Research Article

COVID-19 vaccine and vaccination knowledge, attitudes, and practices of teachers in the Philippines

Michael B. Cahapay[1] and Nathaniel II F. Bangoc[2]

[1]*College of Education, Mindanao State University, General Santos City, Philippines;* [2]*Region XII, Department of Education, Philippines*

Correspondence should be addressed to Michael B. Cahapay   iD   mbcahapay@up.edu.ph

The triumph of vaccination programs requires the modification of human behavior, which in turn, needs an understanding of knowledge, attitudes, and practices (KAPs) regarding vaccine and vaccination. This paper aimed to investigate the COVID-19 vaccine and vaccination KAPs of the teachers. Following a quantitative correlation research design, 2272 K to 12 teachers from Mindanao, Philippines were surveyed using an adapted instrument. The data collected were treated using descriptive statistics, Chi-square, t-test for independent samples, ANOVA, Point Biserial Correlation, and Pearson r. The result shows that most teachers perceive themselves as knowledgeable, possess desirable attitudes, and demonstrate favorable practices toward COVID-19 vaccine and vaccination. It was further found that COVID-19 vaccine and vaccination knowledge significantly differed across gender while both attitudes and practices significantly differed across age, gender, monthly income, and teaching experience. Hence, future policies and measures to improve knowledge, attitudes, and practices should be developed targeting samples with these characteristics. Lastly, the result reveals that COVID-19 vaccine and vaccination knowledge influence attitudes and practices. Thus, to increase desirable attitudes and favorable practices, government officials and concerned groups must promote COVID-19 vaccine and vaccination knowledge.

Keywords: Knowledge, attitudes, practices, vaccine, vaccination, COVID-19

1. Introduction

Coronaviruses have always perturbed the world in the last two decades (Zhu et al., 2020). One of these coronaviruses is the current COVID-19, a new strain of severe acute respiratory syndrome caused by a novel coronavirus (Shereen et al., 2020). Its first few cases were reported in Wuhan, China in late December 2019 (Shanmugaraj et al., 2020). According to the experts, it has a high mutation rate (Wang et al., 2020) and is an extremely transmissible virus (Thorneloe et al., 2020). Thus, it rapidly spread across countries around the world in a few months and was shortly declared a pandemic on March 11, 2020 (World Health Organization, 2020a). As of July 23, 2021, there have been 192,284,207 confirmed cases of COVID-19 infection, including 4,136,518 fatalities (World Health Organization, 2021).

To stop the transmission chain of COVID-19, herd immunity must be attained (World Health Organization, 2020b). Epidemiological experts suggest that the needed percentage to achieve herd immunity is projected at 67% of the population (Randolph & Barreiro, 2020). After a year into the COVID-19 crisis, the global effort to develop and supply an effective vaccine produced several auspicious alternatives. The rapid development of different vaccines is unprecedented; the process typically takes more than eight years (Felter, 2021). Since then, many countries have rolled out their COVID-19 vaccine and vaccination programs, renewing hopes that it may finally put a halt to the current global crisis (Deutsche Welle, 2021). As of 23 July 2021, a total of 3,605,386,928 vaccine doses have been administered (World Health Organization, 2021).

However, the current global crisis is challenged by negative behaviors associated with the COVID-19 vaccine and vaccination. This is supported by initial indications of low vaccine and vaccination acceptance (e.g., Cahapay, 2021; El-Elimat et al., 2021). While the medical consensus on

the advantages of vaccines and vaccination has been proven, an emerging population perceives vaccines as unsafe (Dubé et al., 2021). The anti-vaccination movement is often identified as the main culprit of increasing vaccine hesitancy among the general populace. There have also been unfounded claims that the COVID-19 crisis is a hoax to sell vaccines (Hall, 2020). These issues are disturbing as positive behaviors are needed for successful COVID-19 response (Zhong et al., 2020) including vaccine and vaccination programs.

Given the current situation, an approach to improve the behaviors of individuals is through KAPs studies. According to Andrade et al. (2020), these studies are widely accepted for research to find out what is known, believed, and done in the context of the subject of interest. The results of KAPs studies may be used to identify the baseline knowledge, attitudes, and practices about a specific health-related topic, provide information on needs, issues, and barriers related to the development of effective interventions, and offer inputs essential for the design of an effective intervention program. Such studies are conducted when novel situations arise. Thus, in this research, a KAPs study can be used to assess the baseline levels of awareness as the COVID-19 vaccine and vaccination program is currently and continually being developed in the population of interest.

Related studies assessing the KAPs amid the COVID-19 crisis have been globally reported. A vast body of these studies focus on KAPs toward COVID-19 of general populations (Alqahtani et al., 2021; Asraf et al., 2020; Bates et al., 2020; Kakemam et al., 2020; Kasemy et al., 2020; Lee et al., 2021; Li et al., 2021; Mousa et al., 2020; Ngwewondo et al., 2020; Okello et al., 2020; Rias et al., 2020; Selby et al., 2021; Yousaf et al., 2020). There are also studies on KAPs toward COVID-19 of particular segments (e.g., see Haftom et al., 2020 on quarantined adults; Islam et al., 2020 on slum dwellers; Provenzano et al., 2020 on nursing students; Taye et al., 2021 on people with hypertension; Wong et al., 2020 on ethnic minorities; Zhang et al., 2020 on healthcare workers; Zheng et al., 2021 on industry practitioners). On the other hand, timely studies on KAP toward COVID-19 vaccine and vaccination are few (e.g., Al-Marshoudi et al., 2021; Bhartiya et al., 2021; Elhadi et al., 2021; Seale et al., 2021). A study specifically focusing on the KAPs toward COVID-19 vaccine and vaccination of the segment of the teachers has not been explored.

