COVID-19 Vaccination Status and Post-Vaccination Adverse Effects Among Members of Health Sciences Faculties in Malaysia: A Descriptive Cross-Sectional Study

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Abstract

COVID-19 vaccines are breakthrough to reduce the unprecedented global pandemic; however, misinformation on their efficacy and Adverse Events Following Immunization (AEFI) may impede vaccine uptake. The objective of this study was to evaluate the COVID-19 vaccination compliance rate and AEFI among members of the Health Sciences Faculties (HSF) of our university.

An online, cross-sectional, self-administered, structured questionnaire was distributed to the members of the HSF, SEGI University to study the demographic characteristics, history of infection, type of vaccine received, AEFI, duration, and hospitalization. Convenience sampling and descriptive statistics were employed. The Chi-square test was used to compare the post-vaccination AEs among the CoronaVac® group, Pfizer-BioNTech group, and AstraZeneca group and a p-value of less than 0.05 was considered statistically significant.

About 347 members responded to the survey. Following the first dose, one participant each from the Pfizer-BioNTech and AstraZeneca group tested positive for COVID-19. Following the second dose, two participants from the Pfizer-BioNTech contracted COVID-19 infection. Pain at the injection site (45.2%) and swelling (50.0%) were significantly more common in the Pfizer-BioNTech group, whereas warmth (50.0%) was most experienced by those receiving AstraZeneca. After the second dose, headaches (51.8%), fatigue (50.5%), fever (58.6%), myalgia (51.6%), and chills (65.9%) were found to be the highest among recipients of Pfizer-BioNTech vaccine as compared to the rest.

HSF members exhibited a good compliance rate with COVID-19 vaccination. Recipients of AstraZeneca experienced AEFI for a longer duration than the rest. Identification and reporting of the AEFI of COVID-19 vaccines are the need of the hour to encourage compliance to vaccination among members of the public.

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Introduction

Towards the fag end of 2019, there were disturbing reports of a virus causing rather severe respiratory distress from Wuhan, China. It was labelled as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) which quickly spread like wildfire, wreaking havoc in all parts of the globe, and rapidly spiralled into a severe global health crisis.[1] It was soon learnt that the virus spreads through nasopharyngeal secretions, salivary secretions, aerosols, and droplets.

Consequently, the risk of contracting the infection exponentially increased for members of the healthcare community as they were the most vulnerable segment of the population to be exposed to the deadly virus along with other assorted front-line workers, older adults, and people with co-morbidities who were and still are, at the highest risk of contracting COVID-19 and bearing the brunt of the serious health complications.[2,3] Hence, it is imperative to have 'circuit breakers', effective vaccination protocols, and other preventive measures in place to restrict the spread of the virus and with the advent of

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effective vaccines, hundreds of thousands of lives were saved. [4,5] But the mutating ability of the virus has signalled a grim reminder that the battle is far from over.

Like many other countries, Malaysia has attempted to fight this formidable foe with all the collective might of the scientific apparatus at her disposal. The country commenced vaccinating its population against the virus from the 24th of February 2021.[6] The Drug Control Authority (DCA) and the National Pharmaceutical Regulatory Agency (NPRA) of Malaysia have approved inactivated virus-based CoronaVac®, mRNA-based Pfizer-BioNTech (BNT162b2), and adenovirus-based AstraZeneca vaccine (ChAdOx1 nCoV-19) vaccines for emergency use for health care workers and the public.[7] Members of the healthcare community including faculty members and students of health sciences faculties, such as faculty of medicine, dentistry, optometry, nursing, and pharmacology are being vaccinated under the National Immunization Program (NIP).[6]

The health-related problems that occur post-vaccination are considered as AEFI. These can be true AEFI, which are related to the vaccine, or a coincidental finding that appeared after vaccination. Vaccine AEFI can be systemic, local, and allergic reactions with varying levels of severity.[8] More disturbingly, they may cause hesitancy for vaccination amongst the public which may compromise the vaccine rollout programs set by the Malaysian government. NPRA defines AEFI as any untoward medical occurrence that follows the administration of a vaccine and may not necessarily be causally related to the vaccine itself. Furthermore, NPRA categorizes AEFI into serious (those that require hospitalization, prolonged hospitalization, and/or are life-threatening or suspected to cause death) and non-serious (Non-life threatening ones).[7]

Generally, there is a lack of literature on vaccination compliance rate and AEFI among the various health care fraternity. To the best of our knowledge, no such study has been carried out in Malaysia, so far. Thus, we have attempted to assess the vaccination compliance rate and self-reported AEFI after the first and second doses of vaccination among members of the health care faculties of a private university in Malaysia.

