

Knowledge, attitude, and infection prevention: A study among high school students in Bangkok, Thailand

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ABSTRACT

Background: Knowledge about the transmission of diseases is essential for infection control. People in Thailand live in close proximity. Infection control is extremely integral in keeping the rest of the population from being infected. **Objectives:** The objectives of the study were to assess knowledge on infection control, and attitude on following health guidelines and how those two factors correlate with personal hygiene of Ruamrudee International School high school students in Bangkok, Thailand. **Materials and Methods:** The study was conducted using a questionnaire. A total of 204 Ruamrudee International School students in Bangkok participated. Infection and prevention control-related knowledge, attitudes toward following infection prevention guidelines, and personal hygiene were investigated. Differences between outcomes and sociodemographic factors were analyzed through independent tests and the ANOVA. In addition, preventive behaviors were analyzed by a generalized linear model. **Results:** The high school students showed a decent amount of knowledge with a mean of 6.92 (standard deviation [SD] = 2.15) correct answers out of 10. The students also showed a moderately good level of attitude toward following infection prevention guidelines, at 35.93 (SD = 6.45) of 50 points. In terms of personal hygiene, the respondents revealed a moderate level, at 34.71 (SD = 6.87) of 50 points. There was a statistically significant positive correlation between attitude toward preventive behavior and personal hygiene ($r = 0.567^{**}$, $p < 0.01$) from the correlation coefficient model. The generalized linear model also indicated that the attitude toward following health guidelines had a statistically significant effect on the personal hygiene adopted (Beta = 0.563, $p < 0.05$). **Conclusion:** This study revealed a good knowledge level about infection control among Ruamrudee International School students in Thailand and indicated positive attitudes on following health guidelines and personal hygiene. Even though there was no correlation found between knowledge and behavior, having a positive attitude about following health guidelines was a determinant of personal hygiene. To promote the personal hygiene of the students, the attitude of the students toward following health guidelines needs to also be improved. To improve the students' attitude, accurate knowledge about infection control should be given consistently by the school to promote personal hygiene.


KEY WORDS: Infection Prevention; Infection Control; Hygienic Behaviors

INTRODUCTION

One of the main concerns of health professionals is to maintain good infection control since failure in accomplishing this task

could lead to a spread of disease on a large scale.^[1] Infection control is the practice of maintaining a safe environment for everyone by reducing the risk of potential disease spreading and most common health complication.^[2,3]

Infectious diseases are caused by microorganisms such as viruses, bacteria, fungi, and parasites.^[4] These microorganisms can cause illness, such as fever, nasal congestion, or sore throat.^[4] Most of them can be transmitted through either direct or indirect contact, depending on the type of pathogen.^[4] Consequently, infectious diseases can

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spread rapidly from one person to another.^[5] To prevent further spreading, certain personal hygiene behaviors such as washing hands and wearing masks could be implemented.^[6,7] Therefore, people must have a good level of knowledge about infection control, a positive attitude toward following infection prevention guidelines, and good personal hygiene behavior to effectively prevent the spread of illness.^[7,8] This is extremely relevant when considering capital cities such as Bangkok, where a large majority of the population in the area live near each other.^[9] Therefore, to avoid infectious pathogens, the chain of infection must be broken.^[3] Chain of infection is a process of disease when specific conditions must be reached for microorganisms to spread. To break the chain of infection is to interrupt any state of the chain so the disease cannot be transmitted to another person. To break the chains of infection, the person must possess adequate amounts of knowledge and willingness to follow health guidelines.^[3,10,11]

This research aims to study a group of high school students from Ruamrudee International School (RIS) in Bangkok. Since RIS is one of the largest international schools in Thailand and is located near the high-risk area of the COVID-19 pandemic, studying disease prevention knowledge, attitudes, and personal hygiene could be of use to the disease prevention control of international schools nationwide. To see if the student has adequate knowledge about infection control possesses and positive attitude toward following health guidelines and then correlate those factors with the students' practices of personal hygiene.

MATERIALS AND METHODS

This was a cross-sectional observational study. An online questionnaire was purposely developed and made available through Google Forms between May 22, 2021, and June 22, 2021. High school students of Ruamrudee International School in Bangkok, Thailand, were invited to participate in completing an online questionnaire. A total of 204 students participated. Infection control-related knowledge, attitudes toward following health guidelines, and personal hygiene behaviors were assessed. All students are high schoolers in Ruamrudee in Bangkok. The invitation was sent by email to the institutional emails used by the students. In these emails, information about the study's objectives and 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, no personal data were collected from the participants.

