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Adverse Events Following Administration of COVID-19 Vaccine Among Health Workers in Kwara State, North Central Nigeria

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A – research concept and design; B – collection and/or assembly of data; C – data analysis and interpretation; D – writing the article; E – critical revision of the article; F – final approval of article.

Abstract

Background: The Coronavirus disease 2019 (COVID-19) pandemic has been a health issue of great concern. The disease has caused a substantial reduction in the workforce globally. In 2020, several vaccines were approved to prevent COVID-19 infection.

Objective: This study evaluated adverse events following the administration of the COVID-19 vaccine among secondary healthcare workers in Kwara State, Nigeria

Methods: This was a multicenter, and cross-sectional study conducted in eleven secondary healthcare hospitals among 348 health workers using a validated questionnaire. Ethical approval and informed consent were obtained appropriately. The questionnaire was read, explained, and distributed to the respondents at each facility between December 2022 and June 2023. The forms were filled out accordingly. Appropriate statistical software was used to analyze the collected data.

Results: Among the 348 respondents studied, most were females (70.4%) within the age range of 31-40 years (50.3%). Few (16.4%) of the respondents were infected, however, the majority (62.9%) were fully vaccinated. Approximately one-third (31.1%) received the AstraZeneca vaccine. The most commonly experienced adverse events were fever (34.2%), headache (33.9%), tiredness (31.0%), and general body pain (30.3%). There was a significant association between the type of vaccine administered, dose received, and adverse events experienced at $p < 0.05$. In addition, there was a significant correlation between adverse events and the gender of the respondents at $p < 0.05$.

Conclusion: Some respondents experienced adverse events after administration of COVID-19 vaccination. These events were associated with the type of vaccine, dose of vaccine received, and gender.

Keywords: COVID-19 infection, health workers, vaccination, Kwara State, Nigeria.

INTRODUCTION

Coronavirus disease 2019 (COVID-19) was identified in December 2019 as it was said to have developed from a livestock market in Wuhan, the capital of Hubei province in China, (Allagoa et al., 2021). It is a respiratory tract infection caused by severe acute respiratory syndrome Corona virus-2 (SARS-CoV-2). The disease is an important cause of morbidity and mortality worldwide. COVID-19 is the third leading cause of death in persons aged 45 through 84 years and the second leading cause of death for those aged 85 years (Woolf et al., 2021). COVID-19-related deaths as of September 15, 2021, in the United States (US) were approximately 658,754. Several parts of the US have experienced a third surge in COVID-19 infections, posing a significant burden to the healthcare system with lockdown and severe

economic consequences (Fergert et al., 2020). In Nigeria, as of February 17, 2023, 266,463 cases have been confirmed, 259,904 cases have been discharged, and 3,155 deaths have been recorded in 36 states and the Federal Capital Territory. While in Kwara state there are 4,691 confirmed cases, 4175 discharged and 64 deaths (NCDC, 2023). In February 2023, a total of 111,985,403 vaccine doses have been administered in Nigeria (NCDC, 2023). The rapid development and distribution of COVID-19 vaccines globally have been crucial in taming the unprecedented health crisis caused by the SARS-CoV-2 virus. Vaccination campaigns worldwide have played a pivotal role in reducing the severity of COVID-19 infections, hospitalizations, and fatalities (Moghadas et al., 2021). However, as with any other medical interventions, COVID-19 vaccines are not without their share of potential risks and adverse effects. These events can range from mild reactions, such as pain at the injection site or fatigue, to more serious complications (Angeli et al., 2022). Some vaccines that are presently available in the market for public use include the Oxford/AstraZeneca vaccine, Pfizer/BioNTech vaccine and Moderna vaccine among others ((NCDC, 2023).

The benefits of COVID-19 vaccination far outweigh the risk of not receiving the vaccine as far as the significant morbidity and mortality associated with COVID-19 are concerned. Healthcare workers, because of their increased exposure to COVID-19 participants, being on the front lines, high risk of exposure, and potential to transmit to others at higher risk, were among the first to receive COVID-19 vaccines during the initial phases of vaccination campaigns. Although these vaccines have undergone laborious testing and approval processes, monitoring untoward side events remains a critical aspect of their ongoing safety assessment (Craxi et al., 2021). Adverse events following the administration of COVID-19 vaccine among healthcare workers are of particular interest because of their high-risk occupational exposure and the potential implications for their well-being as well as the overall healthcare system (Ariza-Montes et al., 2022). The collective experience of healthcare workers provides valuable insights into the occurrence and nature of adverse events following COVID-19 vaccination. By profiling these adverse events, healthcare professionals and regulatory authorities can better inform individuals about potential experiences following vaccination and provide appropriate guidance and support.

Therefore, the objective of this study was to determine the adverse events following the administration of COVID-19 vaccines among health workers who received the COVID-19 vaccination at Kwara State Secondary Healthcare facilities.

