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Original Article

Adverse Events Following COVID-19 Vaccination in Malaysia: A Cross-Sectional Study

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Abstract

Background: Vaccination remains the most effective strategy for controlling the COVID-19 pandemic. However, the COVID-19 vaccinations have been linked to a number of side effects. This study aimed to assess the frequency of vaccine-related adverse events among individuals in Malaysia. **Methods:** A cross-sectional, online questionnaire-based survey was conducted among vaccinated individuals in Malaysia from March to November 2024. Participants were recruited using a snowball sampling method, in which the initial respondents were invited through social media platforms and institutional networks and were encouraged to share the survey link with other eligible individuals. A 17-item self-administered questionnaire was designed, validated, and subsequently distributed through online platforms. The inclusion criteria encompassed Malaysian residents aged 18 years and above who had received at least one dose of a COVID-19 vaccine, were able to read and understand English or Malay, and provided informed consent prior to participation. Respondents were excluded if they were below 18 years of age, unvaccinated, or submitted incomplete or inconsistent responses. **Result:** Of 408 respondents, 288 (70.6%) reported experiencing side effects. Females (66.3%) and individuals aged 45–54 years (26.4%) were more likely to report adverse events. Fever was the most common side effect, with the highest proportion observed among Pfizer vaccine recipients (71.4%). The majority of participants (92%) reported only mild to moderate effects, such as fever and localized injection-site pain, which resolved without hospitalization. A substantial proportion (74.2%) of respondents reported prior COVID-19 infection. **Conclusion:** This study provides important insights into post-COVID-19 vaccination experiences in Malaysia. Most adverse events were mild and self-limiting, with only a small fraction requiring medical attention.

Keywords: *COVID-19 Vaccine; Cross-Sectional Survey; Malaysia; Side Effects; Vaccine Safety*

Introduction

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Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), also known as 2019 coronavirus illness (COVID-19), was declared by the World Health Organisation (WHO) in March 2020 (Feng et al., 2020). The virus has resulted in over five million deaths globally, causing severe health issues and significant disruptions to daily life (Onyeaka et al., 2021). Common COVID-19 symptoms include fever, dry cough, shortness of breath, and fatigue. In severe cases, the virus can lead to complications such as pneumonia, acute respiratory distress syndrome (ARDS), multi-organ failure, septic shock, and coagulopathy (Mehta et al., 2021; Zaim et al., 2020). For diagnosis, the reverse transcription polymerase chain reaction (RT-PCR) test remains the gold standard (Yaamika et al., 2023). Mitigation approaches, such as safe distance, excellent personal cleanliness, and mask use, helped to flatten the infection curve, but the introduction of COVID-19 vaccinations offers a promising answer to the pandemic (De Bruin et al., 2020). It also spurred worldwide efforts for prevention, treatment, and vaccination. The discovery of a variety of vaccinations, including live attenuated, inactivated, recombinant protein, vector, DNA, and mRNA vaccines, has enabled a quick response to COVID-19 (Peng et al., 2021). Vaccine development follows a structured process, beginning with preclinical testing on animals to evaluate safety and effectiveness. This is followed by clinical trials in humans, which progress through multiple phases—starting with small groups of volunteers and expanding to larger populations to collect more comprehensive data on safety and efficacy (Yaamika et al., 2023).

In Malaysia, the COVID-19 vaccination program was implemented in three phases: phase 1 vaccinated frontline workers, including healthcare personnel; phase 2 included other healthcare workers and senior citizens; phase 3 vaccinated the entire eligible population (Hamdan et al., 2022). This stepwise plan ensured that vulnerable populations received priority protection from COVID-19. Malaysia obtained 99.4% first-dose immunisation rates and 98.2% second-dose rates among adults, demonstrating the vaccine's high safety and efficacy. However, only 68.8% of Malaysian adults have received their booster injection as of yet (MoH, 2022). A local study on vaccine hesitancy in receiving the COVID-19 booster shot among vaccinated individuals who have completed their primary vaccination series found that experiencing side effects from a previous COVID-19 vaccination was significantly associated with a lower likelihood of receiving the shot (Lee et al., 2023). This phenomenon is known as vaccine hesitancy, and it refers to those who, despite having access to vaccines, choose not to obtain them. This reticence might be attributed to a variety of things, including safety concerns, previous experiences, or misinformation (Ng et al., 2022).

