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Willingness to vaccinate against COVID-19 of high school students: A study among grade 9-12 students in an international school in Bangkok, Thailand

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Abstract

Objective: The purpose of this study was to assess the willingness to vaccinate against COVID-19 and identify predictors of and reasons for unwillingness to vaccinate among high school students in an international school in Bangkok, Thailand.

Methods: In June 2021, all students from Ruamrudee International School of Bangkok were invited to participate in completing an online questionnaire. A total of 221 students participated. COVID-19 related knowledge, attitudes toward COVID-19 and willingness to vaccinate against COVID-19 were assessed.

Findings: The analysis of the correlations between the outcomes of the study indicated the existence of positive and statistically significant correlations between the willingness to vaccinate against the COVID-19 vaccine and COVID-19 related-knowledge ($r=.223^{**}$, $p<0.01$). Other predictors that contributed include having a moderate level of knowledge regarding COVID-19, poor risk perception due to online learning under COVID-19 lockdown measures, low level of confidence in the government, lack of quality vaccines availability and the uncertain side effects of each vaccine.

Conclusion: The low level of willingness to vaccinate against COVID-19 is causing a major problem as vaccines are key to lower the COVID-19 cases. Education on COVID-19 should be provided and the government should take action to increase students' confidence in them.

Keywords: COVID-19, Vaccination, Willingness, Knowledge

INTRODUCTION

Coronavirus disease (COVID-19) contains a virus known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which can severely harm the body [1]. Its chain of infection begins with droplets from an infected person's cough, sneeze, or breath that can be found in the air or on any surface you contact [1]. When infected, the virus moves down the respiratory tract; it attacks receptors on healthy cells by attaching its spiky surface proteins, especially cells in your lungs [1]. Since the coronaviruses store their genetic material in RNA (ribonucleic acid), it will replicate this and the virus will soon spread in the body [2]. Symptoms of this disease can range from mild to severe and may appear 2-14 days after someone is exposed to the virus; this includes fever, cough, tiredness, difficulty breathing, chest pain, etc. Preventative measures involve regularly washing your hands with soap and water or alcohol, maintaining social distance of at least 1 meter, avoiding touching your eyes, nose or mouth, and staying home if you feel unwell [2].

Currently, COVID-19 is rapidly spreading around the world and has become a major global threat, affecting more than 185 million people with over 4 million deaths worldwide [3]. Achieving herd

immunity through high vaccination coverage rates in the population is required to stop this pandemic from causing further damage. Vaccines boost immunity within the body and prevent us from getting the COVID-19 virus. There are many types of vaccines available globally such as whole virus, protein subunit, viral vector, and nucleic acid (RNA and DNA). Whole virus vaccines include live attenuated vaccines which use a weakened form of a virus but can still grow and replicate and inactivated vaccines which contain genetic material that has been destroyed, making them incapable of infecting and replicating cells but still capable of triggering an immune response [5]. Protein subunit vaccines use a specific protein from the virus [5]. Viral vector vaccines rely on body cells to produce antigens, which is accomplished by delivering genetic code for the COVID-19 spike proteins present on the virus's surface, into human cells via a modified virus [5]. Nucleic acid vaccines contain instructions for the body to make a specific protein from the pathogen, which is used to manufacture antigens and trigger an immune response [5].

As the COVID-19 pandemic worsens in Thailand, concerns regarding vaccine availability and its side effects arose. As of July 2021, there are more than 330,000 cases, over 2700 deaths, and up to 85,000 active cases [6]. This number had been rising exponentially over the past week due to the new variants of the virus, for instance, the alpha, beta, gamma, and delta variants. There are 4 vaccines available in Thailand: AstraZeneca, Sinovac, Moderna, and Johnson-Johnson, with Sinovac being the most common brand [7]. Sinovac contains an inactivated virus, which has been clinically proven that it has a low efficiency as it is not resistant to new variants of the coronavirus spreading in Thailand. Currently, around 14% of Thailand's population had received their first dose of vaccination while around 5% received two doses [6].

Government has prioritized vaccinating healthcare workers at high risk of exposure and older people, especially ones with congenital diseases, followed by teachers and working people [7]. Soon after these groups of people are vaccinated, the next focus group will be students under 18. However, the study conducted has revealed that this group of people are filled with hesitancy of getting vaccinated. Although the timeline of having quality vaccines for distribution is still uncertain, it is salient to inform the public regarding the safeness of the vaccines and gain their trust, so that they will cooperate well and be willing to receive the vaccines once it arrives. Consequently, there is also a critical need to inform them regarding knowledge on COVID-19 in order to ease the curb of the pandemic.