Materials and methods

Study design, setting, subjects, and data collection

This was a cross-sectional, online questionnaire-based survey conducted among the academic and non-academic staff members and students of the Health Sciences Faculties (HSF) which include faculties of Medicine (FOM), Dentistry (FOD), Optometry (FOO), and Pharmacy (FOP) in SEGI University, Malaysia. Ethical approval to conduct this study was obtained from the SEGI UC Ethics Committee, SEGI University [SEGI EC/StR/FOD/ 03 /2021-2022]. Participation in the survey was voluntary and the questionnaire was administered via Google form link to faculty members who were eligible for COVID-19 vaccination at the university.

To minimize the selection bias in this open survey, a convenience sampling method was adopted, and the questionnaire was administered online to all the eligible members of the health sciences faculty.

Inclusion criteria: Students and staff members of HSF such as FOM, FOD, FOO, and FOP of SEGI university who were ≥18 years of age and eligible to receive COVID-19 vaccination.

Exclusion criteria: Students and staff members who refused to give consent and were not willing to take part in the survey were excluded. Participants who submitted incomplete questionnaires were not considered for statistical analysis.

Informed consent was obtained from the participants as one of the items in google form questionnaire, prior to data collection. For those who did not give their consent, the questionnaire was automatically closed, and no data was collected. Sample size for this study was calculated using Raosoft sample size calculator. With a collective population size of 753 staff members and students, the number of respondents needed to achieve a confidence level of 95% with a margin of error of 5%, was 255.

Questionnaire design and data collection

A structured questionnaire was prepared in *Google Form* format. The first part of the questionnaire evaluated demographic characteristics such as age, gender, and medical co-morbidities. The second part of the

questionnaire evaluated the history of COVID-19 infection, type of vaccine received, types of adverse effects (AEFI), duration of the AEFI, and hospitalization after the vaccination. Following vaccination, a period of one week was set as the time duration to record the AEFI.

The systemic AEFI investigated in our study included headache, fatigue, diarrhoea, fever, arthralgia, myalgia, nausea, and increased heart rate, while the local AEFI studied included pain and tenderness at the site of injection, swelling, and swollen armpit glands. Besides these, allergic AE in the form of anaphylaxis was also recorded.

The questionnaire was pre-tested on a sample of two staff members and students from health sciences faculties, SEGI University to assess for content and semantic comprehension. Item analysis of the questionnaire was also conducted to check for internal consistency, which yielded a Cronbach's alpha value of 0.79.

Following the validation, the final version of the questionnaire was administered using *Google Forms*, and responses were accepted from the 18th of October to the 1st of November 2021. The questionnaire link was circulated to the target population via emails and WhatsApp (Facebook Inc.).

Statistical analysis

Responses to the questionnaire were exported into Excel™ and subsequently, data was analyzed using the Statistical Package for the Social Sciences Statistics for Windows version 22 (IBM Corp.: Armonk, New York, The United States). Descriptive data were expressed as frequencies and percentages.The Chi-square test was employed to analyze the AEFI among the four types of vaccines received, whereby a *p*-value of <0.05 was considered to be statistically significant.

Results

A total of 347 participants responded to the survey. The characteristics of the study population is shown in Table 1. The majority of the respondents are females (72.0%), with almost two-thirds belonging to the 21-24 years old age group (60.2%). Underlying medical issues such as allergies, asthma, and hypertension were reported by 15.3% of the respondents. At the point of data collection, almost all the respondents had completed their two doses of vaccination, with only 1.7% had received only the first dose. The majority of the participants received CoronaVac® (37.8%) followed by Pfizer-BioNTech (36.0%) .

Characteristics	Group	n (%)
Gender	Male	97 (28.0)
	Female	250 (72.0)
Age group	16-20	82 (23.6)
	21-24	209 (60.2)
	25-30	28 (8.1)
	31-35	8 (2.3)
	36-40	7 (2.0)
	41-45	2 (0.6)
	46-50	5 (1.4)
	51 and above	6 (1.7)
Faculty	Dentistry	187 (53.9)
	Medicine	68 (19.6)
	Optometry	42 (12.1)
	Pharmacy	50 (14.4)
Medical history	No	294 (84.7)
	Yes	53 (15.3)
Vaccination status	Both dosses	341 (98.3)
	First dose only	6 (1.7)
Type of vaccine	AstraZeneca	84 (24.2)
	Pfizer-BioNTech	125 (36.0)
	CoronaVac®	131 (37.8)
	Others	7 (2.0)

Table 1. Characteristics of study population.

