่อยที่สุด ขณะที่ร้อยละ 94.9 ของตัวอย่างในพื้นที่ชนบทรายงานว่า ญาติหรือคนรู้จักเป็นแหล่งข้อมูลหลัก **สรุป:** ความเข้าใจผิดเกี่ยวกับการใช้ยาปฏิชีวนะยังคงพบได้มากใน สปป. ลาว แม้ว่าประชาชนจะทราบถึงข้อบ่งชี้ที่เหมาะสมในการใช้ยาปฏิชีวนะ แต่ก็ไม่ได้ปฏิบัติตามข้อกำหนดทางกฎหมายเมื่อซื้อยาและไม่ปฏิบัติตามคำแนะนำจนฉะฉาน จึงควรปรับปรุงให้มีการปฏิบัติตามคำสั่งใช้ยาอย่างเคร่งครัดและส่งเสริมความรู้เกี่ยวกับการใช้ยาที่เหมาะสมเพื่อป้องกันและลดอุบัติการณ์ของการดื้อยาปฏิชีวนะ

คำสำคัญ: ยาปฏิชีวนะ การใช้ยาอย่างสมเหตุผล สาธารณรัฐประชาธิปไตยประชาชนลาว พฤติกรรมผู้ป่วย การดื้อยาปฏิชีวนะ

Introduction

A global action to tackle the growing problem of resistance to antibiotics was endorsed at the World Health Assembly in May 2015. Antimicrobial resistance has been recognized by WHO as one of the most serious threats to public health. The emergence and spread of antimicrobial resistance (AMR) are increasing rapidly due to many accelerating factors. Irrational use of antibiotics in human, animal, and agriculture leads to antimicrobial resistance and increase of ineffective

treatment worldwide. (1-2) However, the major causes leading to antimicrobial resistance from the pharmaceutical industry are prescription and dispensing of the drugs, and patients' self-medication. Irrational use of the antibiotics is also the result from misconception of antibiotic use in both public and private sectors in many countries. (2) Lao People's Democratic Republic (Lao PDR) is a poor and landlocked developing country in South East Asia with an increasing number of private provision of drug.(3) A little is known about current

situation of antibiotic use, and irrational drug use in general, in Laos. Many previous studies indicated that overuse and misuse of antibiotics among physicians and self-medication of antibiotics by the public are found widely.(4-5) It is also found that the irrational use of antibiotic is spreading in Laos. Middle-aged adults in Pakse city, Champasak province showed a high level of perceived barriers in performing preventive behaviors.(6) Tendency of antibiotic overuse has been increasing, since prescriptions for antibiotics, injections, non-essential drugs, and non-generics are high. Information on drug use is insufficient.(4) For example, 91% of patients with respiratory tract diseases, and sexually transmitted infection bought antimicrobials from local private pharmacies without a physician's prescription.(5) Many people believed that antibiotics should be available over the counter.(7) Laos is also one of the several countries that medications are accessible to the public.(5, 7) This facilitate the use of drugs from pharmacies among public. Due to weak law enforcement on drug control, some antibiotics are also available in retail shops even though they are not legally allowed in Laos PDR. During the fiscal year 2010-2011, the leading causes of hospitalized death in Lao P.D.R were acute respiratory infection and diarrhea.(8) WHO survey in 12 countries among WHO member states of the Southeast Asia and Western Pacific Region, but Laos not included, revealed widespread public misunderstanding about antibiotic resistance in 2015. This survey points to the urgent need to improve understanding around antibiotic resistance and change the way antibiotics are used. (9) Although, the specific policy on antibiotics and some regulations on rational drug use (RDU) are available, they are not comprehensive. These measures include the control of antibiotic import and local manufacturing, registration, and selling. In addition, awareness raising campaign has also been carried out to improve knowledge on antibiotic use among healthcare providers, stakeholders, and end users with the provision of

information using mass media, and poster of RDU on antibiotic.(8) This present research aimed to investigate the present situation based on the theory of Health Belief Model (HBM). We tried to explain how Laos used antibiotics along with six elements of the theory including; perceived of susceptibility, severity, benefits, barriers, cues to action, and self-efficacy. The survey findings could be used as an input for formulating governmental policies and measures to reduce antibiotic resistance.

Methods

The study was approved by the National Ethics Committees for Health Research, Lao PDR (Ethics clearance No. 019/NECHR, VTE, dated March 13, 2017). Information was presented to local authorities before conducting the study. All interviewees were informed on the purpose of the project. A written consent was taken from the interviewees after being informed that all collected information should remain confidential and anonymous. A subject could withdraw anytime during the study.