This study focuses on the COVID-19 vaccine and vaccination of the teachers. The segment of teachers has become one of the worst affected due to the COVID-19 crisis, causing them negative psychological outcomes such as anxiety, stress, fear, and burnout (Carreon et al., 2021; Wu et al. 2020). As such, the United Nations International Children's Education Fund (2020) has called for the vaccination of teachers across the world. Acknowledging further the crucial part that teachers serve in the implementation of the educational recovery plan, the Philippine government has expressed the need for the teachers to be vaccinated against COVID-19 (Mercado, 2020). Thus, investigating the KAPs toward COVID-19 vaccine and vaccination of the segment of the teachers at this point is an important research interest. It will yield practical understanding that would guide measures to improve the behaviors of the teachers necessary for the success of vaccine and vaccination programs.

The purpose of this research is to investigate the COVID-19 vaccine and vaccination KAPs of the teachers. Specifically, it sought to answer the following questions:

RQ 1) What are the COVID-19 vaccine and vaccination KAPs of the teachers?

RQ 2) Is there a significant difference in the COVID-19 vaccine and vaccination KAPs of the teachers?

RQ 3) Is there a significant relationship between the COVID-19 vaccine and vaccination KAPs of the teachers?

2. Method

This section discusses the methods of the study. It includes the research design, sample, instrument, data collection, and data analysis.

2.1. Research Design

This study is generally signed as qualitative research. Specifically, it employed a correlational research design. A correlational research design measures variable to identify the degree to which these variables are related in an identifiable pattern (Curtis et al., 2016). It is appropriate for this study as it aimed to associate COVID-19 vaccine and vaccination knowledge, attitudes, and practices across sample characteristics and determine the influence of COVID-19 vaccine and vaccination knowledge on attitudes, and practices.

2.2. Sample

The respondents of this study were 2,272 employed K to 12 teachers from Region XII, Mindanao, Philippines during the school year 2020-2021. They were selected through a simple random sampling technique in which each respondent has the same probability of being selected for the sample (Taherdoost, 2016). The respondents were included regardless of gender, age, educational attainment, and socioeconomic status. Table 1 presents the summary of the sample characteristics.

Table 1
Sample characteristics

Characteristics	n	%
Age		
34 years old and below	1071	47.1
35 to 44 years old	644	28.3
45 years old and above	557	24.5
Gender		
Male	423	18.6
Female	1849	81.4
Marital Status		
Single	724	31.9
Married	1548	68.1
Monthly Income		
PHP23,000 and below	960	42.3
PHP24,000 and above	1312	57.7
Education Attainment		
Undergraduate degree	221	9.7
Graduate units or degree	2051	90.3
Teaching Experience		
0-10 years	1477	65.0
11-20 years	438	19.3
21 years and above	357	15.7

Moreover, as the Philippine government rolled out its vaccination program, there has been a call to prioritize the teachers. Advocacy groups have pointed out that teachers are compelled to report to schools, visit homes to distribute instructional materials, and facilitate government programs. Thus, vaccination of the teachers is a crucial component of the road to educational recovery (Rocamora, 2021).

2.3. Instrument

This study used a survey instrument to gather the needed data. The first part consisted of a question asking the COVID-19 vaccine and vaccination knowledge of the teachers and answerable with a "no" or "yes" option. On the other hand, the items for COVID-19 vaccine and vaccination attitudes and practices were adapted from the instruments developed by Seale et al. (2021) and Islam et al. (2021). They have five items each framed on a scale of 1 as "Disagree" and 3 as "Agree." The Cronbach alphas generated for these items in this study were .902 for attitudes and .808 for practices, which are considered strong reliabilities.

2.4. Data Collection

The researchers initially sought ethics review approval for this study. Following the DepEd Order No. 16 series of 2017 on Research Management Guidelines, prior administrative endorsement serving as ethics review for this study was obtained from the Department of Education Region XII.

The data of this study were collected in three weeks from June 03-18, 2021 through an online survey using Google Forms. An online survey is preferred as the modality of data collection because of the difficulty of a face-to-face survey considering the continuing restrictions caused by the COVID- 19 crisis. Before participating in the survey, the respondents were presented to a first layer of the web questionnaire. This part will describe the goal of the research, the procedure for completing the survey, and the ethical considerations involved in the process. To maintain privacy, the names of the respondents were not required. It was also stressed that participation in the survey is voluntary, no incentive is involved, and withdrawal at any given point is allowed. Informed consent was provided in which the respondents will have to agree by ticking a box before they could proceed to the main part of the online survey.