METHODOLOGY

Settings of the Study

The study was conducted in eleven selected secondary health facilities in Kwara State. The health facilities studied were selected from the three senatorial districts in Kwara State. These include General Hospital Ilorin (119), Civil Service Hospital Ilorin (40), Sobi Specialist Hospital Ilorin (19), and Children Specialist Hospital Ilorin (32). These facilities are located in the Central Senatorial district of the state, with General Hospital Ilorin having the highest number of health workers. The General Hospitals- Omu Aran (24), Offa (32), Erinle (28) and Oro (10) are located in the South Senatorial District, whereas the General Hospital Patigi (17), General Hospital Lafiagi (17), and General Hospital Okuta (10) are located in the North Senatorial District.

Sample Size Determination and Sampling Technique

The sample size was determined based on the availability of staff in each facility using Cochran's formula. Based on the formula, a sample size of 324 was obtained. An additional 7.5% was added to reduce errors arising from the likelihood of non-compliance, giving a final sample size of 348.

Study Design

Between December 2022 and June 2023, a multicentre, descriptive, and cross-sectional study using questionnaire and oral interviews were conducted among health workers in Kwara State. A total of 348 health workers were enrolled into the study following approval by the Ethics and Research Committee of the Kwara State Ministry of Health, Ilorin. Written and verbal consents were obtained from the participants before enrolment.

Study Population

Three hundred and forty-eight health workers within the selected secondary healthcare facilities were recruited into the study.

Inclusion and exclusion criteria

i. Those involved in the study were health workers aged 20 years and above.
ii. Health workers who have been vaccinated with at least a brand of the COVID-19 vaccine.

iii. Participants working within selected healthcare facilities in the State.
iv. Health workers who consented to participate in the study.

Exclusion criteria

i. Health workers who are yet to receive the COVID-19 vaccination.
ii. Participants who refused to be part of the study.

Study Tool and Data Collection Process

The administered questionnaire was designed by selecting relevant questions from previous research (Allagoa et al., 2021; Boi-Dsane et al., 2022; Aldali et al., 2023). The questionnaire comprised four sections: (i) Socio-demographic information (ii) Perception and knowledge of the participant regarding COVID-19 infection. (iii) Information on the adverse events experienced following the administration of the COVID-19 vaccines and (iv) Information on vaccine hesitancy. The questionnaire was piloted at a secondary health facility outside the study settings for validity and reliability. The questionnaire was adjusted before distribution to the targeted participants. The researchers conducted face-to-face interviews with the enrolled participants in the English language. All participants agreed to participate in the study. Participants were required to indicate their response to each question by choosing either 'yes', or 'no'. Each adverse event was ticked based on subjective information from the participants. The participants expressed themselves verbally or filled out the questionnaire.

Data Analysis

The generated data were analyzed using Statistical Package for Social Sciences (SPSS) version 23. Descriptive, student-t test (for quantitative data (numerical measurements) and chi-square test for qualitative data (the non-numerical data) were used.

Statistical significance was considered at alpha < 0.05 and 95% confidence interval.

RESULTS AND DISCUSSION

According to demographic findings, there were more female participants (70.4%) compared with males (29.6%), mostly within the age range of 31-40 years (50.3%). The majority of the participants were married (68.7%). The bulk of the participants were educated up to B. Sc. (51.7%) with postgraduate education having the least (11.5%). From the professional point of view, 26.4% of participants were nurses, 21.3% were pharmacy technicians, 19.0% were pharmacists, 14.7% were doctors, 10.6% were laboratory technicians, and other professionals in the hospitals accounted for 8.0%. The majority of participants were Christians (56%) with 44% being Muslims (Table 1).

Table 1: Socio-demographic information of the selected health workers among hospitals in Kwara State, Nigeria

Socio-Demographic information		Frequency (n)	Percentage (%)
Sex	Male	103	29.6
	Female	245	70.4
Age (years)	20	18	5.2
	20-30	93	26.7
	31-40	175	50. 3
	41-50	49	14.1
	51-60	12	3.4
	>60	1	0. 3
Profession	Nurse	92	26.4
	Doctor	51	14.7
	Pharmacist	66	19.0
	Pharmacy Technician	74	21. 3
	Lab Technician	37	10.6
	Others	28	8.0
Educational background	Health technician/School of nursing	128	36.8
	B. Sc.	180	51.7
	Postgraduate	40	11.5
Marital status	Single	99	28.4
	Married	239	68.7
	Divorced	6	1.7
	Complicated	4	1.1
Religion	Christians	195	56.0
	Muslims	153	44.0

