Infection and Drug Resistance

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ORIGINAL RESEARCH

Evaluation of the Most Visible Symptoms Associated with COVID-19 Vaccines Among the Residents of Makkah, Saudi Arabia: An Observational, Cross-Sectional Study

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Background: This research evaluated the most visible symptoms associated with coronavirus (COVID-19) vaccines among residents in Makkah of Saudi Arabia.

Methods: A cross-sectional study was conducted in 2021 among a representative sample of residents receiving COVID-19 vaccination at King Abdullah Medical City, Al Ukayshiyyah, and Umm Al-Qura University vaccination centers. A total of 805 participants selected by a census sampling method were included. Data regarding characteristics, medical history, and post-vaccination symptoms were obtained with an interview-based questionnaire.

Results: The participants' mean age was 25.20 ± 15.5 years. Of them, 61.7% and 38.3% received one and two doses of the COVID-19 vaccine, respectively. 2.2% have an allergic reaction to the COVID-19 vaccine. 25.3% were infected with COVID-19, 23% were infected before the first dose, and only 1.6% were infected after the first dose. Significant statistical associations were found between males and females in smoking status, age, body mass index, history of diabetes mellitus, and types of COVID-19 vaccines (P-value < 0.05). After adjustment for confounding variables, male participants had lower odds of having swelling, redness, or pain at the injection site, muscle or joint pain, headache, dizziness, and nausea compared to female participants [OR = 0.596, 95% CI = (0.388–0.916)], [OR = 0.272, 95% CI = (0.149–0.495)], [OR = 0.529, 95% CI = (0.338–0.828)], [OR = 0.263, 95% CI = (0.125–0.554)], and [OR = 0.145, 95% CI = (0.31–0.679), P < 0.05 for all], respectively.

Conclusion: The female participants may have a higher risk of post-COVID-19 vaccination symptoms than males among Makkah residents of Saudi Arabia.

Keywords: COVID-19, evaluation, Saudi Arabia, symptoms, vaccines

Introduction

In December 2019, Wuhan City, China, experienced an outbreak of COVID-19 caused by SARS-CoV-2. The World Health Organization declared it a public health emergency. Over 16,000 deaths and 2.8 million new cases occurred in 28 days, with 764 million confirmed cases and 6.9 million fatalities.[1,2]

Ensure reliable diagnostic laboratory operations, avoid cross-contamination, and follow proper laboratory practices and guidelines. Maintain unidirectional workflow and follow the aseptic technique in each step to prevent cross-contamination and ensure proper handling of biological specimens.[3]

Received: 15 March 2023
Accepted: 8 July 2023
Published: 8 August 2023

COVID-19 patients typically experience mild-to-moderate respiratory illness and recover without therapy. Serious diseases are more common in older individuals and those with underlying medical disorders.[4]

COVID-19 causes respiratory symptoms like fever, coughing, and shortness of breath, potentially leading to pneumonia, severe acute respiratory syndrome, and death.[5] Preventing spread involves hand hygiene, covering the nose and mouth, and avoiding close contact with those with fever and cough.[6] COVID-19 is a mysterious infection requiring extensive study and collaboration for containment, prevention, and treatment.[7] A safe and effective vaccine is crucial for addressing the pandemic.[8]

Saudi Arabia has experienced 475,500 COVID-19 cases and 7000 fatalities.[9] The country has implemented preventive measures, including banning international flights, closing mosques, schools, and universities, and implementing a reliable vaccine program to mitigate the impact of disease.[10,11]

The Saudi Arabian Food and Drug Authority approved four COVID-19 vaccines, including Pfizer-BioNTech, Oxford-AstraZeneca, Johnson & Johnson, and Moderna, nationwide. The program began in December 2021 and has immunized around 16 million people.[12–14] Vaccine campaign targeted high-risk groups, including the elderly and healthcare professionals.[15] Saudi Arabia initiates early immunization drive to combat COVID-19.[10,16]

Saudi Arabia Food and Drug Authority approved four COVID-19 vaccines, but differences in vaccination effectiveness may be due to faster development and mRNA vaccines, a new technology.[17–19] Saudi Arabia's Ministry of Health combines multiple COVID-19 vaccines amid scarcity.[20] Accordingly, the study assesses post-vaccination side effects of mixed and matched COVID-19 vaccines in Makkah, Saudi Arabia, focusing on prominent adverse effects.