2.5. Data Analysis

The IBM Statistical Package for Social Science version 17 was employed for the data analysis of this study. The assumption of normality was confirmed, thus parametric tests were used. A preliminary analysis of the data using descriptive statistics was provided for the frequency, mean, percentage rate, and standard deviation for all the variables. Chi-Square tests were conducted to compare the COVID-19 vaccine and vaccination knowledge of the teachers across sample characteristics. On the other hand, t-test for independent samples and ANOVA were performed to compare the COVID-19 vaccine and vaccination attitudes and practices across the sample characteristics. Finally, Point Biserial Correlation was applied to test the influence of COVID-19 vaccine and vaccination knowledge on attitudes and practices and Pearson r on the influence of COVID-19 vaccine and vaccination attitudes on practices. All tests were done at a 0.05 level of significance.

3. Results and Discussion

The main objective of this study is to investigate the COVID-19 vaccine and vaccination knowledge, attitudes, and practices of the teachers. This section presents the results.

Table 2
COVID-19 vaccine and vaccination knowledge

Knowledge	Response	n	%
Do you know about the COVID-19 vaccine and vaccination?	No	69	3.0
	Yes	2203	96.9

Table 2 presents the COVID-19 vaccine and vaccination knowledge of the teachers. The result shows that only 69 (3%) answered "No" and 2203 (96.9%) answered "Yes" as regards their knowledge about the COVID-19 vaccine and vaccination. This outcome suggests that a large majority of the teachers perceive themselves as knowledgeable regarding the COVID-19 vaccine and vaccination.

This result of the study is comparable to the findings of some recent research. Al-Marshoudi et al. (2021) found similar but a slightly lower level of perceived knowledge of the COVID-19 vaccine of Omani residents. When asked if they heard of the COVID-19 vaccine, 88% of the respondents affirmed. The same trend can be gleaned from the findings of Seale et al. (2021) who uncovered similar but a slightly lower level of perceived knowledge of the COVID-19 vaccine of Australian residents. On responding to the question if they have heard of the COVID-19 vaccine, 88% of the respondents confirmed. However, it contrasts with the recent findings of Bhartiya et al. (2021) in Indian residents. When the respondents in their study were similarly asked if they know the w of the COVID-19 vaccine, only 9% responded that they know while 91% either believe that it did not

exist or they did not know about it. The slight similarities and stark differences in the results of the present paper and other studies may be attributed to some factors. According to Seale et al. (2020), differences in attitudes and practices may be due to a single or combination of factors such as the variation in the wording of the question, level of confidence and trust in the government, or concerns about increasing local transmission. Table 3 displays the COVID-19 vaccine and vaccination attitudes and practices of the teachers.

Table 3
COVID-19 vaccine and vaccination attitudes and practices

Attitudes	SD	Mean	Description
The newly discovered COVID-19 vaccine is safe.	.53787	2.2404	Undecided
It is not possible to reduce the incidence of COVID-19 without vaccination.	.62908	2.2435	Undecided
Vaccines are effective at preventing diseases.	.58458	2.3672	Agree
The COVID-19 vaccine is essential for us.	.56549	2.5412	Agree
The COVID-19 vaccine should be distributed fairly to all of us.	.51039	2.6684	Agree
Overall Mean		2.41214	Agree
Practices	**SD**	**Mean**	**Description**
I do what my health care professional recommends about COVID-19 vaccination.	.53401	2.5900	Agree
I encourage my family and friends to get vaccinated against COVID-19.	.59832	2.4778	Agree
I follow government guidelines about COVID-19 vaccines.	.47753	2.7261	Agree
I take the COVID-19 vaccine without any hesitation if it is available.	.66030	2.4954	Agree
I plan to be vaccinated against COVID-19.	.66501	2.4218	Agree
Overall Mean		2.5422	Agree

As regards the COVID-19 vaccine and vaccination attitudes, it can be interestingly noted from the result that the teachers are undecided whether the newly discovered COVID-19 vaccine is safe (M=2.2404) and if it is not possible to reduce the incidence of COVID-19 without vaccination (M=2.2435). Moreover, they agree that vaccines are effective at preventing diseases (2.3672), essential (2.5412), and should be distributed fairly (2.6684). Overall, the attitudes of the teachers obtained a mean of 2.41214 described as agree. It implies that the teachers have desirable attitudes toward the COVID-19 vaccine and vaccination.

This result aligns with the findings of Seale et al. (2021). They found out that the respondents generally held positive attitudes toward vaccination, with 83% of them agreeing that vaccines are effective at preventing diseases. Similarly, Elhadi et al. (2021) demonstrated in the findings of their research that 86% of their respondents affirmed that vaccination could reduce morbidity, 94.2% believed that finding an effective vaccine was possible and would reduce the COVID-19 burden, and 93.1% believed that the COVID-19 vaccine should be provided for free. On the other hand, it is interesting to note in the finding of Islam et al. (2021) that only 26% recognize the COVID-19 vaccine as safe.