Study site and sample

This cross-sectional study was conducted in Lao PDR. In 2015, a total population in nine districts of Vientiane capital (VTE) was 820,940. The size of the population and socioeconomic situation in each district differ somewhat in terms of household economy and education. Two-stage sampling was used in this study. (10) In the first stage, Sisattanak, Xaythany, and Sangthong districts were conveniently chosen to represent urban, suburban, and rural district. The total population in these 3 districts was 291,786 people with the estimated antibiotic users of 262,607 from 90% prevalence of antibiotic use in VTE. The precision at 5% and confidence interval 95% were used to calculate the sample size from Krejcie and Morgan method. Minimum sample size of 384 household was required. We recruited 89, 256, and 39 participants from

Sisattanak, Xaythany, and Sangthong districts proportionate to their population.

The first household selected was the first household left-side next to the city hall. The next houses to the first were also selected for data collection until the recruited number of participants reached the needed number. We recruited one member from each household whom aged 18 or more and reported the use of an antibiotic during the past three months. In this study, antibiotic use was defined as those obtained with or without prescription from a physician. Subject must be able to complete the questionnaire by oneself and was willing to participate. Data were collected from March to May 2017.

Instrument

The HBM was used as the framework of the study to understand antibiotics uses. The constructs in the HBM including modifying factors (socio-demographic characteristics and knowledge), perception of risk susceptibility, severity, benefits to action, barriers to action, self-efficacy, and cues to action. (11-12), were employed to derive questions in self-administered questionnaire. The final questionnaire with 39 items was divided into four parts. Part 1 was the questions on modifying factors including personal characteristics (7 questions), and knowledge on antibiotics (10 items). The correct response on each question on knowledge was summed and transform to percent. Part 2 of the questionnaire consisted of 14 questions on perception of antibiotics including perceived susceptibility, severity, barriers, and benefits of antibiotic use. The response format was a 3 point scale (agree, unsure and disagree).

Part 3 was the questions on source of antibiotics and sources of information on antibiotics as cues to action. The subjects were asked to select three main sources of antibiotics within last 3 months. The sources presented in the questionnaire included mass media, healthcare providers, relatives/members of the

family, neighbors, others who had experienced the disease, and place they received antibiotics from.

Part 4 was the questions on self-efficacy in using antibiotics as prescribed, self-medication, and request antibiotics from a physician. Response format was regular, often, sometimes, and never.

Data analysis

Data were stored in Microsoft Excel and imported to analyze with Stata version 14. Descriptive statistics was used to summarize the variables measured in this study.

Results

Table 1 shows background information of 384 subjects. The mean age was 34.3 ± 12.1 years (ranging from 18 to 75 years old). Half of the participants were women (55.5%), and single (52.1%). The most frequently reported ethnic was Lao Loum (91.4%). In Sangthong, there was only Lao Loum ethnic. Two-thirds of the participants graduated in bachelor's degree and earned their monthly income over 1,000,001 LAK.

Table 2 summarizes knowledge on antibiotics among subjects. The participants demonstrated a fair knowledge about antibiotics. Percentages of subjects with correct answers were higher than 80% in only one questions from the total of 10 questions. Majority of subjects (87.8%) were aware that antibiotics were useful for treating bacterial infections. Nevertheless, only some of them (34.1%) realized that antibiotics were not appropriate for viral infections. Some participants (33.6%) were confused that antibiotics were both effective against bacteria and viruses.

Sangthong, a rural area, showed the highest proportion (89.7%) of subjects with a correct answer on the question "antibiotics were not effective against both bacteria and viruses". Eighty-two percent of subjects knew that antibiotics can only be prescribed by physicians. This was higher than that in Sisattanak (77.5%) and Xaythany (71.1%).

A relatively low percentage of the sample (42.7%) was aware that they should take all prescribed

antibiotics even symptoms improved. Those in urban and suburban areas were more likely to complete

Table 1. Socio-demographic characteristics of respondents who used antibiotics in last 3 months.

