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Knowledge and attitudes towards COVID-19 vaccines among university students, faculty members and staffs

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ABSTRACT

One of the key strategies to stop the increase of coronavirus disease 2019 (COVID-19) cases is vaccines. The uncertainty and refusal of Filipinos to get the COVID-19 vaccine will be a crucial barrier to achieve the immunization coverage required for population protection. Thus, this study was conducted to determine the knowledge and attitude of the Nueva Ecija University of Science and Technology students and faculty and staff towards the COVID-19 vaccine. A descriptive study approach and total sampling were adopted. A questionnaire was constructed to accumulate data on the respondents' profile, knowledge, attitude and source of information about the vaccine for COVID-19. Informed consent and permission to conduct were acquired. Various statistical tools were used to analyze the data. The respondents were knowledgeable and had positive attitude towards the COVID-19 vaccine. Their primary source of information was from social media on the internet and television. There is a positive association between their attitude and knowledge of the COVID-19 vaccine, which means that they are closer to having a positive attitude when they are knowledgeable about the COVID-19 vaccine. Therefore, health education campaigns to increase their knowledge or awareness about the COVID-19 vaccine should encourage them to receive a COVID-19 vaccine shot.

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1. INTRODUCTION

The Coronavirus disease 2019 (COVID-19) is a global menace that affects the entire world [1]. It is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a new coronavirus strain [2] type that has become a severe public health problem worldwide. As of July 9, 2021, WHO had received reports of 185,038,806 confirmed COVID-19 cases worldwide, with 4,006,882 deaths [3]. In the Philippines, the first COVID-19 case was reported on January 30, 2020 [4] and its second case was confirmed on January 31, 2020. The patient's condition deteriorated on February 1, and after a cardiac arrest, he was unable to be revived. As a result, it was confirmed as the first COVID-19 death outside of China [4]. Since then, the number of new cases in the country has been significantly increasing.

Many countries around the world, including the Philippines, have implemented different intervention, which includes the mandatory use of face mask, social distancing, prohibiting mass gathering, school and universities closures, travel restrictions, quarantine and lockdowns (the largest throughout history) and many more [5]–[8]. The effort done by our public and health authorities to break the chain of contagion seems not

enough since cases of infection continue to rise along with the number of deaths [9], [10]. As of July 9, 2021, the total confirmed cases of COVID-19 in the Philippines balloon to 1,455,585, with 25,650 deaths [3].

One of the key strategies to stop the increase of COVID-19 cases is vaccines [11]. A vaccination usually comprises an agent that looks like a disease-causing germ and is often manufactured from weakened or destroyed microbes, their toxins, or one of their surface proteins. The agent induces the immune system to detect the agent as a threat and eliminate it, as well as to recognize and destroy any future germs linked with that agent. Vaccines can be preventive (to prevent or reduce the symptoms of a future infection by a natural or "wild" pathogen) or therapeutic (to cure an infection that has already occurred) (to fight a disease that has already occurred, such as cancer) [12]–[14].

Vaccination is one of the most effective and safe ways to prevent infectious diseases in both individuals and the entire public. This method provides direct vaccine benefits as well as indirect protection for people who are not immune (herd or social immunity). The success of a pandemic will be determined by acquired immunity in a sufficient proportion of the population (herd immunity), which for COVID-19 is projected to be 67% [15]. Increased population immunity by natural causes or by permitting a large number of people to become ill would result in an unprecedented demand for healthcare resources and more deaths globally [15].

To reduce the impact of the pandemic, the students, faculty and staff, as part of the general population in the country, can help the government attain herd immunity by allowing their selves and encouraging others to get vaccinated. Thus, acquiring sufficient knowledge and having a positive attitude towards the vaccine is necessary since one of the factors that affect the vaccine uptake of an individual is the public attitude towards the safety and efficiency of the vaccine [16]. The uncertainty and refusal of Filipinos to get the COVID-19 vaccine will be a crucial barrier to achieving the immunization coverage required for population protection.

Several studies on knowledge and attitude during the COVID-19 pandemic have been carried out. However, this study focuses more on examining knowledge and attitudes towards COVID-19 in general [17]–[19]. Knowledge and attitude studies on vaccination programs are still rare. Therefore, this research aims to find out what students, faculty, and staff know about the COVID-19 vaccine and their attitude towards it.

2. RESEARCH METHOD

During the roll-out of the COVID-19 vaccination in the Philippines, a descriptive research approach was utilized to analyze the knowledge and attitudes of students, teachers, and staff at Nueva Ecija University of Science and Technology. It began in March and will be completed in July, 2021. The target population was all students, faculty, and staff who could use Messenger and had internet access; hence total sampling was used. Only 1,872 people signed up for the study and agreed to take part.

