



VAX SAVVY: EXPLORING KNOWLEDGE, AWARENESS, AND PERCEPTIONS OF COVID-19 VACCINES AMONG VACCINATED STUDENTS

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Received: 8 September 2023 • Accepted: 29 October 2023 • Published: 31 October 2023

Abstract

Efforts to control COVID-19 continue to be a global priority, with ongoing research and public health measures aimed at minimizing the impact of the disease. In response to the COVID-19 pandemic, vaccines have emerged as a vital tool for mitigating its impact. This cross-sectional study involved the distribution of structured questionnaires to 165 vaccinated pharmacy students at a Malaysian public university. The study aimed to investigate the knowledge, awareness, and perceptions of COVID-19 vaccines among this specific cohort. The findings underscore a commendable level of knowledge (between 88.5% and 98.9%) as well as awareness and perceptions among the respondents regarding COVID-19 and its vaccines. They exhibited a clear understanding of the importance of vaccination in curbing the disease and expressed a willingness to educate others on its significance. Moreover, the respondents held positive perceptions about vaccine safety, the elicited immune response, and the protective efficacy conferred by vaccination. The study's outcomes reveal the pharmacy students' robust grasp of the importance, safety, and effectiveness of COVID-19 vaccines. Their positive attitude towards vaccination emphasizes its role in controlling the pandemic and underscores the importance of disseminating this knowledge. This study offers valuable insights into the knowledge and perceptions of a specific population group, contributing to our broader understanding of various aspects of COVID-19 vaccine.

Keywords: Awareness; COVID-19; Knowledge; Perception; Students; Vaccine

Cite as: Othman, M. I., Sulaiman, S., Mohd Najib, M. N. (2023). Vax Savvy: Exploring Knowledge, Awareness, and Perceptions of Covid-19 Vaccines among Vaccinated Students. *Asian People Journal*, 6(2), 188-202.

INTRODUCTION

COVID-19, a respiratory illness caused by the novel coronavirus SARS-CoV-2, was first identified in Wuhan, China, in December 2019 (Elengoe, 2020). The virus rapidly spread, leading to reported cases of COVID-19 in 212 countries and territories, affecting more than 71.2 million individuals by December 2020 and resulting in over 1.6 million deaths (Al-Sharif et al., 2021). In Malaysia, a resurgence of infections in late September 2020 led to a significant surge in cases, with daily reports exceeding 4,000 new cases by mid-January 2021 (Hashim et al., 2021). The emergence of COVID-19 has posed a substantial threat to various aspects of human life, including health, the economy, and education. In March 2020, the World Health Organization (WHO) declared COVID-19 a global outbreak as it spread across the globe, including in Malaysia (Thomas et al., 2021). While WHO announced on May 5 that COVID-19 was no longer deemed a global health emergency, it remains a significant ongoing threat (Barbour, 2023).

Vaccination stands as a highly effective strategy for controlling (Koirala et al., 2020) the spread of COVID-19 and safeguarding individuals from the virus (Kim & Lee, 2022). Since the pandemic's onset, governments, health organizations, and researchers have been diligently working to develop and distribute vaccines against COVID-19. The availability of these vaccines has played a pivotal role in the battle against the pandemic, with widespread vaccination recognized as the requirement for curbing transmission and eventually ending the crisis (Chen & Lu, 2021). The U.S. Food and Drug Administration (FDA) granted approval for mass immunization with Pfizer-BioNTech and Moderna COVID-19 vaccines approximately 11 months after the virus's emergence. Clinical trials have demonstrated the ability of these vaccines to stimulate the production of antibodies and offer protection against COVID-19 infection (Earle et al., 2021). In parallel, Malaysia launched its National COVID-19 Immunization Program in February 2021, aiming to confer immunity to 80% of the population and attain herd immunity (Loo & Letchumanan, 2021).

