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Did health professionals accept the COVID-19 vaccination at the initial period of its introduction?

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Abstract: Health professionals are essential informants to encourage people to receive the COVID-19 vaccination for herd immunity, ensuring that all people in the community are protected. This study aimed to assess the COVID-19 vaccination rate and associated factors among health professionals. A cross-sectional study was conducted among 220 health professionals using a rapid online survey in April 2021. The instrument was a self-administered questionnaire tested for content validity and reliability. Demographic data, history of COVID-19 vaccination, and work experiences were presented using frequency and percent. Associated factors were analyzed using binary logistic regression (stepwise LR). A p-value of less than 0.05 was considered statistically significant. The vaccination rate for the COVID-19 vaccination among health professionals was high (83.2%). The associated factors with receiving vaccination were contact with patients and their belongings (aOR 3.9, 95% CI: 1.489–10.468), respected persons (aOR 2.9, 95% CI: 1.114–7.582), and vaccination passports (aOR 2.4, 95% CI: 1.071–5.552). Work characteristics, role models, and approval for vaccination enhanced vaccination acceptance. The benefit of this study could be implemented by increasing self-evaluation of susceptible risk for infection, encouraged by respected persons, and promoting the use of an approval document for vaccination.

Keywords: *COVID-19 vaccine, Health professional, Vaccination, Voluntary.*

1. Introduction

The world pandemic of SARS-CoV-2 (Coronavirus disease 2019; COVID-19) has negative impacts on people's health, society, economy, and daily life, as well as the health system and public health [1, 2]. The measures for COVID-19 prevention in Thailand were multiple measures in order to have the most effective prevention and control of the pandemic of the disease. For example, individual practices—handwashing with soap, alcohol gel, or alcohol spray; wearing a face mask; social distancing, staying far from each other, avoiding crowded events, and avoiding touching others' belongings [3-5]; personal protective equipment [4]. In addition, for social or government measures, there are lockdowns, as well as the introduction of COVID-19 vaccines [3, 6].

In the era of non-stopped spreading, herd immunity or mass vaccination was believed to control the pandemic, prevent the severity of infection, and reduce the mortality rate when people infected with COVID-19. That the COVID-19 vaccines were emergency-approved to use against its pandemic. However, vaccine hesitancy was an essential factor affecting acceptance for vaccination [7-9]. The vaccination rate of the COVID-19 vaccine varied from country to country as well as differed from their sociodemographic factors [7, 10-15].

A survey in 19 countries reported 71.5% of COVID-19 vaccination acceptance [12]. The vaccination rate was 62.1% in Japan [10] 64.7% in Saudi Arabia [7], and 60.8% in India [13]. A study in a northern province of Thailand in April 2021 found that the vaccination rate of household

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participants was 41.1% [11]. It was a similar finding of a national survey of more than one hundred ninety-three thousand participants across country reported the vaccination rate of 44.0% [16]. The vaccination rate fluctuated at varied times and increased in August 2021, almost up to 90% [16]. This study was conducted since only a health expert was the subject of certain research about the acceptance of the COVID-19 vaccine [17, 18]. Non-clarified healthcare workers and a restricted area in a central province of Thailand were the subjects of another investigation [19]. The acceptance of the COVID-19 vaccine among health professionals must then be investigated in order to determine the vaccination rate and the factors that are associated with their acceptance.

2. Literature Review

The COVID-19 pandemic has had a negative impact on almost every aspect of life. This is because the pandemic has caused each country around the world to have to take measures to prevent and control the spread of the virus [20]. Measures to prevent and control the spread of infection at the individual level, for example, wearing a face mask, washing hands with soap or alcohol gel, keeping a distance from others, avoiding contact with sick people and their belongings, and self-quarantining from others when there is a risk of infection [21]. In addition, there are social measures both at the national and international levels, such as closing areas or communities, arranging quarantine areas for those at risk of infection, prohibiting travel across areas, temporarily closing service establishments such as hotels, cinemas, shopping malls, parks, public transportation, etc., including closing the country [22, 23].