In Table 2, the perception and knowledge of COVID-19 symptoms among the health workers studied were fever (49.6%), cough (49.2%), sneezing (12.6%), breathing difficulty (8.3), headache (8.1%), cold (7.8%) sore throat (3.2%), catarrh (2.9%), and runny nose (2.6%), among others. The majority of the participants' perception and knowledge of the COVID-19 mode of transmission was inhalation of respiratory droplets from infected patients (91.1%), followed by contaminated blood (8.9%). Most of the participants' perception and knowledge of procedures that prevent COVID-19 were face masks (36.2%), social distancing (36.2%), hand washing (16.1%), vaccination (8.1%), and hand sanitizer (2.3%). The least were terminal cleaning (0.3%) and ventilation spaces (0.3%). The majority of the participants believed there was a cure for COVID-19 infection (59.2%), (27.6%) of participants did not believe there was a cure for COVID-19, (13.2%) of participants were not sure that there was a cure for COVID-19. The majority of participants had a negative opinion on the likelihood of COVID-19 infection (53.7%), whereas (16.4%) had a positive opinion and (29.9%) are not quite sure. The majority of the participants believed that sterilization and social distancing measures, as well as wearing a face-mask, were still necessary after vaccination (61.2%), (21.8%) of participants did not believe so and (17.0%) of participants were not sure.

Table 2: Assessment of health workers' perception and knowledge of COVID-19

Parameters studied		Frequency (n)	Percentage (%)
Symptoms of COVID-19	Body pain	3	0.9
	Breathing difficulty	29	8. 3
	Catarrh	10	2.9
	Chest pain	4	1.2
	Cold	27	7.8
	Cough	171	49.2
	Diarrhoea	1	0. 3
	Dizziness	2	0.6
	Dyspnea	1	0. 3
	Fatigue	5	1.5
	Fever	173	49.6
	Headache	28	8.1
	Itching	1	0. 3
	Amnesia	1	0.3
	Loss of appetite	2	0.6
	Muscle ache	1	0. 3
	Nausea	1	0. 3
	Nose bleeding	1	0. 3
	Runny Nose	9	2.6
	Shortness of breath	4	1.2
	Sneezing	44	12.6
	Sore throat	11	3.2
	Sweating	3	0.9
	Swelling	1	0. 3
	Throat pain	2	0.6
	Tiredness	2	0.6
	Transmitted disease	1	0. 3
	Variation in persons	1	0. 3
	Respiratory distress	3	0.9
	Loss of taste	2	0.6
	Malaise	1	0. 3
	Vomiting	2	0.6
Mode of transmission of COVID-19	Contaminated blood	31	8.9
	Inhalation of respiratory droplet of infected patients	317	91.1
	Drinking unclean water	0	0
	Eating junks	0	0

Procedures that prevent COVID-19	Avoiding contact with infected persons	1	0. 3
	Education	1	0. 3
	Facemask	126	36.2
	Good Hygiene	4	1.1
	Hand sanitizer	8	2. 3
	Handwashing	46	16.1
	Isolation	11	3.2
	Maintaining COVID-19 protocol	1	0. 3
	Non-aerosol generating procedure	1	0. 3
	Personal hygiene	3	0.9
	Personal protective equipment	3	0.9
	Preventive Measure	4	1.1
	Sanitation	1	0. 3
	Social distancing	126	36.2
	Sterilization	7	2.0
	Terminal cleaning	1	0. 3
	Vaccination	28	8.1
	Ventilation Spaces	1	0. 3
Believe that there is a cure for COVID-19	Yes	206	59.2
	No	96	27.6
	Maybe	46	13.2
Opinion on likelihood of COVID-19 infection	Yes	57	16.4
	No	187	53.7
	Maybe	104	29.9
Do you think sterilization and social distance measures, as well as wearing face masks are still necessary after vaccination	Yes	213	61.2
	No	76	21.8
	Maybe	59	17.0

- **Multiple responses**

Most of the participants (81.3%) were not infected with the virus, (68.4%) of the participants were ready to inform relatives of their COVID-19 status, whereas (27.9%) will not inform relatives about their status. The majority of the participants (58.6%) had received COVID-19 vaccines, whereas 41.4% were yet to receive them. Approximately one-third (31.1%) of the participants received the AstraZeneca vaccine, followed by Pfizer (12.9%) and Johnson and Johnson/Janssen (10.9%). The least vaccine received was Moderna (7.5%). Most health workers received the second dose (26.1%) of the vaccine. Among the challenges hindering the acceptance of COVID-19 vaccines, fear of adverse effects has the highest percentage (35.4%) followed by vaccine inefficacy (12.4%). The least barrier to acceptance of the vaccine was cultural belief (5.7%) (Table 3).

