

Attitude and acceptance of a coronavirus disease 2019 vaccine: A cross-sectional study of Chiang Mai University's undergraduate students, Chiang Mai in Thailand

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ABSTRACT

Background: Coronavirus disease 2019 (COVID-19) has affected all aspects of life globally and becomes a major threat to public health around the world. One of the most important actions that need to be taken to stop the pandemic is vaccinations. Managing the COVID-19 pandemic in the long-term, vaccine hesitancy and negative attitudes toward vaccines are major barriers. **Objectives:** This study aimed to investigate undergraduate students' knowledge, risk perceptions, and attitudes toward COVID-19 vaccinations among undergraduate students in Chiang Mai University, Thailand. **Materials and Methods:** The study was conducted using a questionnaire. A total of 280 students participated. COVID-19 related knowledge, risk perception, and attitude toward COVID-19 vaccines were assessed. Statistical test using SPSS statistics to analyze differences between intention to be vaccinated and socio-demographic was done using exact *P*-value, Pearson's Chi-square test, and Binary Logistic Regression. **Results:** Students revealed a moderate level of COVID-19 related knowledge. A moderate level of risk perception of getting COVID-19 has the highest number of students who want to get vaccinated ($n = 76$, 51.0%). Intention to get vaccinated was 53% ($n = 148$). The analysis of a binary logistic regression indicated that the monthly household income of students had a statistically significant effect on the intention to get vaccinated. Level of monthly household income predicted the deposition of intention to get vaccinated of students (Exp [B] = 0.773, $P < 0.001$). Most students had no intention to be vaccinated against COVID-19 due to concerns on side effects and efficacy of the current availability of COVID-19 vaccine in Thailand. Therefore, to increase more acceptance of COVID-19 vaccination among students, more choices of COVID-19 vaccine with high efficacy should be provided. **Conclusion:** Government should take firm and faster action for the unavailability of vaccines in Thailand to decrease vaccine hesitancy rate and give Thai citizens more choices of vaccine brands with higher levels of vaccine efficacy. Side effects from vaccines are one of the reasons for increase in vaccine hesitancy. Therefore, if Thai people can choose a higher efficacy vaccine, the news about vaccine side effects will be lower. Government should start educating and letting people know about side effects and whether the side effects are life threatening or not.

KEY WORDS: Severe Acute Respiratory Syndrome Coronavirus 2; Coronavirus Disease 2019; Vaccine; Intention to Vaccinate

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INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic caused by the virus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) goes beyond what we can imagine in this era. We have become the witness of the pandemic that spread globally across all continents. COVID-19 emerged in China

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toward the end of 2019. Thailand was relatively successful in containing the pandemic throughout most of 2020, but has been experiencing an uncontrolled resurgent outbreak since April 2021. An initial wave of infections, mostly traced to nightlife venues and a boxing match in Bangkok, peaked on March 22, 2020 at 188 newly confirmed cases per day. As preventive measures were implemented, the outbreak subsided by May, and the country reported almost no locally transmitted infections until December, when it saw a surge of infections primarily clustered around large migrant worker communities in Samut Sakhon Province. The new outbreak spread to many provinces, with a maximum daily of 959 cases reported on January 26, 2021, before partially subsiding in February. In April, however, a new wave of infections originated from Bangkok's Thonglor area nightlife venues and rapidly spread in Bangkok as well as throughout the country. It was identified to be of the highly transmissible variant (SARS-CoV-2 Alpha variant) and since April 14, 2021, over a thousand cases per day were being identified, causing a shortage of hospital beds as government policy required admission of all confirmed cases. The pandemic has heavily disrupted the economy of Thailand, of which tourism is a significant sector. The government has borrowed and announced several assistance measures, including cash handouts to those affected and a 1.9 trillion-baht (US\$60 billion) stimulus package, though few people have actually received it. Dissatisfaction with its economic impact and government response contributed to the second wave of 2020–2021 Thai protests starting from July 18, 2020.^[1]