The questionnaire made for the study was based on numerous related literatures. The questionnaire was divided into four sections: The leading section dealt with the information source from which the respondents learned about the vaccine for COVID-19; the second fragment consisted of questions about their profile (respondents' type and the college or department where they are affiliated); the third part was composed of statements about their knowledge on COVID-19 vaccines [20]–[31], which encompassed general knowledge, type of vaccine, benefits, side effects or adverse effects and the COVID-19 vaccination in the Philippines; and the last part was contained statements regarding their attitude to wards COVID-19 vaccines [32], [33]. Following an exhaustive study of the literature published in English and expert opinions, the questionnaire were adjusted for substance, language, and cultural appropriateness. Pre-testing and revisions were made to the questionnaire. Because of the ongoing community quarantine across the country, which led to the suspension of face-to-face classes and adopting a work-from-home program for most university personnel, data was gathered online utilizing a Google form as the questionnaire.

The Office of the University President was approached for permission. The responder was required to give informed consent before they could answer the questionnaire. The subjects' secrecy and confidentiality were respected, and they were given sufficient time to respond to the questions.

All completed answers were validated and double-checked. The information from the Google Form was then imported into statistical packages for social sciences (SPSS). The author double-checked and cleansed all data files until they were ready for evaluation. Data cleaning was executed to check for accuracy and missing values and variables. Their level of awareness measured the responses to their knowledge about the COVID-19 vaccine by four statements in each category. Five statements reflecting agreement on the importance of and willingness to embrace COVID-19 vaccines once they become available were used to assess attitudes about the COVID-19 vaccine. Frequency and percentage were calculated for the socio-demographic profile and sources of information. Pearson correlation was used to examine the relationship between their knowledge and attitudes concerning the COVID-19 vaccination.

3. RESULTS AND DISCUSSION

3.1. Source of information of the respondents about COVID-19 vaccine

The respondents' sources of knowledge about the COVID-19 vaccine are shown in Table 1. The news they see on television (80.8%) and the various social media platforms (77.2%) are their primary source of information. Thus, television and social media platforms were essential sources of information in this pandemic time. Lau *et al.* [34] and Elnadi *et al.* [35] found that the internet and television were the common sources of knowledge about COVID-19. Furthermore, most of the data was in English, making it easier for the responders to comprehend [36].

Table 1. Source of information of the respondents about COVID-19 vaccine

Source of information	Frequency (f)	Percentage (%)
Television	1,513	80.8
Radio	21	1.1
Newspaper	161	8.6
Family and friends	862	46.0
Social media	1,446	77.2
Scientific articles	373	19.9
Pharmaceutical report	139	7.4
Healthcare providers	483	25.8

3.2. Socio-demographic profile of the respondents

A total of 1,872 participants were chosen to take part in the research. Most of them, or 1,704 (91.0%), were students and 461 (24.7%) are from the management and business technology department seen in Table 2.

Table 2. Socio-demographic profile of the respondents

Socio-demographic profile	Frequency (f)	Percentage (%)
Type of respondent student	1,704	91.0
Faculty members	142	7.6
Non-teaching staff	26	1.4
College/Department/Management and Business	461	24.7
Communication technology	202	10.8
Education	332	17.7
Nursing	142	7.6
Criminology	70	3.7
Architecture	26	1.4
Agriculture	90	4.8
Industrial technology	257	13.7
Arts and Sciences	31	1.7
Public administration	58	3.1
Engineering	4	0.2
Graduate school	7	0.4
Laboratory high school	170	9.1
Non-teaching	22	1.2

3.3. Knowledge of the respondents about COVID-19 vaccine

The respondents were aware on all of the claims regarding their general understanding about the COVID-19 vaccination, according to the study's findings. Item statement number 3, which is about immunity against SARS-COV 2, obtained the highest weighted mean, while item statement number 2, which is about anaphylaxis, obtained the lowest weighted mean. The overall weighted mean garnered was 2.82, which means that respondents were “knowledgeable” seen in Table 3. Thus, the respondents were aware of what the COVID-19 vaccine is. The findings were backed up by a research [37], [38]. They found that Filipinos knew a lot about COVID-19 before and throughout the implementation of the enhanced community quarantine in Luzon. With this, it is not surprising that they were knowledgeable about the COVID-19 vaccine. Furthermore, almost all Filipinos are aware of COVID-19 vaccines developed [39]. However, the studies from [40]–[42] cited by [43] state that the increase of awareness regarding anaphylaxis is very important, which only means that Filipinos' awareness regarding anaphylaxis is not very high.

