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Willingness to vaccinate against COVID-19: A study among high school students in Montfort College Chiangmai, Thailand

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Abstract: **Background: The willingness to be vaccinated against COVID-19 was the determinant in Thailand achieving herd immunity. Unwillingness was the impediment to COVID-19 vaccination. We could assess factors that lead to vaccine refusal and level of willingness by observing factors related to willingness.**

Objective: To measure level of willingness to be vaccinated against COVID-19 and predictive factors for vaccination.

Methodology: Montfort College students were sent links to complete an online questionnaire. The survey was completed by 341 students. Willingness to be vaccinated against COVID-19, knowledge of COVID-19, and attitude toward COVID-19 were all evaluated. Participation was entirely voluntary, and no personal information was collected from any participant.

Descriptive statistic were used to describe socio demographic characteristics. A generalized linear model was calculated to determine the predictive factors of willingness to be vaccinated against COVID-19

Findings: Participants demonstrated an intermediate level of COVID-19 related knowledge, answering a mean of 9.76 (SD=1.87) correct answers out of 14 questions. The analysis of the correlations between outcome of the study illustrated the existence of positive and statistically correlations between risk perception of getting COVID-19 (r=.159, p<0.01) and the confidence in the government (r=.179**, p<0.01).**

Conclusion: The findings of this study showed a moderate level of willingness to get vaccinated against COVID-19. Results of risk perception of getting COVID-19 was at a poor level. Participants also illustrated low confidence in the government. In light of this, predictive factors for willingness were risk perception and confidence in government, which risk perception showed stronger influence in willingness. In addition, risk perception of getting COVID-19 and confidence in government positively associated with willingness to vaccinate against COVID-19.

Keywords: **COVID-19 Vaccine, Vaccine hesitancy, high school students.**

I. INTRODUCTION

COVID-19 was first recognized on 31 December 2019 in Wuhan City, reporting the cluster of viral pneumonia [1] .On 11 February 2019, the World Health Organization (WHO) announced an official name of the disease COVID-19, CO stands for corona, VI stands for virus, and D stands for disease. At the same time, the International Committee on Taxonomy of Virus (ICTV) declared severe acute respiratory syndrome coronavirus (SAR-CoV-2) as the name of the virus based on the phylogenetic relationship of the coronavirus causing SARS outbreak in 2003 [2] .To inhibit COVID-19 infection, a vaccine with 80% efficacy is necessary. In light of this, herd immunity is required at 75-90% varied with the size of population [3] .Acceptance in COVID-19 ranged from almost 90%-55% globally, in which 71.5% decided to get vaccinated if the vaccines were approved to be safe and effective [4] .In the previous study in the UK and U.S., willingness to get vaccinated against COVID-19 associated with low-income, poor educational background, and not receiving flu vaccine before [5,6] .In addition, findings in Australia showed vaccine refusal among people who have lower education and are reluctant to get flu vaccine [7] .Those who revealed unwillingness showed mistrust of vaccine safety or effectiveness [5,6] .

Thailand was now facing the largest outbreak with 1,234,487 confirmed cases. Thai people who were shot the first dose are 33,427,463 people and the second dose are 8,684,695 [8] .Currently, Thailand utilized CoronaVac as the major vaccine. The ministry of public health announced that the CoronaVac would be used for the first dose and Oxford/Astrazeneca for the second dose. For the frontline workers, they would receive Pfizer-Biotech for the booster [11] .The challenge for Thailand was the upward trend of the number of deaths, which is contradictory to the number of active cases that started to decline. Regarding the government target, people who got the first dose accounted for 48% of the government target, the second dose represented 17.2% of the target [8]. To achieve the target, it relied on Thai citizens to get vaccinated against COVID-19 at 75-90% of the population.

This brings to the study among high school students in Thailand about Willingness to get vaccinated against COVID-19. This finding focused on students in grade 10 to 12 as they were the next target of the government to get vaccinated after that of healthcare workers and high risk people [14] .The aims of the study were to find the factors related to the decision to vaccinate in the high school students and level of willingness to get vaccinated. This was because even though students were the next target, there had been a controversial issue about vaccine side effects and mistrust in vaccine benefits. Hence, the research was conducted among the high school students in Montfort College to find the factors that influenced the students.

