Research Article

Knowledge, attitude, and preventive behavior toward pathogen spreading of high school students in Thailand

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ABSTRACT

Background: The spread of pathogens rapidly affects all aspects of life. Although the medicine is more advanced, the epidemic situations still can occurred. This continues to increase and is a major public health problem. Therefore, public health maintenance behavior has the effect of inhibiting the spread of pathogens. Breaking the chain of pathogen spread can reduce the spread of bacterial infections and the severity of the epidemic. **Objectives:** This study aimed to assess community knowledge, attitude, and preventive behavior toward pathogen spreading among high school students in Chonburi, Thailand. **Materials and Methods:** The study was conducted using a questionnaire. A total of 329 students participated. Knowledge about infection prevention, attitude toward preventive behavior, attitude toward preventive rules and regulation supported, and pathogen transmission preventive behavior were assessed. Independent *t*-test and ANOVA were used to analyze differences between outcomes and sociodemographic. **Results:** Students revealed a poor level of knowledge about infection prevention, correctly answering 2.52 (SD = 1.31) question in a total of 5, a high level of attitude toward preventive behavior, average score was 23.31 (SD = 2.22) of 25, and a high level of attitude toward preventive rules and regulation supported, the average scores at 21.48 (SD = 2.71), question in a total of 25, and a high level of pathogen transmission preventive behavior at the average score of 29.69 (SD = 4.06) questions in a total of 35. **Conclusion:** This research revealed that the high school students of Chonburi Science School at Prince Chulabhorn have a low level of knowledge about pathogens, and shows that they have a positive attitude toward prevention behavior, a good attitude toward supporting prevention rules and regulations, and good prevention behavior. Students have very little knowledge because the school does not have guidance, but some students can discover information by themselves through internet channels as long as they have equipment and connections. Therefore, this study can provide positive attitudes for a young teenager because he is constantly listening and following the rules. Therefore, specific knowledge about the basic prevention of pathogen transmission and infection is essential for all, and should be taught and strengthened in schools where all students know and are aware of this need, and all students will regularly take action to protect themselves such as wearing a mask and washing hands with alcohol gel.

KEY WORDS: Infection Control; Preventive Behavior; Rules and Regulations

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INTRODUCTION

The proliferation of pathogens has had a profound effect on all facets of existence. Despite the fact that medical knowledge has improved, however, the epidemic scenario demonstrates this which is still escalating and posing a significant public health threat, such as the coronavirus

disease 2019 (COVID-19) epidemic which is a developing illness between 2019 and 2021. There are over 63 million individuals globally who have been infected with COVID-19, which has killed over 1.4 million people.[1] This issue has an impact on the economy as well as on society. This is due to the fact that certain businesses, such as tourism, earn less income. A large number of firms were forced to close. As a result, businesses are compelled to make significant changes, with many reducing employment and personnel in order to reduce operational expenses.[2]

In living creatures, germs, or pathogens, are the primary cause of illness. Germs are tiny creatures that develop and reproduce in the bodies of other species. These microorganisms may enter the bodies of plants, animals, and humans, resulting in infection and potentially deadly illness. Infectious agents refer to these harmful organisms, which include viruses, rickettsia, bacteria, protozoa, and fungus.[3] These infections can be disseminated in the following ways by people who have the disease or are carriers of the disease. To begin, both direct and indirect contact transmission must be established. The second mode of transmission is by droplet and airborne transmission. Pathogens are transmitted through a chain of infection known as the chain of infectors. Stopping the transmission of infections by breaking the chain of transmission using procedures including regular hand washing, frequent use of alcohol gel, wearing a mask, and cleaning and sanitizing various pieces of equipment.