Table 3. General knowledge of the respondents about COVID-19 vaccine

Item statement	Very knowledgeable		Knowledgeable		Not knowledgeable		Not very knowledgeable		Weighted mean	Verbal interpretation
	F	%	F	%	F	%	F	%		
1. A COVID-19 vaccines is a vaccine that is designed to provide acquired resistance to SARS CoV-2, the virus that causes COVID-19.	390	20.0	791	40.5	585	30.0	106	5.4	3.05±0.84	Knowledgeable
2. Anaphylaxis is a life-threatening, multi-system allergic reaction to a chemical such as a vaccine, medicine, or food. Breathing difficulties, loss of consciousness, and a dip in blood pressure are all possible symptoms.	290	14.9	792	40.6	614	31.4	176	9.0	2.64±0.85	Knowledgeable
3. Vaccine efficacy is defined as the percentage reduction in disease in a vaccinated group relative to an unvaccinated group under ideal conditions.	615	31.5	787	40.3	421	21.6	49	2.5	2.78±0.81	Knowledgeable
4. Herd immunity is a considerable community section that develops immunity to an illness. Disease transmission from person to person becomes rare. As a result, the community as a whole, not just individuals who are immune, is protected.	363	18.6	868	44.4	540	27.6	101	5.2	2.80±0.81	Knowledgeable
Overall Weighted Mean									2.82±0.64	Knowledgeable

Legend: F=Frequency; %=Percentage; 3.26–4.00=Very knowledgeable, 2.51–3.25=Knowledgeable, 1.76–2.50=Not knowledgeable, 1.75–1.00=Not very knowledgeable

Second, the respondents were knowledgeable on all the statements about the different types of COVID-19 vaccines. Item statement number 1, which is about mRNA – based vaccine (Pfizer and Moderna), obtained the highest weighted mean equivalent to 2.77. The overall weighted mean garnered was 2.64, meaning they were "knowledgeable" seen in Table 4. The result showed that Filipinos were much aware of the different types of vaccine, especially the mRNA-based vaccine of Pfizer and Moderna. Comirnaty (Pfizer) is the only brand that more than half of the respondents (59%) are familiar with, according to [44], followed by mRNA-1273 (Moderna). As a result, it's safe to assume that the responders were well-versed in the concept of an mRNA-based vaccine.

Table 4. Knowledge of the respondents about the different types of COVID-19 vaccine

Item statement	Very knowledgeable		Knowledgeable		Not knowledgeable		Not very knowledgeable		Weighted mean	Verbal interpretation
	F	%	F	%	F	%	F	%		
1. Pfizer and Moderna are mRNA-based vaccines which contain material from the virus that causes COVID-19 that gives our cells instructions for how to make a harmless protein that is unique to the virus.	354	18.1	861	44.1	520	26.6	137	7.0	2.77±0.84	Knowledgeable
2. Novavax is a protein subunit vaccination that contains harmless fragments of the COVID-19 virus rather than the whole germ.	219	11.2	827	42.3	631	32.3	195	10.0	2.57±0.83	Knowledgeable
3. Vector vaccines such as AstraZeneca, Janssen, Sputnik V, and Covaxin employ a modified version of a different virus that contains components from the virus that causes COVID-19.	285	14.6	786	40.2	612	31.3	189	9.7	2.62±0.86	Knowledgeable
4. Inactivated vaccines, such as SinoVac and Sinopharm, are made up of virus particles or other pathogens that have been grown in culture and subsequently killed to remove their disease-causing potential.	271	13.9	772	39.5	626	32.1	203	10.4	2.59±0.86	Knowledgeable
Overall Weighted Mean									2.64±0.75	Knowledgeable

Legend: F=Frequency; %=Percentage; 3.26–4.00=Very knowledgeable, 2.51–3.25=Knowledgeable, 1.76–2.50=Not knowledgeable, 1.75–1.00=Not very knowledgeable

Third, the respondents were knowledgeable on all the statements about the benefits of the COVID-19 vaccine. Item statement number 1, which is about preventing or becoming extremely ill or dying due to COVID-19, obtained the highest weighted mean equivalent to 3.11, while item statement number 3, which is about the concept of herd immunity, obtained the lowest weighted mean equivalent to 3.01. The

overall weighted mean garnered was 3.06, which means that respondents were "knowledgeable" seen in Table 5. Because of the high public awareness of the Filipinos about the COVID-19 vaccine [45], it is expected that they are much aware, too, of the primary benefits of taking the COVID-19 vaccine, which is to reduce the probability of contracting the virus or help save someone from getting extremely ill, even if they do get the virus [46]. However, the concept of herd immunity obtained the lowest weighted mean because it necessitates a more thorough understanding of disease transmission and immunizations, and it is still a novel concept in vaccine advocacy [27], [47].

Table 5. Knowledge of the respondents about the benefits of receiving a COVID-19 vaccine

Item statement	Very knowledgeable		Knowledgeable		Not knowledgeable		Not very knowledgeable		Weighted mean	Verbal interpretation
	F	%	F	%	F	%	F	%		
1. COVID-19 can make you very sick, or it may kill you if you don't get the OCIVD-19 vaccine.	545	27.9	1021	52.3	279	14.3	27	1.4	3.11±0.70	Knowledgeable
2. The COVID-19 vaccines protects you against infecting others with the COVID-19 virus.	533	27.3	1002	51.3	293	15.0	44	2.3	3.08±0.73	Knowledgeable
3. Increase the number of people in the community who are immune to COVID-19, making it more difficult for the disease to spread and increasing herd immunity.	465	23.8	1011	51.8	354	18.1	42	2.2	3.01±0.73	Knowledgeable
4. Stop the COVID-19 virus from spreading and replicating, which would allow it to mutate and become resistant to vaccination.	478	24.5	1006	51.5	341	17.5	47	2.4	3.02±0.73	Knowledgeable
Overall weighted mean									3.06±0.65	Knowledgeable