II. INSTRUMENT

The questionnaire was developed based on a literature review including (1) COVID-19 background, COVID-19 symptoms, herd-immunity, types of vaccine from WHO, CDC, and ICTV (2) studies performed on the same topic were 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 the experts in the field to validate its content. A pre-test was then performed with a small sample of students in grade 10 to 12 from other schools 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 23 questions; 4 about sociodemographic date (gender, year level, vaccination, health score) and 19 items divided into 4 sections

Knowledge related to COVID-19: this scale consisted of 14 questions related to general knowledge about COVID-19 and vaccines. The participants were asked to choose the correct answer from 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 scores corresponded to a higher level of knowledge. The level of knowledge was assessed by percentage, 80-100% indicated high level, and 60-79% indicated moderate level, and lower than 60% indicated low level.

Attitude toward COVID-19: this scale was composed of 2 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 COVID-19 prevention” factor consisted of 2 items and varied from 2 to 10 and the higher values corresponded to a more positive attitude toward preventive behavior. The attitude was assessed by percentage, 80-100% indicated positive attitude, 60-79% indicated moderate attitude, and lower than 60% indicated negative attitude.

Risk perception of contracting COVID-19: this scale was composed of 1 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 “Risk perception of contracting COVID-19” factor consisted of 1 item and varied from 1 to 5 and the higher values corresponded to a more positive attitude toward preventive behaviour. The level of risk perception was assessed by percentage, 80-100% indicated high level, and 60-79% indicated moderate level, and lower than 60% indicated low level.

Confidence in the government in handling the pandemic: this scale was composed of 2 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 “confidence in government” factor consisted of 2 items and varied from 2 to 10 and the higher values corresponded to a more positive attitude toward preventive behavior. The level of confidence in government was assessed by percentage, 80-100% indicated high level, 60-79% indicated moderated level, and lower than 60% indicated low level.

Willingness to get vaccinated: this scales referred to the level of willingness to vaccinate against COVID-19 and included 2 items. The item was answered using a five-point scale (From 1-Low to 10-High). A high score on this scale indicated a high level of willingness, ranging from 1 to 10. Another item requires participants to give a reason for vaccine hesitancy. The level of willingness to vaccinate against COVID-19 was assessed by percentage, 80-100% indicated high level, 60-79% indicated moderate level, and lower than 60% indicated low level.

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. 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 towards COVID-19 and willingness to get vaccinated) 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 4-6 Students of Montfort School, Chiang mai, Thailand, by using Google form. The invitation was sent by link to the google form. 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.

III. RESULT

This study consisted of 341 participants. The sociodemographic characteristics of the sample are presented in Table 1. The majority of participants are female (n=206, 60.4%). Most participants were in grade 12 (n=172, 50.4%) followed by students in grade 5 (n=116, 34%) and grade 9 (n=53, 15.5%) respectively. A total of 172 (50.4%) participants had got vaccinated before whilst the others had never got vaccinated (n=169, 49.6%).

With regards to knowledge about COVID-19, participants demonstrated moderate knowledge about COVID-19. The average number of correct answers was 9.76 (SD=1.87) from 14 questions in total. Female participants illustrated a higher number of correct answers (M=9.92, SD=1.72) than male participants (M=9.52, SD=2.05). Students in grade 12 accounted for the highest score, which is 10.06 (SD=1.63), followed by students in grade 11 (M=9.75, SD=1.73) and grade 10 (M=8.83, SD=2.51) respectively. Those participants who had got vaccinated showed higher scores (M=10.06, SD=1.59) than those who had not (M=9.46, SD=2.07).

According to the attitude toward COVID-19, participants showed a good level of attitude toward COVID-19 (M=8.43, SD=1.49), female participants demonstrated better attitude (M=8.54, SD=1.36) than male participants (M=8.26, SD=1.65). Students in grade 12 showed better attitude (M=8.54, SD=1.43) than that of students in grade 11 (M=8.30, SD=1.62) and grade 10 (M=8.36, SD=1.37). Participants who got vaccinated before revealed better attitudes (M=8.58, SD=1.34) than those who were not (M=8.28, SD=1.61).

In light of risk perception, participants showed a low level of risk perception (M=2.47, SD=1.06), male participants illustrated a lower level of risk perception (M=2.33, SD=1.04) than female (M=2.56, SD=1.04). Students in grade 10 accounted for the highest level of risk perception (M=2.68, SD=1.11) followed by students in grade 12 (M=2.47, SD=1.01) and grade 10 (M=2.39, SD=1.10). Participants who were vaccinated showed higher levels of risk perception (M=2.53, SD=1.02) than those who were not (M=2.41, SD=1.10).