Vaccination is a way to prevent and control the spread of infection and reduce the severity of the disease if infection occurs. It is expected that if at least 80% of the population is vaccinated, herd immunity can be achieved [8, 24]. However, the emergency use authorization of COVID-19 vaccines during the pandemic has led to public hesitation about vaccine efficacy, side effects, and other adverse reactions [7, 25, 26]. Therefore, it is necessary to encourage people to get vaccinated against COVID-19 [16, 19]. It is expected that health professionals will be the group of people who can encourage people to cooperate in getting vaccinated [25]. Before building public confidence to cooperate in getting vaccinated against COVID-19, it is necessary to study the acceptability of COVID-19 vaccines among health personnel. When they have confidence in the vaccines and accept vaccination, they will be able to better reduce vaccine hesitancy among the public [25].

3. Methodology

3.1. Study design

A cross-sectional online survey was implemented for data collection in April 2021.

3.1.1. Inclusion Criteria

- Health professionals
- Having a computer or other devices connected to an internet
- Able to read and write Thai language
- Exclusion criteria
- Incomplete response questionnaire

3.2. Research Tools

A self-administered questionnaire was developed by the researcher from the literature review. There are 3 domains: 1) demographic characteristics and history of COVID-19 vaccination (11 items); 2) working characteristics (10 items); and 3) factors related to decision-making of receiving COVID-19 vaccination (11 items).

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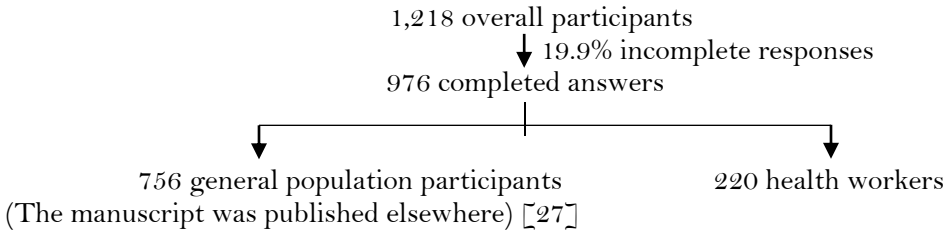
3.3. Tools Measurement

Five experts conducted a content validity index (CVI), assigning scores of 4-3-2-1 for highly relevant, quite relevant, somewhat relevant, and irrelevant categories, respectively [16]. The CVI; item CVI (scale CVI) was 0.98 for domains 1 and 2 and 1.0 for domain 3.

The questionnaire had high reliability in a pilot group (n = 55). The Cronbach's α coefficient was 0.87 and 0.91 for domains 2 and 3, respectively.

3.4. Data Collection

The research team was a representative health professional from 44 provinces out of 77 provinces of Thailand, attended a national conference, and formed an academic network. The research team purposively sampled the eligible participants and distributed the link of an online questionnaire to them via social networks and email. The online survey was conducted in April 2021. The eligible participants may receive repeated invitation, please only one.



3.5. Data Analysis

Descriptive statistics, including frequency, percentage minimum, maximum, and standard deviation (SD) were used to present demographic characteristic, working characteristic, and motivation to COVID-19 vaccination. Chi-squared test was performed in univariate analysis to assess significant factors of COVID-19 vaccination. Binary logistic regression was performed to identify the predictive factors. A p-value of 0.05 was considered as a significant level.

4. Results of the Study

Table 1 presents the participants' demographic characteristics. Most of the participants were female (75%), aged 40 to 49 years (31.8%), and Buddhist (71.4%). The proportion of married participants was nearly equal to that of single participants, at 50.0% and 46.4%, respectively. Most of the participants reported having a bachelor's degree (81.4%).

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Table 1.
Demographic characteristics of participants (n = 220)