To realize this goal, the Malaysian government rolled out a nationwide COVID-19 vaccination initiative that extended free vaccine access to all residents, encompassing both citizens and non-citizens. The program unfolded in three phases spanning from February 2021 to February 2022, aligning with the National COVID-19 Immunisation Programme (NIP). Phase 1 concentrated on vaccinating frontline workers, followed by Phase 2 prioritizing individuals aged 60 and above, those with disabilities, and high-risk groups. Phase 3 aimed to immunize populations residing in areas with a heightened COVID-19 disease burden, alongside the remainder of the adult population. This comprehensive approach sought to safeguard lives and mount an effective response against the pandemic (Shukor et al., 2023). Understanding the knowledge, awareness, and perceptions of COVID-19 vaccines among pharmacy students (Saeed et al., 2023) is of paramount importance, given their role as future healthcare providers. This study holds several key implications, including its potential to inform public health strategies, monitor vaccine uptake, combat vaccine misinformation, shape vaccination policies, and assess the vaccine's real-world impact. One crucial aspect is its utility in identifying areas where educational interventions may be required, ensuring that pharmacy students possess the necessary knowledge and skills to assist patients in making well-informed decisions about vaccination once they enter the workforce.

By gauging pharmacy students' knowledge, awareness, and perceptions, this study can also contribute to the development of effective public health strategies aimed at controlling the virus's spread and safeguarding communities from its adverse effects. It is noteworthy that a prior study focusing on COVID-19 knowledge and awareness yielded excellent and good scores among students (Othman et al., 2022a), underscoring the potential of

this current study to build upon and reinforce these positive trends in understanding and addressing the pandemic and its vaccination strategies. Several publications have explored into the knowledge, acceptance, attitudes, concerns, and perceptions surrounding COVID-19 vaccines among Malaysians (Nurul et al., 2021; Syed Alwi et al., 2021; Sri, 2021; Chan et al., 2022b). However, these studies predominantly focused on the general public, with the exception of Chan et al. (2022), which centred on youths aged 18-19 years. Notably, none of these investigations specifically targeted respondents who had received COVID-19 vaccinations.

Considering this gap in research, the primary objectives of our study were to elucidate the knowledge, awareness, and perceptions regarding COVID-19 vaccination among pharmacy students who have been successfully vaccinated. Our study specifically focused on vaccinated pharmacy students at Universiti Teknologi MARA (UiTM), Cawangan Pulau Pinang, Kampus Bertam, Pulau Pinang, Malaysia. This unique focus aims to provide insights into the perspectives of this specific group, shedding light on their experiences and viewpoints regarding COVID-19 vaccination.

METHODOLOGY

This cross-sectional study was conducted in April 2022 and focused on Diploma in Pharmacy students at UiTM Kampus Bertam, Pulau Pinang. Respondents were chosen based on their willingness to participate in the research. The sample size was determined using the Raosoft sample size calculator, targeting a recommended sample size for a population of 300 students, considering a 90% confidence level, 5% margin of error, and a 50% response distribution, which yielded a requirement of 143 respondents. Convenient sampling was employed for the study, and ultimately, 165 valid responses were collected.

Data collection was facilitated through an online survey questionnaire created using Google Forms. All participants were invited to complete the survey through a questionnaire sent via WhatsApp, accompanied by request letters for their participation (Othman et al., 2022b; Othman et al., 2023). The questionnaire was accessible through a provided Google Forms link and comprised three main sections:

1. Socio-demographics: This section collected information on gender, age, area of residence, year of study, vaccine status, and types of vaccines received (Table 1).
2. Knowledge of COVID-19: The second section included seven questions aimed at assessing respondents' knowledge about COVID-19 vaccines, with response options of 'yes,' 'no,' or 'don't know/unsure' for each question (Table 2).
3. Awareness and Perceptions of COVID-19: The third section consisted of fifteen questions designed to gather data on respondents' awareness and perceptions regarding COVID-19 vaccines, offering response choices of 'agree,' 'disagree,' or 'don't know/unsure' for each question (Table 3).

Participants were duly informed about the study's purpose, and their personal identifiable information was anonymized to ensure confidentiality. They were also given the option to withdraw from the study at any time. Subsequently, the collected data was analysed using descriptive statistics, with frequency (N) and percentage (%) utilized to present respondents' sociodemographic information and their responses regarding knowledge and awareness of COVID-19 vaccines. The obtained results were presented in tabular format, providing a comprehensive overview of the respondents' characteristics, knowledge, and perceptions related to COVID-19 vaccines.