Legend: F=Frequency; %=Percentage; 3.26–4.00=Very knowledgeable, 2.51–3.25=Knowledgeable, 1.76–2.50=Not knowledgeable, 1.75–1.00=Not very knowledgeable

Next, all of the statements describing the negative/side effects of taking a COVID-19 vaccine were understood by the respondents. Item statement number 1, which is about the mild side effects, obtained the highest weighted mean. The overall weighted mean garnered was 2.86, which means that respondents were "knowledgeable" seen in Table 6. The reason for this is that many articles emphasize the importance of taking the COVID-19 vaccine and just like any vaccine, it can also cause side effects, but most are mild to moderate only. With this, health authorities and government officials can somehow encourage their citizens to take the vaccine since it is effective and safe and if a side effect occurs, it's only mild to moderate [48].

Table 6. Knowledge of the respondents about the adverse/side effects of receiving a COVID-19 vaccine

Item statement	Very knowledgeable		Knowledgeable		Not knowledgeable		Not very knowledgeable		Weighted mean	Verbal interpretation
	F	%	F	%	F	%	F	%		
1. After the first or second dosage of the COVID-19 vaccine, moderate side effects such as pain, fever, exhaustion, and others may occur.	509	26.1	943	48.3	365	18.7	55	2.8	3.02±0.76	Knowledgeable
2. The COVID-19 vaccine's negative effects include headaches, muscular discomfort, chills, joint pain, feeling unwell, nausea, and vomiting.	400	20.5	951	48.7	442	22.6	79	4.0	2.79±0.78	Knowledgeable
3. COVID-19 vaccines may have effects that are comparable to COVID-19 sign and symptoms.	299	15.3	881	45.1	551	28.2	141	7.2	2.71±0.82	Knowledgeable
4. COVID-19 vaccines do not interact with our DNA and cause fertility problems.	352	18.0	919	47.1	503	25.8	98	5.0	2.81±0.80	Knowledgeable
Overall weighted mean									2.86±0.68	Knowledgeable

Legend: F=Frequency; %=Percentage; 3.26–4.00=Very knowledgeable, 2.51–3.25=Knowledgeable, 1.76–2.50=Not knowledgeable, 1.75–1.00=Not very knowledgeable

Finally, when it came to their understanding of the COVID-19 vaccine inoculation in the Philippines, the respondents were aware on all of the statements. Item statement number 3, which is about the priority groups to be vaccinated, obtained the highest weighted mean equivalent to 3.10. The overall

weighted mean garnered was 2.86, which means “knowledgeable” seen in Table 7. The reason for this is that nowadays, every Filipino is "eagerly" waiting to get their COVID-19 shots opposing the hesitancy they showed in the past. It only implies that they are waiting for their turn to get vaccinated. After all, they know that they do not belong to the priority group and figure out that they do not yet belong to the group because they are aware of it.

Table 7. Knowledge of the respondents about the vaccination of the COVID-19 vaccine in the Philippines

Item statement	Very knowledgeable		Knowledgeable		Not knowledgeable		Not very knowledgeable		Weighted mean	Verbal interpretation
	F	%	F	%	F	%	F	%		
1. The Philippines was the last Southeast Asian country to get a supply of COVID-19 vaccine.	344	17.6	858	43.9	547	28.0	123	6.3	2.76±0.83	Knowledgeable
2. The first dose of the COVID-19 vaccine in the Philippines was given to Dr. Gerardo Legaspi, director of Philippine General Hospital.	259	13.3	819	41.9	591	30.3	203	10.4	2.61±0.86	Knowledgeable
3. The priority groups to be vaccinated are frontline health staff, senior persons, the indigent population, and uniformed personnel.	235	11.9	1228	62.1	442	22.4	71	3.6	3.10±0.78	Knowledgeable
4. President Rodrigo Duterte signed the COVID-19 Vaccination Program Act of 2021 that sets up an indemnification fund to compensate those who would suffer adverse effects from COVID-19 shots.	364	18.6	925	47.4	486	24.9	97	5.0	2.83±0.80	Knowledgeable
Overall Weighted Mean									2.82±0.66	Knowledgeable

Legend: F=Frequency; %=Percentage; 3.26–4.00=Very knowledgeable, 2.51–3.25=Knowledgeable, 1.76–2.50=Not knowledgeable, 1.75–1.00=Not very knowledgeable