Characteristics	Number of respondents (%)			
	Total (n=384)	Sisattanak (n=89)	Xaythany (n=256)	Sangthong (n=39)
gender				
male	171 (44.5)	44 (49.4)	114 (44.5)	13 (33.3)
female	213 (55.5)	45 (50.6)	142 (55.5)	26 (66.7)
age (years)				
18-30	184 (47.9)	40 (44.9)	128 (50.0)	16 (41.0)
31-40	111 (28.9)	34 (38.2)	69 (26.9)	8 (20.5)
41-50	40 (10.4)	9 (10.1)	26 (10.2)	5 (12.8)
51-60	34 (8.8)	4 (4.5)	24 (9.4)	6 (15.4)
> 60	15 (4.0)	2 (2.3)	9 (3.5)	4 (10.3)
average age±SD	34.3±12.1	33.7±9.5	33.5±11.4	41.0±18.0
ethnic group				
Lao Loum	351 (91.4)	81 (91.0)	231 (90.2)	39 (100)
Lao Sung	27 (7.03)	6 (6.7)	21 (8.2)	0 (0)
Lao Theung	2 (0.50)	2 (2.3)	0 (0)	0 (0)
Phou Thai or Thai Dam	4 (1.04)	0 (0)	4 (1.6)	0 (0)
educational level				
none	6 (1.6)	0 (0)	5 (2.0)	1 (2.6)
primary school	28 (7.5)	2 (2.3)	19 (7.4)	7 (30.8)
secondary school	12 (3.1)	1 (1.1)	8 (3.1)	3 (10.3)
high school	26 (6.8)	2 (2.3)	19 (7.4)	5 (28.2)
certificate level (1-2 years)	17 (4.1)	2 (2.3)	15 (5.9)	0 (0)
bachelor degree	240 (62.5)	65 (73.0)	152 (59.4)	23 (28.2)
master degree	54 (14.1)	17 (19.1)	37 (14.5)	0 (0)
doctoral degree	1 (0.3)	0 (0)	1 (0.39)	0 (0)
occupation				
student	68 (17.7)	9 (10.1)	49 (19.1)	10 (25.6)
government officer/ enterprise	190 (49.5)	52 (58.4)	130 (50.8)	8 (20.5)
employee (daily/ monthly)	53 (13.8)	14 (15.7)	36 (14.1)	3 (7.7)
business owner	28 (7.3)	6 (6.7)	14 (5.5)	8 (20.5)
farmer/ agriculture/ fishing	10 (2.6)	0 (0)	5 (2.0)	5 (12.8)
retired	9 (2.3)	2 (2.3)	6 (2.3)	1 (2.6)
unemployed	19 (5.0)	4 (4.5)	10 (3.9)	3 (7.7)

Table 2. Knowledge on antibiotic use

Knowledge on antibiotic	Number (%) of subject who answered correctly			
	Total (n=384)	Sisattanak (n=89)	Xaythany (n=256)	Sangthong (n=39)
Antibiotics are effective against bacteria.	337 (87.8)	83 (93.3)	222 (84.0)	32 (82.0)
Antibiotics are not effective against viruses.	131 (34.1)	34 (38.2)	91 (35.6)	6 (15.4)
Antibiotics are not effective against both bacteria and viruses.	225 (66.4)	68 (76.4)	152 (59.4)	35 (89.7)
I take all prescribed antibiotics at a time.	177 (46.1)	43 (48.3)	125 (48.8)	9 (23.1)
Antibiotics can only be prescribed by physicians.	284 (74.0)	69 (77.5)	183 (71.5)	32 (82.0)
I always use antibiotics as instructed on the package labeling	303 (78.9)	72 (80.9)	205 (80.1)	26 (66.7)
I always complete the course of treatment with antibiotics even if I feel better.	164 (42.7)	34 (38.2)	114 (44.5)	16 (41.0)
I never keep the leftover antibiotic for future need.	247 (64.3)	56 (62.9)	179 (69.9)	12 (30.8)

antibiotics (48. 3% and 48. 8% , respectively) , in comparison to those in a rural district (23.1%).

Table 3 presents the respondents' attitudes towards the use of antibiotics. They highly perceived that they were susceptible to bacterial infections leading to common diseases as cold, coughing, sore throat, diarrhea, and wound. Additionally, respondents in rural areas (94.9%) were more likely than those in suburban (58.6%) and urban areas (73.0%) to believe that exercise and healthy diets were a better measure than antibiotics in preventing infectious diseases. The minority of the respondents (13. 8%) knew that antibiotics could cause adverse drug reaction.