Therefore, the behavior of maintaining public hygiene has an effect on inhibiting the spread of pathogens. Breaking the chain of spreading germs can reduce the spread of contagious diseases and the severity of the outbreak. Because infectious diseases are not limited to health issues. It also affects the economy and society, leading to various problems. It can be observed that many diseases may have methods of contact with people in many ways if there is a high number of person-to-person spreads of infection. This will lead to a widespread infection at the national level and throughout the world. Therefore, studying and understanding the spread of pathogen transmission are important. Because it is the first line of defense against infection by preventing the disease from spreading to others and yourself.[4]

Personal hygiene is an essential problem that should be instilled in children from an early age. In order to prevent pathogens from invading the body, as well as to maintain physical wellness, good health, and strength, it is considered the cornerstone of self-care behaviors. The implementation of habits that help to stay clean not only prevents this accumulation but also provides added personal and social benefits. According to Supreeda Aduyanon, the new normal is a new way of life. It's a new way of living everyday life. People are turning to being more careful and taking care of themselves. In this direction, she said that emerging infectious diseases that may occur in the future, such as diseases caused by mutations of a new flu strain, diseases caused by new drug-resistant pathogens, etc., preparing to cope with these epidemics.[5] Therefore, it is not only a work in the medical and public health framework but also requires cooperation from society by raising knowledge and supporting people on health, immunity, and prevention guidelines to cope with contagious diseases that may occur in the future.[6]

A community that is educated about the virus's modes of transmission and potential for infection, as well as the symptoms and proper use of personal protective equipment, among other topics, is more likely to develop favorable attitudes toward preventive measures, which is a strong predictor of preventive health behavior adherence in the majority of cases.[7]

Emerging adulthood as a life stage, which includes students in higher education, is a phase of learning and personality development in the cognitive, physical, emotional, sexual, family, and social domains.[8] However, empirical evidence indicates that high school students engage in a high rate of health risk behaviors,[9] which tend to persist throughout life and have a substantial long-term impact on their health and well-being.[10]

This research aims to study knowledge, attitude, and preventive (KAP) behavior toward pathogen spreading in Grade 10–12 students of Prince Chulabhorn Science High School, Chonburi, to find a way and tools to promote hygiene behavior and reduce the spread of pathogens.

MATERIALS AND METHODS

This was a cross-sectional observational study. An online questionnaire was purposely developed and made available through Google Forms between April 8, 2020, and May 15, 2020. All students enrolled in the academic year 2020 at Princess Chulabhorn Science High School, Chonburi, in Grade 10–12 students. The invitation was sent by e-mail to the institutional e-mails used by the students. At Princess Chulabhorn Science High School, Chonburi, all the enrolled students have access to their institutional e-mails, so they all received an invitation. In these emails, information about the objectives of the study as well as the ethical guarantee of confidentiality and anonymity in the data collected as stated in the informed consent was explained. Participation was completely free and voluntary, and no personal data were collected from any participant. Of the 430 enrolled students, a total of 329 higher education students participated in the study (response rate: 76.51%).

Ethical Consideration

This research uses an anonymous data collection method to collect data from Grade 10 to 12 students of Prince Chulabhorn Science School, Chonburi, Thailand, using Google Forms.

The invitation was delivered through email to every high school students' institutional e-mail addresses. These e-mails outlined the study's aims as well as the ethical assurance of secrecy and identity in the data obtained, as indicated in the informed permission. Participation was completely free and voluntary of respondents in the research, and anonymity or respondents from any participant.

Instruments

The questionnaire was developed based on a literature review including (1) information provided by and guidelines from the Health Authorities (Thai Ministry of Public Health and World Health Organization) regarding pathogen spreading and (2) studies already performed on the same topic in other countries where several common items were used to assess each of the dimensions analyzed in this study. The proposed items were then grouped, and redundant items were removed.

A preliminary version of the instrument was reviewed by three infection control specialists to validate its content. A pre-test was then performed with a small sample of high school students to test for comprehension and difficulty. All the questions remained without modifications. The psychometric characteristics of the questionnaire were tested, as described in the statistical analysis subsection.

The final version of the questionnaire contained 25 questions; three about sociodemographic data (gender, age, and educational level) and 22 items divided into four sections [Table 1].