To better control the pandemics, vaccination is needed. Vaccines prevent us in the first instance from getting sick. When a person gets vaccinated against a disease, their risk of infection is also reduced so they are also less likely to transmit the virus to others. As more people in a community get vaccinated, fewer people remain vulnerable, and there is less possibility for an infected person to pass the pathogen on to another person. Vaccines are a key strategy to stop the escalation of the COVID-19 pandemic and cost-effective public health interventions ever implemented that are saving millions of lives each year. Understanding vaccine acceptance is important, given the large population and because it has relatively high vaccine hesitancy for existing vaccines and relatively low vaccination coverage.^[2] Characterizing how vaccine efficacy and duration of vaccine protection could impact acceptance is also important. Many people have doubts about vaccine safety and this is going to be a challenge for health-care providers, policymakers, and the government to increase the acceptance towards vaccination. Vaccine hesitancy was defined by the WHO Strategic Advisory Group of Experts as “delay in acceptance or refusal of vaccination despite availability of vaccination services. One major obstacle facing the achievement of such a goal is believed to be vaccine hesitancy and skepticism among the population

worldwide. Such skepticism was demonstrated in a poll that was conducted in the US, where 50% of the Americans said they are willing to take the vaccine, 30% are unsure, while 20% are refusing the vaccine. In another survey of adult Americans, 58% intended to be vaccinated, 32% were not sure, and 11% did not intend to be vaccinated. However, one more study reported 67% of the Americans would accept a COVID-19 vaccine if it is recommended to them, there were significant demographic differences in vaccine acceptance. If vaccine hesitancy continues, the COVID-19 pandemic could last for years and take millions of lives.” Factors of individual cognition include individuals' beliefs or attitudes toward vaccination, such as perceived efficacy or benefits of vaccines, safety concerns (e.g., side effects), and perceptions on characteristics of vaccines (e.g., ways to take vaccines and countries in which vaccines are made). Factors of social processes refer to interpersonal interactions on attitudes and perceptions of vaccination. An example of such factors is recommendations from significant others, such as family members and health authorities. Practice issues focus on factors that directly affect vaccination behaviors, such as vaccine availability, accessibility, and vaccination cost.

Although there is no cost for vaccines, Thai Public Health Minister Anutin Charnvirakul announced that people will not be given a choice of which COVID-19 vaccine they receive. Amid widespread criticism of the slow rollout of vaccination in Thailand, the health minister discussed the process of vaccines being approved for distribution within Thailand. Many are concerned about possible side effects from the different vaccine options.^[3]

Thailand is running low on vaccines. With the most severe wave of COVID-19 continuing to rise, and the emergence of the more transmissible Delta variant, health officials are giving priority to those most at risk of a severe infection. The elderly and those with certain underlying health conditions, particularly in Bangkok where the rapid-spreading mutated strain is more prevalent, will be given priority in the vaccination program, according to the Ministry of Foreign Affairs Department of Information News Division director Pensom Lertsithichai, who reported the daily CCSA briefing in English.^[4]

Given that limited research has addressed COVID-19 vaccine acceptance among Thai people in different ages and factors influencing their vaccination decision-making, the current study aimed to (1) explore the proportions of undergraduate Thai people who would accept, hesitate, or refuse to take a COVID-19 vaccine (i.e. level of vaccine acceptance) (2) examine whether the factors that may affect vaccine acceptance were weighed differently in vaccination decision making by different age groups according to their levels of COVID-19 vaccine acceptance.

MATERIALS AND METHODS

This was a cross-sectional observational study using an online questionnaire which was purposely developed and made available through Google Forms between April 19 and May 12, 2021. COVID-19 knowledge, attitudes, and acceptance toward COVID-19 vaccine were assessed. Undergraduate students enrolled in the Chiang Mai University, Chiang Mai, Thailand bachelor's degree were eligible and were invited to participate in the study. The invitation was sent by an undergraduate social media group. A total of 280 students participated in this study. Information about the objectives of the study as well as the confidentiality and anonymity in the data collected as stated in the informed consent were explained. Participation was voluntary and no personal data were collected from any participant.