General information		**Frequency**	**%**
Sex			
	Female	165	75.0
	Male	55	25.0
Age (years)			
	20–29	60	27.3
	30–39	59	26.8
	40–49	70	31.8
	50–60	31	14.1
	mean: 38.01, SD: 9.80, min: 22.6, max: 57.0		
Marital status			
	Married	110	50.0
	Single	102	46.4
	Widow/Separated	8	3.6
Religion			
	Buddhist	157	71.4
	Islam	63	28.6
Education level			
	Bachelor	179	81.4
	Master and higher	41	18.6
Position			
	Nurse	102	46.4
	Public Health Technical Officer	63	28.6
	Thai medical medicine	26	11.8
	Pharmacist	17	7.7
	Dental Public Health Technical Officer	12	5.5
Level of health service			
	Primary health care	86	39.1
	Secondary health care	109	49.5
	Tertiary health care	25	11.4
Income/month (35 Baht ≈ 1 USD)			
	≤ 15,000 Baht	29	13.2
	15,001–30,000 Baht	79	35.9
	30,001–45,000 Baht	64	29.1
	45,001–50,000 Baht	24	10.9
	> 50,000 Baht	24	10.9
Duration of working (years)			
	0–5	56	25.5
	6–10	45	20.5
	11–15	26	11.8
	16–20	17	7.7
	> 20	76	34.5
Region of Thailand			
	South	68	31.0
	North-eastern	52	23.7
	North	32	14.5
	Central	26	11.8
	East	21	9.5
	West	21	9.5
COVID-19 vaccinated			
	Yes	183	83.2
	No	37	16.8

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The study includes participants in five different careers: nurses (46.4%), public health technical officers (28.6%), Thai traditional medicine personnel (11.8%), pharmacists (7.7%), and dental public health technical officers (5.5%). Half of participants were working in secondary health care (49.5%), with an income of 15,001-30,000 Baht/month (35.9%), and working more than 20 years (34.5%). One-third worked in the southern region of Thailand. (31.0%). Most of the participants were COVID-19 vaccinated (83.2%)

Table 2 presents the participants' working characteristics. Almost all participants wore a face mask when staying close to their patients (98.2%), staying close to their colleagues (95.5%), and wearing a face mask during their working hours, except while drinking or eating (89.1%).

Table 2.
Working characteristics (n = 220)

Working characteristics	Frequency (%)	
	Yes	No
Wearing a face mask when staying close to clients	216 (98.2)	4 (1.8)
Staying close to colleagues	210 (95.5)	10 (4.5)
Wearing a face mask in working time, except while drinking or eating	196 (89.1)	24 (10.9)
Direct contact with clients	191 (86.8)	29 (13.2)
Direct contact with colleagues	188 (85.5)	32 (14.5)
Wearing a face mask when staying close to the colleagues	161 (73.2)	59 (26.8)
Stay close to other people	157 (71.4)	63 (28.6)
Direct contact with other people	130 (59.1)	90 (40.9)
Stay close to the service client	85 (38.6)	135 (61.4)
Changing a new face mask after taking off the old one	59 (26.8)	161 (73.2)

Table 3.
Motivation for COVID-19 vaccination (n = 220)

Antecedents	COVID-19 vaccinated acceptance Frequency (%)	
	Yes	No
Perceiving high prevalence and incidence rate of COVID-19	174 (79.1)	46 (20.9)
Vaccination certificate	166 (75.5)	54 (24.5)
Free COVID-19 vaccination	152 (69.1)	68 (30.9)
Perceiving a threat that people usually do not protect themselves from the COVID-19 infection	137 (62.3)	83 (37.7)
Influenced by colleagues	114 (51.8)	106 (48.2)
You can't always follow infection prevention measures, so you want to get vaccinated.	109 (49.5)	111 (50.5)
Being a role model to encourage others to do so	95 (43.2)	125 (56.8)
Influenced by respectful persons	76 (34.5)	144 (65.5)
Influenced by Thai politicians	63 (28.6)	157 (71.4)
Influenced by well-known persons	53 (24.1)	167 (75.9)
Influenced by actors/actresses/singers/internet stars	33 (15.0)	187 (85.0)

Table 3 presents the antecedents that motivate for the COVID-19 vaccination. The top three antecedents were perceiving a high rate of COVID-19 infection (79.1%), getting the approval document for COVID-19 vaccination (75.5%), and free COVID-19 vaccination (69.1%).