Table 3: Health workers'COVID-19 information

Parameters	Responses	Frequency (n)	Percentage (%)
Ever infected with COVID-19	Yes	57	16.4
	No	283	81. 3
	Maybe	8	2. 3
Readiness to inform relatives of COVID-19 status	Yes	238	68.4
	No	97	27.9
	Maybe	13	3.7
Have you ever tested for COVID-19	Yes	193	55.5
	No	155	44.5
Have you received COVID-19 vaccine	Yes	218	62.6

	No	130	37.4
Types of COVID-19 vaccine received	Moderna	26	7.5
	Pfizer	45	12.9
	AstraZeneca	109	31. 3
	Johnson & Johnson/Janssen	38	10.9
Received Dose of COVID-19 vaccine	First	65	18.7
	Second	91	26.1
	Third	63	18.1
Challenges hindering acceptance of COVID-19 vaccine**s**	Vaccine inefficacy	43	12.4
	Fear of adverse effects	123	35.4
	Cultural belief		
	Religious belief	20	5.7
		21	6.0

Muscle pain at the injection was the most common adverse event reported after immunization with COVID-19 vaccines (34.5%) followed by fever (34.2%), headache (33.9%), body weakness (31.0%), and general body pain (30.3%). Few participants complained of fainting (1.4%) and anaphylactic reactions (1.4%) (Table 4).

Table 4: Adverse events experienced after COVID-19 vaccination

Adverse Events	**Frequency (n)**	**Percentage (%)**
Swelling at the injection site	49	14.1
Redness at the injection site	42	12.1
Fever	119	34.2
Headache	118	33.9
Muscle pain at the injection site	120	34.5
Body weakness	108	31.0
Coughing	15	4. 3
Diarrhoea	12	3.4
Nausea and vomiting	13	3.7
Breathlessness	8	2. 3
Joint pain	54	15.5
Fainting	5	1.4
Anaphylactic reaction	5	1.4
Swollen lymph node	6	1.7
Itching	25	7.2
General body pain	103	30. 3

- **Multiple responses**

Table 5 shows that swelling at the injection site, redness at injection, muscle pain at injection site, and coughing were associated with the types of vaccines received at $p < 0.05$. However, other adverse events were independent of the type of vaccine received at p-value > 0.05.

Table 5: Relationship between the types of vaccine and adverse events experienced

Adverse events experienced by the participants	Vaccine								Total		p-value	χ^2
	Moderna		Pfizer		AstraZeneca		Johnson& Johnson					
	n		n		n		n					
Swelling at injection site	7	3.2	13	6.0	10	4.6	5	2. 3	35	16.1	0.008*	11.844
Redness at injection site	7	3.2	10	4.6	5	2. 3	8	3.7	30	13.8	0.001*	15.942
Fever	11	5.0	23	10.6	38	17.4	16	7. 3	88	40.4	0.306	3.618
Headache	12	5.5	21	9.6	37	17.0	18	8. 3	88	40.4	0.290	3.745
Muscle Pain at injection site	15	6.9	24	11.0	32	14.7	18	8. 3	89	40.8	0.006*	12.58
Tiredness	11	5.0	21	9.6	31	14.2	16	7. 3	79	36.2	0.113	5.967
Coughing	5	2. 3	3	1.4	2	0.9	1	0.5	11	5.0	0.003*	13.973
Diarrhoea	1	0.5	2	0.9	4	1.8	1	0.5	8	3.7	0.978	0.195
Nausea and vomiting	3	1.4	-	-	5	2. 3	1	0.5	9	4.1	0.121	5.818
Breathlessness	2	0.9	3	1.4	1	0.5	-	-	6	2.8	0.062	7. 335
Joint pain	6	2.8	9	4.1	20	9.2	5	2. 3	40	18. 3	0.764	1.153
Fainting	1	0.5	-	-	3	1.4	-	-	4	1.8	0.450	2.645
Anaphylactic reaction	1	0.5	-	-	3	1.4	-	-	4	1.8	0.450	2.645
Swollen lymph node	1	0.5	-	-	3	1.4	1	0.5	5	2. 3	0.692	1.458
Itching	3	1.4	4	1.8	5	2. 3	7	3.2	19	8.7	0.069	7.096
General body pain	11	5.2	21	9.9	32	15.1	15	7.1	79	37. 3	0.092	6.440

***Level of significance at $p < 0.05$; a = not relevant, therefore removed. For quantitative data (numerical measurements) student-t test was used while chi-square test was used for qualitative data (the non-numerical data).**

Table 6 shows that none of the adverse events was associated with the dose received at $p > 0.05$.

Table 6: Relationship between the dose received and adverse events

Adverse events	Dose received						Total		p-value	χ^2
	First		Second		Third					
	n		n		n		n			
Swelling at the injection site	11	5.0	16	7. 3	11	5.0	38	17.4	0.994	0.012
Redness at the injection.	7	3.2	15	6.8	7	3.2	29	13.2	0.490	1.427
Fever	28	12.8	41	18.7	19	8.7	88	40.2	0.153	3.759
Headache	22	10.0	35	16.0	22	10.0	79	36.1	0.818	0.401
Muscle pain at the injection site	26	11.9	34	15.5	22	10.0	82	37.4	0.838	0. 353
Tiredness	22	10.0	24	11.0	20	9.1	66	0.1	0.57	1.114
Coughing	2	0.9	4	1.8	5	2. 3	11	5.0	0.425	1.712
Diarrhoea	2	0.9	1	0.5	4	1.8	7	3.2	0.190	3. 321
Nausea and vomiting	2	0.9	1	0.5	4	1.8	7	3.2	0.190	3. 321
Breathlessness	3	1.4	4	1.8	-	-	7	3.2	0.232	2.926
Joint pain	12	5.5	13	5.9	12	5.5	37	16.9	0.683	0.763
Fainting	-	-	2	0.9	3	1.4	5	2. 3	0.196	3.257
Anaphylactic reaction	1	0.5	2	0.9	2	0.9	5	2. 3	0.823	0. 389
Swollen lymph node	1	0.5	1	0.5	3	1.4	5	2. 3	0.291	2.469
Itching	7	3.2	3	1.4	3	1.4	13	5.9	0.135	4.010
General body pain	17	7.9	29	13.6	26	12.1	72	33.6	0.146	3.855