RESULT AND DISCUSSION

Respondents' Demographic

A total of 165 students participated in the survey, with ages ranging from 19 to 22 years. The response rate was 55.0%, surpassing the minimum sample size of 143. Table I shows the students were predominantly female (82.4%) with 17.6% being male. Most respondents lived in suburban areas (46.7%), followed by urban (28.5%) and rural (24.8%) areas. Many respondents were in their second year of study (49.7%), with 16.4% in their first year and 33.9% in their third year. All students have received the COVID-19 vaccine, with 70.9% having received first, second and booster doses, and 29.1% only receiving first and second doses. The most common vaccine received among respondents was Pfizer-BioNTech (Pfizer) (52.7%), followed by Sinovac (20.0%), mixed vaccines (16.4%), and AstraZeneca (10.9%).

According to interim findings from a clinical trial, the Pfizer-BioNTech COVID-19 vaccine demonstrated a high efficacy rate of 95.0% in preventing symptomatic laboratory-confirmed COVID-19 among individuals without previous SARS-CoV-2 infection (Oliver et al., 2020). The study further highlighted that the vaccine's effectiveness, exceeding 92%, remained consistent across various demographics, including age, sex, race, ethnicity, and underlying medical conditions, as well as among those with prior SARS-CoV-2 infection. On the other hand, the AstraZeneca vaccine was the least common type of vaccine received by the respondents, possibly due to concerns regarding its lower efficacy rate of 79% in preventing COVID-19 (Mallapaty & Callaway, 2021).

In our study, 71.5% of the participants reported having received all recommended vaccinations during their lifetime, while 24.8% indicated they had incomplete vaccination records. Approximately 3.7% of respondents were uncertain about their vaccination status. Malaysia has established a standard practice of providing vaccinations to children from birth, following the National Immunisation Programme (NIP). The government fully covers the cost of immunization for Malaysian children up to the age of 15. Vaccination coverage rates have consistently ranged between 94% and 98% annually (Chan et al., 2018). However, it has not been a common practice among adults to seek vaccination, mainly due to a lack of awareness regarding the benefits of immunization in the adult population (Lim et al., 2014).

Table 1: Sociodemographic of respondents (N=165)

Item		Frequency (N)	Percentage (%)
Gender	Male	29	17.6
	Female	136	82.4
Area of Residence	Rural	41	24.8
	Sub-Urban	77	46.7
	Urban	47	28.5
Year of Study	Year 1	27	16.4
	Year 2	82	49.7
	Year 3	56	33.9
Vaccination Status	1st dose only	0	0
	1st and 2nd dose only	48	29.1

	1st, 2nd, and booster dose	117	70.9
Types of Vaccine Received	Pfizer	87	52.7
	AstraZeneca	18	10.9
	Sinovac	33	20.0
	Mixed	27	16.4
Have you received all necessary vaccines in your lifetime?	Yes	118	71.5
	No	6	3.7
	Unsure/Don't Know	41	24.8

Knowledge of COVID-19 Vaccination

Table 2 provides an overview of respondents' knowledge regarding COVID-19 vaccination. The results reveal a high level of awareness among participants regarding the effectiveness of COVID-19 vaccines. A substantial majority, comprising 90.9% (150 respondents), expressed confidence in the vaccines' effectiveness, while a smaller proportion of 8.5% (14 respondents) remained uncertain about this aspect. The effectiveness of COVID-19 vaccines is a pivotal consideration for individuals when determining whether to opt for vaccination. This assessment aligns with previous research indicating that vaccine acceptance is influenced by factors such as concerns about side effects, safety, information availability, and religious and cultural considerations linked to COVID-19 vaccines (Syed Alwi et al., 2021). COVID-19 vaccines, like other vaccines, have undergone rigorous clinical trials to establish their effectiveness in preventing the disease while minimizing short-term adverse reactions. Given the limited availability of long-term human studies, these trials required larger participant cohorts compared to conventional drug studies (Calina et al., 2020).