Malaysia's National COVID-19 Immunisation Programme (PICK) was developed to speed up the vaccination process, and the coordinating minister manages it. This initiative provides free immunisations to all Malaysian citizens and non-citizens. The National COVID-19 Immunisation Programme (PICK) now provides Malaysians with four vaccine brands: Comirnaty® (Pfizer BioNTech), CoronaVac® (Sinovac), CanSino®, and Vaxzervria® (AstraZeneca). Additionally, the Johnson & Johnson (Janssen) vaccine has been granted conditional approval (Suah et al., 2021). COVID-19 vaccinations have been linked to several side effects, with the majority appearing after the first and second doses. The most adverse effects of single-dose COVID-19 vaccines (Pfizer-BioNTech, Sinovac, Oxford-AstraZeneca, CanSino and Johnson & Johnson) include injection site pain, swelling, fatigue, headache, nausea, muscle pain, weakness, chills, fever, skin rash, malaise, and diarrhoea (Karuppannan et al., 2024). Additionally, according to the Centres for Disease Control and Prevention (CDC, 2025), post-vaccination surveillance has identified several rare but clinically significant adverse events associated with COVID-19 vaccination, such as anaphylaxis, myocarditis, pericarditis, Guillain-Barré syndrome (GBS) and thrombosis with thrombocytopenia syndrome (TTS) in the United States. Therefore, this research is carried out to study the frequency or ratio of the population in Malaysia which has suffered any adverse event after receiving vaccines administered towards the people. This study will also help to provide a better understanding and insight into the demographics of participants within a given population group with regard to the implications of vaccines.

Methodology

Study Design

This study was a cross-sectional, online questionnaire-based survey conducted among the vaccinated individuals in Malaysia between March to November 2024. The 17-item questionnaire was created and validated that involved personal particulars of participants, symptoms / adverse events experienced, history of allergy and history of previous Covid 19 infection, treatment of symptoms, opinion of vaccine hesitancy and opinion on the importance of vaccination. The self-administered questionnaire using Google Forms and shared through social media platforms such as Facebook, WhatsApp, and Telegram. Participants were invited to voluntarily participate in the survey and were encouraged to distribute the link among their peers, following the snowball sampling method. Using the Raosoft online sample size calculator (https://www.raosoft.com/samplesize.html, assessed on 15/02/2024), with a 5% margin of error, a 95% confidence level, and a 50% response distribution, the necessary sample size for this study was determined to be 377 participants.

Statistical Analysis

Descriptive analysis and frequency assessment were performed on the participants' characteristics. Multivariate logistic regression was used to identify the predictors of willingness to participate in, support for and concerns about the COVID-19 vaccination programme. Since wiliness, support and concern data were collected with a 5-point Likert scale, they were transformed into binary data (Yes=Very Likely, Likely; No=Neither, Not Likely, Very Not Likely) before the analysis. The predictors were dummy-coded before the analysis. The predictors were 'entered' into the regression model. The association between the predictors and outcomes were defined using odds ratio (OR) and 95% confidence interval (CI). A significant association was defined as $p<0.05$. Statistical analysis was performed using Statistical Software for Social Science version 26 (IBM, Armonk, USA).

Ethical Consideration

Ethical approval for this study was granted by the Research Ethics Committee of Universiti Geomatika Malaysia with ethical number UGM/RI 2024-020 on 2024.

Results

Participants Information

Details of the study participants' information are presented in Table 1. Generally, a total of 403 respondents completed the survey, with about an equal percentage of women and men (50 %) participating, and most respondents (24.3 %) were between 45 and 54 years old. The majority of the respondents were Malay (44.7 %), followed by Indian (28.3 %), Chinese (24.8 %) and others (2.2 %). The others represent as native people in Sabah and Sarawak. About 55.3 % of the respondents were pursuing or had completed their first degree. A total of 263 respondents were employed, and 38 % of them were frontline workers directly responding to the health crisis and providing essential services. The majority (67.5 %) of respondents reported no previous history of allergy to any medication or vaccine.