***Level of significance at P < 5%; a = not relevant, therefore removed. For quantitative data (numerical measurements) student-t test was used while chi-square test was used for qualitative data (the non-numerical data).**

Table 7 shows the association between gender and adverse events. The results revealed that swelling at injection site, joint pain and itching were dependent on gender at p <0.05.

Table 7: Relationship between gender and adverse events

Adverse-events	Gender				p-value	χ^2
	Male		Female			
	n		n			
Swelling at the injection site	22	6. 3	27	7.8	0.034**	6.760
Redness at the injection site	13	3.7	29	8. 3	0.837	0.042
Fever	37	10.6	82	23.6	0.660	0.194
Headache	38	11.0	80	23.1	0.461	0.544
Muscle Pain	39	11.2	81	23. 3	0. 390	0.740
Tiredness	38	10.9	70	20.1	0.126	2. 346
Coughing	6	1.7	9	2.6	0. 367	0.814
Diarrhoea	5	1.4	7	2.0	0. 351	0.869
Nausea and vomiting	4	1.1	9	2.6	0.925	0.009
Breathlessness	2	0.6	6	1.7	0.783	0.076
Joint pain	23	6.6	31	8.9	0.023**	5.180
Fainting	3	0.9	2	0.6	0.134	2.250
Anaphylactic reaction	2	0.6	3	0.9	0.608	0.263
Swollen lymph node	3	0.9	3	0.9	0.269	1.220
Itching	12	3.4	13	3.7	0.036**	0.112
General body pain	35	10. 3	68	20.0	0.193	1.693

***Level of significance at P < 5%; a = not relevant, therefore removed. For quantitative data (numerical measurements) student-t test was used while chi-square test was used for qualitative data (the non-numerical data).**

DISCUSSION

A larger number of the respondents were females (70.4%), which agrees with the survey data of COVID-19 vaccine adverse events among hospital staff in a national referral hospital in Indonesia by Djanas et al. (2021), where females had the highest number of participants. However, this study was contrary to the study by Odeigah et al. (2022) where males accounted for 64.3%. In this study, most of the health workers (50.3%) were aged between 31 and 40. This age category contradicts the findings of Djanas et al. (2021), with an age range of 26-30 as the most frequent. The previous research work of World Health Organization (WHO) (2021) and Ungar, et al. (2021) revealed that many respondents who received the COVID-19 vaccine were above 35 years of age, with more women, which corresponds with the results of this study. A majority (68.7%) were married, similar to the outcome of the research by Djanas et al. (2021), where 61.5% were married. Sociodemographic factors have been reportedly associated with vaccine administration adverse events among health workers de-Araujo et al., (2022) as observed in the current study. Almost half of the participants (49.6%) stated that COVID-19 presents with fever. This is consistent with the study by Alghamdi et al. (2022). The majority of the health workers had inhalation of respiratory droplets of infected patients as the mode of transmission of COVID-19 infection, which agrees with the study of Zhong et al., 2020 and contradicts Johansson et al., (2022) that has less than half participants not recognized mode of transmission of the infection. Most of the participants chose face masks (36.2%) followed by hand washing (16.1%) as procedures that prevent COVID-19 infection. This is consistent with the study by Ameme et al. (2021) whereby the majority agreed that social distancing and the use of face masks were measures to prevent COVID-19 infection. In addition, Abboah-Offei et al. (2021) showed that the use of a facemask can go a long way in preventing the spread of airborne diseases, including COVID-19. The findings of Wang et. al. (2020) showed that the rate of infection was 1.26 times

higher in people who did not use a mask. This finding contradicts Damette et al. (2023), who state that the use of a face mask has little or no effect on the risk of infection. The majority of participants had a negative opinion on the likelihood of COVID-19 infection and few participants had positive ideas on the likelihood of COVID-19 infection, similar to the study by Adane et al. (2022). Most of the health workers studied believed that sterilization and social distancing measures, as well as wearing a face mask, were still necessary after vaccination. This is similar to the report of Lubega et al. (2022) but contradicts the CDC (2021) guidelines, which stated that fully vaccinated people do not need to wear face masks.