Furthermore, an overwhelming 98.9% of respondents demonstrated awareness regarding the various types and brands of COVID-19 vaccines, including Pfizer-BioNTech, AstraZeneca, Sinovac, CanSino Biologist, and Sputnik V (Shukor et al., 2023). It is important to note that the last two vaccines mentioned, CanSino Biologist and Sputnik V, have not yet been received by the government. The Malaysian government has secured a total of 66.7 million doses of COVID-19 vaccines from five different manufacturers through the COVAX Facility, as part of the NIP. The NIP was initiated in February 2021 under the oversight of the special committee known as Jawatankuasa Khas Jaminan Akses Bekalan Vaksin COVID-19 (JKJAV) (Chan et al., 2022a).

Likewise, a substantial portion of students (84.8%) displayed knowledge of the recommended dosing regimens, and a significant majority (92.1%) recognized the necessity of a booster dose. According to the CDC, booster shots are recommended for individuals aged 65 and above, those residing in long-term care facilities, and individuals aged 50-64 with underlying medical conditions. The recommended timing for the booster dose is 6 months after completing the primary vaccination (Matta et al., 2021). Similarly, a study conducted by Kudlay & Svistunov (2022) revealed that using the AstraZeneca vaccine as the initial dose and the Pfizer vaccine as the second dose led to a notable increase in the immune response.

A total of 98.8% (n=164) of our respondents are aware that the COVID-19 vaccines' can produce several side effects. It was reported that 95.8% of Malaysians were concerned about the vaccine's side effects (Syed Alwi et al., 2021). The most reported side effects were injection site pain, fatigue, headache, muscle aches, chills, joint pain and fever (Lee et al., 2021), which usually lasted for several days. These side effects were observed more

frequently after the second dose of the vaccine. Though serious side effects like anaphylaxis (Beatty et al., 2021) can occur, these are rare. However, our respondents were aware that the risks of COVID-19 infection, which can cause serious complications, outweigh the risks of vaccination.

Moreover, a significant proportion of respondents (88.5%) expressed the opinion that universal vaccination is necessary to bring an end to the pandemic. Numerous research studies support the notion that vaccination plays a pivotal role in halting the COVID-19 pandemic. According to Alsayedahmed (2021), vaccination stands as the most critical means to attain herd immunity and diminish the transmission of the virus. Correspondingly, Iboi et al. (2020) employ a mathematical model to illustrate that achieving herd immunity requires vaccinating at least 82% of the susceptible population in the United States. Additionally, their research suggests that a combination of vaccination and other preventive measures like mask-wearing and social distancing can substantially lower the threshold required to effectively control the pandemic.

In addition, 98.2% of respondents reported being knowledgeable about their COVID-19 vaccine status through the mobile health application MySejahtera. MySejahtera was developed during the initial wave of the COVID-19 pandemic with the primary purposes of contact tracing, assessing health risk levels, overseeing the isolation of infected individuals, and offering information about nearby healthcare facilities for COVID-19 testing. Over time, the functionality of MySejahtera has been extended to encompass vaccination-related information (Samsuri et al., 2022).

Table 2: Students’ responses on knowledge about COVID-19 vaccines

Question	Yes		No		Unsure/Don't know	
	N	%	N	%	N	%
Do you know about the effectiveness of COVID-19 vaccine?	150	90.9	1	0.6	14	8.5
Are you aware of various types/brands of COVID-19 vaccine?	163	98.9	0	0	2	1.2
Are you aware that COVID-19 vaccines should be taken as a single dose or two doses? (depending on the types/brands)	140	84.8	6	3.6	19	11.5
Are you aware about COVID-19 booster dose administration?	152	92.1	5	3	8	4.8
Do you know that COVID-19 vaccine may have side effects/adverse effects?	163	98.9	0	0	2	1.2
Do you think everyone should get vaccinated to end the COVID-19 pandemic?	146	88.5	4	2.4	15	9.1
Are you aware of your COVID-19 vaccine status in MySejahtera app?	162	98.2	0	0	3	1.8

Awareness and Perceptions of COVID-19 Vaccination

Table 3 provides an insight into respondents' awareness and perceptions concerning COVID-19 vaccination. A significant majority of students expressed agreement with the safety (87.3%) and the necessity for COVID-19

vaccines for everyone (89.7%). This aligns with analyses conducted by Yuan et al. (2020), indicating that vaccine candidates exhibited safety, tolerability, and immunogenicity. Additionally, Rosenberg et al. (2021) reported that authorized vaccines currently in use demonstrate high effectiveness in preventing COVID-19 hospitalizations.