Table 2 shows the Covid-19 infection status post-vaccination. One respondent each who received AstraZeneca and Pfizer vaccines was infected with COVID-19 after receiving their first vaccination dose. Upon completing two vaccination doses, two patients who were vaccinated with Pfizer-BioNTech were found to contract COVID-19.

		n (%)	Astra-Zeneca n (%)	Pfizer-BioNTech n (%)	CoronaVac® n (%)	Others n (%)
Positive after first dose	No	345 (99.4)				
	Yes	2 (0.6)	1 (1.2)	1 (0.8)	0 (0.0)	0 (0.0)
Positive after second dose	No	334 (96.3)				
	Yes	2 (0.6)	0 (0.0)	2 (1.6)	0 (0.0)	0 (0.0)

Table 2. COVID-19 infection status after vaccination.

The respondents reported various AEFI, which is listed in Table 3. These AEFI were categorized into systemic, local, and allergic reactions. Under the systemic category, the most common AEFI reported by the respondents were

headache, fatigue, fever, myalgia and chills, and fever. For local AEFI, respondents mostly complained of pain at injection site, swelling, tenderness, warmth, and itchiness where they were injected. Among the allergic reactions experienced an anaphylactic reaction, swelling on the face and lips and skin burning.

First dose	n (%)	Second dose	n (%)
Systemic AEs			
None	75 (21.6)	None	155 (44.7)
Headache	130 (37.5)	Headache	83 (23.9)
Fatigue	154 (44.4)	Fatigue	103 (29.7)
Fever	98 (28.2)	Fever	70 (20.2)
Nausea	19 (5.5)	Nausea	12 (3.5)
Myalgia	90 (25.9)	Myalgia	64 (18.4)
Arthralgia	33 (9.5)	Arthralgia	21 (6.1)
Chills and fever	72 (20.7)	Chills and fever	41 (11.8)
Diarrhea	11 (3.2)	Diarrhea	7 (2.0)
Change in blood pressure/ heart rate	5 (1.4)	Change in blood pressure/ heart rate	1 (0.3)
Palpitation	5 (1.4)	Palpitation	6 (1.7)
Giddiness	1 (0.3)	Giddiness	1 (0.3)
Dizziness	1 (0.3)	Dizziness	1 (0.3)
Sleepy	3 (0.9)	Sleepy	1 (0.3)
Tired	2 (0.6)	Unable to sleep	1 (0.3)
Second menstruation/ month	1 (0.3)	Panic attacks	1 (0.3)
Pain at injection site	1 (0.3)	Swollen tonsil	1 (0.3)
Breast pain	1 (0.3)	Skin rash	1 (0.3)
		Numbness on left side of body	1 (0.3)
		Prolonged cough	1 (0.3)
Local AEs			
None	108 (31.1)	None	146 (42.1)
Pain at injection site	217 (62.5)	Pain at injection site	180 (51.9)
Swelling	34 (9.8)	Swelling	23 (6.6)
Tenderness	48 (13.8)	Tenderness	37 (10.7)
Swollen armpit glands	7 (2.0)	Swollen armpit glands	3 (0.9)
Bruising	12 (3.5)	Bruising	7 (2.0)
Warmth	30 (8.6)	Warmth	15 (4.4)
Redness	10 (2.9)	Redness	8 (2.3)
Itchiness at injection site	13 (3.7)	Itchiness at injection site	10 (2.9)
Allergic reaction			
Yes	7 (2.0)	Yes	7 (2.1)
No	340 (98.0)	No	329 (97.9)
Anaphylactic reaction - Which includes Urticaria, pruritus with or without rash and angioedema, Upper airway swelling, bronchospasm	1 (0.3)	Anaphylactic reaction	2 (0.6)
Swelling / redness on face and lips	2 (0.6)	Swelling / redness on face and lips	1 (0.3)
Skin burning	1 (0.3)	Skin burning	1 (0.3)
Rash	3 (0.9)	Rash	5 (1.4)
Peri orbital edema	1 (0.3)		

Table 3. Reported AEFI after First and second dose of vaccination.

The association between AEFI experienced and the type of vaccine received is shown in Table 4. This analysis was conducted only for the top five AEFI reported for systemic and local categories, as the other AEFI reported were too small in number, thus rendering it meaningless for any statistical analysis to be conducted.

Significant differences in the reported AEFI were observed between the various types of vaccine. Following the administration of the first dose, under the systemic category, episodes of headaches (44.6%), fever (62.2%) and chills (75.0) were significantly more commonly experienced among those receiving Astra-Zeneca, while myalgias were more commonly reported by those receiving Pfizer-BioNTech (41.1%). As for local AEFI, pain at injection site (45.2%) and swelling (50.0%) are significantly more common among recipients of Pfizer-BioNTech, whereas warmth (50.0%) was most commonly experienced by those receiving Astra-Zeneca.