Infection prevention knowledge

It consisted of five questions related to the transmission of infectious agents, the mode of transmission included airborne, droplet, and contact. The participants were asked to choose the correct answer from four multiple choices. One point was assigned to each correct answer while providing an incorrect answer received zero points. The sum of all items was made hence higher source corresponded to a higher level of knowledge.

Attitude toward prevention behavior

This scale was composed of five items, and the response categories consisted of a 5-point Likert scale (from 1 – strongly disagree to 5 – strongly agree), with the highest score corresponding to more positive attitudes toward preventive behavior. Some items on the scale were inverted for the analysis. A sum of all the items within each factor was made to obtain a score. "Attitudes toward preventive behavior" factor consisted of seven items and varied from 1 to 25, with the highest score corresponding to more positive attitudes toward preventive behavior.

Attitude toward preventive rules and regulation support

This scale was composed of five items, and the response categories consisted of a 5-point Likert scale (from 1 – strongly disagree to 5 – strongly agree), with the highest score corresponding to more positive attitudes toward preventive rules and regulation support. Some items on the scale were inverted for the analysis. A sum of all the items within each factor was made to obtain a score. "Attitude toward rules and regulation support" factors consisted of five items and varied from 1 to 25, with the highest score corresponding to more positive attitudes toward preventive behavior.

Preventive behavior

This scale referred to the number of preventive behavior adopted and included seven items (personal protective equipment, physical distance, hand washing, disinfection, and exposure to COVID-19). Each item was answered using a 5-point scale (from 1 – never to 5 – always), with 1 point assigned to each behavior that was always practiced. The number of behavior practiced was added up. A high score on this scale indicated good preventive behavior, ranging from 1 to 35.

Statistical Analysis

The analysis was performed using SPSS for Windows,

Table 1: Differences in outcomes according to the sociodemographic characteristics of participants (n=400) attitude toward prevention behavior

Sociodemographic characteristic	*n* (%)	Infection prevention knowledge (range 0–5)		Attitude toward preventive behavior (range 5–25)		Attitude toward rules and regulation support (range 5–25)		Pathogen transmission preventive behavior (range 7–35)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Gender		2.52	1.31	23.31	2.22	21.48	2.71	29.69	4.06
Male	85 (25.8)	3.02	1.16	23.95	1.88	20.47	2.84	28.34	4.15
Female	244 (74.2)	2.34	1.32	23.09	2.29	21.83	2.58	30.16	3.93
Year level									
G.10	114 (34.7)	2.28	1.24	23.13	2.24	21.47	2.84	29.73	3.74
G.11	115 (35.0)	2.33	1.28	22.98	2.37	21.14	2.72	29.28	4.07
G.12	100 (30.4)	3.00	1.32	23.89	1.90	21.87	2.53	30.13	4.38

version 26.0. To analyze the psychometric characteristics of the scales, an exploratory factor analysis, using principal component analysis with varimax rotation, was carried out. Afterward, reliability was analyzed through the calculation of item-total correlation coefficients and Cronbach's alpha (α) for the scales of the questionnaire. The descriptive analyses were presented in absolute (n) and relative (%) frequencies, mean (M), and standard deviations (SD). To assess the differences between the outcome variables and the sociodemographic characteristics, considering the sample size, independent *t*-tests and the ANOVA were used, as appropriate. The correlations between the outcomes of the study were calculated by Pearson's correlation. Finally, a generalized linear model was calculated to determine the predictive variables of the preventive behaviors. Exp (β) and the respective 95% confidence intervals (95% CI) were presented. Statistical significance was defined as $P < 0.05$.

RESULTS

This study comprised a total of 329 students from Grade 10 to 12. The sociodemographic characteristics of the sample are presented in Table 1. Most of the students were female (n = 244, 74.2%) and there were 85 male students (25.8%). The highest number of students was studying in Grade 11 (n = 115, 35.0%) followed by Grade 10 (n = 114, 34.7%) and Grade 12 (n = 100, 30.4%), respectively.