Methods

Study Design and Period

This observational cross-sectional study was conducted between June 29, 2021, and August 11, 2021.

Study Setting

The study was conducted at King Abdullah Medical City Specialist Hospital, Al Ukayshiyyah, and Umm Al-Qura University vaccination centers in Al-Abdiyah, Makkah, Saudi Arabia.

Study Participants

The study included 805 participants aged 12–87 from Saudi Arabia who received COVID-19 vaccinations at King Abdullah Medical City Specialist Hospital, Al Ukayshiyyah, and Umm Al-Qura University. Pregnant, lactating women and serious illness participants were excluded.

Study Sampling

The study involved 805 participants from King Abdullah Medical City Specialist Hospital, Al Ukayshiyyah, and Umm Al-Qura University vaccination centers in Al-Abdiyah, Makkah, Saudi Arabia, with a response rate of 89.4%.

Data Collection

Interview Based Questionnaire

The study used an interview-based questionnaire to gather demographic data, medical history, and post-COVID-19 symptoms. The questionnaire's face and content validity were independently validated by seven experts.[21] The pilot study involved 30 participants, with a Cronbach's alpha of 0.85. Participants received COVID-19 vaccines, were informed of study purposes, and were given communication methods like Call, WhatsApp, or Telegram. Study participants were contacted via a preferred method to discuss post-COVID-19 vaccine symptoms. Results were shared on the first, seventh, and twenty-eighth days of receiving the first- and second-dose vaccines (Figure 1).

The study used a census sampling method to reduce bias and ensure qualified data collectors conducted data collection. The independent variable was COVID-19 vaccination, while the dependent variables were visible symptoms associated with the vaccine and other factors.