First dose					
	AstraZeneca n (%)	Pfizer-BioNTech n (%)	CoronaVac® n (%)	Others n (%)	p value
Systemic AEs					
Headache	58 (44.6)	36 (27.7)	33 (25.4)	3 (2.3)	0.000**
Fatigue	48 (31.2)	52 (33.8)	53 (34.4)	1 (3.1)	0.025*
Fever	61 (62.2)	21 (21.4)	13 (13.3)	3 (3.1)	0.000**
Myalgia	32 (35.6)	37 (41.1)	20 (22.2)	1 (1.1)	0.001**
Chills and fever	54 (75.0)	8 (11.1)	9 (12.5)	1 (1.4)	0.000**
Local AEs					
Pain at injection site	59 (27.2)	98 (45.2)	55 (25.3)	5 (2.3)	0.000**
Swelling	12 (35.3)	17 (50.0)	4 (11.8)	1 (2.9)	0.013*
Tenderness	15 (31.3)	19 (39.6)	14 (29.2)	0 (0.0)	0.314
Warmth	15 (50.0)	12 (40.0)	3 (10.0)	0 (0.0)	0.001**
Itchiness at injection site	4 (30.8)	2 (15.4)	6 (46.2)	1 (7.7)	0.236
Allergic reaction					
Yes	0 (0.0)	2 (28.6)	5 (71.4)	0 (0.0)	0.248

Second dose					
	AstraZeneca n (%)	Pfizer-BioNTech n (%)	CoronaVac® n (%)	Others n (%)	P value
Systemic AE					
Headache	16 (19.3)	43 (51.8)	22 (26.5)	2 (2.4)	0.006**
Fatigue	18 (17.5)	52 (50.5)	32 (31.1)	1 (1.0)	0.003**
Fever	11 (15.7)	41 (58.6)	17 (24.3)	1 (1.4)	0.000**
Myalgia	18 (28.1)	33 (51.6)	13 (20.3)	0 (0.0)	0.003**
Chills and Fever	8 (19.5)	27 (65.9)	6 (14.6)	0 (0.0)	0.000**
Local AE					
Pain at injection site	34 (18.9)	91 (50.6)	53 (29.4)	2 (1.1)	0.000**
Swelling	7 (30.4)	10 (43.5)	5 (21.7)	1 (4.3)	0.375
Tenderness	10 (27.0)	17 (45.9)	10 (27.0)	0 (0.0)	0.339
Warmth	4 (26.7)	7 (46.7)	4 (26.7)	0 (0.0)	0.699
Itchiness at injection site	2 (20.0)	3 (30.0)	5 (50.0)	0 (0.0)	0.850
Allergic reaction					
Yes	0 (0.0)	3 (42.9)	4 (57.1)	0 (0.0)	0.448

*p<0.05
**p<0.01

Table 4. Reported AEFI by vaccine type.

Similarly, upon completion of two vaccination doses, significant differences in terms of systemic AEFI were observed between the recipients of the different types of vaccines. The occurrences of headaches (51.8%), fatigue (50.5%), fever (58.6%), myalgia (51.6%) and chills (65.9%) were found to be highest among recipients of Pfizer-BioNTech vaccine as compared to the rest. For local AEFI, upon completion of both doses, significant difference was only found for pain at the injection site whereas it is most commonly experienced among those receiving Pfizer-BioNTech (50.6%), as compared to recipients of Astra-Zeneca (18.9%) and CoronaVac® (29.4%).

With regards to allergic reactions experienced, no significant difference was seen between the different types of vaccines.

Table 5 shows the self-management of AEFI employed by the respondents post-vaccination. Following administration of the first dose, no significant differences in terms of self-management of AEFI were observed between the recipients of the various types of vaccine.

First dose					
	AstraZeneca n (%)	Pfizer-BioNTech n (%)	CoronaVac® n (%)	Others n (%)	P value
Management of AEFI					
Self-medicated to avoid the Adverse Effects before and after vaccination	22 (20.6)	46 (43.0)	39 (36.4)	0 (0.0)	0.106
Consult a general physician	1 (7.1)	5 (35.7)	8 (57.1)	0 (0.0)	0.330
Duration of AEFI					
>3 days	6 (37.5)	4 (25.0)	6 (37.5)	0 (0.0)	0.063
24-72 hrs	6 (18.8)	13 (40.6)	12 (37.5)	1 (3.1)	
24-48 hrs	21 (15.4)	51 (37.5)	59 (43.4)	5 (3.7)	
<24 hrs	51 (31.5)	56 (34.6)	54 (33.3)	1 (0.6)	
Require hospitalization	0 (0.0)	1 (50.0)	1 (50.0)	0 (0.0)	0.872
Second dose					
	AstraZeneca n (%)	Pfizer-BioNTech n (%)	CoronaVac® n (%)	Others n (%)	P value
Management of AEFI					
Self-medicate to avoid the Adverse Effects before and after vaccination	26 (34.7)	18 (24.0)	28 (37.3)	3 (4.0)	0.025*
Consult a general physician	3 (25.0)	4 (33.3)	5 (41.7)	0 (0.0)	0.959
Duration of AEFI					
>3 days	8 (53.3)	1 (6.7)	6 (40.0)	0 (0.0)	0.013*
24-72 hrs	8 (36.4)	7 (31.8)	7 (31.8)	0 (0.0)	
24-48 hrs	25 (24.5)	29 (28.4)	43 (42.2)	5 (4.9)	
<24 hrs	23 (19.0)	56 (46.3)	42 (34.7)	0 (0.0)	
Require hospitalization	0 (0.0)	1 (25.0)	3 (75.0)	0 (0.0)	0.447

