

Knowledge, Attitude and Preventive Behavior toward COVID-19 among high school students in Bangrak District, Bangkok, Thailand: Cross sectional survey

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Abstract: COVID-19, as an emerging disease, has been spreading since December 2019, hundreds of million of people were infected. The transmission route of COVID-19 was made directly between humans through droplet and respiratory secretions and indirectly through contact with contaminated surfaces and can also be transmitted by asymptomatic individuals. Thai people under 18 years old were not included in the first vaccine roll out plan, therefore being strict under COVID-19 measure is crucial to prevent this group of people from COVID-19

Purpose: To assess knowledge about COVID-19, attitude toward preventive behaviors, risk perception of getting COVID-19 and preventive behavior toward COVID-19 among high school students of a private high school in Bangkok.

Methodology: In May-July 2021, all students from a private high school in Bangrak district, Bangkok, Thailand were invited to participate in completing an online questionnaire. A total of 350 students participated. COVID-19 related knowledge, attitudes toward COVID-19, risk perception and preventive behaviors were assessed. Differences between outcomes and sociodemographics were analyzed through independent t-tests and the ANOVA. A generalized linear model was calculated to determine the predictive variables of preventive behaviors.

Findings: Students revealed a good level of knowledge about COVID-19 ($M=12.27$, $SD=2.27$), a good level of attitudes ($M=31.20$, $SD=3.91$), a moderate level of risk perception getting COVID-19 ($M=13.66$, $SD=3.88$) and a high level of preventive behavior toward COVID-19 ($M=47.35$, $SD=4.68$). A High level of attitudes toward COVID-19 and risk perception of getting COVID-19 were associated with practicing preventive behaviors and that having positive attitudes and a high level of risk perception were main determinants of COVID-19 preventive behaviors.

Conclusion: This study revealed a good knowledge level about COVID-19 among high school students in Bangkok and indicated positive attitudes toward preventive behaviors, high risk perception and a high behavior adoption of preventive behaviors. Having positive attitudes toward preventive behaviors and high risk perception were main determinants of these behaviors. Thus, this study can provide policy makers with relevant cues to help plan health education programs at schools, promoting preventive behaviors and reducing the spread of COVID-19. Investment in the creation of a health-promoting environment in schools which promotes students' trust regarding the safety of using public spaces by offering disinfectant gel, regulating the use of masks and organizing the spaces to guarantee the required physical distancing is fundamental to promote behavior adherence.

Keywords: COVID-19, preventive behavior, high school students.

1. INTRODUCTION

In late December 2019, a cluster of patients with an outbreak of pneumonia of unknown cause was reported in Wuhan, China . By January 7, a novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was identified as the cause of the coronavirus disease 2019 (COVID-19). Virus quickly spread in other regions in China as well as other countries; human-to-human transmission was proved. The World Health Organization (WHO) declared

COVID-19 a Public Health Emergency of International Concern on January 30, 2020 [1]. As of July 21, there were totally 14,562,550 confirmed cases and 607,781 deaths in the world. The Incubation Period (IP) of COVID-19 is about 1–14 days, and the period from the onset of symptoms to death was estimated to range from 6 to 41 days. Interpersonal transmission of COVID-19 occurs through respiratory droplets and contact transmission. As the SARS-CoV-2 was found in stool of patients from China and Thailand, there is a risk of fecal-oral transmission. The sources of infection are patients with symptomatic COVID-19 and asymptomatic patients and patients in IP who are carriers of SARS-CoV-2. [2] According to a study done in Wuhan city, the most common symptoms of COVID-19 were fever, fatigue, dry cough, myalgias, and dyspnea. Of the confirmed cases, 81% suffered mild to moderate disease, 14% suffered severe disease, and only 5% suffered critical illness, with an overall case fatality rate ranging from 2.3% to 5%. Recovery in mild cases occurred after 1 week, while in severe cases, death may be the fate. [3]