3.4. Attitude of the respondents towards COVID-19 vaccine

The respondents' attitudes on the COVID-19 vaccine are shown in Table 8. They agree with all of the statements, indicating that most of them had a positive view of the COVID-19 vaccine. The outcome reflects the Filipinos' positive attitude toward the COVID-19 vaccine, as they feel vaccinations will play an essential part in ending the pandemic and allowing them to resume their normal life. The result is congruent to the study of [49], where their participants also had a positive attitude towards the COVID-19 vaccine. In addition, [50] found that their participants were strongly agreed that it is essential to get a vaccine to protect people from COVID-19. In addition, respondents in [37]'s study had a favorable view of COVID-19. They agreed that they would do everything to protect themselves and their family and follow the directions of their health authority against COVID-19. Given that receiving the COVID-19 vaccine is one method of protecting against COVID-19, it's not unexpected that they have a favorable view of the vaccine. Item statement number one, who is about the importance of vaccines, got the highest weighted mean. The reason for this is that they are much aware of the benefits of receiving a vaccine. As mentioned earlier, item statement number 1 in Table 5, which is about preventing or becoming extremely ill or dying due to COVID-19, got the highest weighted mean, clearly stating why vaccines' importance got the highest weighted mean compared to other statements.

Table 9 depicts the association between respondents' knowledge and attitudes regarding the COVID-19 vaccine. Based on the result, the relationship between their knowledge about the COVID-19 vaccine in general, the types of vaccine, its benefits and side effects, and vaccination status in the Philippines to their attitudes towards the COVID-19 vaccine was significant. It only showed that a person's understanding of the COVID-19 vaccination was associated with their attitude about the vaccine. The outcome was backed up by [33], [51], [52]. According to them, the strongest predictor of positive attitudes towards vaccination was their knowledge. With this, evaluating an individual's knowledge towards the COVID-19 vaccine is vital since having excellent or sufficient knowledge about the vaccine for COVID-19 will yield a positive attitude and an optimistic outlook towards the COVID-19 vaccine means a greater chance for that individual to get vaccinated.

Table 8. Attitude of the respondents towards COVID-19 vaccine

Item statements	Strongly agree		Agree		Disagree		Strongly disagree		Weighted mean	Verbal interpretation
	F	%	F	%	F	%	F	%		
1. Vaccines, in my opinion, are critical for decreasing or eliminating dangerous diseases.	630	33.7	1032	55.1	189	10.1	21	1.1	3.21±0.66	Agree
2. I believe vaccines are effective and do more good than harm.	443	23.7	1134	60.6	272	14.5	23	1.2	3.06±0.64	Agree
3. I am not afraid of getting sick after getting vaccinated.	243	13.0	809	43.2	710	37.9	110	5.9	2.64±0.78	Agree
4. If vaccines against COVID-19 were available, I would definitely be vaccinated.	343	18.3	971	51.9	480	25.6	78	4.2	2.85±0.76	Agree
5. I believe vaccines are important to avoid the emergence of new epidemics and pandemics.	511	27.3	1083	57.9	245	13.1	33	1.8	3.10±0.68	Agree
Overall weighted mean									2.97±0.58	Agree

Legend: F=Frequency; %=Percentage; 3.26–4.00=Completely agree, 2.51–3.25 = Agree, 1.76–2.50=Slightly disagree

Table 9. Relationship between the knowledge and attitude of the respondents towards COVID-19 vaccine

Variables	Correlation coefficient	p-value
General knowledge about COVID-19 vaccine	0.370	0.000*
Types of COVID-19 vaccine	0.344	0.000*
Benefits of COVID-19 vaccine	0.344	0.000*
Side/Adverse effects of COVID-19 vaccine	0.311	0.000*
Vaccination in the Philippines	0.368	0.000*

Legend: *significant at p<0.05

4. CONCLUSION

The students, faculty members and staffs at the Nueva Ecija University of Science and Technology were found to be knowledgeable about the COVID-19 vaccine and to have a favorable attitude toward it. Their primary sources of knowledge regarding the COVID-19 vaccine were television and social media on the internet. The association between their knowledge and attitude towards the COVID-19 vaccine is positive. It implies that they are more likely to have a positive attitude when they are knowledgeable about the COVID-19 vaccine in general, its types, benefits and side effects, and vaccination status in the Philippines.

Having a positive attitude about the COVID-19 vaccination suggests that that person is more likely to take the vaccine shot, which is a good sign that herd immunity against the contagious and deadly COVID-19, will be achieved in the end. Therefore, health education campaigns to increase their awareness or knowledge about the COVID-19 vaccine should be done to turn their attitude into the positive side and finally accept a COVID-19 vaccine shot once the chance of receiving it comes. This is a promising sign for achieving herd immunity against the deadly SARS-CoV2 virus.

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REFERENCES

[1] O. S. Ilesanmi, O. O. Olabumuyi, and A. A. Afolabi, "Mobilizing medical students for improved COVID-19 response in Nigeria: a stop gap in human resources for health mobilizing medical students for improved COVID-19 response in Nigeria: a stop gap in human resources for health," *Global Biosecurity*, vol. 1, no. 4, 2020, doi: 10.31646/gbio.89.