Participants revealed a moderate level of confidence in government (M=3.32, SD=1.38). The male participants showed higher confidence in government (M=3.56, SD=1.57) than the female (M=3.16, SD=1.23. Students in grade 10 had the greatest confidence in government (M=3.38, SD=1.36) followed by students in grade 10 (M=3.36, SD=1.81) and grade 12 (M=3.27, SD=1.25). Participants who were vaccinated had higher confidence (M=3.38, 1.36) those who did not get vaccinated (M=3.26, r=1.41)

For willingness to get vaccinated, participants showed an intermediate level of willingness (M=6.34, r=2.40). Male participants represented larger willingness (M=6.68, r=2.54) than female (M=6.12, r=2.28). Students in grade 10 revealed the highest willingness (M=7.28, r=2.18) followed by grade 12 (M=6.33, r=2.28) and (M=5.92, r=2.57). Participants who were shot had higher willingness (M=6.57, r=2.24) than who were not (M=6.11, r=2.36). Table I.

Table I: Differences in outcomes according to the sociodemographic characteristics of participants (N = 341)

Sociodemographic characteristics	N (%)	Knowledge about COVID-19 (Range 0-14) M (SD)	Attitude toward COVID-19 (Range 2-10) M (SD)	Risk perceptive of getting COVID-19 (Range 1-5) M (SD)	Confidence in Government (Range 2-10) M (SD)	Willingness to vaccinate against COVID-19 (Range 1-10) M (SD)
Gender						
Male	135 (39.6)	9.52 (2.05)	8.26 (1.65)	2.33 (1.04)	3.56 (1.57)	6.68 (2.54)
Female	206 (60.4)	9.92 (1.72)	8.54 (1.36)	2.56 (1.07)	3.16 (1.23)	6.12 (2.28)
Year Level						
Grade 10	53 (15.5)	8.83 (2.51)	8.36 (1.37)	2.68 (1.11)	3.36 (1.81)	7.28 (2.18)
Grade 11	116 (34)	9.75 (1.73)	8.30 (1.62)	2.39 (1.10)	3.38 (1.36)	5.92 (2.57)
Grade 12	172 (50.4)	10.06 (1.63)	8.54 (1.43)	2.47 (1.01)	3.27 (1.25)	6.33 (2.28)
Got vaccinated						
Yes	172 (50.4)	10.06 (1.59)	8.58 (1.34)	2.53 (1.02)	3.38 (1.36)	6.57 (2.42)
No	169 (49.6)	9.46 (2.07)	8.28 (1.61)	2.41 (1.10)	3.26 (1.41)	6.11 (2.36)
Total	341 (100)	9.76 (1.87)	8.43 (1.49)	2.47 (1.06)	3.32 (1.38)	6.34 (2.40)

The analysis of the correlations between the outcome of the study-knowledge, attitudes, risk perception, confidence in government, and willingness to get vaccinated-demonstrated the existence of positive and statistically significant correlations between risk perception of getting COVID-19 (r=.159**,p<0.01), and the confidence in government (r=.179**,p<0.01). Table II.

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

Variables	Knowledge about COVID-19	Attitude toward COVID-19	Risk perceptive of getting COVID-19	Confidence in Government	Willingness to vaccinate against COVID-19
Knowledge about COVID-19	1				
Attitude toward COVID-19	.202**	1			
Risk perception of getting COVID-19	-0.004	0.027	1		
Confidence in Government	-0.024	-0.041	-0.001	1	
Willingness to vaccinate against COVID-19	0.08	0.096	.159**	.179**	1
**Correlation is Significant at the 0.01 *Correlation is Significant at the 0.05					

Results from the generalized linear model represented the risk perception of getting COVID-19 (Beta=.168, p<0.01) and confidence in government (Beta=.156, p<0.01) had a statistically significant effect on the willingness to get vaccinated against COVID-19. Table III.

Table III: Generalized linear model predicting willingness to get vaccinated.