In Thailand, the coronavirus outbreak began on January 13, 2020, with the first confirmed case from China. The government's response to the outbreak began with screening and monitoring exposure. COVID-19 was screened at international airports as well as at hospitals for patients with a history of travel or exposure. It made a huge impact on Thailand in many different aspects. First of all, economically, one of the very common problems that result from this pandemic is that many companies go bankrupt. People start losing jobs, and many people do not have enough income for all their payments. Many, especially low wage workers, are affected as well as prisoners as they are more prone to permanently losing their jobs. [4] For example, Thailand's economy is based on tourism and exports, so most of the businesses were shut down. This greatly alters the economy of Thailand as claimed by the International Crisis Group. Secondly, mentally, these types of epidemics lead the public to experience psychological problems such as post-traumatic stress disorder, psychological distress, depression and anxiety. [5] Some studies have shown that post-traumatic stress disorder is closely related to depression and other psychological problems. In this way, people who were quarantined may easily adopt maladaptive strategies to maintain PTSD symptoms such as invasion, arousal symptoms and strong negative emotions. Therefore, some studies also assume that youth groups may have a tendency to develop psychological problems after experiencing traumatic stress disorder. [6]

There have been few assessments of KAP focusing on the key infection prevention and control measures listed. They have generally found levels of knowledge among healthcare workers and the public to be high and a lower proportion had good practice. Key infection prevention and control measures for COVID-19 include social distancing, hand hygiene, use of facemasks and personal protective equipment. [7] However, they have limited or no impact if not applied correctly through lack of knowledge, inappropriate attitudes or incorrect practice. They have generally found levels of knowledge among healthcare workers and the public to be high and a lower proportion had good practice. For example, a study among healthcare workers in Bangladesh found 99.5% had good knowledge about PPE but only 51.7% had good practice with inadequate supply and lack of training cited by many as reasons for suboptimal practice. In Nigeria, 83.7% of healthcare workers had good knowledge and 77.6% good practice towards COVID-19 prevention with good knowledge being associated with good practice. Among the public, a study on COVID-19 prevention measures in Viet Nam found 92.2% to have a high knowledge level, 68.6% a positive attitude and 75.8% practiced all 6 measures to prevent virus spread with higher knowledge being associated with increased likelihood of practicing prevention measures. In the public in Cameroon, 84.2% scored highly for knowledge, 69% for attitude and 60.8% for practice. [8] Evidence for educational interventions designed to improve KAP for personal protection against COVID-19 is lacking.

Increasing the level of knowledge and subsequently is the solution for prevention of COVID-19. Moreover, proper training of health care workers dealing with patients with suspected or confirmed COVID-19 can significantly prevent the development and transmission of disease to other patients and workers. Therefore, hospitals that provide services to patients with suspected or confirmed COVID-19 should increase the level of knowledge of health care workers and provide them with high-level training. In addition, preventive measures (such as N95 masks, surgical masks, goggles, and protective clothing) will be useful to ensure the safety of health care workers during COVID-19 outbreaks as well as in the future.

2. METHODS

Participants and procedure

This was a cross-sectional observational study. An online questionnaire was purposely developed and made available through Google Form between 15-May-2021 and 1-July-2021. All Assumption college students in high school were eligible and were invited to participate in the study. The invitation was sent to school social media network groups. The

students have access to school social media networks, so they all receive an invitation. In this invitation, 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 were explained. Participation was completely free and voluntary, and no personal data were collected from any participant. Of the 1,086 high school students who study at Assumption college, a total of 345 high school students who study at Assumption college participated in the study (response rate: 31.76%).

Instrument

The questionnaire was developed based on a literature review including the nature of COVID-19, symptoms of disease, transmission of COVID-19 from people who got infected to society, effectiveness and limitations of various types of vaccines and how to prevent from COVID-19 from numbers of sources such as WHO, DDC and others websites. (2) studies performed on the same topic 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 experts to validate its content. A pretest was then performed with a small sample of [who] 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 45 questions; 7 of them are about socio demographic data gender, age, level of education, participant's parent career and their choices of habitat and 38 other items divided into 4 sections which included Knowledge & Understanding about COVID-19, Attitude towards COVID-19, risk perception of getting COVID-19 and preventive COVID-19 behavior.

Knowledge about COVID-19 : this scale consisted of 15 questions related to knowledge and how well do Assumption College high school students understand the symptoms, characteristics and remedy of COVID-19. The participants were asked to choose the correct answer from multiple choices of 4. 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 scores corresponded to a higher level of knowledge.