Table 1: General Information of Study Participants

	Frequency	Percentage (%)
Gender		
Men	204	50.6
Women	199	49.4
Age		
18 – 24	78	19.4
25 – 34	89	22.1
35 – 44	94	23.3
45 – 54	98	24.3
55 – 64	44	10.9
Race		
Malay	180	44.7
Chinese	100	24.8
Indian	114	28.3
Others	9	2.2

Educational Level		
High school	74	18.4
Undergraduate	223	55.3
Graduate	106	26.3
Employment		
Employed	263	65.3
Unemployed	140	34.7
Occupation type		
Frontline job	99	37.6
Non frontline job	164	62.4
Previous history of allergy to medication/vaccine		
Yes	39	9.7
No	272	67.5
Unaware	92	22.8
Have you had any other vaccines, beside the Covid 19 vaccine in the last 5 years?		
Yes	62	15.4
No	341	84.6

COVID-19 Vaccination among Study Participants

As shown in Table 2, the majority of participants (56.6 %) received the Pfizer (Comirnaty) vaccine, followed by AstraZeneca (Vaxzervria) (21.6%). Notably, almost two-thirds (74.2 %) of the respondents had tested positive with COVID-19 at least once in their lifetime.

Table 2: COVID-19 Vaccination

	Frequency	Percentage(%)
Types of COVID-19 vaccination		
AstraZeneca (Vaxzervria®)	87	21.6
Moderna (Spikevax®)	27	6.7
Pfizer (Comirnaty®)	228	56.6
Sinovac (CoronaVac®)	61	15.1
Tested positive for COVID-19 at least once in their lifetime		
Yes	299	74.2
No	104	25.8

Side effects after COVID-19 vaccination

Table 3 illustrates the percentage of participants who experienced side effects after the vaccination. Among the total 403 participants, a majority (71.5%) experienced side effects after COVID-19 vaccination, with more than half (66.3%) being women. Participants in the age range of 45 – 54 years old (26.4%) experienced side effects compared to other age groups.

Table 3: Percentage of Participants who Experienced Side Effects After the Vaccination

	Frequency	Percentage (%)
Experienced side effects after COVID-19 vaccination		
Yes	288	71.5
No	115	26.1
Gender		
Men	97	33.7
Women	191	66.3
Age		
18 – 24	50	17.4
25 – 34	64	22.2
35 – 44	73	25.3
45 – 54	76	26.4
55 – 64	25	8.7

The distribution of the number of side effects reported after the vaccination, expressed in percentages, is displayed in Table 4. Fever was reported as the most frequent side effect experienced among the participants. Pfizer vaccine has the highest percentage of fever experienced by the participants at 71.4 %, followed by AstraZeneca's vaccine at 13.5 %, then it's Sinovac at 10.3 % and lastly Moderna at 3.8 % of the participants. The participants also experienced arm pain, which was the second most prevalent side effect experienced among all the participants who received the vaccine, with 61.9 % reported by participants who were vaccinated with the Pfizer vaccine, and 22.9 % reported by participants who received the AstraZeneca vaccine. Among 115 participants who did not experience any side effects after the vaccination, 52.2 % participants received the Pfizer vaccine, followed by 23.5 % received the AstraZeneca vaccine, and lastly 8.7 % received the Moderna vaccine.

Table 4: Distribution of the Number of Side Effects Reported After the Vaccination

Side Effects	AstraZeneca (Vaxzevria)	Moderna (SpikeVax)	Pfizer (Comirnaty)	Sinovac (Coronavac)	Total
Fever	25	7	132	19	**185**
Arm Pain	27	4	73	14	**118**
Swelling on body	18	7	25	11	**61**
Palpitation	18	9	22	11	**60**
Body ache	1	2	9	5	**17**
Headache	1	2	7	4	**14**
Rash	2	-	1	8	**11**
Vomiting	2	-	6	2	**10**
Difficulty Breathing	3	-	2	-	**5**
Chest Pain	2	-	2	-	**4**
Tiredness	2	-	2	-	**4**
Migraine	-	2	1	1	**4**
Fatigue	-	-	3	-	**3**
Lack of Appetite	-	-	3	-	**3**
Mood swings	-	-	1	-	**1**
No Side Effect	**27**	**10**	**60**	**18**	**115**

Participants recovery from the side effects after the vaccination

Based on the severity of the side effects, this question addresses whether the patients had to seek hospitalisation. The majority of participants (92%) did not experience severe side effects and did not require hospitalisation. However, 23 (8%) participants were admitted due to the side effects. On the other hand, 114 participants (40%) who faced side effects did not consume any over the counter medication and recovered over time (Table 5).