Instruments

The questionnaire was developed using the information provided by the Department of Health, Ministry of Public Health in Thailand as guidelines in regard to infection and prevention control.^[3] In addition, other studies already

performed on the same topic in other countries were also used as reference since several common trends were used to assess each part in this study.^[4] The trends were then grouped and assessed. A preliminary version of the instrument was reviewed by two 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. Finally, the psychometric characteristics of the questionnaires were tested, as described in the statistical analysis subsection. The final version of the questionnaire contained 33 questions: The first three questions were about sociodemographic data (sex, grade level, and household monthly income), and 30 items were divided into three sections.

Knowledge about Infection Control

This section consisted of 10 questions on basic knowledge of infection and prevention control. The participants were asked to choose only one correct answer for choices (A, B, C, and D). One point was assigned to each correct answer while providing an incorrect answer received 0 points. The sum of all items was made, with higher scores corresponding to a higher level of knowledge. The score varies from 0 to 10.

Attitude Toward Following Health Guidelines

This section comprised 10 questions and the response categories consisted of a 5-point Likert scale (1 negative attitude and 5 for positive attitude). A sum of all the items within each factor was made to obtain a score. The "Attitudes toward preventive behaviors" varied from 10 to 50. The sum of all items was made, with higher scores corresponding to a higher level of attitude.

Personal Hygiene Behavior

This section included 10 questions and the response categories consisted of a 5-point Likert scale (1 for never, 2 for hardly, 3 for sometimes, 4 for usually, and 5 for always) with scores assigned to the number of hygienic behaviors (physical distance, hand washing, and mask wearing) practiced added up to a total score from 10 to 50. The sum of all items was made; hence, higher scores correspond to a higher personal hygiene level.

Ethical Consideration

This research used an anonymous data collection method to collect data from Grade 9 to 12 Students of Ruamrudee International School, Thailand, using Google Forms. Invitations were sent by email to the institutional emails used by the students. In these emails, information about the study's objectives and 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.

Statistical Analysis

The analysis was performed using SPSS version 26.0. An exploratory factor analysis, using principal component analysis with varimax rotation, was carried out to analyze the psychometric of demographic factors, knowledge, attitudes, and behaviors characteristics of the scales. The descriptive studies were presented in absolute (*n*) and relative (%) frequencies, mean (*M*), and standard deviations (*SD*). To assess the differences between the outcome variables (demographic factors, knowledge, attitudes, and personal hygiene) and the sociodemographic characteristics, considering the sample size, independent *t*-tests and the ANOVA were used, as appropriate. Pearson's correlation calculated the correlations between the outcomes of the study. 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 204 high school students. The sociodemographic characteristics of the sample are presented in Table 1. Most of the participants were female ($n = 134$, 65.7%) and male ($n = 40$, 34.3%) most participants were in Grade 11 ($n = 108$, 52.9%) followed by Grade 12 ($n = 73$, 35.8%). The minority of the participants in Grades 9–10 at only 23 responses accounted for 11.3% combined. For household income, most of the participants' families earned below 200,000 baht a month ($n = 143$, 70.1%), 200,000–400,000 baht a month ($n = 43$, 21.1%), and for above 400,000, 18 (8.8%).

Regarding knowledge, participants had a decent amount of knowledge correctly answering a mean of 6.92 ($SD = 2.15$) questions out of 10. Females have higher amounts of knowledge 7.33 ($SD = 1.80$) males have slightly lower scores at 6.51 ($SD = 2.50$). Grade levels 9–10 have the least knowledge with mean score out of 10 at 5.78 ($SD = 2.35$) followed by Grade 11 at 7.19 ($SD = 1.81$) lastly with Grade 12 at 7.13 ($SD = 2.30$) with mean average score of overall at 6.73 ($SD = 2.15$). With the overall mean of knowledge score in relation to the household income per month being 6.79 ($SD = 2.15$) with the highest score coming from the group of below 200,000 baht range 7.26 ($SD = 1.98$) with the other two groups of 200,000–400,000 baht getting a mean score of 6.56 ($SD = 2.42$) and with the above 400,000 baht getting a mean score of 6.56 ($SD = 2.04$).