*p<0.05

Table 5. Duration and management of AEFI by vaccine type.

However, at the point of administration of the second dose, significant difference was observed in terms of need for self-medication whereby recipients of CoronaVac® (37.3%) and Astra-Zeneca (34.7%) reported the highest need for self-medication. Significant difference was also observed in terms of duration of AEFI. Furthermore table 5 shows that the recipients of Astra-Zeneca more commonly experienced the AEFI for longer duration (<3 days). Almost half of CoronaVac® recipients reported experiencing AEFI of between 1-2 days whereas Pfizer-BioNTech recipients were observed to experience the shortest AEFI duration of less than 1 day.

Discussion

At the time of writing this paper, Malaysia has reported a total of 4,608,768 COVID-19 infections, of which 4,534,019 cases had recovered while 35,836 succumbed to this dreadful disease with an average of 3,000 new infections each day.[9] Currently, 83.8 % of the Malaysian population had received two doses of vaccine and 85.9 % has received their first dose [9] and 49.5 % of individuals had received a booster dose.[10] In this cohort of members of HSF of an academic institution, we found a 100% self-reported vaccination rate, of which 98.3% of participants received both doses while 1.7% received the first dose of vaccine. This indicates a high vaccination acceptance rate among the students and staff of the HSF. There is an increase of 14.8% in the vaccination rate compared to our earlier pilot study, conducted among Dental Health Care Workers (DHCW).[11]

In our previous study, about 85.2% of the DHCW of the same academic institution had received a vaccination. High vaccination uptake by members of HSF may encourage the general public to get vaccinated as they play a critical role in advising patients and communities. Furthermore, it is imperative for DHCW to get vaccinated in order to protect the patients and other staff of the university.[11]A study by Jana Shaw et al. reported a similar high acceptance rate (97.3%) among the physicians and scientists, while the staff in ancillary services showed the lowest acceptance rate (79.9%).[12]

A study by Elnaem et al. reported that 98.6% of the respondents had registered for vaccination through an MySejahtera application developed by the Government of Malaysia in order to manage COVID-19 outbreaks. Of the 98.6% registered respondents, approximately 77.5% received their vaccinations.[13] Similarly, Syed Alwi et al reported a higher acceptance rate (83.3%) among the general Malaysian population.[14] This could be attributed to the good knowledge, attitude, and perception regarding

COVID-19 prevention among the Malaysian population.[15] However, a small percentage of the general public still refuses to get vaccinated due to concerns regarding the AEFI, safety, lack of information, effectiveness, religious beliefs, and other cultural factors related to the COVID-19 vaccine.[15]

Of the 347 participants who had received the vaccine, four participants had tested positive after the first and second doses of vaccination at the time of data collection. The clinical efficacy of vaccines varies according to the clinical studies conducted, the type of vaccine, the risk of disease among the vaccine receivers. The efficacy of the Pfizer-BioNTech vaccine was found to be 95%,[16] while the Astra-Zeneca vaccine was 62%- 92% [17] and CoronaVac® was 50.4%-91.25%.[18] Therefore, COVID-19 vaccines were not only effective in preventing new infections but also considerably reduces hospitalization, ICU admission, burden on healthcare system, and more importantly mortality rate.[16, 17, 18]

Although the vaccines have established much-needed optimism among the public, this optimism has been dampened by the emergence of new virus variants that are more transmissible and less sensitive to vaccine-induced antibodies. The extent to which emerging variants affect the efficacy of vaccines appears to vary considerably between vaccines and variants. Reductions in vaccine efficacy rendered by circulating variants of concern might thus facilitate the emergence and spread of progressively resistant variants, especially when delaying or waiving second vaccine doses, with potential consequences for pandemic control. [19]

In our cohort, higher systemic and local AEFI are reported after the first dose of vaccination than the second dose. After the first dose, about 78.4% of participants experienced systemic AEFI while 69.9% had local AEFI. However, the incidence of AEFI has reduced to 53.7% for systemic and 57.9% for local after the second dose of vaccination. This finding was in contrast with the study by Elnaem et al. who reported a higher incidence of AEFI after the second dose of vaccination. This could be partially attributed to the pre-medications taken to reduce the severity of AEFI, however, the exact reason needed to be further explored.[13]

Chills, fever, headaches, and myalgia were more commonly experienced systemic AEFI following both doses of vaccination. The participants in Astra-Zeneca group had experienced significantly higher systemic AEFI after the first dose, while the participants in Pfizer-BioNTech group had significantly higher AEFI after the second dose as compared to other two vaccines.