The questionnaire was developed based on a literature review including:

1. COVID-19 vaccine information from the World Health Organization, Centers for Disease Control and Prevention, and Australian Government department of Health
2. Studies already performed on the same topic in other countries where several common items were used to assess each of the dimensions analyzed in this study.

A preliminary version of the instrument was reviewed by three infection control specialists of public hospitals in Thailand to validate its content. A pretest was then performed with a small sample of higher education students to test for comprehension and difficulty. All the questions remained without modifications. The psychometric characteristics of the questionnaires were tested, as described in the statistical analysis subsection. The final version of the questionnaire contained questions; first six questions about socio-demographic data (age, gender, educational level, faculty, parent's occupations, and monthly household income) and 45 items divided into two sections.

The first section related to the knowledge of basic information about COVID-19 and information about COVID-19 vaccine. The participants were asked to choose only one correct answer from 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 hence higher scores corresponded to a higher level of knowledge. The score varies from 4 to 20, with greater than or equal to 16 as a good level, greater than 11 but less than 16 as a moderate level and less than 11 as a poor level.

Risk Perception of Getting COVID-19: This section comprised five questions and the response categories consisted of a five-point Likert scale (1) for never, (2) for hardly, (3) for sometimes, (4) for usually, and (5) for always with the highest score corresponding to more positive attitudes toward

preventive behaviors. The participants were asked to choose the number based on their practices and honestly. A sum of all the items within each factor was made to obtain a score. The Attitudes toward preventive behaviors varied from 5 to 25, with ≥ 20 as a good level, ≥ 15 but < 20 as a moderate level and < 15 as a poor level.

Acceptance to vaccinate against COVID-19: Participants were asked if the COVID-19 vaccines are available, would you get vaccinated or not? The answer was yes or no question.

Ethical Consideration

This research uses an anonymous data collection method to collect data from 280 undergraduate students in Chiang Mai University by Google form. The invitation was sent through a social media platform used by 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.

This study collected statistical data and analyzed it using SPSS statistics. Participant characteristics were summarized using frequencies and percentages. We used cross tabulations and Chi-square tests to estimate associations of participants. Statistical test was done using exact p value, and Binary Logistic Regression.

RESULTS

This study comprised a total of 280 university students, most of the participants were female ($n = 172$, 61.4%) and male ($n = 108$, 38.6%). The highest number of students was in the age group of 18–19 years ($n = 146$, 52.1%), followed by 20–21 years ($n = 97$, 34.6%) and 22–23 years ($n = 26$, 9.3%). Most students were in 1st year ($n = 127$, 45.4%), followed by 2nd year ($n = 72$, 25.7%) and 3rd year ($n = 38$, 13.6%). The highest number of students ($n = 95$, 33.9%) was studying health science and science, 73 students (26.1%) were in Business administration and economics, and two groups with equal number of students ($n = 36$, 12.9%) were in Social science and Engineering and industry. Parent's occupations were mostly Entrepreneur ($n = 82$, 29.3%), government agencies ($n = 75$, 26.8%), and office employee ($n = 46$, 16.4%). The monthly household incomes were mostly more than 60,000 baht ($n = 87$, 31.1%), followed by 20,000 to 40,000 baht ($n = 79$, 28.2%) and $< 20,000$ baht ($n = 60$, 21.4%).

Most of the students revealed a moderate level of knowledge about COVID-19, correctly answering on an average score of 13.45 (SD = 2.95). Male students had higher levels of knowledge (M = 13.66, SD = 2.83) than female students (M = 13.31, SD = 3.01).

Regarding the risk perception of getting COVID-19, low risk of perception was observed in most of the students ($n = 126, 45\%$), followed by moderate risk of perception ($n = 93, 33.2\%$) and high risk of perception ($n = 61, 21.8\%$) [Table 1].