Besides, findings from Pormohammad et al. (2021) revealed that mRNA-based vaccines for COVID-19 exhibited remarkable efficacy, particularly after the administration of both the first and second doses. Consistent with these assessments, a review by Sharma et al. (2021) emphasized the safety, efficacy, long-lasting effects, and suitability for large-scale deployment of successful vaccinations, while highlighting the importance of adhering to recommendations from local health authorities. Haidere et al. (2021), in their review, underscored the pivotal role of effective and safe vaccines in eradicating COVID-19. These vaccines have indeed proven successful in reducing infection rates, severity, hospitalizations, and mortality across various populations (Mohammed et al., 2022). In support of this, Koirala et al. (2020) emphasized that COVID-19 vaccines represent a highly effective strategy for sustainably controlling the pandemic.

Notably, an overwhelming majority of respondents (97.0%) demonstrated a wholehearted acceptance of COVID-19 vaccines, while more than ninety percent actively encouraged others to receive the vaccination and believed in the vaccines' capacity to trigger an immune response against COVID-19. It is well-established that vaccines can elicit an immune response that contributes to protection against infection and reduces disease severity in cases of infection. These positive attitudes toward COVID-19 vaccination resonate with similar trends observed among the Chinese population during the pandemic (Wang et al., 2020). However, Chen et al. (2021) emphasized the importance of addressing vaccine hesitancy and perceived barriers to vaccination, while also promoting voluntary advocacy to encourage friends and family members to get vaccinated. Furthermore, Wang et al. (2021) noted a decline in willingness to accept the COVID-19 vaccine in the third wave compared to the initial wave, underscoring the need for continuous efforts to maintain vaccination enthusiasm.

However, only 61.2% of respondents agreed that reducing COVID-19 cases without vaccination was feasible. To achieve a decrease in COVID-19 cases without vaccination, a combination of various public health preventive measures like physical distancing, mask-wearing, hand hygiene, testing, and contact tracing is necessary. These measures are not foolproof, and widespread vaccination is considered a crucial component in pandemic management. Research by Huang & Kuan (2022) demonstrates the effectiveness of all vaccine types in preventing severe COVID-19 illness. Zhang et al. (2022) emphasize that vaccination significantly bolsters the immune response against viral infections and reduces the transmission of COVID-19 within the community. Additionally, Chakraborty & Parvez (2020) underscore that vaccination is currently the most effective strategy for COVID-19 prevention.

Table 3: Students' responses on awareness and perceptions about COVID-19 vaccines

Questions	Agree		Disagree		Unsure/Don't know	
	N	%	N	%	N	%
COVID-19 vaccine is safe	144	87.3	2	1.2	19	11.5
COVID-19 vaccine is essential for all of us	148	89.7	7	4.2	10	6.1
I have taken COVID-19 vaccine without hesitation	160	97.0	3	1.8	2	1.2