Attitude toward preventive behavior : this scale was composed of 8 items, and response categories consisted of a five-point likert scale (from 1-strongly disagree, to 5 agree) with the highest score corresponding to more positive attitudes toward preventive behaviors. Some items on the scale were inverted for the analysis. A sum of all the items was made to obtain a score. The "Attitude toward preventive behaviors" factor consisted of 8 items and varied from 8 to 40 and the higher values corresponded to a more positive attitude toward preventive behaviors.

Risk Perception of Getting COVID-19 : this scale was composed of 4 items, and response categories consisted of a five-point likert scale (from 1-strongly disagree, to 5 agree) with the highest score corresponding to more positive risk perception of getting COVID-19. Some items on the scale were inverted for the analysis. A sum of all the items was made to obtain a score. The "risk perception of getting COVID-19" consisted of 4 items and varied from 4 to 20 and the higher values corresponded to a more positive risk perception of getting COVID-19.

COVID-19 Preventive Behavior : this scale referred to the number of preventive behaviors adoption and included 11 items which include several questions about participants' daily or common action in COVID-19 situations. For example, how much does participants agree with social distancing, public transport, frequent of washing or sanitize hand in one day and etc. are include in this questionnaire. The data analysis reports to xx items. Each item was answered using a five-point scale (From 1-Never to 5-Always), with one point assigned to each behavior that was always practiced. The number of behaviors practiced was added up. A high score on this scale indicated good preventive behaviors, ranging from 11 to 55.

Statistical analysis

The analysis was performed using SPSS for windows, version 26. To analyse psychometric characteristics of the scales, an exploratory factor analysis, using principal component analysis with varimax rotation, was carried out. Reliability was analyzed through the calculation of item-total correlation coefficients and Cronbach's alpha (α) for the scales of the

questionnaire. The descriptive analysis were presented in absolute (n) and relative (%) frequencies, mean (M) and standard deviations (SD). To assess the differences between the outcome variables (Knowledge, attitudes and behaviors) and the sociodemographic characteristics, considering the sample size, independent t-test and the ANOVA were used as appropriate. The correlations between the outcomes of the study were calculated by Pearson's correlation. Lastly, a generalized linear model was calculated to determine the predictive variables of the preventive behaviors. Exp (β) and the respective 95% confidence intervals (95% IC) were presented. Statistical significance was defined as $p < 0.05$.

Ethical Considerations

This research uses an anonymous data collection method to collect data from grade 10-12 Students of Assumption College School, Bangkok, Thailand, by using Google form. The invitation was sent to school social media networks to the students. In these invitations, 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.

3. RESULT

This study comprised a total of 350 students. The sociodemographic characteristics of the sample are presented in Table 1. Most participants were male (n=315, 90%). Most participants age's were 15-18 (n=214, 61.4) followed by 18 and above years of age group (n=105, 30%), respectively. 121 (34.6%) of the participants studied in grade 10 while the students who studied in 12 grade (n=118, 33.7%). Most participant's parents worked as teacher / employee / official (n=148, 42.3%) and lived in a single house (n=199, 56.9%). There were a large number of participants who live alone, without children and/or senior members (n=226, 64.6%). 226 (64.6%) of all the participants had no congenital disease.

Regarding knowledge about COVID-19, male participants showed higher knowledge scores (M=12.44, SD=2.24) than female participants (M=10.71, SD=1.99). Age groups of below 15 years showed the highest COVID-19 related knowledge score of (M=12.70, SD=2.25). Followed by participants who aged 15-18 and 18 and above (M=12.20, SD=2.14), (M=12.30, SD=2.53), successively. Grade 10 participants provided the highest scores among others (M=13.17, SD=15.9). Participants who were categorized by parent's occupation showed almost equal stats in terms of knowledge about COVID-19.

Participants whose parents were health care workers had the highest scores (M=12.42, SD=2.40). For housing type, participants who lived in condominiums or apartments provided the highest scores (M=12.39, SD=2.32).