The students revealed a poor level of knowledge about infection prevention at the average of 2.52 (SD = 1.31). Male students showed a higher level of knowledge, average of 3.02 (SD = 1.16) than female students who had the average score of 2.34 (SD = 1.32). There were differences in the level of knowledge according to the grade level: Students at Grade 12 showed the highest level of knowledge, average of 3.00 (SD = 1.32) followed by Grade 11 who had the average score of 2.33 (SD = 1.28) and Grade 10 average of 2.28 (SD = 1.24), respectively.

Regarding attitude toward preventive behavior, the students showed a high level of attitude toward preventive behavior at the average of 23.31 (SD = 2.22). Male students showed a higher level of their attitude toward preventive behavior, average of 23.95 (SD = 1.88) than female students who had the average score of 23.09 (SD = 2.29). There were differences in the level of attitude according to the grade level: Students at Grade 12 showed the highest level of knowledge, average of 23.89 (SD = 1.90) followed by Grade 10 who had the average score of 23.13 (SD = 2.24) and Grade 11 average of 22.98 (SD = 2.37), respectively.

Concerning attitude toward preventive rules and regulation supported, the students showed a high level of attitude toward preventive rules and regulation supported at the average of 21.48 (SD = 2.71). Female students showed a higher level of their attitude, average of 21.83 (SD = 2.58) than male students who had an average score of 20.47 (SD = 2.84). There were differences in the level of attitude according to the grade level: Students at Grade 12 showed the highest level of knowledge, average of 21.87 (SD = 2.53) followed by Grade 10 who had the average score of 21.47 (SD = 2.84) and Grade 11 average of 21.14 (SD = 2.72), respectively.

For pathogen transmission preventive behavior, the students showed a high level of pathogen transmission preventive behavior at the average score of 29.69 (SD = 4.06). Female students showed a higher level of pathogen transmission preventive behavior, average of 30.16 (SD = 3.93) than male students who had an average score of 28.34 (SD = 4.15). There were differences in the level of pathogen transmission preventive behavior according to the grade level: Students at Grade 12 showed the highest level of pathogen transmission preventive behavior which an average of 30.13 (SD = 4.38) followed by Grade 10 who had the average score of 29.73 (SD = 3.74) and Grade 11 average of 29.28 (SD = 4.07), respectively [Table 1].

The analysis of correlations between the outcomes of the study – attitude toward preventive behavior, attitude toward preventive rules and regulation support, and pathogen transmission preventive behavior – revealed the existence of positive and statistically significant correlations between the pathogen transmission preventive behavior and attitude toward preventive behavior (r = 0.369, $P < 0.01$) and attitude toward preventive rules and regulation support (r = 0.486, $P < 0.01$). These two variables were intercorrelated [Table 2].

Results from the generalized linear model indicated that the attitude toward preventive behavior and attitude toward preventive rules and regulation support had a statistically significant effect on pathogen transmission preventive behavior adopted. Thus, having a positive attitude toward preventive rules and regulation support (Beta = 0.553, $P < 0.01$) and attitude toward following infection prevention guidelines (Beta = 0.530, $P < 0.01$) predicted the adoption of preventive behavior [Table 3].

DISCUSSION

The result regarding infection control knowledge revealed a poor understanding about spreading of pathogens. Students had a favorable attitude toward preventive behavior and favorable attitude toward rule and environmental support preventing spreading of pathogens. This might be because students could be ignoring and were not focusing on preventing infection. As well as students at this high school having a study – hard type of lifestyle, therefore students might be answering the knowledge question without being careful enough also focusing on other factors such as compliance with friends. In addition, one of the most important results of this study refers to the positive and significant correlation between preventive

Table 2: Pearson's correlation coefficient between the study outcomes

Variable	Knowledge about infection prevention	Attitude toward following infection prevention guideline	Attitude toward preventive rules and regulation support	Pathogen transmission preventive behavior
Knowledge about infection prevention	1			
Attitude toward preventive behavior	0.310**	1		
Attitude toward preventive rules and regulation support	0.051	0.279**	1	
Pathogen transmission preventive behavior	0.100	0.369**	0.486**	1