Table 5: Participants recovery from the side effect after COVID-19 vaccination

	Frequency	Percentage (%)
Hospitalisation due to vaccination		
No	265	92
Yes	23	8
Self-medicated		
No	114	40
Yes	174	60

Participants opinion assessment

Next, participants' opinion regarding the vaccination program was assessed. About 38.5 % of participants expressed 'likely' about being self-volunteers for the vaccination program. Besides, 32.8 % were 'likely' to support the program. On the concern that the COVID-19 vaccine was not offered to them, 31% of the participants answered 'neither' (Table 5).

Table 6: Participants Recover from the Side Effects after COVID-19 Vaccination

	Frequency	Percentage (%)
Self-volunteer for vaccination program		
Very likely	22	5.5
Likely	155	**38.5**

Neither	112	27.8
Unlikely	85	21.1
Very unlikely	29	7.2
Support initiative on vaccination program		
Very likely	25	6.2
Likely	132	**32.8**
Neither	107	26.6
Unlikely	107	26.6
Very unlikely	32	7.9
Your concern if the COVID-19 vaccine was not offered to you		
Extremely concerned	33	8.2
Concerned	117	29.0
Neither	125	**31.0**
Not concerned	104	25.8
Extremely not concerned	24	6.0

Impact of age, gender, previous vaccination and willingness to participate in vaccination programme

Subjects aged 55-64 years (OR: 0.187, 95% CI: 0.45-0.775 vs subjects aged 18-24 years), previously vaccinated for other diseases (OR: 0.442, 95% CI: 0.218-0.896 vs unvaccinated subjects) and had taken medications for previous COVID-19 episodes (OR: 0.426, 95% CI: 0.237-0.767 vs those who did not) showed lower willingness to participate in vaccination programme (Table 6).

Table 7: Factors Associated with Lower Willingness Regarding the COVID-19 Vaccines: Multivariate Logistic Regression Analysis

	B	SE	*p*-value	OR	Lower	Upper
Age=18 to 24	Reference					
Age=25 to 34	-0.401	0.513	0.435	0.670	0.245	1.832
Age=35 to 44	-0.802	0.590	0.174	0.448	0.141	1.426
Age=45 to 54	-0.922	0.585	0.115	0.398	0.126	1.251
Age=55 to 64	-1.679	0.726	**0.021**	0.187	0.045	0.775
Gender=Male	Reference					
Gender=Female	0.405	0.268	0.132	1.499	0.886	2.537
Ethnicity=Malay	Reference					
Ethnicity=Chinese	-0.176	0.385	0.648	0.839	0.395	1.783
Ethnicity=Indian	-0.206	0.335	0.538	0.814	0.422	1.568
Ethnicity=Others	0.059	0.794	0.941	1.060	0.224	5.025
Ethnicity=Not comfortable to answer	-21.311	40192.970	1.000	0.000	0.000	.
Employment Status=Working	Reference					
Employment Status=Unemployed	-0.267	0.446	0.550	0.766	0.320	1.836
Educational Level=Graduate	Reference					
Educational Level=Undergraduate	0.083	0.306	0.786	1.086	0.597	1.978
Educational Level=High School	0.104	0.447	0.815	1.110	0.462	2.667
Occupation Type=Frontliner	Reference					
Occupation Type=non-frontliner	-0.142	0.321	0.659	0.868	0.463	1.628
Occupation Type=None	-0.080	0.576	0.889	0.923	0.299	2.852
Occupation Type=Student	-0.661	0.782	0.398	0.516	0.111	2.393
Marital Status=Married	Reference					
Marital Status=Unmarried	-0.093	0.331	0.780	0.912	0.476	1.745
Marital Status=Widowed or Divorced	0.811	0.622	0.192	2.251	0.665	7.619
Morbidity=Yes	Reference					
Morbidity=No	-0.253	0.421	0.549	0.777	0.340	1.774
Morbidity=Unaware	-0.550	0.486	0.258	0.577	0.223	1.496
Taken other vaccines=Yes	Reference					
Taken other vaccines=No	-0.815	0.360	**0.024**	0.442	0.218	0.896
COVID-19 Vaccine= AstraZeneca (Vaxzevria)	Reference					
COVID-19 Vaccine=Pfizer (Comirnaty)	0.077	0.335	0.818	1.080	0.560	2.081
COVID-19 Vaccine=Sinovac (Coronavac)	-0.420	0.433	0.332	0.657	0.281	1.536