In terms of local AEFI, pain at injection site, swelling, tenderness, and warmth are the most commonly experienced following both doses of vaccination. Participants in Pfizer-BioNTech group experienced significantly more local AEFI than the other two vaccine groups. We found that the AEFI with the CoronaVac® vaccine group are significantly lower than the Pfizer-BioNTech and Astra-Zeneca groups. Similar findings were reported by He et al.[20] , Elnaem et al.[13] and Menni et al.[21] Most of the systemic and local AEFI reported in our study after two doses of vaccination were consistent with the Pfizer-BioNTech, Astra-Zeneca and CoronaVac® vaccine fact sheet.[16, 22]

The differences in AEFI among the vaccine groups could be attributed to the difference in vaccine type. CoronaVac® is an inactivated SARS-CoV-2 vaccine, whereas Pfizer-BioNTech and Astra-Zeneca are nucleic acid and viral vectored vaccines.[13,20] Additionally, gender, age, immunogenic profiles of the participants, and differences in the immunogenic mechanisms of inactivated vaccines and mRNA-based vaccines may play role in the onset of AEFI.[23, 24] Early reports concluded that the CoronaVac® are associated with approximately five times lower side effects than the other two tested vaccines.[20] Similar findings were reported in our study in CoronaVac® group.

In the beginning stage of vaccination, Astra-Zeneca vaccine was considered in National Immunisation Program in Malaysia. However, due to the public fears over its safety and reports of possible links to very rare blood clots, this vaccine was made optional to the public after the public hesitancy and canceling their appointment. However, after weighing the overall benefits and age of the population it was reintroduced into the national immunization program later on.[13]

Interestingly, few participants in our study chose to self-medicate before and after vaccination to avoid the AEFI although there is no evidence to date to show any advantage by premedicating with nonsteroidal anti-inflammatory drugs (NSAIDs). In fact, recent

studies have shown that the NSAIDs taken before vaccination could dampen the cytokine and antibody response to SARS-CoV-2 infection, leading to lower production of antibodies and curtailing other aspects of the immune response to SARS-CoV-2.[25]

The majority of the participants in our study did not consult a physician for their AEFI and most of the AEFI were resolved within 48 hours after the vaccination. Participants in the Astra-Zeneca group experienced a longer duration of AEFI (>3 days) as compared to participants in CoronaVac® group (1-2 days) and Pfizer-BioNTech (less than 1 day).

In our study, nausea, arthralgia, diarrhoea, breast pain, change in blood pressure/ heart rate, palpitation, tiredness, giddiness, dizziness, swollen tonsil, and numbness on the left side of body were the less commonly observed systemic AEFI following both the doses of the vaccination. A study by El-Shitany et al.[26] Elnaem et al.[13] Polack et al.[27] and Baden et al.[28] revealed similar findings. In our cohort, one and three participants from Pfizer-BioNTech and CoronaVac® group respectively required hospitalization for their AEFI. However, there was no statistically significant difference found among the three vaccine groups.

The onset of AEFI after vaccination signifies the immune system's response to the vaccine. The immune system produces cytokines that exert an inflammatory effect on the blood vessels, muscles, and other tissues, which probably leads to flu-like symptoms. These symptoms commonly last for about 24 to 48 hours. Recent studies have found that the high prevalence of AEFI in those below 60 years of age could be attributed to their stronger and more efficient immune systems in them as compared to older individuals.[26]

Few authors have reported the possibility of developing an intense and severe allergic reaction within a few minutes to one hour following the vaccination.[29] In our cohort, 2% of participants experienced allergic reactions such as swelling/ redness on the face and lips, skin burning, rash, periorbital edema, and anaphylactic reaction in Pfizer-BioNTech and CoronaVac® group. Studies have reported that these allergic reactions could be due to the allergenic ingredients such as polyethylene glycol (PEG) in Pfizer-BioNTech and polysorbate 80 in Astra-Zeneca and CanSino vaccines however, CoronaVac® has neither PEG nor polysorbate-80. However, the participants could be allergic to other ingredients present in the vaccine.[16]

The onset of life-threatening allergic reactions such as anaphylaxis after vaccination raised concerns regarding the safety of the vaccines in very few cases.[29] A case of Injection-Induced Trigeminal Neuralgia and Cervical Radiculopathy was reported after CoronaVac®.[30] Earlier studies have reported extremely rare cases of thrombosis, excessive clotting, or bleeding occurring within the first 3 weeks following the Astra-Zeneca vaccination in the younger age groups.[31] This led to the suspension of the Astra-Zeneca vaccines in a few countries especially among younger people, due to reports of vaccine-induced immune thrombocytopenic thrombosis.[31]

Therefore, in addition to the meticulous screening before vaccination, vaccine centers should implement a mandatory post-vaccination observation period and should immediately treat persons experiencing anaphylactic signs and symptoms.[29] In Malaysia, a 30-minute mandatory post-vaccination observation, for both doses, is being followed.