Furthermore, when it comes to COVID-19 vaccine and vaccination practices, the result shows a consistent trend. The teachers agree that they do what their health care professional recommends about COVID-19 vaccination (M=2.5900), encourage their family and friends to get vaccinated against COVID-19 (M=2.4778), follow government guidelines about COVID-19 vaccines (M=2.7261), take the COVID-19 vaccine without any hesitation if it is available (M=2.4954), and plan to be vaccinated against COVID-19 (M=2.4218). Generally, the practices of the teacher got a mean of 2.54222 described as agree. This outcome points to the favorable practices on the COVID-19 vaccine and vaccination.

This result mirrors the findings of the study conducted by Al-Marshoudi et al. (2021). They found out that 59.3% did not have any issues with the vaccine and they would recommend it to their family and friends. They similarly revealed that 57% of the respondents were willing to take the vaccine and 84% of the ones willing to take the vaccine would commit to taking the second dose as well. Moreover, the research of Seale et al. (2021) yielded d similar finding that 84% of their respondents agreed that they generally do what their healthcare professional recommends. Their findings also indicated that 84% of the respondents agree that they should follow government guidelines about vaccines.

Table 4
The difference in COVID-19 vaccine and vaccination knowledge

Sample Characteristics		Knowledge		
		No	Yes	*p*
		n (%)	n (%)	
Age	34 years old and below	34 (3.17)	1037 (96.82)	.51
	35 to 44 years old	22 (3.42)	622 (96.58)	
	45 years old and above	13 (2.33)	544 (97.66)	
Gender	Male	23 (5.44)	400 (94.56)	**.001**
	Female	46 (2.02)	1803 (97.51)	
Marital Status	Single	26 (2.49)	698 (96.41)	.29
	Married	43 (2.78)	1505 (97.22)	
Monthly Income	PHP23,000 and below	37 (3.85)	923 (96.15)	.052
	PHP24,000 above	32 (2.44)	1280 (97.56)	
Educational Attainment	Undergraduate degree	4 (1.81)	217 (98.19)	.26
	Graduate units or degree	65 (3.17)	1986 (96.83)	
Teaching Experience	0-10 years	44 (2.97)	1433 (97.03)	.63
	11-20 years	16 (3.65)	422 (96.35)	
	21 years and above	9 (2.52)	348 (1.08)	

Chi-Square test was performed to explore if COVID-19 vaccine and vaccination knowledge is significantly different across sample characteristics. Table 4 presents the results.

It was found out that, COVID-19 vaccine and vaccination knowledge is significantly different across gender ($p = .001$). The significantly higher COVID-19 vaccine and vaccination knowledge can be observed in females over males (94.56% vs. 97.51%). On the other hand, there is no significant difference noted in COVID-19 vaccine and vaccination knowledge across age, marital status, monthly income, educational attainment, and teaching experience.

This result of the present study is different from the findings of Islam et al. (2021). They discovered that knowledge was significantly different across educational attainment while no significant difference was noted across gender. On the other hand, the result of this paper is supported and negated at large by the findings of Bhartiya et al. (2021). They uncovered that knowledge significantly differed across gender as well as age, education, and income. This trend is further supported in other KAPs studies toward COVID-19 in general. For example, Ngwewondo (2020) revealed that knowledge significantly differed across age but not gender. Similarly, Zheng et al. (2021) also demonstrated that knowledge was significantly different across ages but not gender and years of work experience. Bates et al. (2020) also offer interesting findings, indicating that knowledge significantly differed across educational attainment but not gender, age, and marital status. It should be noted, however, that these KAPs studies do not focus on knowledge toward COVID-19 vaccine and vaccination but COVID-19 in general. Hence, this present study provides evidence as regards the difference in COVID-19 vaccine and vaccination knowledge across selected sample characteristics.

A series of t-test and ANOVA were conducted to compare the COVID-19 vaccine and vaccination attitudes and practices of the teachers across sample characteristics. Table 5 shows the result.

Table 5
The difference in COVID-19 vaccine and vaccination attitudes and practices

Sample Characteristics		Attitudes		Practices	
		M	*p*	M	*p*
Age	34 years old and below	2.38	.03	2.50	.00
	35 to 44 years old	2.42		2.54	
	45 years old and above	2.44		2.61	
Gender	Male	2.39	.001	2.52	.001
	Female	2.47		2.61	
Marital Status	Single	2.41	.75	2.52	.19
	Married	2.41		2.55	
Monthly Income	PHP23,000 and below	2.37	.001	2.48	.00
	PHP24,000 above	2.43		2.58	
Educational Attainment	Undergraduate degree	2.41	.96	2.52	.49
	Graduate units or degree	2.41		2.54	
Teaching Experience	0-10 years	2.39	.00	2.50	.00
	11-20 years	2.40		2.57	
	21 years and above	2.49		2.65	

First, in terms of COVID-19 vaccine and vaccination attitudes, statistically differed based on age (34 years old and below=2.38 vs. 45 years old and above=2.44; *p*=.038); gender (male=2.39 vs. female=2.47; *p*=.001); monthly income (PHP23,000 and below=2.3769 vs. PHP24,000 above=2.43; *p*=.001); and teaching experience (10 years and below=2.39 vs. 21 years and above=2.49). Furthermore, the result uncovers that COVID-19 vaccine and vaccination practices statistically differed according to age (34 years old and below=2.5044 vs. 35-44 years old=2.55 vs. 45 years old and above=2.44; *p*=.000); gender (male=2.52 vs. female=2.61; *p*=.001); monthly income (PHP23,000 and below=2.48 vs. PHP24,000 above=2.58; *p*=.001); and teaching experience (10 years and below=2.50 vs. 11-20 years old=2.5726 vs. 21 years and above=2.65). Overall, both COVID-19 vaccine and vaccination attitudes and practices notably differed across age, gender, monthly income, and teaching experience.