COVID-19 Vaccine=Moderna (SpikeVax)	-0.965	0.659	0.143	0.381	0.105	1.386
COVID-19 Vaccine=Sinovac + Pfizer	-20.232	40192.970	1.000	0.000	0.000	.
Previous COVID-19 History=Yes	Reference					
Previous COVID-19 History=No	0.581	0.317	0.067	1.788	0.961	3.327
Recovered from COVID-19 Side Effects=Yes	Reference					
Recovered from COVID-19 Side Effects=No	-0.650	0.490	0.185	0.522	0.200	1.364
Recovered from COVID-19 Side Effects=Unsure	-0.352	0.406	0.386	0.704	0.318	1.558
Hospitalisation After Side Effects=Yes	Reference					
Hospitalisation After Side Effects=No	-.062	.466	.894	.940	.377	2.344
Taken Over-the-Counter Medication=Yes	Reference					
Taken Over-the-Counter Medication=No	-0.853	0.300	**0.004**	0.426	0.237	0.767

Impact of age, race, previous vaccination and COVID-19 vaccination initiatives

Subjects aged 35-44 years (OR: 0.181, 95% CI: 0.054-0.607 vs subjects aged 18-24 years) and 45-54 years (OR: 0.181, 95% CI: 0.054-0.607 vs subjects aged 18-24 years), were Chinese (OR: 0.446, 95% CI: 0.203-0.980 vs Malays), and had taken other non-COVID-19 vaccines (OR: 0.370, 95% CI: 0178-0.767 vs those who had not taken), were less supportive towards COVID-19 vaccination initiatives. In contrast, female subjects were more likely to support the initiatives compared to males (OR: 1.944, 95% CI: 1.119-3.376) (Table 7).

Table 8: Factors Associated with Less Supportive towards COVID-19 Vaccines: Multivariate Logistic Regression Analysis

	B	SE	*p*-value	OR	Lower	Upper
Age=18 to 24	Reference					
Age=25 to 34	-0.927	0.540	0.086	0.396	0.137	1.141
Age=35 to 44	-1.711	0.618	**0.006**	0.181	0.054	0.607
Age=45 to 54	-1.776	0.622	**0.004**	0.169	0.050	0.573
Age=55 to 64	-1.285	0.728	0.077	0.277	0.066	1.152
Gender=Male	Reference					
Gender=Female	0.665	0.282	**0.018**	1.944	1.119	3.376
Ethnicity=Malay	Reference					
Ethnicity=Chinese	-0.807	0.401	**0.044**	0.446	0.203	0.980
Ethnicity=Indian	-0.307	0.339	0.365	0.736	0.379	1.429
Ethnicity=Others	0.428	0.919	0.642	1.534	0.253	9.297
Ethnicity=Not comfortable to answer	-20.990	40192.970	1.000	0.000	0.000	.
Employment Status=Working	Reference					
Employment Status=Unemployed	-0.239	0.474	0.615	0.788	0.311	1.996
Educational Level=Graduate	Reference					
Educational Level=Undergraduate	-0.134	0.314	0.669	0.875	0.472	1.619
Educational Level=High School	-0.692	0.473	0.144	0.500	0.198	1.265
Occupation Type=Frontliner	Reference					
Occupation Type=Non-frontliner	-0.154	0.333	0.643	0.857	0.446	1.645
Occupation Type=None	-0.153	0.608	0.801	0.858	0.261	2.824
Occupation Type=Student	-0.683	0.838	0.416	0.505	0.098	2.613
Marital Status=Married	Reference					
Marital Status=Unmarried	-0.166	0.347	0.632	0.847	0.429	1.671
Marital Status=Widowed or Divorced	0.194	0.653	0.766	1.214	0.338	4.363
Morbidity=Yes	Reference					
Morbidity=No	-0.422	0.428	0.324	0.656	0.284	1.516
Morbidity=Unaware	-0.636	0.495	0.199	0.529	0.201	1.396
Taken other vaccines=Yes	Reference					
Taken other vaccines=No	-0.995	0.372	**0.007**	0.370	0.178	0.767