From 280 students who participated in the study, there were 149 students, 53.2% who intended to get vaccinated. Most of the students who intended to get vaccinated were female ($n = 92, 32.9\%$). Analyzing by age group, the age group of 18–19 showed highest number of students who intended to get vaccinated ($n = 86, 57.7\%$), followed by 20–21

age group ($n = 44, 29.5\%$) and 22–23 age group ($n = 11, 7.38\%$), respectively. Regarding faculty, health science and science revealed the highest number ($n = 58, 38.9\%$) who intended to get vaccinated, business administration and economics ($n = 30, 20.1\%$), and social science ($n = 21, 14.1\%$), respectively. By analyzing parent's occupation, the finding revealed that entrepreneurs showed the highest number of students ($n = 47, 31.5\%$), followed by government agencies ($n = 38, 25.5\%$) and office workers ($n = 25, 16.8\%$). Regarding monthly household income, the group with more than 60,000 revealed the highest number of students intended to get vaccinated ($n = 50, 33.6\%$), both groups with income between 20,001–40,000 and 40,001–60,000 showed an equal number of students ($n = 38, 25.5\%$). The group with students that have moderate knowledge has the highest number of students who want to get vaccinated ($n = 76, 51.0\%$), good knowledge ($n = 25, 16.8\%$) subsequently. The groups with the lowest level risk perception had the highest number of students intended to get vaccinated ($n = 45, 30.2\%$), followed by moderate risk of perception ($n = 46, 30.9\%$). The analysis of Pearson's Chi-square found that there was a relationship between monthly household income and intention to get vaccinated statistically significant ($r = 0.004, P < 0.01$) [Table 2].

The analysis of a binary logistic regression indicated that the monthly household income of students had a statistically significant effect on the intention to get vaccinated. Level of monthly household income predicted the deposition of intention to get vaccinated of students (Exp [B] = 0.773, $P < 0.001$) [Table 3].

DISCUSSION

A total of 280 participants, 149 students (53%) had intention to get vaccinated against COVID-19 while 131 students (47%) showed no intention to get vaccinated against COVID-19. Higher percentage of students who had intention to get vaccinated was female, 61.7% and 38.3% male students. Finding shows that there was no relationship between gender and intention to get vaccinated and females had a higher percentage of intention to get vaccinated as a result of the majority of participants being female ($n = 172$) compared to male ($n = 108$). Recent study in New Jersey College Students^[5] found that there is no significant relationship between gender and intention to get vaccinated. In contrast, previous studies in Belgium^[6] found that there was a relationship between gender and intention to get vaccinated, statistically significant, ($P < 0.01$). Difference in age group can be one of contributory factors in intention to get vaccinated. Previous research^[7] found that older respondents were more willing to be vaccinated than younger, except that those aged 18–34 were more willing than those aged 35–54. This study shows that there is no relationship between age and intention to get vaccinated and age 18–19 are more willing to get vaccinated,

Table 1: Differences in outcomes according to the socio-demographic characteristics of participants ($n=280$)

Socio-demographic Characteristic	<i>n</i>	%	Knowledge about COVID-19 <i>n</i> (SD)	Risk Perception of Getting COVID-19 <i>n</i> (SD)
Gender			13.45 (2.95)	15.08 (5.13)
Male	108	38.6	13.66 (2.83)	13.79 (5.07)
Female	172	61.4	13.31 (3.01)	15.90 (5.02)
Age				
18–19	146	52.1	13.51 (2.99)	14.46 (4.96)
20–21	97	34.6	13.14 (2.97)	15.75 (5.13)
22–23	26	9.3	13.53 (2.96)	16.62 (5.4)
24–25	11	3.9	15.00 (1.55)	13.81 (5.72)
Faculty				
Health science and science	95	33.9	14.99 (2.47)	13.51 (4.49)
Engineering and industry	36	12.9	13.19 (2.83)	14.89 (4.40)
Business administration and economics	73	26.1	11.92 (2.70)	16.38 (5.27)
Social science	36	12.9	13.36 (2.82)	16.36 (5.49)
Political science	13	4.6	11.69 (3.43)	15.85 (4.54)
Others	27	9.6	13.4 (2.67)	15.30 (6.36)
Parent Occupation				
Agriculture	27	9.6	12.7 (2.84)	16.44 (4.57)
Government agencies	75	26.8	13.89 (2.79)	16.64 (5.18)
Freelance	19	6.8	12.21 (3.27)	16.79 (5.36)
Entrepreneur	82	29.3	13.87 (2.78)	14.15 (5.25)
Office worker	46	16.4	13.91 (2.49)	15.13 (4.47)
Housewife and Others	31	11.1	11.94 (3.56)	16.32 (5.58)
Monthly Household Income				
<20,000 baht	60	21.4	12.13 (3.13)	15.67 (4.79)
20,000–40,000 baht	79	28.2	13.26 (2.49)	16.08 (4.96)
40,001–60,000 baht	54	19.3	13.85 (2.63)	13.98 (5.46)
More than 60,000 baht	87	31.1	14.26 (3.09)	14.46 (5.18)