The objective of this study is to assess the willingness to vaccinate against COVID-19 and identify predictors of and reasons for unwillingness to vaccinate among highschool students in an international school in Bangkok, Thailand. Moreover, this study also investigates whether there is a correlation between knowledge regarding COVID-19, risk perception, level of confidence in the government on COVID-19 and willingness to vaccinate against COVID-19.

Methods

Participants and procedure

This was a cross sectional study where a purposely developed online questionnaire was made available through Google From between the 1st June to 1st July 2021. The invitation to fill the form was sent to all students in grade 9-12 at the Ruamrudee International School, Bangkok, Thailand via school social media groups that all students have access to. All participation was voluntary and information about the purpose of the study, ethical guarantee of confidentiality, anonymity in the data collected was informed in the consent.

Instrument

The questionnaire was developed based on a literature review including (1) information provided by and guidelines from the World Health Organization and Ministry of Public health of Thailand. (2) Several common items were used to assess each of the dimensions analyzed in this study in previous studies on the same issue in other countries. Three infection control specialists reviewed the preliminary version of the instrument to validate its content. Then, a small group of high school students took a pretest to assess understanding and difficulty. There were no modifications to any of the questions. The

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questionnaires' psychometric features were assessed, as indicated in the statistical analysis section. There were 16 questions in the final version of the questionnaire; 3 questions about socio demographic data (gender, grade level, and congenital disease), 10 questions about COVID-19 related knowledge, 3 questions about risk perception of getting COVID-19, level of confidence in the government, and willingness to vaccinate against COVID-19 vaccine.

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 various factors: sociodemographic characteristics, knowledge about COVID-19, risk perception of getting COVID-19, level of confidence in the government on the COVID-19 Vaccines and willingness to vaccinate against COVID-19 vaccine characteristics of the scales. The descriptive studies were presented in absolute (n) and relative (%) frequencies, mean (M), and standard deviations (SD). Differences between the outcome variables and the sociodemographic characteristics, considering the sample size, were assessed using independent t-tests and the ANOVA. Pearson's correlation was used to calculate the correlations between the outcomes of the study. Lastly, predictive variables of the preventive behavior were presented in a generalized linear model with Exp (β) and the respective 95% confidence intervals (95% CI). Lastly, statistical importance was elucidated at $p < 0.05$.

Ethical Consideration

This study employed an anonymous Google form to collect data from students in Ruamrudee International School of Bangkok, Thailand in grades 9-12. The invitation was sent to the students' school's social media groups. The invitation provided details on the study's purpose and the ethical assurance of data protection and anonymity.

Results

This study comprised a total of 221 students, 154 females (69.7%) and 67 males (30.3%). Sociodemographic characteristics of the sample and predictive variables are shown in Table 1. Most students were studying in grade 11 (n=97, 43.9%), followed by grade 10 (n= 60, 27.1%) and grade 9 (n=35, 15.8%) respectively. 198(89.6%) of the students reported not having congenital disease while 23 (10.4%) of the students reported having.

Regarding the knowledge about COVID-19, students indicated a moderate knowledge regarding COVID-19, answering with a mean score of 6.70 (SD=1.23) out of a total of 10. Female students showed higher knowledge scores (M=6.89, SD=1.11) than male students (M=6.25, SD=1.37). Grade 12 students showed the highest COVID-19 related knowledge score of 7.34 (SD=1.34) while Grade 10 students showed a lowest score of 6.58 (SD=1.15). Students who had no congenital disease had a higher COVID-19 related knowledge score of 6.71 (SD=1.21)

Students indicated a low level of risk perception of getting COVID-19 with the average score of 2.21 from a full score of 5. Females revealed a slightly higher risk (M=2.24, SD=0.96) compared to males (M=2.15, SD=1.06). Grade 9 students showed the highest risk with a score of 2.34 (SD=1.14), while Grade 10 students showed the lowest risk with a score of 2.10 (SD=0.93). Students without congenital disease reported a higher risk with a score of 2.26 (SD=0.98) than students with congenital disease (M=1.78, SD=1.00).

Concerning the level of confidence in the government on the COVID-19 vaccines, females reported a higher score of 2.5 (SD=0.76) out of a full score of 5. Grade 11 students showed the most confidence in the government (M=2.61, SD=0.87) while grade 9 students showed the least confidence in the government (M=2.06, SD=0.80).

In terms of willingness to vaccinate against COVID-19 vaccine, students indicated a mean of 3.70 (SD=0.93) out of a full score of 5, with females reporting a slightly higher score than males. Students without congenital disease revealed a mean of 3.74 (SD=0.88) whilst students with congenital disease revealed a mean of 3.39 (SD=1.27).