Concerning attitudes toward COVID-19, grade 10 students showed in general highly favorable attitudes toward preventive behavior (M=32.51, SD= 4.13). By age, participants who aged 15 and below provided marks (M=32.60, SD= 4.72), these being higher than all other age groups. Differing by sex: females showed a higher perception of risk than males (M=32.71, SD= 3.30), (M=31.03, SD= 3.94), respectively. In addition, participants who lived with children and/or seniors and had no congenital disease showed the highest scores in each category (M=31.02, SD=4.05), (M=31.61, SD=3.94).

Regarding risk perception of getting COVID-19, female participants showed that they had more risk due to COVID-19 (M=14.91, SD=3.89). 18 and above year old participants showed the highest mean scores (M=15.29, SD=2.30). (M=15.08, SD=2.47) was the mean scores for grade 12 participants and also the highest scores. Participants whose parents were health care workers were the groups to get the highest score (M=15.50, SD= 2.51). Participants who lived in a single house and also lived alone had the highest scores (M=13.84, SD=3.88), (M=13.86, SD=3.81). Participants who had congenital disease showed the highest scores (M=14.60, SD=3.30).

Concerning towards COVID-19 Preventive behavior, female participants had more scores than male participants (M=49.37, SD=3.89), (M=47.13, SD=4.71). By age, participants who at age 15 and below had the highest scores (M=48.47, SD=3.98). Grade 12 participants provided the highest scores (M=48.01, SD=3.49).

Like risk perception in normal daily life, participants whose parents were health care workers and lived in a single house provided the highest scores (M=48.11, SD=3.42), (M=47.39, SD=4.75).

Table 1: Differences in outcomes according to the sociodemographic characteristics of participants (N = 350)

Sociodemographic characteristics	n (%)	Knowledge & Understanding about COVID-19 (Range 0-15) M (SD)	Attitude toward preventive behaviors (Range 8-40) M (SD)	Risk perception of getting COVID-19 (Range 4-20) M (SD)	COVID-19 Preventive behavior (Range 11-55) M (SD)
Gender					
Male	315 (90)	12.44 (2.24)	31.03 (3.94)	13.52 (3.86)	47.13 (4.71)
Female	35 (10)	10.71 (1.99)	32.71 (3.30)	14.91 (3.89)	49.37 (3.89)
Age					
< 15	30 (8.6)	12.70 (2.25)	32.60 (4.72)	12.47 (4.70)	48.47 (3.98)
15-18	215 (61.4)	12.20 (2.14)	31.72 (3.93)	13.04 (4.13)	46.89 (5.26)
18 and above	105 (30)	12.30 (2.53)	29.74 (3.17)	15.29 (2.30)	47.99 (3.28)
Year Level					
Grade 10	121 (34.6)	13.17 (15.9)	32.51 (4.13)	11.52 (4.48)	46.62 (5.25)
Grade 11	111 (31.7)	11.73 (2.44)	31.03 (3.83)	14.50 (3.38)	47.46 (5.02)
Grade 12	118 (33.7)	11.86 (2.44)	30.02 (3.34)	15.08 (2.47)	48.01 (3.49)
Parent's Occupation					
Health Care worker	38 (10.9)	12.42 (2.40)	30.34 (2.93)	15.50 (2.51)	48.11 (3.42)
Teacher / Employee / Official	148 (42.3)	12.29 (2.30)	31.28 (3.95)	13.47 (3.95)	47.28 (4.53)
Business owner	128 (36.6)	12.24 (2.27)	31.41 (4.02)	13.39 (4.03)	47.25 (5.01)
Freelance / Others	36 (10.3)	12.14 (2.14)	31.03 (4.29)	13.50 (3.81)	47.22 (5.23)
Housing Type					
Single House	199 (56.9)	12.27 (2.28)	30.95 (3.95)	13.84 (3.88)	47.39 (4.75)
Townhouse	40 (11.4)	11.95 (2.14)	32.70 (3.50)	12.80 (4.21)	47.80 (4.85)
Condominium / Apartment	111 (31.7)	12.39 (2.32)	31.11 (3.90)	13.66 (3.74)	47.13 (4.50)
Living Arrangement					
Live Alone / Without children and/or senior	226 (64.6)	11.99 (2.34)	31.30 (3.84)	13.86 (3.81)	47.25 (4.68)
With children and/or senior	124 (35.4)	12.78 (2.06)	31.02 (4.05)	13.31 (3.99)	47.54 (4.68)
Having Congenital Disease					
No	226 (64.6)	12.33 (2.21)	31.61 (3.94)	13.15 (4.08)	47.12 (4.74)
Yes	124 (35.4)	12.16 (2.38)	30.45 (3.75)	14.60 (3.30)	47.77 (4.54)
Total	350 (100)	12.27 (2.27)	31.20 (3.91)	13.66 (3.88)	47.35 (4.68)