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Table 4.
Predicting factors of COVID-19 vaccinated acceptance. (n = 220)

Factors	Adjusted odds ratio	95% CI for EXP (B)		*p*-value
		Lower	Upper	
Participants' characteristics				
Income (Bath/month) (34 Baht = 1 USD)				
≤ 15,000	0.367	0.065	2.084	0.258
15,001–30,000	1.762	0.513	6.050	0.368
30,001–45,000	0.346	0.082	1.459	0.148
45,001–50,000	0.170	0.017	1.745	0.136
> 50,000 (ref.)				
Characteristic of working				
Direct contact with clients (yes & no (ref.))	3.948	1.489	10.468	0.006 **
Encouraged person or event				
Influenced by respectful persons (yes & no (ref.))	2.906	1.114	7.582	0.029 *
Vaccination certificate (yes & no (ref.))	2.431	1.071	5.522	0.034 *

Note: p-value * < 0.05, ** < 0.01

The univariate analysis to assess related factors of COVID-19 vaccination was performed by chi-square. (Table was not shown.) The significant factors include: age, religion, position, level of health service, income, duration of working, region of Thailand, direct contact with clients, vaccination certificate, perceiving threat that people usually not protect themselves from the COVID-19 infection, influenced by colleagues, being a role model to encourage others to do so, influenced by respectful persons, Thai politicians, actors/actresses/singers/internet stars (p-value < 0.25). These factors had non-multicollinearity, the variance inflation factors (VIF) < 4, tolerance > 0.2 [28, 29]. Then, these variables were included in the final model.

Table 4 shows the predicting factors of COVID-19 vaccination. The significant factors were direct contact with clients (aOR = 3.948, 95% CI = 1.489–10.468), influenced by respectful persons (aOR = 2.906, 95% CI = 1.114–7.582), and the vaccination certificate (aOR = 2.431, 95% CI = 1.071–5.522).

5. Discussion

A review reported the vaccination rate among healthcare workers from 33 countries, excluding Thailand, ranged from approximately 23.6 to 97.0% [30]. In Thailand, a survey in May 2021 showed the vaccination rate of approximately 59% in healthcare workers [14] 95.3% in nurses [17] and 95.6% among physicians in a university-based teaching hospital [18]. Compared to the general population, the vaccination rate of the COVID-19 vaccination was high (83.2%) among health professionals. These participants had good knowledge about the vaccine [25, 31] both for its effectiveness and adverse effects. Other studies found that sociodemographic determinants were associated with the vaccination rate [7, 10, 12, 19, 25] but not for our result. However, the finding is diverse from area to area and time to time. COVID-19 vaccination acceptance among health professionals is important since they are a key performance to encourage people to have vaccination [25]. Reducing vaccine hesitancy, they should get enough information for all COVID-19 vaccine dimensions in order to criticize and judge for the benefit of health outcomes. The higher the enhancement for cooperation, the higher the benefit of controlling the pandemic. This situation will successfully induce the vaccination rate when healthcare providers are likely to accept it first. Then, they would provide all essential information to recipients to persuade them for mass vaccination that reaches herd immunization.

High risk of COVID-19 infection, for example, touching an infected person or their belongings, enhanced health professionals' acceptance of the COVID-19 vaccination. National surveys [14, 16, 25]

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found that people who were at high risk of infection were more likely to receive vaccinations [32]. Those who do not accept the COVID-19 vaccination (16.8%, Table 1) should be given vaccine information [13, 18, 33, 34] about the risk of side effects, how to manage them if they occur, how to reduce the severity of infection and mortality, and the benefit to society [34, 35] as a result of the COVID-19 mass vaccination.

According to a preliminary study, the psychological impact of peer modeling boosted the COVID-19 vaccination rate [36]. Five categories of personal media were used in our study to promote vaccination acceptability (Table 3). The relationship with vaccine acceptance was only mentioned by a respected person.

An approval document for COVID-19 vaccination was one of the strategic measures to encourage people to have vaccination [1, 37]. This study's conclusion that a COVID-19 vaccine approval certificate is one tactic that increases vaccination intention is consistent with earlier research [1]. The certificate serves as a passport or boarding pass to release people from home isolation, particularly when the lockdown period is ending. People could go outside for social activities, transportation, and traveling [1, 2, 38]. However, these activities still require the restriction for self-prevention from the disease infection.

6. Conclusion

The vaccination rate for COVID-19 vaccination among health workers was high. Touching patients and their things made them feel susceptible to the risk of infection; respected people and vaccination passports influenced them for vaccination. The era of pandemic diseases that vaccination was believed to prevent and control its spreading, health personnel are one of the key informants to campaign and promote the people's cooperation to have vaccination.