COVID-19 Vaccine= AstraZeneca (Vaxzevria)	Reference					
COVID-19 Vaccine=Pfizer (Comirnaty)	-0.119	0.345	0.730	0.888	0.452	1.745
COVID-19 Vaccine=Sinovac (Coronavac)	-0.740	0.449	0.099	0.477	0.198	1.150
COVID-19 Vaccine=Moderna (SpikeVax)	-0.834	0.698	0.232	0.434	0.111	1.704
COVID-19 Vaccine=Sinovac + Pfizer	-21.408	40192.970	1.000	0.000	0.000	.
Previous COVID-19 History=Yes	Reference					
Previous COVID-19 History=No	0.439	0.332	0.186	1.551	0.810	2.971
Recovered from COVID-19 Side Effects=Yes	Reference					
Recovered from COVID-19 Side Effects=No	-0.544	0.503	0.280	0.580	0.216	1.556
Recovered from COVID-19 Side Effects=Unsure	0.265	0.419	0.528	1.303	0.573	2.964
Hospitalisation After Side Effects=Yes	Reference					
Hospitalisation After Side Effects=No	0.180	0.478	0.706	1.198	0.469	3.058
Taken Over the Counter Medication=Yes	Reference					
Taken Over the Counter Medication=No	-0.331	0.309	0.285	0.718	0.392	1.316

Impact of age, race, previous vaccination and COVID-19 vaccination initiatives

Subjects aged 55-64 years (OR: 0.208, 95% CI: 0.047-0.927 vs subjects aged 18-24 years), were Chinese (OR: 0.290, 95% CI: 0.128-0.659 vs Malays), had taken non-COVID-19 vaccination (OR: 0.488, 95% CI: 0.242-0.985 vs those who had not), and had recovered from COVID-19 side effects (OR: 0.325, 95% CI: 0.117-0.905 vs those who had not) showed lower concern if they were not offered COVID-19 vaccines (Table 8).

Table 9: Factors Associated with Lower Concern Regarding the Unavailability of COVID-19 Vaccines: Multivariate Logistic Regression Analysis

	B	**SE**	***p*-value**	**OR**	**Lower**	**Upper**
Age=18 to 24	Reference					
Age=25 to 34	-0.425	0.521	0.415	0.654	0.236	1.814
Age=35 to 44	-0.622	0.597	0.298	0.537	0.167	1.730
Age=45 to 54	-1.147	0.603	0.057	0.317	0.097	1.035
Age=55 to 64	-1.572	0.763	**0.039**	0.208	0.047	0.927
Gender=Male	Reference					
Gender=Female	0.059	0.280	0.833	1.061	0.613	1.836
Ethnicity=Malay	Reference					
Ethnicity=Chinese	-1.236	0.418	**0.003**	0.290	0.128	0.659
Ethnicity=Indian	-0.668	0.344	0.052	0.513	0.261	1.007
Ethnicity=Others	0.004	0.841	0.996	1.004	0.193	5.218
Ethnicity=Not comfortable to answer	21.667	40192.969	1.000	2569093809.360	0.000	.
Employment Status=Working	Reference					
Employment Status=Unemployed	0.417	0.457	0.361	1.518	0.620	3.717
Educational Level=Graduate	Reference					
Educational Level=Undergraduate	0.449	0.322	0.163	1.567	0.834	2.945
Educational Level=High School	-0.316	0.477	0.507	0.729	0.286	1.855
Occupation Type=Frontliner	Reference					
Occupation Type=Non-frontliner	-0.470	0.334	0.159	0.625	0.325	1.201
Occupation Type=None	-0.888	0.602	0.140	0.412	0.127	1.339
Occupation Type=Student	-0.776	0.797	0.330	0.460	0.097	2.193
Marital Status=Married	Reference					
Marital Status=Unmarried	-0.187	0.344	0.587	0.830	0.423	1.627
Marital Status=Widowed or Divorced	-0.397	0.751	0.597	0.673	0.154	2.930
Morbidity=Yes	Reference					
Morbidity=No	0.125	0.430	0.772	1.133	0.487	2.635
Morbidity=Unaware	0.393	0.492	0.424	1.482	0.565	3.886
Taken other vaccines=Yes	Reference					