Similarly, Islam et al. (2021) disclosed that attitudes were significantly higher among participants who reported being female as compared to males. Other than this finding, most of the other available studies do not explore the significant difference in the COVID-19 vaccine and vaccination attitudes and practices across selected sample characteristics. Exploring KAPs studies toward COVID-19 in general, Ngwewondo (2020) showed that attitudes significantly differed across gender and age, and practices significantly differed across gender but not age. Additionally, Zheng et al. (2021) reported that the attitude significantly differed across age and years of work experience but not gender, and practices significantly differed across gender and years of work experience but not age. Interestingly, Kasemy et al. (2020) found out that attitudes and practices significantly differed across age, gender, income, and educational attainment. However, the comparison to these KAPs studies should be taken cautiously as they do not focus on attitudes and practices toward the COVID-19 vaccine and vaccination but COVID-19 as a whole. Thus, this current research offers a piece of evidence as regards the differences in COVID-19 vaccine and vaccination attitudes and practices across selected sample characteristics.

Lastly, Point Biserial Correlation was used to determine the influence of COVID-19 vaccine and vaccination KAPs. Table 6 illustrates the result. The result reveals that knowledge significantly influences attitudes (*r*=.16, *p*=.00). This means that the more the teachers perceive themselves as knowledgeable about the COVID-19 vaccine and vaccination, the more they possess desirable attitudes (e.g., believe the that COVID-19 vaccine is safe, think that the COVID-19 vaccine is effective, etc.). The result further discloses that knowledge significantly influences practices (*r*=.12,

Table 6
Relationship between COVID-19 vaccine and vaccination KAP

Variables	Attitudes	Practices
Knowledge	.16	.12
	.00	.00
Attitudes		.73
		.00

p=.00) and attitudes significantly influence practices (*r*=.73, *p*=.00). This implies that the more the teachers perceive themselves as knowledgeable about the COVID-19 vaccine and vaccination and demonstrate favorable attitudes about them, the more they demonstrate favorable practices (e.g., follow government guidelines about COVID-19 vaccines, take the COVID-19 vaccine without any hesitation, etc.). It should be noted with caution that the extent of influence of knowledge on attitudes and practices found is low.

The significant correlations found between the COVID-19 vaccine and vaccination KAPs are supported by several studies conducted to assess KAPs toward COVID-19 in general. For example, Iradukunda et al. (2020) unearthed varying positive correlations between knowledge and attitudes, between knowledge and practices, and between attitudes and practices scores. Contrastingly, Basnet et al. (2020) found that knowledge was significantly associated with practices but not knowledge with attitudes and attitudes with practices. This present paper contributes new knowledge as regards the significant relationships between the COVID-19 vaccine and vaccination KAPs.

4. Conclusion

Set in the educational context in a developing country, this study sought to investigate the COVID-19 vaccine and vaccination knowledge, attitudes of the teachers. Specifically, it determined the COVID-19 vaccine and vaccination knowledge, attitudes, and practices, compared COVID-19 vaccine and vaccination knowledge, attitudes, and practices across sample characteristics, and correlated COVID-19 vaccine and vaccination knowledge, attitudes, and practices.

The result shows that most teachers perceive themselves as knowledgeable, possess desirable attitudes, and demonstrate favorable practices toward COVID-19 vaccine and vaccination. Another result of this study demonstrates that COVID-19 vaccine and vaccination knowledge significantly differed across gender while both attitudes and practices significantly differed across age, gender, monthly income, and teaching experience. Lastly, the result provides evidence as regards the significant influence of the COVID-19 vaccine and vaccination knowledge on attitudes and practices.

Based on these main outcomes, this study offers recommendations. First, if relevant interventions should be formulated, samples characteristics in which COVID-19 vaccine and vaccination knowledge, attitudes, and practices significantly differ must be considered. Particularly, teachers who are 34 years old and below, male, with a monthly income of PHP23,000 and below, and 10 years and below must be primarily and strategically considered. Second, government officials and concerned groups must continue promoting COVID-19 vaccine and vaccination knowledge not only in the teachers but also in other vulnerable target samples. Future approaches to increase desirable attitudes and favorable practices must integrate strategies that promote COVID-19 vaccine and vaccination knowledge.

Some limitations should be acknowledged in this study. The researchers did not extensively explore the composite nature of the COVID-19 vaccine and vaccination knowledge, attitudes, and practices. Furthermore, as COVID-19 vaccine and vaccination knowledge, attitudes, and practices are mainly based on the perceptions of the respondents and gathered online, the data may be prone to socially desirable responses. A low extent of influence of COVID-19 vaccine and vaccination knowledge on attitudes and practices was also found which points to other factors not covered in this study.