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Table 1: Differences in outcomes according to the sociodemographic characteristics of participants (N=221)

Sociodemographic Characteristics		Knowledge about COVID-19 (Range 0-10)		Risk Perception of Getting COVID-19 (Range 1-5)		Level of Confidence in the Government on the COVID-19 Vaccines (Range 1-5)		Willingness to Vaccinate Against COVID-19 Vaccine (Range 1-5)	
Gender		6.70	1.23	2.21	0.99	2.48	3.70	3.70.	0.93
Male	67 (30.3)	6.25	1.37	2.15	1.06	2.42	1.00	3.67	1.13
Female	154 (69.7)	6.89	1.11	2.24	0.96	2.50	0.76	3.71	0.83
Grade Level									
Grade 9	35 (15.8)	6.63	1.24	2.34	1.14	2.06	0.80	3.71	1.02
Grade 10	60 (27.1)	6.58	1.15	2.10	0.93	2.50	0.87	3.77	1.06
Grade 11	97 (43.9)	6.60	1.20	2.23	0.95	2.61	0.78	3.63	0.81
Grade 12	29 (13.10)	7.34	1.34	2.24	1.09	2.48	0.87	3.79	0.94
Having Congenital Disease									
No	198 (89.6)	6.71	1.21	2.26	0.98	2.45	0.80	3.74	0.88
Yes	23 (10.4)	6.61	1.44	1.78	1.00	2.70	1.15	3.39	1.27
Total	N=221 (100)	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.

The analysis of the correlations between the outcomes of the study, knowledge, indicated the existence of positive and statistically significant correlations between the willingness to vaccinate against the COVID-19 vaccine and COVID-19 related-knowledge (r=.223**, p<0.01).(Table 2).

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

Variable	Knowledge about COVID-19	Risk Perception of Getting COVID-19	Level of Confidence in the Government on the COVID-19 Vaccines	Willingness to Vaccinate Against COVID-19 Vaccine

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Knowledge about COVID-19	1			
Risk Perception of Getting COVID-19	-.014	1		
Level of Confidence in the Government on the COVID-19 Vaccines	.087	-.073	1	
Willingness to Vaccinate Against COVID-19 Vaccine	.223**	.108	.072	1
**Correlation is significant at 0.01				

Results from the generalized linear model indicated that the COVID-19 related knowledge (Beta=.230, p<0.01) had a statistically significant effect on the willingness to vaccinate against the COVID-19 vaccine.

Table 3: Generalized linear model prediction of willingness to vaccinate against COVID-19

	B	**SE**	**Beta**	**Sig**
Intercept	2.705	.497		.000
Knowledge about COVID-19	.174	.052	.230	.001
Risk Perception of Getting COVID-19	.087	.074	.079	.242
Level of Confidence in the Government on the COVID-19 Vaccines	.097	.062	.104	.120

Table 4: Reasons for Hesitancy on COVID-19 Vaccination

Reasons	n	%
1. Not confident in the vaccines provided by the government	45	50.56
2. Concern about the long-term side effects of the vaccines	39	43.82
3. Not at risk of contracting COVID-19	5	5.62

Discussion

Given the increased severity and death rate of the COVID-19 that was at its peak when the survey was sent out to students, it is concerning that over 81% of the students still indicated that they were still hesitant to get vaccinated. It has been revealed that the leading factor to this is due to a moderate level of knowledge regarding COVID-19 where students only received a mean score of 6.7 out of 10, considering that the questions tested were relatively

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high school level. Moreover, the study acknowledges that over 50% of the students were not confident in the vaccines provided by the government and over 43% were concerned about the long-term effects. Considering that vaccines are key to flatten the COVID-19 curves, these results from the study are worrying. The COVID-19 situation in Thailand is getting worse every day, people are blaming the government for the lack of quality vaccine availability. As of May 2021, the Thai Public Health Minister announced that people will not be given a choice of COVID-19 vaccine they receive [8]. The minister stated that people will only be injected with the most suitable option available for their demographic, even though they are free of charge [8]. This has raised criticism among the Thai people as they are unsatisfied, knowing that the efficiency of each vaccine is different.

Discontent with the military-backed government's vaccination plan has grown; people are setting up political protests in various forms such as parades or through social media due to the fact that governments are only providing low quality vaccines [9]. If this continues, vaccine hesitancy might increase and the COVID-19 pandemic will not cease. Thailand's aim to inoculate at least 70% of its population by year-end will also not be a success [9]. It is extremely important that the government take action now and gain the public's trust, either by proving that the vaccines available right now are effective or importing quality vaccines for the citizens.