Taken other vaccines=No	-0.718	0.358	**0.045**	0.488	0.242	0.985
COVID-19 Vaccine= AstraZeneca (Vaxzevria)	Reference					
COVID-19 Vaccine=Pfizer (Comirnaty)	-0.032	0.349	0.927	0.968	0.488	1.921
COVID-19 Vaccine=Sinovac (Coronavac)	0.092	0.451	0.838	1.096	0.453	2.654
COVID-19 Vaccine=Moderna (SpikeVax)	-0.285	0.701	0.685	0.752	0.191	2.970
COVID-19 Vaccine=Sinovac + Pfizer	-20.722	40192.970	1.000	0.000	0.000	.
Previous COVID-19 History=Yes	Reference					
Previous COVID-19 History=No	0.261	0.326	0.424	1.298	0.685	2.461
Recovered from COVID-19 Side Effects=Yes	Reference					
Recovered from COVID-19 Side Effects=No	-1.123	0.522	**0.031**	0.325	0.117	0.905
Recovered from COVID-19 Side Effects=Unsure	-0.157	0.411	0.702	0.855	0.382	1.911
Hospitalisation After Side Effects=Yes	Reference					
Hospitalisation After Side Effects=No	0.375	0.495	0.448	1.455	0.552	3.837
Taken Over the Counter Medication=Yes	Reference					
Taken Over the Counter Medication=No	-0.261	0.307	0.395	0.770	0.422	1.406

Discussion

Overall, most participants for this study are men, within the range of 45- to 54-year-olds and of Malay ethnicity. More than half of the participants are Pfizer vaccine recipients. As stated on the Malaysia Ministry of Health (MOH) vaccination website (https://covidnow.moh.gov.my/vaccinations), data from 5 October 2022, the most common vaccine used in Malaysia is Pfizer (61.2 %), Sinovac 29.8 %, AstraZeneca 7.9 % and lastly Cansino (0.3%). From a total of 408 participants, 288 of them experienced side effects from COVID-19 vaccination, with mostly females (66.3%) and received the Pfizer (Comirnaty®) vaccine. Pfizer (Comirnaty®) vaccine was reported to have more side effects compared to other types of vaccines (Al Khames Aga et al., 2021; He et al., 2021).

It found that more female participants in our study than male participants reported suffering the adverse events. These findings were in line with those of Ossato et al. (2023), and Alghamdi et al. (2021), who found that vaccine-associated adverse events (AEs) were more common in females than in males. Hormonal and immunological variances have been posited to elucidate this discrepancy, with female subjects typically exhibiting more vigorous immune responses, resulting in elevated antibody synthesis and a heightened incidence of adverse events after influenza vaccination (Klein, S. L., & Flanagan, 2016). This observation aligns with empirical investigations revealing that female individuals also frequently experience more pronounced reactions to other vaccinations (Kiely et al., 2023; Klein et al., 2010).

The preponderance of adverse events catalogued in this investigation was classified as mild to moderate in intensity, including fever and localised pain at the injection site, and most cases resolved without necessitating hospitalisation. This observation bolsters the assertion regarding the safety profile of COVID-19 vaccines, as instances of severe adverse events remained infrequent (8% hospitalisation within this cohort). This finding is in line with previous findings that COVID-19 vaccination caused mild to moderate, short-term side effects such as injection-site pain, fatigue, headache, and fever (Omeish et al., 2022; Alhazmi et al., 2021; Riad et al., 2021). Nevertheless, serious side effects such as venous thromboembolism, arrhythmia, and convulsion/seizure were reported among Pfizer (Comirnaty®) vaccine recipients (Ab Rahman et al., 2022).