Table 2: Intention to vaccinate against COVID-19 by participant characteristics

Socio-demographic characteristic	n	Intention to vaccinate		P-value
		Yes (%)	No (%)	
Gender		149	131	0.908
Male	108	57 (38.3)	51 (38.9)	
Female	172	92 (61.7)	80 (61.1)	
Age				0.065
18–19	146	86 (57.7)	60 (45.8)	
20–21	97	44 (29.5)	53 (45.8)	
22–23	26	11 (7.4)	15 (11.45)	
24–25	11	8 (5.3)	3 (2.2)	
Faculty		149	131	0.196
Health science and science	95	58 (38.9)	37 (28.2)	
Engineering and industry	36	19 (12.8)	17 (13.0)	
Business administration and economics	73	30 (20.1)	43 (32.8)	
Social science	36	21 (14.1)	15 (11.5)	
Political science	13	6 (4.0)	7 (5.3)	
Others	27	15 (10.0)	12 (9.2)	
Parent Occupation		149	131	0.896
Agriculture	27	12 (8.1)	15 (11.5)	
Government agencies	75	38 (25.5)	37 (28.2)	
Freelance	19	10 (6.7)	9 (6.9)	
Entrepreneur	82	47 (31.5)	35 (26.7)	
Office worker	46	25 (16.8)	21 (16.0)	
Housewife and Others	31	17 (11.4)	14 (10.7)	
Monthly Household Income		149	131	0.004
<20,000 baht	60	23 (15.4)	37 (28.2)	
20,000–40,000 baht	79	38 (25.5)	41 (31.3)	
40,001–60,000 baht	54	38 (25.5)	16 (12.2)	
More than 60,000 baht	87	50 (33.6)	37 (28.2)	
Knowledge about COVID-19		149	131	0.360
Good 80%	70	45 (30.2)	25 (16.8)	
Moderate 60–79%	142	76 (51.0)	66 (50.3)	
Poor	68	28 (18.8)	40 (30.5)	
Risk Perception of Getting COVID-19		149	131	0.706
High 80%	61	37 (24.8)	24 (18.3)	
Moderate 60–79%	93	46 (30.9)	47 (35.9)	
Low	126	66 (44.3)	60 (45.8)	

perhaps because the majority are in the age group of 18–19 ($n = 146$). There is no relationship between faculty and intention to get vaccinated and healthcare has the highest number of students who intend to be vaccinated. Study of Italian university students^[8] also shows no significant differences comparing health-care students versus non-healthcare students. Moreover, the study suggests that

Table 3: Predicting of responding “Yes” or “No” according to binary logistic regression