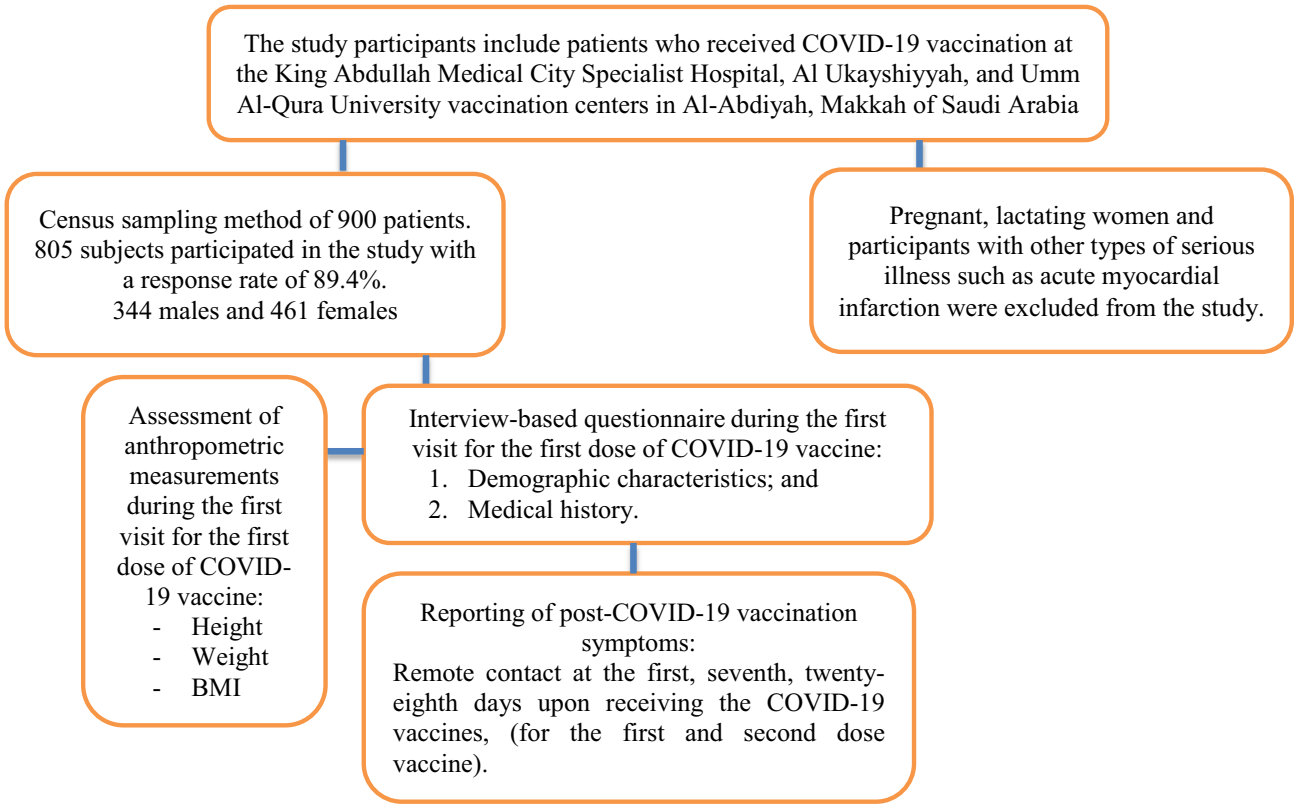

Figure 1 Schematic diagram of the recruitment plan of the study participants.

Assessment of Anthropometric Measurements

A measuring rod attached to a balanced beam scale was used to measure each participant's height (in centimeters) after receiving the first dose of the COVID-19 vaccination. Participants were asked to stand barefoot with their heads up. A standard scale (Seca) was used to measure weight (kg). Participants were requested to remove their bulky outerwear before stepping on the scale, and weight was recorded to the nearest 0.1 kg. By dividing a person's weight in kilograms by their height in square meters, the body mass index (BMI) was determined.[22]

Data Analysis

SPSS for Windows (version 25), a statistical program for social science, was used for data analysis. Descriptive statistics were used to characterize both continuous and categorical data. The significance of the differences between category variables was determined using the chi-square test. The differences between the mean were tested by independent samples *t*-test. Furthermore, crude and adjusted odds ratio (OR) and 95% confidence interval (CI) for the most visible symptoms among the study participants after the COVID-19 vaccine by gender were calculated using binary logistic regression.

Ethics Considerations

The study protocol, which complies with the Declaration of Helsinki (HAPO-02-K-012-2021-08-713), was approved by the College of Medicine at Umm Al Qura University.

Additionally, permission was obtained from the vaccination facilities at King Abdullah Medical City Specialty Hospital, Al Ukayshiyyah, and Umm Al-Qura University. Participants under 18 further provided informed consent signed by a parent or legal guardian. In addition, written informed consent was obtained from each participant.

Results

Eight hundred and five individuals with a mean age of 25.20 ± 15.5 years who lived in Makah and received the COVID-19 vaccine participated in this study. 33.9% of the study participants were from the King Abdullah Medical City Specialist Hospital vaccination center, 32.9% were from the Al Ukayshiyyah vaccination center, and 33.1% were from the Umm Al-Qura University vaccination center. Only 2.2% (n = 18) of them are allergic to the COVID-19 vaccine. 9.6% of the study participants were smokers. More than two-third of the study participants (75.0%) were Saudi. 14.8% of them were classified as underweight (BMI below 18.5 kg/m^2), 13.9% were classified as Overweight (BMI 25.0–29.9 kg/m^2), and 13.9% were classified as obese (BMI > 30.0kg/m^2). Significant statistical associations were found between males and females in smoking status, age, and body mass index (*P*-value < 0.05) (Table 1).

The medical history of the study participants showed that only 4.2% use anticoagulant drugs, 2.9% use corticosteroid therapy, and 1.0% use immunosuppressive drugs. No participants use cancer treatments or have a history of AIDs. 6.8% of the study participants suffered from hypertension, 5.8% from respiratory diseases, and 0.7% from cancer.