Author contributions: All authors have sufficiently contributed to the study, and agreed with the conclusions.

Declaration of interest: No conflict of interest is declared by author.

Funding: No funding source is reported for this study.

References

Al-Marshoudi, S., Al-Balushi, H., Al-Wahaibi, A., Al-Khalili, S., Al-Maani, A., Al-Farsi N., Al-Jahwari, A., Al-Habsi, Z., Al-Shaibi, M., Al-Msharfi, M., & Al-Ismaili, A. (2021). Knowledge, attitudes, and practices (KAP) toward the COVID-19 vaccine in Oman: A pre-campaign cross-sectional study. *Vaccines, 9*(6), 602. https://doi.org/10.3390/vaccines9060602

Alqahtani, A.H., Alqahtani, S.A., Alhodaib, A.S., Al-Wathinani, A.M., Daoulah, A., Alhamid, S. (2021). Knowledge, attitude, and practice (KAP) toward the novel coronavirus (COVID-19) pandemic in a Saudi population-based survey. *International Journal of Environmental Research and Public Health, 16-18*(10), 5286. https:// doi.org/10.3390/ijerph18105286

Altayb Mousa, K. N. A., Saad, M. M. Y., & Tayseer Bashir Abdelghafor, M. (2020). Knowledge, attitudes, and practices surrounding COVID-19 among Sudan citizens during the pandemic: an online cross-sectional study. *Sudan Journal of Medical Sciences, 10,* 32–45. https://doi.org/10.18502/sjms.v15i5.7176

Andrade, C., Menon, V., Ameen, S., & Kumar Praharaj, S. (2020). Designing and conducting knowledge, attitude, and practice surveys in psychiatry: practical guidance. *Indian Journal of Psychological Medicine, 42*(5), 478–481. https://doi.org/10.1177/0253717620946111

Bhartiya, S., Kumar, N, Singh, T., Murugan, S., Rajavel, S., & Wadhwani, M. (2021). Knowledge, attitude and practice towards COVID-19 vaccination acceptance in West India. *International Journal of Community Medicine and Public Health, 8*(3), 1170. https://doi.org/10.18203/2394-6040.ijcmph20210481

Basnet, S., Dahal, S., Tamrakar D., Shakya, Y. R., Jacobson, C., & Shrestha, J. (2020). Knowledge, attitude, and practices related to COVID-19 among healthcare personnel in a tertiary care hospital in Nepal: A cross-sectional survey. *Kathmandu University Medical Journal, 18*(2), 21–28. https://doi.org/10.3126/kumj.v18i2.32940

Bates, B. R., Villegas Botero, A., & Grijalva, M. J. (2020). Knowledge, attitudes, and practices towards COVID-19 among Colombians during the outbreak: an online cross-sectional survey. *Journal of Communication in Healthcare, 13*(4), 262–70. https://doi.org/10.1080/17538068.2020.1842843

Cahapay M. B. (2021). To get or not to get: Examining the intentions of Philippine teachers to vaccinate against COVID-19. *Journal of Human Behavior in the Social Environment, 32*(3), 325–335. https://doi.org/10.1080/10911359.2021.1896409

Carreon, T., Rotas ,E., Cahapay, M., Garcia, K., Amador, R., & Anoba, J. L. (2021). Fear of COVID-19 and remote teaching burnout of Filipino K to 12 teachers. *IJERI: International Journal of Educational Research and Innovation, 15,* 552–567. https://doi.org/10.46661/ijeri.5853

Curtis, E. A., Comiskey, C., & Dempsey, O. (2016). Importance and use of correlational research. *Nurse Researcher, 23*(6), 20-25. https://doi.org/10.7748/nr.2016.e1382

Deutsche Welle. (2021). Countries start rolling out coronavirus vaccine. *Author.* Retrieved from https://www.dw.com/en/countries-start-rolling-out-coronavirus-vaccine/g-56037118

Dubé, E., Ward, J. K., Verger, P., & MacDonald, N. E. (2021). Vaccine hesitancy, acceptance, and anti-vaccination: trends and future prospects for public health. *Annual Review of Public Health, 42*(1), 175-191.

El-Elimat, T., AbuAlSamen, M. M., Almomani, B. A., Al-Sawalha, N. A., & Alali, F.Q. (2020). Acceptance and attitudes toward COVID-19 vaccines: a cross-sectional study from Jordan. *PLOS One, 16*(4), e0250555. https://doi.org/10.1371/journal.pone.0250555

Elhadi ,M., Alsoufi, A., Alhadi, A., Hmeida, A., Alshareea, E., Dokali, M., Abodabos, S., Alsadiq, O., Abdelkabir, M., Ashini, A., & Shaban A. (2021). Knowledge, attitude, and acceptance of healthcare workers and the public regarding the COVID-19 vaccine: a cross-sectional study. *BMC Public Health, 21*(1), 1-21. https://doi.org/10.1186/s12889-021-10987-3

Felter, C. (2021, June 30). *A guide to global COVID-19 vaccine efforts.* Council on Foreign Relations.