[2] M. Pal, G. Berhanu, C. Desalegn, and V. Kandi, "Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2): an update," *Cureus*, Mar. 2020, doi: 10.7759/cureus.7423.

[3] WHO, "WHO Coronavirus disease (COVID-19) Dashboard," *World Health Organization*. 2021. [Online]. Available: https://covid19.who.int/table (accessed Jul. 9, 2021).

[4] E. M. Edrada *et al.*, "First COVID-19 infections in the Philippines: a case report," *Tropical Medicine and Health*, vol. 48, no. 1, p. 21, Dec. 2020, doi: 10.1186/s41182-020-00203-0.

[5] M. K. Al-Hanawi *et al.*, "Knowledge, attitude and practice toward COVID-19 among the public in the Kingdom of Saudi Arabia: a cross-sectional study," *Frontiers in Public Health*, vol. 8, May 2020, doi: 10.3389/fpubh.2020.00217.

[6] S. M. Sherman *et al.*, "COVID-19 vaccination intention in the UK: results from the COVID-19 vaccination acceptability study (CoVAccS), a nationally representative cross-sectional survey," *Human Vaccines & Immunotherapeutics*, vol. 17, no. 6, pp. 1612–1621, Jun. 2021, doi: 10.1080/21645515.2020.1846397.

[7] K. A. Mannan, G. M. O. F. Chowdhury, and D. K. M. Farhana, "The COVID-19 pandemic impacts on manpower export: an econometric analysis of survival strategies of recruiting agencies in Bangladesh," *SSRN Electronic Journal*, 2020, doi:

10.2139/ssrn.3676877.
[8] M. Nicola *et al.*, "The socio-economic implications of the coronavirus pandemic (COVID-19): A review," *International Journal of Surgery*, vol. 78, no. 4, pp. 185–193, Jun. 2020, doi: 10.1016/j.ijsu.2020.04.018.
[9] N. Lurie, M. Saville, R. Hatchett, and J. Halton, "Developing COVID-19 Vaccines at Pandemic Speed," *New England Journal of Medicine*, vol. 382, no. 21, pp. 1969–1973, May 2020, doi: 10.1056/NEJMp2005630.
[10] Y. Yang *et al.*, "The deadly coronaviruses: The 2003 SARS pandemic and the 2020 novel coronavirus epidemic in China," *Journal of Autoimmunity*, vol. 109, p. 102434, May 2020, doi: 10.1016/j.jaut.2020.102434.
[11] K. Pogue *et al.*, "Influences on attitudes regarding potential COVID-19 vaccination in the United States," *Vaccines*, vol. 8, no. 4, p. 582, Oct. 2020, doi: 10.3390/vaccines8040582.
[12] C. J. M. Melief, T. van Hall, R. Arens, F. Ossendorp, and S. H. van der Burg, "Therapeutic cancer vaccines," *Journal of Clinical Investigation*, vol. 125, no. 9, pp. 3401–3412, Sep. 2015, doi: 10.1172/JCI80009.
[13] K. F. Bol *et al.*, "Prophylactic vaccines are potent activators of monocyte-derived dendritic cells and drive effective anti-tumor responses in melanoma patients at the cost of toxicity," *Cancer Immunology, Immunotherapy*, vol. 65, no. 3, pp. 327–339, Mar. 2016, doi: 10.1007/s00262-016-1796-7.
[14] J. M. L. Brotherton, "HPV prophylactic vaccines: lessons learned from 10 years experience," *Future Virology*, vol. 10, no. 8, pp. 999–1009, Aug. 2015, doi: 10.2217/fvl.15.60.
[15] H. E. Randolph and L. B. Barreiro, "Herd Immunity: Understanding COVID-19," *Immunity*, vol. 52, no. 5, pp. 737–741, May 2020, doi: 10.1016/j.immuni.2020.04.012.
[16] A. de Figueiredo, C. Simas, E. Karafillakis, P. Paterson, and H. J. Larson, "Mapping global trends in vaccine confidence and investigating barriers to vaccine uptake: a large-scale retrospective temporal modelling study," *The Lancet*, vol. 396, no. 10255, pp. 898–908, Sep. 2020, doi: 10.1016/S0140-6736(20)31558-0.
[17] M. Saefi *et al.*, "Survey data of COVID-19-related knowledge, attitude, and practices among indonesian undergraduate students," *Data in Brief*, vol. 31, p. 105855, Aug. 2020, doi: 10.1016/j.dib.2020.105855.
[18] M. Saefi *et al.*, "Validating of knowledge, attitudes, and practices questionnaire for prevention of COVID-19 infections among undergraduate students: a RASCH and factor analysis," *Eurasia Journal of Mathematics, Science and Technology Education*, vol. 16, no. 12, p. em1926, Dec. 2020, doi: 10.29333/ejmste/9352.
[19] N. Qutob and F. Awartani, "Knowledge, attitudes and practices (KAP) towards COVID-19 among Palestinians during the COVID-19 outbreak: a cross-sectional survey," *PLOS ONE*, vol. 16, no. 1, p. e0244925, Jan. 2021, doi: 10.1371/journal.pone.0244925.
[20] Y.-D. Li, W.-Y. Chi, J.-H. Su, L. Ferrall, C.-F. Hung, and T.-C. Wu, "Coronavirus vaccine development: from SARS and MERS to COVID-19," *Journal of Biomedical Science*, vol. 27, no. 1, p. 104, Dec. 2020, doi: 10.1186/s12929-020-00695-2.
[21] World Health Organization, "Module 2: Types of vaccine and adverse reactions- Contraindications," *Vaccine Safety Basics*, 2020, [Online]. Available: https://vaccine-safety-training.org/anaphylaxis.html (accessed Jul. 9, 2021).
[22] C. C.-19 R. Team and F. and D. Administration, "Allergic reactions including anaphylaxis after receipt of the first dose of moderna COVID-19 vaccine — United States, December 21, 2020–January 10, 2021," *MMWR. Morbidity and Mortality Weekly Report*, vol. 70, no. 4, pp. 125–129, Jan. 2021, doi: 10.15585/mmwr.mm7004e1.
[23] R. L. Caga-anana, M. N. Razab, G. S. G. Labradora, and E. Metilloc B., "Effect of vaccination to COVID-19 disease progression," *arXiv preprint arXiv*, 2021, [Online]. Available: https://www.voanews.com/covid-19-pandemic/philippines-finally-receives-first-batch-covid-19-vaccine (accessed Jul. 9, 2021).
[24] GOVPH, "FAQs: Vaccines." Department of Health, [Online]. Available: https://doh.gov.ph/faqs/vaccines (accessed Jul. 9, 2021).
[25] B. Doce, "The politics of participation of the philippines COVID-19 vaccination program: a critical political economy approach," *Assemblea: An Online Journal of Political Science*, vol. 2, no. 1, pp. 1–20, 2021.
[26] F. P. Polack *et al.*, "Safety and Efficacy of the BNT162b2 mRNA Covid-19 Vaccine," *New England Journal of Medicine*, vol. 383, no. 27, pp. 2603–2615, Dec. 2020, doi: 10.1056/nejmoa2034577.
[27] C. Betsch, R. Böhm, L. Korn, and C. Holtmann, "On the benefits of explaining herd immunity in vaccine advocacy," *Nature Human Behaviour*, vol. 1, no. 3, p. 56, Mar. 2017, doi: 10.1038/s41562-017-0056.
[28] CDC, "How COVID-19 vaccines work." Centers for Disease Control and Prevention, 2021, [Online]. Available: https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/how-they-work.html (accessed Jul. 9, 2021).
[29] N. Petrovsky and J. C. Aguilar, "Vaccine adjuvants: current state and future trends," *Immunology & Cell Biology*, vol. 82, no. 5, pp. 488–496, Oct. 2004, doi: 10.1111/j.0818-9641.2004.01272.x.
[30] A. R. Tuite, L. Zhu, D. N. Fisman, and J. A. Salomon, "Alternative dose allocation strategies to increase benefits from constrained COVID-19 vaccine supply," *Annals of Internal Medicine*, vol. 174, no. 4, pp. 570–572, Apr. 2021, doi: 10.7326/M20-8137.
[31] CDC, "COVID-19 and your health," *Centers for Disease Control and Prevention*, 2020, [Online]. Available: https://www.cdc.gov/coronavirus/2019-ncov/long-term-effects/index.html (accessed Jul. 9, 2021).
[32] G. Di Martino *et al.*, "Knowledge and attitude towards vaccination among healthcareworkers: a multicenter cross-sectional study in a southern italian region," *Vaccines*, vol. 8, no. 2, p. 248, May 2020, doi: 10.3390/vaccines8020248.
[33] S. J. Cvjetkovic, V. L. Jeremic, and D. V Tiosavljevic, "Knowledge and attitudes toward vaccination: a survey of Serbian students," *Journal of Infection and Public Health*, vol. 10, no. 5, pp. 649–656, Sep. 2017, doi: 10.1016/j.jiph.2017.05.008.
[34] L. L. Lau *et al.*, "Knowledge, attitudes and practices of COVID-19 among income-poor households in the Philippines: A cross-sectional study," *Journal of Global Health*, vol. 10, no. 1, Jun. 2020, doi: 10.7189/jogh.10.011007.
[35] H. Elnadi, I. A. Odetokun, O. Bolarinwa, Z. Ahmed, O. Okechukwu, and A. I. Al-Mustapha, "Correction: Knowledge, attitude, and perceptions towards the 2019 Coronavirus Pandemic: A bi-national survey in Africa," *PLOS ONE*, vol. 16, no. 2, p. e0247351, Feb. 2021, doi: 10.1371/journal.pone.0247351.
[36] J. M. Santiago and E. S. David, "The use of two media of instruction in biology: a quasi-experimental study," *International Journal of Advanced Engineering, Management and Science*, vol. 5, no. 2, pp. 111–115, 2019, doi: 10.22161/ijaems.5.2.3.
[37] J. M. Santiago and A. R. Santos, "Knowledge, attitude and practices of the university students about COVID-19 during the Luzon lockdown in the Philippines," *International Journal of Public Health Science (IJPHS)*, vol. 10, no. 3, pp. 670–678, Sep. 2021, doi: 10.11591/ijphs.v10i3.20844.
[38] J. M. Santiago and R. L. Cajucom, "Knowledge about COVID-19 among university students before the implementation of the enhanced community quarantine in Philippines," *International Journal of Public Health Science (IJPHS)*, vol. 9, no. 4, p. 421, Dec. 2020, doi: 10.11591/ijphs.v9i4.20545.
[39] F. A. del Castillo, "Changing the COVID-19 vaccine narrative to dispel vaccine hesitancy," *Journal of Public Health*, vol. 43, no. 3, pp. e567–e567, Sep. 2021, doi: 10.1093/pubmed/fdab201.
[40] C. Ratanaprug, W. Srisuwatchari, O. Jirapongsananuruk, N. Visitsunthorn, and P. Pacharn, "Carrying rates of epinephrine devices in children with food-induced anaphylaxis," *Asia Pacific Allergy*, vol. 9, no. 2, 2019, doi: 10.5415/apallergy.2019.9.e12.