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Institutional Review Board Statement:

The study protocol was approved by the Ethics Committee for Human Research Subjects, Sirindhorn College of Public Health, Yala, on April 9, 2021 (Project number 049/2564). Since this research is an online data collection, we have written information about the research, research objectives, and contact channels with the researchers at the beginning of the questionnaire. The participants were explained and understood by reading it themselves. The questionnaire cannot be linked to an individual, so there is no negative effect on the respondents. If the research volunteer does not have to sign to consent to participate in the research, but answering the questionnaire means that they are willing and agree to participate in this research.

Transparency:

The authors confirm that the manuscript is an honest, accurate and transparent account of the study that no vital features of the study have been omitted and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

Competing Interests:

The authors report no competing interests in relation to this work. The funder had no role in the study design, implementation, or decision to publish.

Authors' Contributions:

Awirut Singkun was responsible for project administration and supervision, study conceptualization, methodology, and wrote the original draft. Natthawadee Maneeprom, Piriya Patiwikraiwong, and Hanifah Buraka worked for data curation, analyzed the data. All authors proofread and approved the published version of this manuscript.

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References

[1] B. Wang and Y. Ping, "A comparative analysis of COVID-19 vaccination certificates in 12 countries/regions around the world: Rationalising health policies for international travel and domestic social activities during the pandemic," *Health Policy*, vol. 126, no. 8, pp. 755-762, 2022. https://doi.org/10.1016/j.healthpol.2022.05.016

[2] K. Sharun, R. Tiwari, K. Dhama, A. A. Rabaan, and S. Alhumaid, "COVID-19 vaccination passport: prospects, scientific feasibility, and ethical concerns," *Human Vaccines & Immunotherapeutics*, vol. 17, no. 11, pp. 4108-4111, 2021. https://doi.org/10.1080/21645515.2021.1953350

[3] P. Ngamchaliew *et al.*, "Changes in preventive behaviour after COVID-19 vaccination in Thailand: A cross-sectional study," *BMC Public Health*, vol. 22, no. 1, p. 2039, 2022. https://doi.org/10.1186/s12889-022-14494-x

[4] R. R. Maude *et al.*, "Improving knowledge, attitudes and practice to prevent COVID-19 transmission in healthcare workers and the public in Thailand," *BMC Public Health*, vol. 21, pp. 1-14, 2021. https://doi.org/10.1186/s12889-021-10768-y

[5] A. Singkun, "Factors associated with social responsibility among university students in Yala, Thailand during the COVID-19 pandemic," *Journal of Health Research*, vol. 35, no. 3, pp. 265-275, 2020. https://doi.org/10.1108/JHR-05-2020-0142

[6] R. Yorsaeng *et al.*, "The impact of COVID-19 and control measures on public health in Thailand, 2020," *Peer of Journal*, vol. 10, p. e12960, 2022. http://doi.org/10.7717/peerj.12960

[7] M. Al-Mohaithef and B. K. Padhi, "Determinants of COVID-19 vaccine acceptance in Saudi Arabia: A web-based national survey," *Journal of Multidisciplinary Healthcare*, pp. 1657-1663, 2020. https://doi.org/10.2147/JMDH.S276771

[8] A. Asgary, M. M. Najafabadi, R. Karsseboom, and J. Wu, "A drive-through simulation tool for mass vaccination during COVID-19 pandemic," *Healthcare*, vol. 8, no. 4, p. 469, 2020. https://doi.org/10.3390/healthcare8040469

[9] A. K. Ulrich, M. E. Sundaram, and N. E. Basta, "Supporting individual vaccine decision-making: A role for vaccination counselors," *Vaccine*, vol. 40, no. 14, p. 2123, 2022. https://doi.org/10.1016/j.vaccine.2022.02.012

[10] M. Machida *et al.*, "Acceptance of a COVID-19 Vaccine in Japan during the COVID-19 Pandemic," *Vaccines*, vol. 9, no. 3, p. 210, 2021. https://doi.org/10.3390/vaccines9030210

[11] Y. Payaprom, H. Tantipong, P. Manasatchakun, S. Chandeekeawchakool, and S. Khamchai, "COVID-19 Vaccine acceptance from the perspective of people living in Northern Thailand: A mixed methods research," *Nursing Journal CMU*, vol. 49, no. 2, pp. 41-54, 2022.