I have encouraged my family or friends or relatives to get vaccinated	149	90.3	4	2.4	12	7.3
It is not possible to reduce COVID-19 cases without vaccinations	101	61.2	31	18.8	33	20.0
If everyone maintains the preventive measures, COVID-19 pandemic can be eradicated without vaccination	72	43.6	55	33.3	38	23.0
Vaccines produce an immune response against COVID-19	151	91.5	4	2.4	10	6.1
COVID-19 vaccine caused serious reactions apart from what reported	56	33.9	32	19.4	77	46.7
COVID-19 vaccines made in Europe or America are safer than those made in other countries	20	12.1	33	20.0	112	67.9
COVID-19 pandemic will end soon although not everybody could be vaccinated	45	27.3	50	30.3	70	42.4
People who have recovered from COVID-19 infection do not have to get vaccinated	22	13.3	102	61.8	41	24.8
After taking COVID-19 vaccine, protection against COVID-19 is achieved immediately	40	24.2	93	56.4	32	19.4
I can stop practicing precautions such as masking, physical distancing and hygiene after receiving COVID-19 vaccine	18	10.9	140	84.8	7	4.2
COVID-19 vaccine provides long-term protection against coronavirus infection	87	52.7	28	17.0	50	30.3
I'm worried of becoming ill with COVID-19 although I'm vaccinated	127	77.0	24	14.5	14	8.5

Likewise, only 43.6% of respondents believed that the COVID-19 pandemic could be eliminated without vaccination if everyone continues practicing preventive measures. While adhering to preventive measures can help contain the virus's spread, complete eradication without widespread vaccination is unlikely. Achieving herd immunity through vaccination makes it challenging for the virus to spread and eventually fade away. Additionally, not everyone can consistently maintain preventive measures. Iboi et al. (2020) suggest that combining vaccination with other interventions can enhance COVID-19 elimination, while Guner et al. (2020) emphasize that prevention remains the most potent weapon against the global pandemic.

Among the respondents, 46.7% were uncertain about whether COVID-19 vaccines could cause severe reactions beyond what has been reported. While COVID-19 vaccines have undergone rigorous clinical trials and proven safe and effective during development, like any medical intervention, they can lead to adverse reactions. Research by Klugar et al. (2021) identified injection site pain, headache, and fatigue as the most common side effects among healthcare workers who received mRNA-based or viral vector-based vaccines. Qaderi et al. (2022) observed common cutaneous side effects such as redness, itchiness, and urticarial rash. Similarly, Alhazmi et al. (2021) reported fatigue and injection site pain as the prevailing side effects among Saudi Arabian vaccine recipients. Most of these side effects are mild and self-resolving within a few days, including pain or swelling at

the injection site, fever, headache, muscle or joint aches, and fatigue. In extremely rare cases, occurring in a small number of individuals, COVID-19 vaccines have been linked to severe reactions like anaphylaxis, vaccine-induced thrombotic thrombocytopenia, myopericarditis, and Guillain-Barré syndrome (Fragkou & Dimopoulou, 2021). Nonetheless, COVID-19 vaccines have been shown to be generally safe, with no serious adverse events in most cases (Kaur et al., 2021).

Our study showed that only 27.3% of respondents believed that the COVID-19 pandemic would conclude soon, even if not everyone could be vaccinated. Predicting the pandemic's end is challenging, but widespread vaccination is seen as a crucial element in its control. The timeline for ending the pandemic depends on various factors, including vaccination rates, virus prevalence, emerging variants, and healthcare system capabilities. Experts generally concur that an effective COVID-19 vaccine is the key to ultimately ending the pandemic (van Riel & de Wit, 2020). Likewise, only 13.3% of respondents believed that individuals who have recuperated from COVID-19 need not be vaccinated. While some level of natural immunity may develop in those who recover, the duration and potency of this immunity remain uncertain. As a precaution, it is still advisable for recovered individuals to receive vaccination to ensure prolonged protection. Vaccination significantly boosts their immune response and provides robust defense against worrisome variants (Abbasi, 2021).

Additionally, 56.4% of respondents disagreed that COVID-19 protection is immediate after vaccination. Indeed, full protection against COVID-19 typically develops a few weeks after the final vaccine dose and can vary based on vaccine type and individual immune response. Mahase (2020) noted that the Pfizer-BioNTech COVID-19 vaccine may offer some early protection starting around 12 days after the first dose. Andrews et al. (2022) found that vaccine effectiveness against symptomatic COVID-19 with the delta variant peaked in the early weeks following the second dose. Moreover, 84.8% of respondents disagreed with the notion of ceasing preventive measures after receiving the COVID-19 vaccine. While vaccination adds a significant layer of protection, it does not guarantee immunity or prevent virus transmission to others. Hence, it remains crucial to maintain preventive measures like mask-wearing, physical distancing, and hand hygiene even after vaccination (Su et al., 2021).