Table 1 Characteristics of the Study Population by Gender

Variables		Total (n=805)	Male (n=344)	Female (n=461)	*P*-value
		No. (%)	No. (%)	No. (%)	
Do you live in Makkah?					
Yes		805 (100)	344 (42.7)	461 (57.3)	-
No		0 (0.0)	0 (0.0)	0 (0.0)	
Did you receive the COVID-19 vaccine?					
Yes		805 (100)	344 (42.7)	461 (57.3)	-
No		0 (0.0)	0 (0.0)	0 (0.0)	
Age (years)	**Mean±SD**	25.20±15.5	26.45±16.8	24.26±14.4	0.048
Age categories					
Youth (less than 18 years)		196 (24.3)	89.0 (25.9)	107 (23.2)	0.408
Adults (18 to 64 years)		586 (72.8)	243 (70.6)	343 (74.4)	
Elderly (more than 64 years)		23.0 (2.9)	12.0 (3.5)	11.0 (2.4)	
Name of COVID-19 vaccination centers					
King Abdullah Medical City		273 (33.9)	116 (33.7)	157 (34.0)	0.603
Al Ukayshiyyah		265 (32.9)	110 (31.9)	155 (33.6)	
Umm Al-Qura University vaccination center		267 (33.1)	118 (34.3)	149 (32.3)	
Are you allergic to the COVID-19 vaccine?					
Yes		18.0 (2.2)	5.0 (1.5)	13.0 (2.8)	0.234
No		787 (97.8)	339 (98.5)	448 (97.2)	
Do you smoke?					
Yes		77.0 (9.6)	59.0 (17.2)	18.0 (3.9)	0.001
No, I do not smoke, and I do not live with a smoker		551 (68.4)	223 (64.8)	328 (71.1)	
No, I do not smoke, but I live with a smoker		177 (22.0)	62.0 (18.0)	115 (24.9)	

(*Continued*)

Table 1 (Continued).

Variables	Total (n=805)	Male (n=344)	Female (n=461)	*P*-value
	No. (%)	No. (%)	No. (%)	
Nationality				
Saudi	604 (75.0)	251 (73.0)	353 (76.6)	0.250
Other	201 (25.0)	93.0 (27.0)	108 (23.4)	
BMI kg/m^2				
Underweight (BMI below 18.5 kg/m^2)	119 (14.8)	42.0 (12.2)	77.0 (16.7)	0.008
Normal weight (BMI 18.5 to 24.9 kg/m^2)	462 (57.4)	184 (53.5)	278 (60.3)	
Overweight (BMI 25.0–29.9 kg/m^2)	112 (13.9)	55.0 (16.0)	57.0 (12.4)	
Obesity class I (BMI 30.0–34.9 kg/m^2)	79.0 (9.8)	46.0 (13.4)	33.0 (7.2)	
Obesity class II (BMI 35.0–39.9 kg/m^2)	21.0 (2.6)	12.0 (3.5)	9.0 (2.0)	
Obesity class III (BMI above 40 kg/m^2)	12.0 (1.5)	5.0 (1.5)	7.0 (1.5)	

Notes: Data are expressed as means ± SD for continuous variables and as a percentage for categorical variables. The differences between means were tested by using an independent sample *t*-test. The chi-square test was used to examine differences in the prevalence of different categorical variables.
Abbreviations: SD, standard deviation; BMI, body mass index; COVID-19, coronavirus disease 2019.

61.7% (n = 497) and 38.3 (n = 308) of the study participants received one and two doses of COVID-19 vaccine, respectively. 87.1% and 12.9% of the study participant received Pfizer-BioNTech, and Oxford/AstraZeneca COVID-19 vaccines for the first dose, respectively. 29.3%, 8.3%, and 0.6% of the study participants received Pfizer-BioNTech, Oxford/AstraZeneca, and Johnson and Johnson COVID-19 vaccine for the second dose, respectively. 25.3% of the study participants were infected with COVID-19; 23% were infected before the first dose, and only 1.6% were infected after the first dose.