The respondents were asked to identify the source of antibiotics information. Two major sources of information were mass media and recommendation from others. Healthcare providers was the most common source in the category recommendation from others in urban and suburban districts (91% and 92.6%, respectively). On the contrary, subjects in the rural area stated recommendation from relatives (94.9%) and acquaintances (94.9%) as the most common source of information on antibiotics. The major mass media on antibiotics information were television (80.7%), radio (75.0%), and internet (74.0%), respectively. Notably in

Sisattanak, an urban district, people were most likely to get information from the Internet (80.9%). Drug stores were the most common source of antibiotics in 84.9% of subjects, while groceries were the least popular source of antibiotics. However, nearly 20% of respondents in urban and suburban areas reported that they had bought antibiotics from groceries (Table 4).

Discussion

This quantitative study was an important baseline on patterns of antibiotics use, knowledge and attitudes regarding antibiotics among Lao PDR. citizens. Nearly two-thirds of subjects realized that antibiotics can only be legally prescribe by physicians. However, the majority of respondents (84.9%) obtained antibiotic directly from private pharmacies without prescriptions. This magnitude was a little higher than those reported in various studies carried out worldwide. (12-16) Nonetheless, only 3% of European residents had acquired an antibiotic from a pharmacy without a prescription. (14) There was a report of poor private pharmacy practices in Lao PDR due to the provision of care and poor recommendation on drug use to the patients by non-pharmacist personnel. (7) Availability, affordability, rational use, and drug quality should be

observed. Despite, antibiotics are legally prescribed by physician, physicians and pharmacists must play a critical role in contributing public knowledge of rational antibiotic use. (13)

A large number of respondents incorrectly identified indications of antibiotics and preferred self-

medication for common diseases with antibiotics. Often, those respondents expected antibiotics treatment in the cases of typical viral infections. This number was higher than those reported in many countries. (12-16) While prescribing and dispensing practices in Laos were not fully appropriate in terms of the rationality of antibiotics

Table 3. Subjects' perception regarding antibiotics

Perception on antibiotics	Number (%) of subject agreeing with statements			
	Total (n=384)	Sisattanak (n=89)	Xaythany (n=256)	Sangthong (n=39)
Perceived Susceptibility				
It is not easy for me to get bacterial infecting causing ...				
- common cold	75 (19.5)	75 (19.5)	26 (29.2)	47 (18.4)
- coughing	60 (15.6)	60 (15.6)	16 (18.0)	42 (16.4)
- sore throat	74 (19.3)	74 (19.3)	15 (16.8)	59 (23.1)
- diarrhea	82 (21.4)	82 (21.4)	18 (20.2)	55 (21.5)
- wound	79 (20.6)	79 (20.6)	20 (22.5)	52 (20.3)
Airborne bacteria can cause bacterial infection in me.	50 (13.0)	50 (13.0)	15 (16.8)	34 (13.3)
Bacterial infection can be spread from person to person.	260 (67.7)	260 (67.7)	57 (64.0)	165 (64.4)
Perceived Severity				
If I get bacterial infection,...				
-I have to take off my work and lose income	300 (78.1)	300 (78.1)	74 (83.2)	199 (77.7)
-the risk of death is increased	275 (71.6)	275 (71.6)	57 (64.0)	182 (71.1)
Perceived benefits to prevent disease				
Antibiotics are effective to prevent;				
- common cold	70 (18.2)	27 (30.3)	38 (14.8)	5 (12.8)
- coughing	62 (16.2)	19 (21.4)	40 (15.6)	3 (7.7)
- sore throat	51 (13.3)	14 (15.7)	35 (13.7)	2 (5.1)
- diarrhea	93 (24.2)	23 (25.8)	61 (23.8)	9 (23.1)
- wound	81 (21.1)	20 (22.5)	55 (21.5)	6 (15.4)
Antibiotics speed up the recovery from most infections	32 (8.3)	4 (4.4)	25 (9.8)	3 (7.7)
Perceived barriers				
Antibiotics always cause adverse drug reactions	53 (13.8)	12 (13.5)	34 (13.3)	7 (18.0)
Unnecessarily use of antibiotics can increase the bacteria resistance.	40 (10.4)	10 (14.6)	21 (8.2)	9 (23.1)
It is harmful to use antibiotics by oneself without prescription	199 (51.8)	57 (64.0)	130 (50.8)	12 (30.8)

Table 4. Sources of antibiotics and information regarding antibiotics reported by subjects