The analysis of the correlations between the outcomes of the study - knowledge, attitudes, risk perception and behavior - revealed the existence of negative and statistically significant correlations between the preventive behaviors and knowledge related to COVID-19 ($r=-0.194^{**}$, $p<0.01$), and positive statistically significant between the preventive behavior and the attitudes toward preventive behavior ($r=0.379^{**}$, $p<0.01$), risk perception of getting COVID-19 ($r=0.200^{**}$, $p<0.01$). (Table 2.)

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

Variables	Knowledge & Understanding about COVID-19	Attitude toward preventive behaviors	Risk perception of getting COVID-19	COVID-19 Preventive behavior
Knowledge & Understanding about COVID-19	1			
Attitude toward preventive behaviors	-0.098	1		
Risk perception in normal daily life	-.197**	-0.064	1	
COVID-19 Preventive behavior	-.194**	.379**	.200**	1
**Correlation is Significant at the 0.01				
*Correlation is Significant at the 0.05				

Referring to Table 3, the generalized linear model showed that attitudes toward preventive behaviors ($B=0.424$, $p<0.01$) and risk perception of getting COVID-19 ($B=0.146$, $p<0.01$) had significant effects on the preventive behaviors. [Table 3].

Table 3: Generalized linear model predicting preventive behaviors of COVID-19

	β	SE	p	EXP (β)	95% IC	
					Lower	Upper
Gender	0.467	0.776	0.548	0.03	-1.059	1.994
Age	-0.356	0.585	0.544	-0.044	-1.507	0.796
Year Level	1.015	0.447	0.024	0.18	0.136	1.895
Parent's Occupation	-0.017	0.285	0.951	-0.003	-0.577	0.542
Housing Type	-0.183	0.246	0.457	-0.036	-0.668	0.301
Living Arrangement	0.727	0.475	0.127	0.074	-0.208	1.661
Having Congenital Disease	0.479	0.498	0.337	0.049	-0.5	1.457
Knowledge & Understanding about COVID-19	-0.174	0.108	0.106	-0.085	-0.386	0.037
Attitude toward preventive behaviors	0.506	0.061	0	0.424	0.387	0.626
Risk perception of getting COVID-19	0.175	0.063	0.005	0.146	0.052	0.299

4. DISCUSSION

The results showed that participants had a high level of knowledge about COVID-19, male students revealed a higher level of knowledge about COVID-19 than female students. However, females have a more positive attitude toward preventative actions and risk perception of contracting COVID-19 than males. This could be related to the fact that women are more careful than men when it comes to their activities, contrast to Mungkalarungsi S. et al., [9] that conducted a study assessing level of COVID-19 related knowledge among students aged 16-18 in Thailand and from 2,173 participants, found that participants had a moderate level of COVID-19 knowledge. This could be attributed to the fact that the sample size of the two studies was much different. There were some similarities between the result scores in terms of risk perception of getting COVID-19 in this research and Mungkalarungsi S. et al. [9], Cha Luckanakul C. [10] which also showed low numbers of risk perception of getting COVID-19. This may be caused by the lockdown policies that the Thai government has published to keep citizens in specific areas stayed at their places and avoid meetings with each other which could lead to spreading of COVID-19. In contrast to Nilpetch P.'s [11] studies that most participant had a moderate level of risk perception of getting COVID-19. This may be because of the period conducting this study during Jun-July COVID-19 infection rate in Bangkok was high.