Intriguingly, participants within the age bracket of 45 to 54 years exhibited a greater propensity to report side effects when juxtaposed with younger demographics. This phenomenon may be correlated with immunosenescence, wherein older adults demonstrate diminished immune responses, while middle-aged individuals may elicit more vigorous responses, culminating in discernible side effects (Fleisher, 2013). A study by El-Shitany et al., 2021 reported that Pfizer (Comirnaty®) recipients over 60 years of

age experienced side effects such as local symptoms and injection site pain compared to those under 60 years old; meanwhile, those under 60 years of age experienced flu-like symptoms and flu symptoms more than those over 60 years old in Saudi Arabia. Side effects such as normal injection site pain, fatigue and headache were more common in participants aged ≤49 years versus >49 years of the Sinopharm recipients in UAE (Saeed et al., 2021). Conversely, the ≤ 39 years old age group had a significantly higher level of side effects, such as headache/fatigue and joint pain, than the older age group ≥ 39 years old) for Pfizer (Comirnaty®) recipients among German health workers (Klugar et al., 2021).

Our logistic regression analysis revealed that a prior history of vaccination against other diseases and previous utilisation of COVID-19 medications were correlated with a diminished willingness to engage in COVID-19 vaccination initiatives. This underscores the potential influence of vaccine fatigue and earlier negative health experiences in shaping public attitudes (Syed Alwi et al., 2021). The substantial proportion of participants (74.2%) reporting prior COVID-19 infection may have additionally impacted the reporting of side effects, as individuals with a history of infection are known to generate more robust immune responses, thereby reporting a greater frequency of side effects post-vaccination. The public health ramifications of these findings are significant for the uptake of booster vaccinations in Malaysia. Local research (Lee et al., 2023) has already indicated that adverse experiences following primary vaccination are predictive of reduced acceptance of booster doses.

Our findings reinforce the necessity for targeted educational initiatives and reassurance strategies, particularly aimed at women and those who have previously encountered side effects. From a policy perspective, clear communication emphasising that the majority of side effects are mild, self-limiting, and indicative of immune protection may serve to mitigate vaccine hesitancy. Healthcare professionals should prioritise active post-vaccination monitoring and facilitate access to consultations to enhance confidence in forthcoming immunisation campaigns.

Limitations

This study has several limitations. The cross-sectional design limits the ability to establish causal relationships between vaccination and the reported adverse events. Data obtained through self-administered online questionnaires may be subject to recall and reporting biases. As the survey was conducted online, individuals without internet access may have been excluded, leading to potential selection bias and underrepresentation of certain population groups. Furthermore, voluntary participation could have attracted respondents with stronger experiences or opinions, affecting the overall representativeness of the findings. Lastly, the reported adverse events were not clinically verified, which may influence the accuracy of the data.

Conclusion

This survey provides significant insights into the adverse events encountered by vaccinated individuals in Malaysia. The preponderance of adverse effects was mild and ephemeral, with merely a minor fraction necessitating hospitalisation. Female participants and those within the 45–54 age bracket exhibited a higher propensity to report side effects, which is consistent with international trends. The results underscore the necessity for transparent communication and supportive post-vaccination care to mitigate public apprehension. Enhancing vaccine education and addressing hesitancy are imperative to achieving elevated coverage for booster initiatives and forthcoming immunisation programs. The existence of vaccine hesitancy associated with adverse experiences should prompt policymakers to formulate customised risk communication strategies, particularly targeting individuals with previous negative encounters. Healthcare professionals ought to be equipped with the skills to reassure patients regarding anticipated side effects, distinguish them from serious adverse reactions, and deliver timely interventions. Our findings further accentuate the importance of ongoing pharmacovigilance and extended safety monitoring of COVID-19 vaccines in Malaysia, thereby fostering public confidence in continuous immunisation endeavours. Future investigations should delve into the psychological and social dimensions of vaccine acceptance, in addition to examining the long-term effects of repeated booster doses.

Conflict of Interest

The author(s) declare that there is no conflict of interest regarding the publication of this article.

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