Haftom, M., & Petrucka P.M. (2020). Determinants of face mask utilization to prevent covid-19 pandemic among quarantined adults in Tigrai Region, Northern Ethiopia. *Clinical Nursing Research, 30*(7), 105477382110132. https://doi.org/10.1177/10547738211013219

Hall, R. (2020). Anti-vaccination movement could derail fight against coronavirus, experts warn. *Independent.* https://www.independent.co.uk

Hussain, A., Garima, T., Singh, B. M., Ram, R., Tripti, R. P. (2020). Knowledge, attitudes, and practices towards COVID-19 among Nepalese Residents: A quick online cross-sectional survey. *Asian Journal of Medical Sciences, 11*(3), 6–11. https://doi.org/10.3126/ajms.v11i3.28485

Islam, M.S., Emran, M.G.I., Rahman, M.E., Banik, R., Sikder, M.T., Smith L., & Hossain, S. (2020). Knowledge, attitudes and practices associated with the COVID-19 among slum dwellers resided in Dhaka City: A Bangladeshi interview-based survey. *Journal of Public Health, 43*(1), 13–25. https://doi.org/10.1093/pubmed/fdaa182

Islam, M. S., Siddique, A. B., Akter, R., Tasnim, R., Sujan, M. S., Ward, P. R., Sikder, M. T. (2020). Knowledge, attitudes and perceptions towards COVID-19 vaccinations: a cross-sectional community survey in Bangladesh. *BMC Public Health, 21,* 1851. https://doi.org/10.1186/s12889-021-11880-9

Kakemam, E., Ghoddoosi-Nejad, D., Chegini, Z., Momeni, K., Salehinia, H., Hassanipour, S., Ameri, H., & Arab-Zozani, M. (2020). Knowledge, attitudes, and practices among the general population during COVID-19 outbreak in Iran: A national cross-sectional survey. *Frontiers in Public Health, 8,* 585302 https://doi.org/10.3389/fpubh.2020.585302

Kasemy, Z. A., Bahbah, W. A., Zewain, S. K., Haggag, M. G., Alkalash, S. H., Zahran, E., & Desouky, D. E. (2020). Knowledge, attitude and practice toward COVID-19 among Egyptians. *Journal of Epidemiology and Global Health, 10*(4), 378. https://doi.org/10.2991/jegh.k.200909.001

Lee, M., Kang, B. A., & You, M. (2020). *Association between knowledge, attitudes and practices (KAP) Towards The COVID-19: A cross-sectional study in South Korea.* Research Square. https://doi.org/10.21203/rs.3.rs-73653/v1

Li, Y., Liu, G., Egolet, R. O., Yang, R., Huang, Y., & Zheng, Z. (2021). Knowledge, attitudes, and practices related to COVID-19 among Malawi adults: a community-based survey. *International Journal of Environmental Research and Public Health, 18*(8), 4090. https://doi.org/10.3390/ijerph18084090

Melesie Taye, G., Bose, L., Beressa, T. B., Tefera, G. M., Mosisa, B., Dinsa, H., Birhanu, A., & Umeta, G. (2020). COVID-19 knowledge, attitudes, and prevention practices among people with hypertension and diabetes mellitus attending public health facilities in Ambo, Ethiopia. *Infection and Drug Resistance, 13*, 4203–4214. https://doi.org/10.2147/idr.s283999

Mercado, N. A. (2020, December 23). Include teachers in priority groups for COVID-19 vaccination, says Gatchalian. *INQUIRER.net.* https://newsinfo.inquirer.net

Ngwewondo, A., Nkengazong, L., Ambe, L. A., Ebogo, J.T., Mba, F.M., Goni, H.O., Nyunai, N., Ngonde, M. C., & Oyono, J. L. E. (2020). Knowledge, attitudes, practices of/towards COVID 19 preventive measures and symptoms: A cross-sectional study during the exponential rise of the outbreak in Cameroon. *PLOS Neglected Tropical Diseases, 14*(9), e0008700. https://doi.org/10.1371/journal.pntd.0008700

Okello, G., Izudi, J., Teguzirigwa, S., Kakinda, A., & Van Hal, G. (2020). Findings of a cross-sectional survey on knowledge, attitudes, and practices about COVID-19 in Uganda: Implications for public health prevention and control measures. *BioMed Research International,* 5917378. https://doi.org/10.1155/2020/5917378

Provenzano, S., Santangelo, O.E., Armetta, F., Pesco, G., Allegro, A., Lampasona, M., Terranova, A., Danna, G., & Firenze, A. (2020). COVID-19 infection: comparing the knowledge, attitude and practices in a sample of nursing students. *Acta Biomed for Health Professions, 91*(12), 10252. https://doi.org/10.23750/abm.v91i12-S.10252

Randolph, H. E., & Barreiro, L. B. (2020). Herd immunity: Understanding COVID-19 immunity. *Immunity, 52*(5), 737–741. https://doi.org/10.1016/j.immuni.2020.04.012

Rias, Y.A., Rosyad, Y.S., Chipojola, R., Wiratama, B.S., Safitri, C.I., Weng, S.F., Yang, C. Y., & Tsai, H. T. (2020). Effects of spirituality, knowledge, attitudes, and practices toward anxiety regarding COVID-19 among the general population in indonesia: a cross-sectional study. *Journal of Clinical Medicine, 9*(12), 3798. https://doi.org/10.3390/jcm9123798