The majority of the participants are ready to inform relatives of their COVID-19 status. This contradicts the study of Akinyemi et al. (2022). The high frequency of readiness to inform relatives found in this study could be attributed to the health workers' perception and knowledge of the virus. Overall, only half of the participants received COVID-19 vaccines. The study revealed the rationale for rejecting the vaccines, with the commonest reasons being safety-related issues, including fear of adverse effects. These results were similar to the study of Nomhwange et al. (2021) where the population studies were hesitant to take the vaccine due to fears of adverse events.

The most common adverse events experienced are muscle pain at the injection site, fever, headache, tiredness, and general body pain. This agrees with the findings of Aldali et al. (2023) where majority of the recipients of the vaccine had pain at the injection site; fever, headache, tiredness and chills. Muscle pain at the injection site, tiredness, and headache were the most reported adverse events by many researchers Djanas et al., (2021);Boi-Dsane et al., (2022) which agree with the findings in this research. Also, the adverse events experienced by the recipients were similar to those reported by the World Health Organization (Shima Bukuro et al., 2020) where anaphylactic reactions and fainting were reported by the recipients. The adverse events experienced varied based on the vaccine type as observed in this study. The Pfizer brand of the vaccine showed the highest frequency of people with swelling at the injection site, followed by the AstraZeneca brand with Johnson Johnson with the last frequency. This agrees with previous reports of Safi-Haider et al., (2023); Kant et al., (2021) which indicated more adverse events following the administration of Pfizer and AstraZeneca COVID-19 vaccines. Furthermore, this study observed that some adverse events were significantly dependent on gender, this agrees with the previous findings that showed females reporting more adverse events Safi-Haider et al., (2023). In this study, one (1) individual reported fainting after receiving the Moderna vaccine, whereas three (3) reported fainting after receiving the AstraZeneca vaccine, although few studies have shown that fainting is a rare adverse event following immunization (Alemayehu et al., 2022). Two recipients showed vaccine-induced syncope associated with fear and anxiety upon injection of the vaccine, Chretien et al., (2022) accounting for 0.019% with Pfizer vaccines. Diarrhea, nausea and vomiting, breathlessness, joint pain, fainting, anaphylactic reaction, swollen lymph nodes and itching, these adverse events are less commonly reported with COVID-19 vaccines but can occur. The low percentages in this research are consistent with the rarity of these adverse events (CDC 2019). Nausea, diarrhea, and vomiting were more prominent among those who received the AstraZeneca vaccine compared with the Pfizer vaccines; this trend was observed earlier by Kant et al., (2021).

Fever and headache reported were higher in this study with the administration of AstraZeneca and Pfizer vaccines, with the most prominent being AstraZeneca. The findings of Kant et al. (2022) all follow the same pattern. Caronna and Pozo-Rossich et al., (2021) which reported headache as the most prominent adverse event contradict this study. There was also greater acceptance for the second dose despite the adverse events reported in this research, which follow the trend seen in the study by Charpin-Bardales et al. (2021). A report by the Food and Drug Administration revealed that the frequency of local adverse events was slightly higher after the second dose than the first dose (CDC, 2019).

CONCLUSION

The most commonly experienced adverse events for the four vaccines from Pfizer, AstraZeneca, Moderna, and Johnson–Johnson were fever, headache, tiredness, and general body pain. These adverse events were more pronounced with AstraZeneca followed by Pfizer vaccines. Breathlessness was most prominent with the Pfizer vaccine followed by the Moderna vaccine, whereas coughing was most common with the Moderna vaccine followed by the Pfizer vaccine and less common with the AstraZeneca and Johnson-Johnson vaccines. Females were more prone to adverse events than males following the administration of COVID-19 vaccines. In all, the adverse events recorded were well-tolerated. As shown in this study, adverse events associated with COVID-19 vaccination differ significantly with age, area of specialization, and educational level. Therefore, these disparities must be considered in

vaccination interventions. This study allows healthcare professionals, regulatory agencies, and policymakers to make informed decisions and take appropriate measures to ensure vaccine safety.

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ETHICAL CONSIDERATIONS

Ethical approval was obtained from the Kwara State Ministry of Health Ethical Review Committee with the approval ID number; ERC/MOH/2022/10/078 dated 15th December 2022. Cooperation between the relevant heads of departments at the study sites was sought and obtained. Confidentiality of data extracted from the participants' questionnaires was ensured.

REFERENCES

Abboah-Offei M., Salifu Y., Adewale B., Ofosu-Poku, J.R., Beryl, E. and Opare- Lokko A. (2022). A rapid review of the use of face mask in preventing the spread of COVID-19. International Journal of Nursing Studies Advances. 4: doi.org/10.1016/j.ijnsa.2022.100093.

Adane, M., Ademas, A. and Kloos, H. (2022). Knowledge, attitudes, and perceptions of COVID-19 vaccine and refusal to receive COVID-19 vaccine among healthcare workers in northeastern Ethiopia. BMC Public Health. 22:1–14. doi.org/10.1186/s12889-021-12362-8.