Our goal is to increase and raise public vaccination rates as this appears to be the best way to tackle this dreadful disease. It is critical that we get back to our normal lives as soon as possible, and the ideal way seems to be to get the public vaccinated and follow tight standard operating procedures (SOPs) during interactions with each other. This holds true for healthcare workers who treat patients on a regular basis, and they must be able to do so without the fear of neither infecting nor contracting the disease. It is generally established that, despite vaccines, we can remain asymptomatic and pose a risk to vulnerable patient groups such as t he elderly and young children, particularly those compromised medically.

Conclusions

We noticed a high compliance rate to the COVID-19 vaccination (98.3%) among our study cohort. Identifying and reporting COVID-19 vaccine adverse events is very important in the current situation for obvious safety concerns. Although no life-threatening allergic responses were observed, the majority of AEFI presented were chills, fever, myalgia, pain at the injection

site, swelling, tenderness, and warmth. We believe that an app-based survey would be a cost-efficient but effective tool for allowing participants to report the onset of AEFI in real-time. Such surveys are essential as the scientific community joins forces to bring all of their combined strength to bear on this epidemic so that we might all emerge unhurt and can resume our normal lives as quickly as possible.

Declaration of Interest

The authors report no conflict of interest.

References

1. Phelan AL, Katz R, Gostin LO. The Novel Coronavirus Originating in Wuhan, China: Challenges for Global Health Governance. JAMA 2020;323(8):709-10.
2. Warnakulasuriya S. Protecting dental manpower from COVID-19 infection. Oral Dis 2021;27(3):651-54.
3. Tangcharoensathien V, Bassett MT, Meng Q, Mills A. Are overwhelmed health systems an inevitable consequence of covid-19? Experiences from China, Thailand, and New York State. BMJ 2021;372:83.
4. Ather A, Patel B, Ruparel NB, Diogenes A, Hargreaves KM. Coronavirus Disease 19 (COVID-19): Implications for Clinical Dental Care. J Endod 2020;46(5):584-95.
5. Centers for Disease Control and Prevention. COVID-19 information page (Online) Available from https://www.cdc.gov/coronavirus/2019-ncov/index.html.
6. Jawatankuasa Khas Jaminan Akses Bekalan Vaksin COVID-19. Program Imunisasi Covid-19 Kebangsaan (Online). Available from https://www.vaksincovid.gov.my/en/ Accessed November 15, 2021.
7. https://www.npra.gov.my/easyarticles/images/users/1066/ADR%20Reporting/COVID-19-Vaccines_AEFI-Summary-Report-data-as-of-20211029.pdf
8. Centers for Disease Control and Prevention. Vaccine safety [online] Available from https://www.cdc.gov/vaccinesafety/ensuringsafety/sideeffects/index.html. Accessed November 15, 2021.
9. Ministry of health Malaysia. COVID-19 Latest Update. [Online]. Available from: http://covid-19.moh.gov.my/ Accessed November 15, 2021.
10. https://covidnow.moh.gov.my/Accessed on November 24, 2021.
11. Pandarathodiyil AK, Veerabhadrappa SK, Termizi Bin Zamzuri A, Binti Abd Razak SN. COVID-19 vaccination compliance rate and self-reported post-vaccination adverse effects among the members of dental faculty in Malaysia: A cross-sectional study. J Int Oral Health 2022;14:182-8.
12. Shaw J, Hanley S, Stewart T, Salmon DA, Ortiz C, Trief PM, Asiago Reddy E, Morley CP, Thomas SJ, Anderson KB. Health Care Personnel (HCP) attitudes about COVID-19 vaccination after emergency use authorization. Clin Infect Dis 2022;75(1):814-821.
13. Elnaem MH, Mohd Taufek NH, Ab Rahman NS, Mohd Nazar NI, Zin CS, Nuffer W, Turner CJ. COVID-19 Vaccination Attitudes, Perceptions, and Side Effect Experiences in Malaysia: Do Age, Gender, and Vaccine Type Matter? Vaccines 2021;9(10):1156.