Rocamora, J. A. L. (2021). Inclusion of education personnel in vax priority list hailed. *Philippine News Agency.* https://www.pna.gov.ph/

Seale, H., Heywood, A.E., Leask, J., Sheel, M., Durrheim, D.N,, Bolsewicz, K., & Kaur, R. (2020). Examining Australian public perceptions and behaviors towards a future COVID-19 vaccine. *BMC Infectious Diseases, 21,* Article 120. https://doi.org/10.1186/s12879-021-05833-1

Selby, L., Tripathi, V., & Hariharan, S. (2020). Knowledge, attitudes and practices (KAP) regarding the novel coronavirus disease (COVID-19) post-lockdown in Trinidad and Tobago. *Social Work in Public Health, 36*(5), 558–76. https://doi.org/10.1080/19371918.2021.1932664

Shanmugaraj, B., Malla, A., & Phoolcharoen, W. (2020). Emergence of Novel Coronavirus 2019-nCoV: Need for Rapid Vaccine and Biologics Development. *Pathogens, 9*(2), 148. https://doi.org/10.3390/pathogens9020148

Shereen, M. A., Khan, S., Kazmi, A., Bashir, N., & Siddique, R. (2020). COVID-19 infection: Emergence, transmission, and characteristics of human coronaviruses. *Journal of Advanced Research, 24*, 91–8. https://doi.org/10.1016/j.jare.2020.03.005

Taherdoost, H. (2016). Sampling methods in research methodology; how to choose a sampling technique for research. *SSRN Electronic Journal, 5*(2), 18-27. https://doi.org/10.2139/ssrn.3205035

Thorneloe, R., Wilcockson, H. E., Lamb, M., Jordan, C. H., & Arden, M. (2020). *Willingness to receive a COVID-19 vaccine among adults at high-risk of COVID-19: A UK-wide survey*, 1-15. https://doi.org/10.31234/osf.io/fs9wk

United Nations International Children's Education Fund. (2020). *Teachers should be prioritized for vaccination against COVID-19.* Author.

Wang, C., Horby, P., Hayden, F., & Gao, G. (2020). A novel coronavirus outbreak of global health concern. *The Lancet, 395*(10223), 470–473.

Wong, C.L., Chen, J., Chow, K.M., Law, B.M.H., Chan, D.N.S., So, W.K.W., Leung, A. W. Y., & Chan, C. W. H. (2020). Knowledge, attitudes and practices towards COVID-19 amongst ethnic minorities in Hong Kong. *International Journal of Environmental Research and Public Health, 17*(21), 7878. https://doi.org/10.3390/ijerph17217878

World Health Organization. (2020a). *Coronavirus disease (COVID-19) pandemic.* Author.

World Health Organization. (2020b). *Coronavirus disease (COVID-19): Herd immunity, lockdowns and COVID-19.* Author.

World Health Organization. (2021). *WHO Coronavirus disease (COVID) dashboard.* Author.

Yousaf, M.A., Noreen, M., Saleem, T., & Yousaf, I. (2020). A cross-sectional survey of knowledge, attitude, and practices (KAP) toward pandemic COVID-19 among the general population of Jammu and Kashmir, India. *Social Work in Public Health, 35*(7), 569–78. https://doi.org/10.1080/19371918.2020.1806983

Zhang, M., Zhou, M., Tang, F., Wang, Y., Nie, H., Zhang, L., & You, G. (2020). Knowledge, attitude, and practice regarding COVID-19 among healthcare workers in Henan, China. *Journal of Hospital Infection, 105*(2), 183–187. https://doi.org/10.1016/j.jhin.2020.04.012

Zheng, L., Chen, K., Ma, L. (2021). Knowledge, attitudes, and practices toward Covid-19 among construction industry practitioners in China. *Frontiers in Public Health, 8*, Article 599769. https://doi.org/10.3389/fpubh.2020.599769

Zhou, P., Yang, X-L., Wang, X-G., Hu, B., Zhang, L., Zhang, W., Si, H. R., Zhu, Y., Li, B., Huang, C. L., Chen, H. D., Cen, J., Luo, Y., Guo, H., Jiang, R. D., Liu, M. Q., Chen, Y., Shen, X. R., Wang, X., Zheng, X. S., Zhao, K., Chen, Q. J., Deng, F., Liu, L. L., & Shi, Z. L. (2020). Addendum: A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature, 588*, E6. https://doi.org/10.1038/s41586-020-2951-z

Zhong, B-L., Luo, W., Li, H-M., Zhang, Q-Q., Liu, X-G., Li, W-T.,& Li, Y. (2020). Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. *International Journal of Biological Sciences, 16*(10), 1745–52. https://doi.org/10.7150/ijbs.45221

Zhu, Z., Lian, X., Su, X., Wu, W., Marraro, G. A., & Zeng, Y. (2020). From SARS and MERS to COVID-19: a brief summary and comparison of severe acute respiratory infections caused by three highly pathogenic human coronaviruses. *Respiratory Research, 21*, Article 224. https://doi.org/10.1186/s12931-020-01479-w