Regarding the attitude of the participants, they have a score range of 35.93 ($SD = 6.45$) questions out of 10. Females having higher positive attitude 36.62 ($SD = 5.93$) males had slightly less at 35.23 ($SD = 6.96$). Grades 9–10 have a mean score at 36.22 ($SD = 6.15$) followed by Grade 11 at 35.85 ($SD = 5.40$) lastly with Grade 12 at 36.55 ($SD = 7.77$) with mean average score overall at 36.21 ($SD = 6.15$). With the overall mean of attitude score concerning the household income per month being 36.54 ($SD = 6.55$) with the highest score coming from the group of below 200,000 baht range 35.98 ($SD = 6.05$) with the other two groups of 200,000–400,000 baht getting a mean score of 36.09 ($SD = 7.17$) and with the above 400,000 baht getting a mean score of 37.56 ($SD = 6.44$).

Regarding the behavior of the participants, they have a score range of 34.71 ($SD = 6.87$) questions. Females have a higher positive attitude 35.87 ($SD = 6.38$) males have slightly less at 33.54 ($SD = 7.36$). Grades 9–10 have a mean score out of 37.30 ($SD = 6.26$) followed by Grade 11 at 34.43 ($SD = 6.57$) lastly with Grade 12 at 35.33 ($SD = 7.21$) with mean average score overall at 35.69 ($SD = 6.68$). With the overall mean of

Table 1: Differences in outcomes according to the sociodemographic characteristics of participants ($n=204$)

Sociodemographic characteristic	n (%)	Knowledge about infection control (Range 0–10)		Attitude toward health guidelines (Range 10–50)		Hygienic behavior (Range 10–50)	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
Gender		6.92	2.15	35.93	6.45	34.71	6.87
Male	70 (34.3)	6.51	2.50	35.23	6.96	33.54	7.36
Female	134 (65.7)	7.33	1.80	36.62	5.93	35.87	6.38
Grade level		6.73	2.15	36.21	6.15	35.69	6.68
Grades 9–10	23 (11.3)	5.78	2.35	36.22	5.29	37.30	6.26
Grade 11	108 (52.9)	7.19	1.81	35.85	5.40	34.43	6.57
Grade 12	73 (35.8)	7.23	2.30	36.55	7.77	35.33	7.21
Household income per month		6.79	2.15	36.54	6.55	35.32	7.13
Below 200,000	143 (70.1)	7.26	1.98	35.98	6.05	35.09	6.28
200,000–400,000	43 (21.1)	6.56	2.42	36.09	7.17	34.47	8.43
Above 400,000	18 (8.8)	6.56	2.04	37.56	6.44	36.39	6.69
Total	204 (100)	7.05	2.10	36.14	6.32	35.07	6.80

behavior score concerning the household income per month being 35.32 (SD = 7.13) with the highest score coming from the group of below 200,000 baht range 35.09 (SD = 6.28) with the other two groups of 200,000–400,000 baht getting a mean score of 34.47 (SD = 8.43) and with the above 400,000 baht getting a mean score of 36.39 (SD = 6.69) [Table 1].

The analysis of the correlations between the outcomes of the study – knowledge about infection control, attitudes toward following health guidelines, and personal hygiene behavior – revealed the existence of positive and statistically significant correlations between the attitude toward following health guidelines and personal hygiene ($r = 0.567^{**}$, $P < 0.01$) [Table 2].

Results from the generalized linear model indicated that the attitude toward following health guidelines had a statistically significant effect on the infection hygiene behaviors adopted (Beta = 0.563, $P < 0.05$). A positive attitude toward following health guidelines predicted the adoption of that infection hygienic behavior [Table 3].

DISCUSSION

The participants in this experiment showed a moderately good amount of knowledge about infection control. Although this may seem surprising, this trend is also mirrored in some higher education institutions and universities, even though having access to large amounts of information, there are still gaps

in knowledge present.^[12,13] For example, when the questions are more associated with common knowledge, such as what is the vector of malaria, a large percentage of the participants were capable of getting the answer right. However, when the questions were more specific or used specific terminology, a larger majority of the participants got the question wrong. This lack of knowledge could be attributed to a lack of interest and need for external research since this research was conducted during the start of the pandemic and most people were not concerned with the issue.

Although there is an increase in knowledge about infection control as the grade of the students increases. The amount of positive attitude remains relatively the same. While the amount of hygienic behavior decreases slightly. This could be attributed to higher grade being more focused on their studies and disregarding hygienic behavior as a result.