14. Syed Alwi, S.A.R., Rafidah, E., Zurraini, A. A survey on COVID-19 vaccine acceptance and concern among Malaysians. BMC Public Health 2021;21(1):1129.
15. Mohamad Nor N Ayn U, Solehan HM, Mohamed NA, Hasan Abu ZI, Umar NS, Sanip S, et al. Knowledge, attitude and practice (KAP) towards COVID-19 prevention (MCO): An online cross-sectional survey. Int J Res Pharm Sci 2020;11(1):1458-68.
16. Clinical guidelines on COVID-19 vaccination in Malaysia 4th Edition. Available from: https://covid-19.moh.gov.my/garis-panduan/garis-panduan-kkm
17. Meo SA, Bukhari IA, Akram J, Meo AS, Klonoff DC. COVID-19 vaccines: comparison of biological, pharmacological characteristics and adverse effects of Pfizer/BioNTech and Moderna Vaccines. Eur Rev Med Pharmacol Sci 2021;25(3):1663-69.
18. Jara A, Undurraga EA, González C, Paredes F, Fontecilla T, Jara G, et al. Effectiveness of an Inactivated SARS-CoV-2 Vaccine in Chile. N Engl J Med 2021;385(10):875-884.
19. Sanders RW, de Jong MD. Pandemic moves and countermoves: vaccines and viral variants. Lancet 2021;397(10282):1326-27.
20. He Q, Mao Q, Zhang J, Bian L, Gao F, Wang J, Xu M, Liang Z. COVID-19 Vaccines: Current Understanding on Immunogenicity, Safety, and Further Considerations. Front Immunol 2021;12:669339.
21. Menni C, Klaser K, May A, Polidori L, Capdevila J, Louca P, et al. Vaccine side-effects and SARS-CoV-2 infection after vaccination in users of the COVID Symptom Study app in the UK: a prospective observational study. Lancet Infect Dis 2021;21(7):939-49.
22. Pfizer COVID-19 vaccine EUA fact sheet for healthcare providers administering vaccine 2021.[Internet] [Accessed on November 15, 2021]. Available from: https://www.fda.gov.
23. Voysey M, Clemens SAC, Madhi SA, Weckx LY, Folegatti PM, Aley PK, et al. Oxford COVID Vaccine Trial Group. Safety and efficacy of the ChAdOx1 nCoV-19 vaccine (AZD1222) against SARS-CoV-2: an interim analysis of four randomised controlled trials in Brazil, South Africa, and the UK. Lancet 2021;397(10269):99-11.
24. Tanriover MD, Doğanay HL, Akova M, Güner HR, Azap A, Akhan S, et al. CoronaVac Study Group. Efficacy and safety of an inactivated whole-virion SARS-CoV-2 vaccine (CoronaVac): interim results of a double-blind, randomised, placebo-controlled, phase 3 trial in Turkey. Lancet 2021;398(10296):213-22.
25. Chen JS, Alfajaro MM, Chow RD, Wei J, Filler RB, Eisenbarth SC, Wilen CB. Non-steroidal anti-inflammatory drugs dampen the cytokine and antibody response to SARS-CoV-2 infection. J Virol 2021;95(7):14-21.
26. El-Shitany NA, Harakeh S, Badr-Eldin SM, Bagher AM, Eid B, Almukadi H, et al.. Minor to Moderate Side Effects of Pfizer-BioNTech COVID-19 Vaccine Among Saudi Residents: A Retrospective Cross-Sectional Study. Int J Gen Med 2021;14:1389-01.
27. Polack FP, Thomas SJ, Kitchin N, Absalon J, Gurtman A, Lockhart S, Perez JL, Perez Marc G, Moreira ED, Zerbini C, et al. Safety and Efficacy of the BNT162b2 mRNA Covid–19 Vaccine. N Engl J Med 2020;383(27):2603-15.
28. Baden LR, El Sahly HM, Essink B, Kotloff K, Frey S, Novak R, Diemert D, Spector SA, Rouphael N, Creech CB, et al. Efficacy and Safety of the mRNA–1273 SARS-CoV–2 Vaccine. N Engl J Med 2021;384(5):403-16.
29. CDC COVID-19 Response Team; Food and Drug Administration. Allergic Reactions Including Anaphylaxis After Receipt of the First Dose of Pfizer-BioNTech COVID-19 Vaccine - United States, December 14-23, 2020. MMWR Morb Mortal Wkly Rep 2021;70(2):46-51.
30. Manuel Dwiyanto Hardjo Lugito, Febrina Rahmayanti. Injection-Induced Trigeminal Neuralgia and Cervical Radiculopathy after Vaccination against COVID-19: A Case Report. J Int Dent Med Res 2022; 15(3):1311-1314.
31. Wise, J. COVID-19: European Countries Suspend Use of Oxford-AstraZeneca Vaccine after Reports of Blood Clots. BMJ 2021:372;699.