Variable	B	S.E.	Sig.	Exp (B)
Age	0.477	0.255	0.062	1.611
Year	-0.294	0.170	0.084	0.745
Faculty	0.041	0.079	0.608	1.041
Parents occupation	-0.098	0.080	0.218	0.906
Monthly Household Income	-0.310	0.114	0.007	0.773

vaccination attitude is not only influenced by the students' level of health knowledge, but probably by other motivational and psychological factors. Although parent occupations show no relationship of intention to be vaccinated, household income is the only factor that has a relationship with intention to get vaccinated. Current settings about vaccines in Thailand, Thai Public Health Minister said that people will not be given a choice of which COVID-19 vaccine they receive because of the unavailability of vaccines. Moreover, the efficacy of the vaccines given by the government (Sinovac and Astrazeneca) has lower efficiency compared to vaccines available to the UK, USA, Australian, and other European countries. News about the side effects of given vaccines affect the negative attitude of intention to be vaccinated in Thailand. COVID-19 situation affects Chiang Mai's economics in which it mostly relied on tourism.^[9] As a result of decline in tourism, lower household income was observed. Delay in government action caused many factories and businesses to cutoff salaries from workers and some were temporarily unemployed. This could contribute to a negative attitude toward the government.^[10] The groups with lower household income were more likely to have negative views toward the government. Consequently, less trust in the government lowers the intention to get vaccinated. No relationship was found between knowledge of COVID-19 and risk perception of getting COVID-19. Vaccine attitude and intention to be vaccinated were influenced not only from level of COVID-19 knowledge and risk perception, but other motivational and psychological factors. Psychological constructs from study in University Students in France^[11] said that “Confidence” defined as trust in the effectiveness and safety of vaccines, in the reliability and competence of the health services and health professionals is the contributory factor of intention to get vaccinated. Moreover, the previous study in College Students in New Jersey^[5] suggest that family encouragement seems to play an important role in vaccine acceptance. In addition, the research suggested that one of the strongest correlates of intention to vaccinate was whether participants discussed vaccine information with others. Other previous research has shown that discussion with a provider is one of the key determinants of vaccination behaviors.

The previous study from the USA, the group that is unwilling to get vaccinated has lower educational level, low COVID-19 knowledge, ethics minority groups, and worries about side effects.^[12] Side effects are the main concern why Belgians are not willing to get vaccinated^[13] while study

from France reveals people with negative views toward the government are unwilling to be vaccinated, Australian are willing to be vaccinated because of trust in the government.^[11,14] The previous research in Indonesia shows that people are willing to get vaccinated if the efficacy rate of the vaccine is 90% or above. Indonesian said that they are less willing to get vaccinated if the efficacy is only 50%.^[2] Study from college students in New Jersey reveals that students who were healthcare workers, had a family member who had received a COVID-19 vaccine, and received a seasonal flu vaccine were more likely to receive the COVID-19 vaccine.^[5] There are no significant factors that affect the intention to vaccinate university students in Italy.^[8] Various factors in different countries affect the intention to be vaccinated. The common factors among previous studies conducted in different countries are the worries about side effects. In addition, political situations in different countries affect the acceptance rate of COVID-19 vaccines. In Australia, high acceptance rates were due to the level of confidence in the government compared to France where low confidence in the government affects the acceptance rate of vaccines.^[11,14]

Study during COVID-19 period, collect data through online form, only students who had access to the internet and connection device could participate in the study, data collection during April-May when the actual vaccination had started in different countries, news about side effects of vaccines affect attitude of people. This study collected data during April-May, vaccination had been rolled out in many countries, there was news about side effects from getting vaccinated against COVID-19 from different types of vaccine, this could affect people's attitude toward COVID-19 vaccination. Students study from home during COVID-19 situations which decrease risk perception of getting COVID-19.

This study found that there are no significant factors except for monthly household income that affect intention to get vaccinated among undergraduate students in Chiang Mai University, Thailand. The escalating development of the COVID-19 vaccine creates concern for Thai people and people from other countries. Moreover, the current situation of COVID-19 affects the intention to be vaccinated in Thailand. Thai people were not given the choice to receive vaccines and there were limited choices (only Sinovac and Astrazeneca). In addition, the low trust in the government vaccines affected the acceptance of vaccines given by the government.^[4]

CONCLUSION

Government should take firm and faster action for the unavailability of vaccines in Thailand to decrease vaccine hesitancy rate and give Thai citizens more choices of vaccine

brands with higher levels of vaccine efficacy. Side effects from vaccines are one of the reasons for increase in vaccine hesitancy. Therefore, if Thai people can choose a higher efficacy vaccine, the news about vaccine side effects will be lower. Government should start educating and letting people know about side effects and whether the side effects are life threatening or not.