The level of knowledge and awareness regarding COVID-19 scores might also be influenced by the student's year. Among the other classes, grade 10, which must be the youngest in Thai senior high school, received the highest scores,

13.17. This could be due to the Grade10 educational timetable, while grade 11 and 12 must concentrate on upcoming university entrance exams such as the SAT, IELTS, and admission tests. Apart from that, parents' employment has a significant impact on their children's knowledge and awareness of COVID-19, attitudes toward preventative practices, and perceptions of the risk of contracting COVID-19. Moreover, children raised by health-care workers have the best knowledge and awareness of COVID-19, as well as the lowest risk perception of contracting COVID-19; however, children raised by business owners have the best attitudes toward preventative actions. Furthermore, people's awareness and understanding of COVID-19, attitudes toward preventive behaviors, risk perception of getting COVID-19, and COVID-19 preventive activity have all been influenced by the type of home they live in. Individuals who live in condominiums and apartments have the best awareness of COVID-19, with a score of 12.39, while those who live in townhouses have the lowest knowledge and understanding of COVID-19, with a score of 11.95. The way you live has an impact on your knowledge and understanding of COVID-19. For example, participants who have others in their house tend to get more information and news about COVID-19 situation in order to take care of others not to be infected. People who live alone, with children, and seniors received 11.99 and 12.78 points, respectively. People who have congenital diseases have lower scores, 12.16, on awareness of COVID-19 than those who do not have congenital diseases, 12.16. Attitude toward preventive behaviors and risk perception of getting COVID-19 scores of participants who had congenital disease did not show a significant difference. It could be assumed that there are other factors that affected COVID-19 preventive behavior more than having.

According to the table, COVID-19 preventive behavior scores which were done by participants showed a high level which could be affected by participants' surrounding people that have a preventive behavior. This caused the participants themselves to get influenced by others. Moreover, school and staff play a big part in cultivating good behavior that could keep them away from getting COVID-19. This result showed a relation in terms of COVID-19 preventive behavior scores in this research between Nilpetch P.'s [11] which also got high scores in the same topics. Unlike, Piyachotisukij L.'s [12] study that illustrates the difference between this result which has lower scores than this research.

According to table2, COVID-19 preventive behavior correlates between attitude toward preventive behaviors at 0.379 and risk perception of getting COVID-19 at 0.200. This relationship may be caused by participants' mindset about getting and preventing infection by COVID-19. For example, participants who got the high score in attitude toward preventive behaviors tend to have a better attitude towards COVID-19 situations and it also caused them to create preventive behavior toward COVID-19. So, in order to have better or effective COVID-19 preventive behavior, participants need to improve their attitude toward preventive behaviors and risk perception of getting COVID-19. It could be done by various ways such as schools should have more information about COVID-19 effected or the symptom to alert high-school students to get correct and reliable sources of information and adapt it to their daily life. Moreover, teachers or educational staff need to make this as a daily topic to talk to their children in order to not let these topics out of students' focus and make them more aware in order to have better preventive behavior.

Limitation

Due to the fact that Thailand was on COVID-19 circumstances, almost every place was locked down especially, in school. So, it was definitely a challenge to collect the precise data just from online survey and through social media. Moreover, it can not be sure that whoever did the questionnaire was focused and participated, not just carelessly answered. In addition, it was hard to reach out for every target and to provide an equal chance to them because social interaction was always harder than on-site conversation.

5. CONCLUSIONS

This study revealed a good knowledge level about COVID-19 among high school students in Bangkok and indicated positive attitudes toward preventive behaviors, high risk perception and a high behavior adoption of preventive behaviors. Moreover, it reinforces that a high level of attitude and a high risk perception were associated with practicing preventive behaviors and that having positive attitudes toward preventive behaviors and high risk perception were main determinants of these behaviors. Thus, this study can provide policy makers with relevant cues to help plan health education programs at schools, promoting preventive behaviors and reducing the spread of the virus. Investment in the creation of a health-promoting environment in schools which promotes students' trust regarding the safety of using public spaces by offering disinfectant gel, regulating the use of masks and organizing the spaces to guarantee the required physical distancing is fundamental to promote behavior adherence.