**Correlation is significant at 0.01

behavior and the teenager lifestyle. As previously shown, most teenagers have a habit of hanging out with their friends and tend to focus on playing.[11] Tawan Petpaiboon studied about preventive behavior toward COVID-19 among high school students found that students had moderate level of knowledge and attitude following preventive behavior without and with presence of rules and moderate level of COVID-19 preventive behavior. High school students might rarely think about the preventive infection and knowledge about infectious disease prevention because it was not taught at the high school level.[12] However, if public health is promoting specific knowledge, such as how to prevent COVID-19, people will receive information through various social media platforms, such as primary health care as the foundation of a sustainable health system for universal health coverage and health-related sustainable development goals.[13] This aspect demonstrates the importance of the internet in conducting health education campaigns aimed at higher education students.

Glomja *et al*. (2002) studied the knowledge and behavior of COVID-19 prevention among people in Phayao Province and revealed that most of the respondents completed primary school education. Most participants aged between 51 and 60 years old had a middle level of knowledge of COVID-19 prevention because they had experience of preventing H1N1 influenza during the year 2010, so they had knowledge and understanding of epidemic prevention and most of the respondents had a good level of infection prevention attitude.[14] Rajbhandar *et al*. (2019) conducted a study about the knowledge and practice of personal hygiene among secondary school students in Grades 9 and 10. They found that the study of Grade 9–10 secondary school students had a good level of knowledge about personal hygiene. This was a very encouraging finding, similar to the study which reported good knowledge levels. Notably higher findings in this study could be due to greater integration of personal hygiene components into the school curriculum and school health programs, and making regulations. This study also showed that students have positive attitudes toward at a good level, so they are ready to follow the rules that help prevent infection. Including a conducive environment for infection prevention helps students to maintain a good level of infection behavior (environment behavior).[15] Roger (1978) refers to Suebsomran (2554)

Table 3: Generalized linear model predicting behavior

Generalized linear model predicting behavior	B	SE	Beta	*P*-value
Intercept	2.206	2.438		0.366
Age	0.407	0.452	0.060	0.369
Gender	1.683	0.463	0.182	0.000
Year	–0.368	0.335	–0.073	0.273
Knowledge about infection prevention	0.104	0.155	0.034	0.503
Attitude toward following infection prevention guideline	0.530	0.094	0.290	0.000
Attitude toward preventive rules and regulation support	0.553	0.075	0.370	0.000

identified attitude as a determinant of how a person thinks and feels about people around them in their environment and situations. Attitudes are based on beliefs that may influence future behavior. Furthermore, attitude is merely a readiness to respond per stimulus and is a dimension of assessment to show likes or dislikes about an issue which is considered in-person communication (interpersonal communication). That is the effect of exposure that will affect behavior further.[16] The respondents had a good attitude toward environmental regulations for infection prevention. This may be due to the attitude toward preventing infection.

Limitation

The survey was given to the students of Grade 10–12 students of Princess Chulabhorn Science High School, Chonburi, of KAP behavior toward pathogen spreading during a COVID-19 pandemic period. The data collected with the use of an online platform. This results in the usage of Google Forms. Google Forms is only available for those people that have access to the internet and smartphone. Therefore, the group that does not have the key was not reached during the data collecting period.

CONCLUSION

This research revealed that high school students at the Princess Chulabhorn Science High School, Chonburi,

have little knowledge of pathogens and show a positive attitude toward prevention behavior, a good attitude toward prevention rules and regulations, and good prevention behavior. The knowledge of the students is poor because the school does not have guidance, but some students have good information because they find it for themselves through the Internet channel, as long as they have the equipment and the connection. Therefore, this study can provide a positive attitude to young adolescents because they are constantly listening and following the rules. Therefore, specific knowledge about pathogen transmission and basic infection prevention is essential for everyone. It should be taught and strengthened in schools where all students know and are aware of the need, and all students will take action on a regular basis such as wearing a mask and washing hands with alcohol gel.

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