[12] J. V. Lazarus *et al.*, "A global survey of potential acceptance of a COVID-19 vaccine," *Nature Medicine*, vol. 27, no. 2, pp. 225-228, 2021. https://doi.org/10.1038/s41591-020-1124-9

[13] A. Raut, A. Samad, J. Verma, and P. Kshirsagar, "Acceptance, hesitancy and refusal towards COVID-19 vaccination," *Clinical Epidemiology and Global Health*, vol. 21, p. 101283, 2023. https://doi.org/10.1016/j.cegh.2023.101283

[14] C. Pheerapanyawaranun *et al.*, "COVID-19 vaccine hesitancy among health care workers in Thailand: The comparative results of two cross-sectional online surveys before and after vaccine availability," *Frontiers in Public Health*, vol. 10, p. 834545, 2022. https://doi.org/10.3389/fpubh.2022.834545

[15] F. M. Wong, "Factors associated with knowledge, attitudes, and practices related to oral care among the elderly in Hong Kong community," *International Journal of Environmental Research and Public Health*, vol. 17, no. 21, p. 8088, 2020. https://doi.org/10.3390/ijerph17218088

[16] H. Kosiyaporn, C. Netrpukdee, N. Pangkariya, O. Chandrasiri, and V. Tangcharoensathien, "The impact of vaccine information and other factors on COVID-19 vaccine acceptance in the Thai population," *Plos One*, vol. 18, no. 3, p. e0276238, 2023. https://doi.org/10.1371/journal.pone.0276238

[17] N. Butsing, W. Maneesriwongul, P. J. Visudtibhan, S. Leelacharas, and K. Kittipimpanon, "COVID-19 vaccine acceptance and hesitancy among nurses in Thailand: Implications, challenges, and future prospects for attitudes and vaccine literacy," *Vaccines*, vol. 12, no. 2, p. 142, 2024. https://doi.org/10.3390/vaccines12020142

[18] M. Sirikalyanpaiboon *et al.*, "COVID-19 vaccine acceptance, hesitancy, and determinants among physicians in a university-based teaching hospital in Thailand," *BMC Infectious Diseases*, vol. 21, pp. 1-12, 2021. https://doi.org/10.1186/s12879-021-06863-5

[19] J. Kunno *et al.*, "Satisfaction with COVID-19 vaccines in health care workers and the general population: A cross-sectional study in Urban Bangkok, Thailand," *Vaccines*, vol. 10, no. 8, p. 1345, 2022. https://doi.org/10.3390/vaccines10081345

[20] M. U. Kraemer *et al.*, "The effect of human mobility and control measures on the COVID-19 epidemic in China," *Science*, vol. 368, no. 6490, pp. 493-497, 2020. https://doi.org/10.1126/science.abb4218

[21] J. Bedford *et al.*, "COVID-19: Towards controlling of a pandemic," *The Lancet*, vol. 395, no. 10229, pp. 1015-1018, 2020. https://doi.org/10.1016/S0140-6736(20)30673-5

[22] M. P. Hossain *et al.*, "The effects of border control and quarantine measures on the spread of COVID-19," *Epidemics*, vol. 32, no. 1, pp. 1-8, 2020. https://doi.org/10.1016/j.epidem.2020.100397

[23] S. Kharroubi and F. Saleh, "Are lockdown measures effective against COVID-19?," *Frontiers in Public Health*, vol. 8, no. 1, pp. 1-4, 2020. https://doi.org/10.3389/fpubh.2020.549692

[24] M. J. Baeza-Rivera, C. Salazar-Fernández, L. Araneda-Leal, and D. Manríquez-Robles, "To get vaccinated or not? Social psychological factors associated with vaccination intent for COVID-19," *Journal of Pacific Rim Psychology*, vol. 15, no. 1, pp. 1-15, 2021. https://doi.org/10.1177/18344909211051799