This result is consistent with the study of knowledge, attitudes, and preventive behaviors toward COVID-19 among higher education students in^[14] analyses that revealed sex differences regarding the main variables with females' scores systematically higher than males' scores. This is aligned with the “men's health gap” revealing that globally, health outcomes are substantially worse among men than women. Due to social constructions of masculinity, males are more unwilling and lack the motivation to search for health-related information, moreover, traditional masculinity is associated with risky behaviors and less utilization of preventive health care.^[15,16]

Although the results are not significant, the lowering of attitude and behavior could be explained by Abraham Maslow's Hierarchy of Needs, as explained by the MasterClass staff. Since the students have already received physiological needs, safety needs, they are less concerned with the issue, thus causing their attitude and behavior score to be lowered the more household income is present. Due to the natural relationship between the increase in household income and better treatment and safety.^[17,18]

Attitude toward following health guidelines, most participants had a decent attitude toward following health guidelines. This is because being a relatively competitive school, the students' knowledge level was similar to other studies. Most of the students had a good understanding of infection control. There are some relations between knowledge and attitude. The study from Mbroh^[19] about attitudes and behavior in psychology stated that classical conditioning, operant conditioning, and observational learning could be used to bring about attitude change. Classical conditioning can create positive emotional reactions to an object, person, or event by associating positive feelings with the target object. Operant conditioning can be used to strengthen desirable attitudes and weaken undesirable ones. People can also change their attitudes after observing the behavior of others. Another

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

Variable	Knowledge about infection control	Attitude toward following health guidelines	Hygienic behavior
Knowledge about infection control	1		
Attitude toward following health guidelines	0.218**	1	
Hygienic behavior	0.114	0.567**	1

**Correlation is significant at 0.01

Table 3: The generalized linear model predicting hygienic behaviors

Variables	B	SE	Beta	Sig.
Intercept	12.616	3.041		0.000
Gender	1.580	0.844	0.111	0.063
Grade level	-0.625	0.622	-0.059	0.316
Household income per month	-0.125	0.621	-0.012	0.840
Knowledge about infection control	-0.072	0.199	-0.022	0.720
Attitude toward following health guidelines	0.607	0.064	0.563	0.000

evidence on the relation between knowledge and attitude^[13] conducted a study about Assessing Knowledge, Attitude, and Practices of Hand 2019 Hygiene Among University Students in Minnesota State University in Mankato found that both levels of knowledge and attitude about hand hygiene were in good level still there were gaps in their knowledge, attitude, and practices. Once being educated or trained to increase the level of knowledge and understanding, humans tend to follow what they know. However, it is not only knowledge that matters according to Rukmanee *et al.*^[20] even when knowledge is provided through television it is not sufficient and a more direct teaching method is necessary for improving attitude and preventative behavior.

Most of the participants showed a decent level of infection prevention behavior. This may be because a positive attitude is correlated with the increase in hygienic behavior. Due to the participants, having a decent positive attitude toward the amount of hygienic behavior is also decent. A study done about COVID-19 done by Tawan Petpaiboon, supports the idea that promoting preventive behaviors and accurate knowledge should be done consistently by the school.^[21] To build up the same positive attitudes in the absence of rules as in this research, teachers and staff should show a sense of trust to students since this may form preventive behaviors in students.

Limitation

The questionnaire was given to the students during a COVID-19 pandemic period. Therefore, it was difficult to spread out the questionnaires manually. Hence, the questionnaire could not be hard copied. 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. For the knowledge toward infection and prevention part, the questions required some scientific knowledge. Some of the participants could search the questions that they were struggling with on the internet.

CONCLUSION

This study revealed a good knowledge level about infection control among Ruamrudee International School students in Thailand and indicated positive attitudes toward hygienic behaviors. Even though there is no causal relationship found between knowledge and behavior, having a positive attitude toward following health guidelines is the main determinant of hygienic behaviors. To promote the hygienic behavior of the students, the attitude of the students toward following health guidelines needs to be improved. To improve the students attitude, accurate knowledge about infection control should be given consistently by the school to promote hygienic behaviors.