	B	SE	EXP (β)	Sig (p)	95% CI	
					Lower	Upper
Gender	-0.545	0.264	-0.111	0.04	-1.064	-0.025
Year Level	-0.294	0.175	-0.09	0.094	-0.639	0.05
Got vaccinated	-0.252	0.255	-0.053	0.324	-0.753	0.25
Health Score	0.082	0.088	0.051	0.353	-0.091	0.256
Knowledge about COVID-19	0.114	0.071	0.089	0.109	-0.025	0.253
Attitude toward COVID-19	0.135	0.087	0.084	0.124	-0.037	0.306
Risk perceptive of getting COVID-19	0.381	0.12	0.168	0.002	0.145	0.617
Confidence in Government	0.27	0.092	0.156	0.004	0.089	0.452

The reasons for COVID-19 vaccine hesitancy were preferring more options of COVID-19 vaccines (N=51.91%), worrying about vaccine side effects (N=27.39%), not feeling the risk of getting COVID-19 (N=9.55%), and personal reason (N=11.15%).

Table IV.

Reasons for COVID-19 Vaccine hesitancy	N (%)	Total (n=314)
1. Preferred more choices of COVID-19 Vaccine	51.91	163
2. Concerned over side effects	27.39	86
3. Did not feel risk contracting COVID-19	9.55	30
4. Personal Reason	11.15	35
Total	**100**	**314**

IV. DISCUSSION

The study indicated that the vaccine hesitancy increased in female and those who were not vaccinated. In addition, student in grade 10 revealed more acceptance among other students in the other year levels. The average results were that participants had moderate knowledge related to COVID-19, positive attitude toward COVID-19, poor risk perception of getting COVID-19 and confidence in government. Accordingly, participants who had been received vaccine before showed better knowledge, more positive attitude, higher risk perception and confidence in government, and more willingness to receive COVID-19 vaccine. The factor associated with willingness of COVID-19 vaccines uptake were risk perception of getting COVID-19 and confidence in government, illustrating positive correlations with willingness. Participants also gave the reason for unwillingness, preferring more choices of COVID-19 vaccines as a majority, concerning over side effects was the second.

In the prior research in the UK, indicating female gender had more vaccine refusal and hesitancy, also intermediate to the high level of mistrust and worrying about unforeseen side effects were the important determinants of uncertainty and unwillingness [5] .Similarly, findings in other countries represented low acceptance of COVID-19 vaccines among those who were not vaccinated flu vaccine before [5-7] .People who had poor government compliances showed unwillingness to get vaccinated [5] .COVID-19 vaccine hesitancy may be caused by people having no experience of people around them got severely conditions or died because of COVID-19 [16] . Also there was the connection between political beliefs and attitudes to vaccine, criticism of the government's strategy lead to failure of vaccination campaign [16-17]. As the results was shown, the survey was collected when Thailand was in the largest outbreak, insufficient resources, and high demand of hospitalization, meanwhile vaccination among risk group was particularly low[8, 12-13]. Since the government showed failure in COVID-19 administration [9-10] and importing vaccine with low induction of neutralizing antibody than COVID-19 infection [15, 18], resulting in participants demonstrated low confidence in government.

This study was conducted when there was a lockdown in Chiang Mai, so the survey was collected online through the link that was sent to the students. Thus, the online survey was not accessible for students who did not have devices. Secondly, it was possible that students would search for the answers about COVID-19 and consequently resulted in high scores in the knowledge section. However, the sample of the study was directly affected by COVID-19 situation. Also, students had more accessibility to stay up-to-date about COVID-19 situation and directly resulted in willingness to get vaccinated.

V. CONCLUSION

Participants showed an intermediate level of willingness to vaccinate against COVID-19 at average 6.34, knowledge was indicated at moderate level, the participants also demonstrated a positive attitude toward COVID-19, risk perception of getting COVID-19 was at a poor level, and low confidence in government was illustrated. Predictive factors for willingness to be vaccinated were risk perception of getting COVID-19 and level of confidence in the government. Common reasons for vaccine hesitancy were preferring more choices of vaccine than what being procured and concerning side effects. According to the results, providing up-to-date information related to COVID-19–new variants and its severity, side effects after recovering from COVID-19, and the current situation–to raise awareness of students about actual risk of COVID-19. The government should offer more choices of vaccines, importing vaccines with more efficacy, and provide more medical information to assure safety of vaccination.

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Conflict of Interest

The author declared no conflict of interest.

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