[25] N. Biswas, M. Toheeb, K. Jagdish, and J. H. Price, "The nature and extent of COVID-19 vaccination hesitancy in healthcare workers," *Journal of Community Health*, vol. 46, no. 6, pp. 1244-1251, 2021. https://doi.org/10.1007/s10900-021-00984-3

[26] Z. Figa *et al.*, "Acceptance of COVID-19 vaccine among healthcare workers in Africa, systematic review and meta-analysis," *Public Health In Practice*, vol. 4, no. 2, pp. 1-8, 2022. https://doi.org/10.1016/j.puhip.2022.100343

[27] A. Singkun, H. Booraka, K. Tohrayor, and J. Sornboot, "Factors influencing acceptance of the COVID-19 vaccination in Thailand: The initiate phase of introducing COVID-19 vaccines," *Nurture*, vol. 19, no. 1, pp. 1-8, 2025. https://doi.org/10.55951/nurture.v19i1.933

[28] H. Midi, S. K. Sarkar, and S. Rana, "Collinearity diagnostics of binary logistic regression model," *Journal of Interdisciplinary Mathematics*, vol. 13, no. 3, pp. 253-267, 2010. https://doi.org/10.1080/09720502.2010.10700699

[29] R. M. Yusoff, F. Khan, A. Mubeen, and K. Azam, "A study about factors influencing the university performance," *Sains Humanika*, vol. 64, no. 2, pp. 1-5, 2013. https://doi.org/10.11113/sh.v64n2.55

[30] M. Sallam, "COVID-19 vaccine hesitancy worldwide: A concise systematic review of vaccine acceptance rates," *Vaccines*, vol. 9, no. 2, p. 160, 2021. https://doi.org/10.3390/vaccines9020160

[31] M. Yigit, A. Ozkaya-Parlakay, and E. Senel, "Evaluation of COVID-19 vaccine refusal in parents," *The Pediatric Infectious Disease Journal*, vol. 40, no. 4, pp. e134-e136, 2021. https://doi.org/10.1097/INF.0000000000003042

[32] A. Wismans, R. Thurik, R. Baptista, M. Dejardin, F. Janssen, and I. Franken, "Correction: Psychological characteristics and the mediating role of the 5C Model in explaining students' COVID-19 vaccination intention," *Plos One*, vol. 16, no. 11, p. e0259922, 2021. https://doi.org/10.1371/journal.pone.0259922

[33] I. Ullah, K. S. Khan, M. J. Tahir, A. Ahmed, and H. Harapan, "Myths and conspiracy theories on vaccines and COVID-19: Potential effect on global vaccine refusals," *Vacunas*, vol. 22, no. 2, pp. 93-97, 2021. https://doi.org/10.1016/j.vacun.2021.01.001

[34] P. Wongnuch *et al.*, "Acceptance and accessibility to the early phase COVID-19 vaccination among the healthcare workers and hill tribe population in Thailand," *Scientific Reports*, vol. 12, no. 1, p. 11035, 2022. https://doi.org/10.1038/s41598-022-15149-y

[35] W. Phiban, K. Wanitchanon, U. Sirithammaphan, U. Chaisang, and A. Singkun, "Effect of a multidisciplinary program with seven color balls on non-communicable diseases prevention in a Muslim community: A real-world study," *Edelweiss Applied Science and Technology*, vol. 8, no. 4, pp. 1727-1737, 2024. https://doi.org/10.55214/25768484.v8i4.1548

[36] A. Ramirez *et al.*, "Pilot study of peer modeling with psychological inoculation to promote coronavirus vaccination," *Health Education Research*, vol. 37, no. 1, pp. 1-6, 2022. https://doi.org/10.1093/her/cyab042

[37] M. Caserotti *et al.*, "People's perspectives about COVID-19 vaccination certificate: Findings from a representative Italian sample," *Vaccine*, vol. 40, no. 51, pp. 7406-7414, 2022. https://doi.org/10.1016/j.vaccine.2022.08.016

[38] T. C. Voo, M. J. Smith, I. D. Mastroleo, and A. Dawson, "COVID-19 vaccination certificates and lifting public health and social measures: ethical considerations," *The Eastern Mediterranean Health Journal*, vol. 28, no. 6, pp. 454-458, 2022. https://doi.org/10.26719/emhj.22.023

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