Akinyemi, J.O., Agunbiade, M. O., Salawu, M.M., Eniade, O.D., Yaya, S. and Fawole, O.I. (2022). Perceptions of COVID-19 transmission risk and testing readiness in rural Southwest Nigeria. Scientific African. 17: doi.org/10.1016/j.sciaf.2022.e01334.

Aldali, J., Meo, S.A. and Al-Khlaiwi, T. (2023). Adverse Effects of Pfizer (BioNTech), Oxford-AstraZeneca (ChAdOx1 CoV-19), and Moderna COVID-19 Vaccines among the Adult Population in Saudi Arabia: A Cross-Sectional Study. Vaccines,11(2):231.

Alemayehu, A., Demissie, A., Yusuf, M., Abdullahi, Y., Abdulwehab, R., Oljira, L. and Feleke, D. (2022). COVID-19 vaccine side effect: age and gender disparity in adverse effects following the first dose of AstraZeneca COVID-19 vaccine among the vaccinated population in Eastern Ethiopia: a community-based study. SAGE Open Medicine 10:1–9.DOI: 10.1177/20503121221108616

Alghamdi, S.A., Alfares, M.A., Alsulami, R.A., Alghamdi, A.F., Almalawi, A.M., Alghamdi, M.S., Hazazi, H.A., Alfares, M. (2022). Post-COVID-19 syndrome: incidence, risk factor, and the most common persisting symptoms. Cureus. 14(11).

Allagoa, D.O., Oriji, P.C., Oguche, O.I., Ozori, S.E., Tekenah, E.S., and Obagah, L. (2021). Acceptance of COVID-19 vaccination among doctors in the Federal Medical Centre, Yenagoa, South-South, Nigeria. IOSR Journal of Dental and Medical Sciences, 20(5):60–67.

Ameme, D.K., Odikro, M.A., Baidoo, A., Dsane-Aidoo, P., Nuvey, F.S., Jackson, D.G., Mohammed, A.G., Alemna, F., Tender, Georgia, E.K, Ghartey, N. K. Wullar, O. G. Maximore, L., Asamoah, Y.K. and Kenu, E. (2021). Hand hygiene and face mask wearing practices for COVID-19 prevention: a non-intrusive observation of patrons of community convenience shops in Accra, Ghana. Pan African Medical Journal. 40 (195):10.11604/pamj.2021.40.195.26195.

Angeli. M., Neofotistos, G., Mattheakis, M. and Kaxiras, E. (2022). Modeling the effect of the vaccination campaign on the COVID-19 pandemic. Chaos, Solitons & Fractals, 154, 111621.

Ariza-Montes, A, Mahmood, F., Han, H. and Saleem, M. (2022). The mental well-being of healthcare professionals during the COVID-19 pandemic. Journal of Occupational and Environmental Medicine, 64(5):429–442.

Boi-Dsane, N. A. A., Dzudzor, B., Justice, Y. A. and Aheto, M. K. (2022). Prevalence of common adverse events experienced following COVID-19 vaccination and its associated factors in Ghana: Cross-sectional study design. Health Sci. Rep.;e1012. 1–18. https://doi.org/10.1002/hsr2.1012

Caronna, E. and Pozo-Rosich P. (2021). Headache as a Symptom of COVID-19: Narrative Review of 1-Year Research. Springer Nature Current Pain and Headache Reports .25:73. https://doi.org/10.1007/s11916-021-00987-8

Centres for Diseases Control and Prevention CDC (2019). Novel coronavirus, Wuhan, China. 2020. https://www.cdc.gov/coronavirus/2019-nCoV/summary.html. Accessed on 1st February 2023.

Centres for Diseases Control and Prevention CDC (2021). Reactions and Adverse Events of the Pfizer-BioNTech COVID-19 Vaccine. Available online: https://www.cdc.gov/vaccines/covid-19/info-by product/pfizer/reactogenicity.html (accessed on 7th March 2023).

Chapin-Bardales, J., Gee, J. and Myers, T. (2021). Reactogenicity following receipt of mRNA- Based COVID-19 vaccines. JAMA. 325:2201–2202.

Chrétien, B., Stroiazzo, R., Pierre-Yves Le Houssel, T.L., Jacquet, M., Lheureux, C., Voyen, S. Court, P., Dolladille, C., Alexandre J., Fedrizzi, S. and Humbert, X. (2022). COVID-19 vaccines associated with vasovagal malaise: A retrospective study in two mass vaccination centers and analysis of the WHO pharmacovigilance database, J. Human Vaccines & Immunotherapeutics, 18:6, 2135918, DOI: 10.1080/21645515.2022.2135918

Craxì, L., Casuccio, A., Amodio, E. and Restivo, V. (2021). Who should get COVID-19 vaccine first? A survey to evaluate hospital workers' opinion. Vaccines, 9(3), 189.