Sources of antibiotics information	Number (%) of subjects			
	Total (n=384)	Sisattanak (n=89)	Xaythany (n=256)	Sangthong (n=39)
mass medias				
- internet	284 (74.0)	72 (80.9)	190 (74.2)	22 (56.4)
- television	310 (80.7)	68 (76.4)	208 (81.2)	34 (87.2)
- radio	288 (75.0)	63 (70.8)	193 (75.4)	32 (82.0)
- magazine	233 (60.7)	57 (64.0)	158 (61.7)	18 (46.2)
- FDA journal	188 (49.0)	51 (57.3)	133 (52.0)	4 (10.2)
- newspaper	233 (60.7)	50 (56.2)	168 (65.6)	15 (38.5)
recommendation from others				
- healthcare providers	350 (91.2)	81 (91.0)	237 (92.6)	32 (82.1)
- relative members	306 (79.7)	65 (73.0)	204 (79.7)	37 (94.9)
- neighbor	248 (64.6)	53 (59.6)	162 (63.3)	33 (84.6)
- acquaintances	259 (67.5)	56 (62.9)	166 (64.8)	37 (94.9)
sources of antibiotics				
- central hospital	293 (76.3)	71 (79.8)	196 (76.6)	26 (66.7)
- district hospital	216 (56.3)	47 (52.8)	142 (55.5)	27 (69.2)
- healthcare center	169 (44.0)	32 (35.6)	116 (45.3)	21 (53.8)
- pharmacy store	326 (84.9)	74 (83.1)	214 (83.6)	38 (97.4)
- private clinic	276 (71.9)	57 (64.1)	191 (74.6)	28 (71.8)
- groceries	69 (18.0)	16 (18.0)	50 (19.5)	3 (7.7)

use, information on drug use provided is also insufficient.(4) For this reason, we suggested the antibiotic awareness campaign emphasizing the fact that antibiotics are effective only against bacteria.

More than 42.7% of subjects in our study completed their antibiotic as prescribed. Whereas 79% of European, 71% of Malaysian, and 58% of Hong Kong did so. (14-16) Considerably, 35.1% of the subject in this study vs. 15.1% in Lithuania (13) indicated three days or less to be an appropriate duration of antibiotic use. This misconception contributed to the emergence and spread of antibiotics resistance. (12, 13) Subsequently, the most important steps in fighting antimicrobial resistance are augmenting knowledge of general public and changing their attitudes toward unnecessary use of

antibiotics, taking a full course of treatment, and not giving out medication to other people or keeping left-over medication for future needs.

In terms of outpatient visits, common cold, tonsillitis, and pharyngitis ranked in the top conditions. This study showed a large number of participants requested physicians to prescribe antibiotics in the case of common cold and sore throat. (8) They showed low perceived barrier in antibiotics use. Less than 20% of Laos believed that antibiotics can cause adverse drug reactions, while in another study was 92.9%.(13) Despite fewer European respondents (15% in 2011) expected a prescription for antibiotics because of colds (14), 74.5% of our subjects requested antibiotics from a physician in the same condition. A numerous report has shown that

patient's expectation is a crucial factor for antibiotic prescribing. (12, 17) These will also provide further insight in designing public education campaigns to promote rational antibiotic use. A report declared a successful change in behavior after European antibiotic awareness day campaign. They stated limited use and became more cautious regarding the use of antibiotics.(14) Australia also achieved a drop-in self-medication with antibiotics for flu, colds, and coughs as a result of educational campaigns. (18) On the other hand, a minor change from education campaigns regarding the viral or bacterial nature of certain infections was reported from New Zealand, England, and Scotland. (19, 20)

Those in Sisattanak were more likely to get information from the internet. This result was similar to European countries. (14) Contradictory, the internet can play a significant role in raising public awareness on antibiotics and creating the right attitudes towards antibiotics prescribing in the UK. (20)

This study has many limitations. First, the subjects were not representative to general population of VTE. Unusually high proportion of those with higher education indicates selection bias. Regardless of sample size, the use of a self-report method of data collection was affected by respondents' memory, and, thus, in some cases, there was recall bias. It is possible that respondents may over-report or under-report because of social undesirability effect. This study also included a relatively small percentage of the respondents with more than 60 years old. We suggest further study to investigate an association among use of antibiotics, baseline characteristics, and knowledge on antibiotics. Expanding the study to all regions and more qualitative studies are needed among Lao's antibiotics users, pharmacists, grocery owners, FDA, and all stakeholders. The finding from this study may be useful for developing an intervention to reduce misunderstanding toward antibiotics use.

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