[41] A. Murad and C. H. Katelaris, "Anaphylaxis audit in a busy metropolitan Emergency Department: a review of real life management compared to best practice," *Asia Pacific Allergy*, vol. 6, no. 1, p. 29, 2016, doi: 10.5415/apallergy.2016.6.1.29.
[42] B. Seo *et al*., "119 Rescue team's awareness of anaphylaxis and asthma exacerbation in Gyeonggi-do province of Korea: Before and after education," *Allergy, Asthma & Respiratory Disease*, vol. 7, no. 4, p. 199, 2019, doi: 10.4168/aard.2019.7.4.199.
[43] Y.-S. Chang, "The 10th Anniversary of Asia Pacific Allergy," *Asia Pacific Allergy*, vol. 10, no. 1, 2020, doi: 10.5415/apallergy.2020.10.e10.
[44] A. P. Bautista Jr., D. G. Bleza, D. M. Balibrea, and C. Equiza, "Acceptability of Vaccination Against COVID-19 Among Selected Residents of the Cities of Caloocan , Malabon , and Navotas, Philippines," *Preprints*, no. February, 2021, doi: 10.20944/preprints202104.0702.v1.
[45] R. A. Gita-Carlos, "Most Pinoys aware of COVID-19 vax: poll," *Philippine News Agency*, 2021.
[46] University of Missouri, "What are the Benefits of Getting the COVID-19 Vaccine?" pp. 1–4, 2021, [Online]. Available: https://www.muhealth.org/our-stories/what-are-benefits-getting-covid-19-vaccine (accessed Jul. 9, 2021)
[47] E. Shim, G. B. Chapman, J. P. Townsend, and A. P. Galvani, "The influence of altruism on influenza vaccination decisions," *Journal of The Royal Society Interface*, vol. 9, no. 74, pp. 2234–2243, Sep. 2012, doi: 10.1098/rsif.2012.0115.
[48] WHO, "Side Effects of COVID-19 Vaccines," *World Health Organization*. World Health Organization, 2021, [Online]. Available: https://www.who.int/news-room/feature-stories/detail/side-effects-of-covid-19-vaccines (accessed Jul. 9, 2021).
[49] M. S. Islam *et al*., "Knowledge, attitudes and perceptions towards COVID-19 vaccinations: a cross-sectional community survey in Bangladesh," *BMC Public Health*, vol. 21, no. 1, p. 1851, Dec. 2021, doi: 10.1186/s12889-021-11880-9.
[50] K. A. Mannan and K. M. Farhana, "Knowledge, attitude and acceptance of a COVID-19 vaccine: a global cross-sectional study," *SSRN Electronic Journal*, vol. 6, no. 4, p. 23, 2020, doi: 10.2139/ssrn.3763373.
[51] M. Riccò, S. Cattani, F. Casagranda, G. Gualerzi, and C. Signorelli, "Knowledge, attitudes, beliefs and practices of occupational physicians towards vaccinations of health care workers: A cross sectional pilot study in North-Eastern Italy," *International Journal of Occupational Medicine and Environmental Health*, vol. 30, no. 5, pp. 775–790, Jun. 2017, doi: 10.13075/ijomeh.1896.00895.
[52] C. Ledda, C. Costantino, M. Cuccia, H. C. Maltezou, and V. Rapisarda, "Attitudes of healthcare personnel towards vaccinations before and during the covid-19 pandemic," *International Journal of Environmental Research and Public Health*, vol. 18, no. 5, pp. 1–11, Mar. 2021, doi: 10.3390/ijerph18052703.

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