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REFERENCES

1. COVID-19 Pandemic in Thailand-Wikipedia; 2021. Available from: https://www.en.wikipedia.org/wiki/COVID-19_pandemic_in_Thailand. [Last accessed on 2021 Jun 19].
2. Harapan H, Wagner A, Yufika A, Winardi W, Anwar S, Gan A, *et al.* Acceptance of a COVID-19 vaccine in Southeast Asia: A cross-sectional study in Indonesia. *Front Public Health* 2020;8:381.
3. Fronde N. Thai People Not Given Choice Which Covid-19 Vaccine they Receive, *Thaiger*; 2021. Available from: https://www.thethaiger.com/coronavirus/thai-people-not-given-choice-which-covid-19-vaccine-they-receive#google_vignette. [Last accessed on 2021 Jun 18].
4. Ashworth C, Ashworth C. Thailand Low on Covid-19 Vaccines, Priority Given to At-risk Groups, *Thaiger*; 2021. Available from: <https://www.thethaiger.com/news/national/thailand-low-on-covid-19-vaccines-priority-given-to-at-risk-groups>. [Last accessed on 2021 Jun 23].
5. Kecejevic A, Basch C, Sullivan M, Chen Y, Davi N. COVID-19 vaccination and intention to vaccinate among a sample of college students in New Jersey. *J Community Health*; 2021. Available from: https://www.researchgate.net/publication/351121032_COVID-19_Vaccination_and_Intention_to_Vaccinate_Among_a_Sample_of_College_Students_in_New_Jersey. [Lasted access on 2021 Jun 16].
6. Kessels R, Luyten J, Tubeuf S. Willingness to get vaccinated against Covid-19 and attitudes toward vaccination in general. *Vaccine* 2021;39:4716-22.
7. Dorman C, Perera A, Condon C, Chau C, Qian J, Kalk K, *et al.* Factors associated with willingness to be vaccinated against COVID-19 in a large convenience sample. *J Community Health*; 2021. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8033546/>. [Lasted access on 2021 Jun 16].
8. Barello S, Nania T, Dellafiore F, Graffigna G, Caruso R. Vaccine hesitancy among university students in Italy during the COVID-19 pandemic. *Eur J Epidemiol* 2020;35:781-3.
9. World's Friendliest City Suffering-how Long Can Tourist Spots Hold Out? *South China Morning Post*; 2021. Available from: <https://www.scmp.com/lifestyle/travel-leisure/article/3121542/worlds-friendliest-city-chiang-mai-suffering-covid-19>. [Last accessed on 2021 Jun 22].
10. Majority of Thais Unhappy with Government's Handling of

- Covid-19. The Straits Times; 2021. Available from: <https://www.straitstimes.com/asia/se-asia/majority-of-thais-unhappy-with-governments-handling-of-covid-19>. [Last accessed on 2021 Jul 06].
11. Tavolacci M, Dechelotte P, Ladner J. COVID-19 vaccine acceptance, hesitancy, and resistancy among university students in France. *Vaccines* 2021;9:654.
 12. Fisher K, Bloomstone S, Walder J, Crawford S, Fouayzi H, Mazor K. Attitudes toward a potential SARS-CoV-2 vaccine. *Ann Intern Med* 2020;173:964-73.
 13. Willingness to Get Vaccinated Against COVID-19: Profiles and Attitudes Towards Vaccination. UC Louvain; 2021. Available from: <https://www.uclouvain.be/fr/instituts-recherche/irss/helesi/actualites/willingness-to-get-vaccinated-against-covid-19-profiles-and-attitudes-towards-vaccination.html>. [Last accessed on 2021 Jul 27].
 14. Dodd R, Cvejic E, Bonner C, Pickles K, McCaffery K, Ayre J, *et al.* Willingness to vaccinate against COVID-19 in Australia. *Lancet Infect Dis* 2021;21:318-9.

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