Damette, O. and Duc Huynh, T. L.. (2023). Face mask is an efficient tool to fight the Covid-19 pandemic and some factors increase the probability of its adoption, Scientifc Reports. 13:9218:doi.org/10.1038/s41598-023-34776-7

De Araújo TM, Souza, F.d.O., Pinho, P.d.S. and Werneck, G.L. (2022). Beliefs and Sociodemographic and Occupational Factors Associated with Vaccine Hesitancy among Health Workers. Vaccines 10. https://doi.org/10.3390/ vaccines10122013.

Djanas, D., Martini, R.D., Putra, H., Zanir, A. and Nindrea, R.D. (2021). Survey data of COVID-19 vaccine side effects among hospital staff in a national referral hospital in Indonesia. Data in brief. 1;36:107098.

Fegert, J.M., Vitiello, B., Plener, P.L. and Clemens, V. (2020). Challenges and burden of the Coronavirus 2019 (COVID-19) pandemic for child and adolescent mental health: a narrative review to highlight clinical and research needs in the acute phase and the long return to normality. Psychiatry Ment Health 14:20.1–11:doi.org/10.1186/s13034-020-00329-3.

Johansson, M.A. Quandelacy, T.M., Kada, S., Prasad, P.V., Steele, M., Brooks, J.T., Slayton, R.B., Biggerstaff, M. and Butler, J.C. (2021). SARS-CoV-2 transmission from people without COVID-19 symptoms. JAMA network open. 4;4(1):e2035057-.

Kant, A., Jansen, J., van Balveren, L. and van Hunsel F. (2022). Description of Frequencies of Reported Adverse Events Following Immunization Among Four Diferent COVID-19 Vaccine Brands. Drug Safety 45:319–331. https://doi.org/10.1007/s40264-022-01151-w

Lio, C.F., Cheong, H. H., Lei, C.I., Lo, I. L. Yao, L., Lam, C.and Leong, I.H.. (2021). Effectiveness of personal protective health behaviour against COVID-19. BMC Public Health. 21:827:1-12. doi.org/10.1186/s12889-021-10680-5.

Moghadas,S.M., Vilches, T.N., Zhang, K., Wells, C.R., Shoukat, A., Singer, B.H., Meyers, LA., Neuzil, K.M., Langl ey, J.M., Fitzpatrick, M.C. and Galvani, A.P. (2021).The Impact of Vaccination on Coronavirus Disease (COVID-19) Outbreaks in the United States. Clin Infect Dis. 73(12):2257–2264. doi: 10.1093/cid/ciab079.

NCDC (2023). COVID-19 in Nigeria. Available at: https://covid19.ncdc.gov.ng/. Accessed on 1/11/2023.

Nomhwange O., N. Nkereuwem, W. E. Olanrewaju, S. Nwosu, N. Adamu, U., Danjuma, E. Onuaguluchi, N., Enegela, J., Nomhwange, E., Baptiste, A.E.J. and Mulombo, W. K. (2022). COVID-19 vaccine hesitancy amongst healthcare workers: An assessment of its magnitude and determinants during the initial phase of national vaccine deployment in Nigeria. eClinicalMedicine 50:101499 doi.org/10.1016/j.

Odeigah, L.O., Mutalub, Y.B., Agede, O.A., Obalowu, I.A., Aiyetoro, S.and Jimoh, G.A. (2022) Adverse events following COVID-19 vaccination in Kwara State, North-central Nigeria. PLOS Global Public Health. 15;2(8):e0000835.

Safi Haider, S.M., Alvi, S.A., Khan, H., Majeed, R., Syed T., Anwar, A. and Hashmi A.A. (2023). Common Side Effects of Pfizer COVID-19 Vaccine: An Experience From Pakistan. Cureus 15(6):1–10, DOI 10.7759/cureus.40878.

Shima-bukuro, T.T., Cole, M. and Su, J.R. (2021) Reports of Anaphylaxis After Receipt of mRNA COVID-19 Vaccines in the US. Journal American Medical Association, 325(11)

Ungar, L. (2021). The Gender Vaccine Gap: More Women Than Men Are Getting COVID Shots. Medscape. 2021. Available from: https://www.medscape.com/viewarticle/949206. Accessed on February 15, 2023.

Wang, Y., Deng, Z., and Shi, D. (2021). How effective is a mask in preventing COVID-19 infection? Med Devices Sens.;4:e10163. 1–12. doi.org/10.1002/mds3.10163.

Woolf, S.H., Chapman, D.A.and Lee, J.H. (2021). COVID-19 as the Leading Cause of Death in the United States. JAMA 325(2): 123–124. doi:10.1001/jama.2020.24865.

World Health Organization. (2020), Laboratory testing for coronavirus disease 2019 (COVID-19) in suspected human cases.

Zhong, N.S., Zheng, B.J. and Li, Y.M. (2003). Epidemiology and cause of severe acute respiratory syndrome (SARS) in Guangdong, People's Republic of China, in February, 2003.Lancet., 362(9393):1353–1358.

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