REFERENCES

1. The Importance of Infection Prevention and Control (ipc). Richmond Dental Medical. Available from: <https://www.richmonddental.net/library/the-importance-of-infection-prevention-and-control-ipc>. [Last accessed on 2021 Jul 31].
2. Halton Healthcare Services. Infection Control- Halton Healthcare (n.d.). Available from: <https://www.haltonhealthcare.on.ca/patients/your-stay/infection-control>. [Last accessed on 2021 Jul 31].
3. Associate for Professional in Infection Control Epidemiology, Breaking the Chain of Infection. Available form: <http://www.ashnha.com/wp-content/uploads/2017/10/Break-the-Chain-of-Infection.pdf>. [Last accessed on 2021 Jul 31].
4. Mayoclinic. Infectious Disease. Available form: <https://www.mayoclinic.org/diseases-conditions/infectious-diseases/symptoms-causes/syc-20351173>. [Last accessed on 2021 Jul 31].
5. Infectious Diseases: Symptoms, Causes, Treatments. Cleveland Clinic. (n.d.). Available form: <https://www.my.clevelandclinic.org/health/diseases/17724-infectious-diseases>. [Last accessed on 2021 Jul 31].
6. Taylor JK, Basco R, Zaied A, Ward C. Hand hygiene knowledge of college students in Alabama, U.S.A. *Clin Lab Sci* 2010;23:89-93.
7. Sultana M, Alam Mahumud R, Razzaque Sarker A, Mahmud Hossain S. Hand Hygiene Knowledge and Practice Among University Students: Evidence from Universities of Bangladesh, Doverpass; 2015. Available from: <https://www.dovepress.com/hand-hygiene-knowledge-and-practice-among-university-students-evidence-peer-reviewed-fulltext-article-RMHP>. [Last accessed on 2021 Jul 31].
8. World Health Organization. Infection Prevention and Control of Epidemic-and Pandemic-prone Acute Respiratory Infections in Health Care. Geneva: World Health Organization; 2014.
9. Thailand Population 2021 (Live). Thailand Population 2021 (Demographics, Maps, Graphs). (n.d.). Available form: <https://www.worldpopulationreview.com/countries/thailand-population>. [Last accessed on 2021 Jul 31].
10. Robertson L, O'Toole J, Evans N. COVID-19 Pandemic: A World in Turmoil; 2020. Available form: <https://www.atrainceu.com/content/2-understanding-chain-infection>. [Last accessed on 2021 Jul 31].
11. Glomjai T, Kaewjiboon J, Chachvarat T. Knowledge and behavior of people regarding self-care prevention from novel Coronavirus 2019 (COVID-19). *Nurse Public Health Educ J* 2020;2:29-38.
12. Pradhan NA, Mughis W, Ali TS, Naseem M, Karmaliani R. School-based interventions to promote personal and environmental hygiene practices among children in Pakistan: Protocol for a mixed methods study. *BMC Public Health* 2020;20:481.
13. Mbroh LA. Assessing Knowledge, Attitude and Practices of Hand 2019 Hygiene Among University Students. *Cornerstone*; 2019. Available from: <https://www.cornerstone.lib.mnsu.edu/cgi/viewcontent.cgi?article=1948&context=etds>. [Last accessed on 2021 Jul 31].
14. Alves RF, Samarinda C, Precioso J. Knowledge, attitudes and preventive behaviors toward COVID-19: A study among higher education students in Portugal. *J Health Res* 2020;1:1-11.

15. Mansfield AK, Addis ME, Mahalik JR. Why Won't He Go to the Doctor?: The psychology of men's help seeking. *Int J Mens Health* 2003;2:93-109.
16. Baker P, Dworkin SL, Tong S, Banks I, Shand T, Yamey G. The men's health gap: Men must be included in the global health equity agenda. *Bull World Health Organ* 2014;92: 618-20.
17. MasterClass Staff. A Guide to the 5 Levels of Maslow's Hierarchy of Needs; 2020. Available from: <https://www.masterclass.com/articles/a-guide-to-the-5-levels-of-maslowshierarchy-of-needs>. [Last accessed on 2021 Jul 31].
18. Ajzen I. The theory of planned behavior. *Organ Behav Hum Decis Process* 1991;50:179-211.
19. Cherry K. Attitudes and Behavior in Psychology. *Verywell Mind Website*; 2021. Available from: <https://www.verywellmind.com/attitudes-how-they-form-change-shape-behavior-2795897>. [Last accessed on 2021 Jul 31].
20. Rukmanee N, Yimsamran S, Rukmanee P, Thanyavanich N, Maneeboonyang W, Puangsa-Art S, *et al*. Knowledge, attitudes and practices (kap) regarding influenza A (H1N1) among a population living along Thai-Myanmar border, Ratchaburi province, Thailand. *Southeast Asian J Trop Med Public Health* 2014;45:825.
21. Petpaiboon T. Knowledge, attitudes, and preventive behaviors toward coronavirus disease-19: A study among high school students in Bangkok. *Int J Med Sci Public Health* 2021;10: 62-7.

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