Previous studies had shown that there seemed to be common factors leading to the people's hesitancy and unwillingness to receive COVID-19 vaccines. For instance, a study conducted in the United Kingdom revealed that people who had poor adherence to COVID-19 government guidelines showed high hesitancy in receiving the vaccine [10]. Another study conducted in France had indicated that there was a significant connection between political beliefs and attitude to vaccines [11]. As the pandemic unfolds, there was a public discussion about vaccination safety, as well as campaigns condemning government officials to a defensive posture [11]. However, this study contrasts with a study conducted in Australia, where these two variables were negatively correlated [14]. There were over 75% of the people that stated they had confidence in the state and federal government's response, which is the main reason for their willingness to get vaccinated. Thus, attitudes and hesitancy or uncertainty toward the vaccines are highly linked with confidence in the government.

Additionally, insufficient health literacy contributed to the low willingness to be vaccinated. Previous studies have shown that a notably high proportion of the people indicated that they were unwilling to vaccinate and had a poor level of knowledge regarding COVID-19 [12].

Risk perception also played a major role in vaccine acceptance. A study conducted in Indonesia indicated that healthcare workers are more supportive of a COVID-19 vaccine than the non-healthcare workers [13]. The main drivers of healthcare workers to get vaccinated were self-protection and the desire to protect family, friends, and patients. Moreover, they had more comprehensive knowledge and had high awareness that led to them wanting to protect their family members [13]. Nevertheless, the study was conducted in April 2020 when Indonesia only had 8000 confirmed COVID-19 cases. This might have influenced the people, especially the healthcare workers, attitude toward the vaccine. The result might highly alter if the study was conducted now, where there are a total of 2.53M cases [14]. Still, perceiving high risk is highly associated with positive support for vaccination.

Furthermore, previous studies had also indicated that low income, not receiving flu vaccine, female gender, and people who are living with children showed high hesitancy toward receiving the vaccines. This result would benefit from a qualitative study to complement this quantitative work and would help to capture and understand how people's willingness to be vaccinated against the COVID-19 are linked with their knowledge regarding COVID-19, attitude, risk perception, and other personal factors.

Limitations

This study includes several limitations. The data was collected during June 2021, which was during

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the third wave of COVID-19 in Thailand. There were new measures introduced such as locking down the city by not allowing people to eat at restaurants. People were encouraged to stay home, whether it be working from home or online learning. This has definitely influenced the risk perception of students as they are likely to not feel the risk while staying home for the entire day. Additionally, the study was conducted among highschool students, and the questions regarding COVID-19 were only made for high school level, which might have influenced the score they received on the test.

Strengths

There were various strengths in this study. All students were able to fill out the survey as everyone had access to wifi and a smartphone or computer. Furthermore, the students answered the survey on their own schedule, allowing them to have flexibility with completion time and thus produce honest answers.

Conclusion

This study indicated the main reasons that affected student's unwillingness to receive COVID-19 vaccines, this includes having a moderate level of knowledge regarding COVID-19, poor risk perception due to online learning under COVID-19 lockdown measures, low level of confidence in the government, lack of quality vaccines availability and the uncertain side effects of each vaccine. Thailand had imposed restrictions to political and civil rights, making the citizens frustrated. Protestors had participated in parades after various dissatisfaction with the government. The citizens had no trust in the prime minister prior to the COVID-19 pandemic, and were not satisfied after he failed to cope with the pandemic [15]. In addition, the current Thailand vaccination policy provided the citizens with only two main vaccine brands to choose from; both had been proven to not resist many new variants of the coronavirus. Not only this but many people also experienced severe side effects after receiving vaccines provided by the government.

Several actions can be taken by the government to ease the curb of the COVID-19 pandemic. For instance, the government should prove to the citizens that they are able to handle and control the situation in Thailand. This could be done in many forms such as providing quality vaccines for citizens so that they will have a choice regarding vaccines they are confident and are willing to take. They should also impose effective lockdown measures with clear regulations to control the COVID-19 cases. Furthermore, the government ought to properly reallocate the country's resources based on the priority of the situation. This recommendation is based on the recent action taken by the government; as of June 28, the government had budgeted 2.2 thousand million baht for purchasing submarines [16]. This had sparked Thai's anger on the government as they believe that the utmost essential place money should be spent is on mRNA vaccines.

Despite various disagreements in Thailand, this study has revealed that the more important factor affecting willingness to vaccinate among highschoolers is knowledge regarding COVID-19. Students should be educated regarding the knowledge of the COVID-19, whether it be from teachers in schools or from news. There should be special health education courses in school to inform and educate students on new COVID-19 variants and preventive measures. This will allow students to be more knowledgeable about COVID-19 and be more willing to be vaccinated against the vaccines.

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