REFERENCES

- [1] Chih-Cheng Lai, Yen Hung Liu, Cheng-Yi Wang, Ya-Hui Wang, Shun-Chung Hsueh, Muh-YenYen, Wen-Chien Ko and Po-Ren Hsueh. Asymptomatic carrier state, acute respiratory disease, and pneumonia due to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2): Facts and myths. *Journal of Microbiology, Immunology and Infection*. Volume 53, Issue 3, June 2020, Pages 404-412. Available from: <https://www.sciencedirect.com/science/article/pii/S1684118220300402>
- [2] Gaurav Kumar, Mukesh Kumar, Mansi Gupta and Meerut, Uttar Pradesh. India Strategies and Statics to Control the Corona Virus (Covid-19) Global Epidemic 2019-20: A Review. *Recent Trends in Pharmaceutical Sciences and Volume-2, Issue-2 (March-August, 2020) Research*. Volume-2, Issue-2 (March-August, 2020).
- [3] medRxiv preprint. Epidemiological and clinical features of 2019-nCoV acute respiratory disease cases in Chongqing municipality, China: a retrospective, descriptive, multiple-center study. [cited on 2021 Sep 15]. Available from: <https://www.medrxiv.org/content/medrxiv/early/2020/03/03/2020.03.01.20029397.full.pdf>
- [4] Zeinab A. Kasemy, Wael A. Bahbah, Shima K. Zewain, Mohammed G. Haggag, Safa H. Alkalash, Enas Zahran, and Dalia E. Desouky. Knowledge, Attitude and Practice toward COVID-19 among Egyptians. *J Epidemiol Glob Health*. 2020 Dec; 10(4): 378–385. doi: 10.2991/jegh.k.200909.001.
- [5] Liang, L., Ren, H., Cao, R. et al. The Effect of COVID-19 on Youth Mental Health. *Psychiatr Q* 91, 841–852 (2020). <https://doi.org/10.1007/s11126-020-09744-3>
- [6] Tawan Petpaiboon. Knowledge, attitudes, and preventive behaviors toward coronavirus disease-19: A study among high school students in Bangkok. *International Journal of Medical Science and Public Health* 2021, Volume 10, Issue 1.
- [7] Robin Goodwin, Juthatip Wiwattanapantuwong, Arunya Tuicomepee, Panrapee Suttiwan, Rewadee Watakakosol, and Menachem Ben-Ezrac. Anxiety, perceived control and pandemic behaviour in Thailand during COVID-19: Results from a national survey. *J Psychiatr Res*. 2021 Mar; 135: 212–217. doi:10.1016/j.jpsychires.2021.01.025
- [8] Ferdous MZ, Islam MS, Sikder MT, Mosaddek ASM, Zegarra-Valdivia JA, Gozal D (2020). Knowledge, attitude, and practice regarding COVID-19 outbreak in Bangladesh: An online-based cross-sectional study. *PLoS ONE* 15(10): e0239254. <https://doi.org/10.1371/journal.pone.0239254>
- [9] Mungkalarungs S., Tangjongrach K., Sooparichthiros P., Limprasert A., Eamsawat K., Khieosiri I., Ratanavilai N. Intention to vaccinate against COVID-19 of high school students aged 16-18 years old in Thailand: Cross sectional online survey. *Institute for Urban Disease Control and Journal*; 2021; 6 (2).
- [10] Chanacharn Luckanakul. COVID-19 related Knowledge and Preventive behaviour of Delta Variant among grade 10-12 students in Bangkok. *International Journal of Healthcare Sciences* ISSN 2348-5728 (Online) Vol. 9, Issue 2, pp: (12-18), Month: October 2021 - March 2022.
- [11] Preechamong Nilpetch. Knowledge, Attitude and COVID-19 Preventive Behaviour among grade 10-12 students in Bangkok. *International Journal of Healthcare Sciences* ISSN 2348-5728 (Online). Vol. 9, Issue 2, pp: (71-77), Month: October 2021 - March 2022.
- [12] Leelapa Piyachotisukij. Knowledge, Attitudes, and Preventive Behavior of COVID-19 among High School Students. *International Journal of Healthcare Sciences* ISSN 2348-5728 (Online) Vol. 9, Issue 2, pp: (19-24), Month: October 2021 - March 2022.