Next, only 52.7% of respondents agreed that COVID-19 vaccines offer long-term protection against the virus. While COVID-19 vaccines have demonstrated strong efficacy in preventing severe illness, hospitalization, and death, the duration of their protection remains uncertain. Research by Lin et al. (2021) suggests that because vaccine recipients are immunized at different times and community infection rates with SARS-CoV-2 fluctuate, traditional statistical methods may not accurately estimate long-term vaccine effectiveness. Some studies indicate that monoclonal antibodies derived from COVID-19 patients can neutralize SARS-CoV-2, and convalescent plasma therapy has shown promise. However, it is still unclear whether vaccination can induce a sustained protective antibody response (Lv et al., 2020).

Meanwhile, a total of 77.0% of respondents expressed concerns about falling ill despite being vaccinated. While vaccination is a crucial step in COVID-19 protection, it does not guarantee complete immunity. Nonetheless, vaccination significantly reduces the risk of severe illness, with most vaccinated individuals experiencing mild or moderate symptoms and recovering fully. Research by Özüdoğru et al. (2022) revealed the lowest transmission rate of COVID-19 among fully vaccinated healthcare workers. Additionally, Birhane et al. (2021) reported that a small proportion of fully vaccinated individuals may still contract symptomatic or asymptomatic COVID-19 infections.

Lastly, a total of 67.9% of respondents expressed uncertainty regarding whether vaccines produced in America or Europe were superior to those from other regions. It's important to note that the safety and effectiveness of COVID-19 vaccines are established through rigorous clinical trials and regulatory approval processes (Chirico et al., 2022), regardless of their place of production. Many COVID-19 vaccines have received emergency use authorization from regulatory bodies like the European Medicines Agency (EMA) and the US Food and Drug Administration (FDA) (Lurie et al., 2020). These agencies adhere to stringent standards to ensure vaccine safety and efficacy. It's worth mentioning that different vaccines may possess distinct characteristics, such as technology, dosing requirements (Goyal et al., 2022), and storage needs, which may make them better suited for specific populations or settings. Ultimately, the choice of vaccines should align with a country's population needs, ensuring sufficient vaccine availability (Ng et al., 2021).

Nonetheless, it's essential to acknowledge the limitations of this study. The relatively small sample size, composed primarily of pharmacy students, may not fully represent the broader population. Additionally, as a cross-sectional study, it offers a snapshot of knowledge and perceptions at a specific moment, lacking the capacity to track changes over time. Furthermore, the study did not extensively explore the potential impact of social and cultural factors on participants' perceptions, which could be relevant to a more comprehensive understanding of the subject matter.

CONCLUSION

In conclusion, the findings of our study indicate that the respondents exhibited a commendable level of knowledge and awareness regarding COVID-19 and the associated vaccines. Their knowledge encompassed various aspects of COVID-19 vaccines, such as their types, dosages, effectiveness, and potential side effects. Moreover, the respondents were well-informed about the MySejahtera app, which serves as a valuable resource for obtaining information about COVID-19 vaccines.

Furthermore, the respondents displayed a high degree of awareness and held positive perceptions towards COVID-19 vaccines. They recognized the significance of COVID-19 vaccination as a crucial tool in containing the spread of the disease and expressed willingness to educate others about the importance of getting vaccinated. Additionally, they were cognizant of the safety aspects, immune response, and the protective benefits conferred by COVID-19 vaccines. These findings underscore the importance of effective communication and education initiatives to maintain and enhance public awareness and knowledge regarding COVID-19 and vaccination. It is evident that a well-informed and positively inclined population plays a pivotal role in combatting the pandemic effectively and promoting public health.

ACKNOWLEDGEMENT

The authors would like to thank all parties involved for their valuable time and efforts in giving thoughtful responses through the survey conducted. We are grateful to UiTM Cawangan Pulau Pinang for providing us with the opportunity to undertake this study.

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