Significant statistical associations were found between males and females in having diabetes mellitus, type of COVID-19 vaccine for the first dose, and type of COVID-19 vaccine for the second dose (*P*-value < 0.05) (Table 2).

Table 2 Medical History Variables for the Study Population by Gender

Variables		Total (n=805)	Male (n=344)	Female (n=461)	*P*-value
		No. (%)	No. (%)	No. (%)	
Use of anticoagulant drugs	Yes	34.0 (4.2)	15.0 (4.4)	19.0 (4.1)	0.862
	No	771 (95.8)	329 (95.6)	442 (95.9)	
Use of corticosteroid therapy	Yes	23.0 (2.9)	8.0 (2.3)	15.0 (3.3)	0.524
	No	782 (97.1)	336 (97.7)	446 (96.7)	
Use of immunosuppressive drugs	Yes	8.0 (1.0)	2.0 (0.6)	6.0 (1.3)	0.478
	No	797 (99.0)	342 (99.4)	455 (98.7)	
Use of cancer treatments	Yes	0 (0.0)	0 (0.0)	0 (0.0)	-
	No	805 (100)	344 (42.7)	461 (57.3)	
Use of other treatments	Yes	133 (16.5)	49.0 (14.2)	84.0 (18.2)	0.079
	No	672 (83.5)	295 (85.8)	377 (81.8)	

(*Continued*)

Table 2 (Continued).

Variables		Total (n=805)	Male (n=344)	Female (n=461)	*P*-value
		No. (%)	No. (%)	No. (%)	
History of diabetes mellitus	Yes	55.0 (6.8)	31.0 (9.0)	24.0 (5.2)	0.025
	No	750 (93.2)	313 (91.0)	437 (94.8)	
History of hypertension	Yes	49.0 (6.1)	22.0 (6.4)	27.0 (5.9)	0.431
	No	756 (93.9)	322 (93.6)	434 (94.1)	
History of respiratory diseases	Yes	47.0 (5.8)	25.0 (7.3)	22.0 (4.8)	0.090
	No	758 (94.2)	319 (92.7)	439 (95.2)	
History of cancer	Yes	6.0 (0.7)	2.0 (0.6)	4.0 (0.9)	0.488
	No	799 (99.3)	342 (99.4)	457 (99.1)	
History of AIDS	Yes	0 (0.0)	0 (0.0)	0 (0.0)	-
	No	805 (100)	344 (42.7)	461 (57.3)	
History of organ transplantation	Yes	3.0 (0.4)	1.0 (0.3)	2.0 (0.4)	0.608
	No	802 (99.6)	343 (99.7)	459 (99.6)	
History of rheumatoid arthritis	Yes	18.0 (2.2)	7.0 (2.0)	11.0 (2.4)	0.468
	No	787 (97.8)	337 (98.0)	450 (97.6)	
History of renal failure / dialysis	Yes	3.0 (0.4)	0.0 (0.0)	3.0 (0.7)	0.187
	No	802 (99.6)	344 (100)	458 (99.3)	
History of heart problems	Yes	21.0 (2.6)	8.0 (2.3)	13.0 (2.8)	0.420
	No	784 (97.4)	336 (97.7)	448 (97.2)	
History of other diseases	Yes	92.0 (11.4)	42.0 (12.2)	50.0 (10.8)	0.311
	No	713 (88.6)	302 (87.8)	411 (89.2)	
How many doses of COVID-19 vaccine did you receive?	One dose	497 (61.7)	217 (63.1)	280 (60.7)	0.273
	Two doses	308 (38.3)	127 (36.9)	181 (39.3)	
Type of COVID-19 vaccine for the first dose	Pfizer-BioNTech	701 (87.1)	286 (83.1)	415 (90.0)	0.006
	Oxford/AstraZeneca	104 (12.9)	58.0 (16.9)	46.0 (10.0)	
	Johnson and Johnson	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	
	Moderna	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	
Type of COVID-19 vaccine for the second dose	Pfizer-BioNTech	236 (29.3)	85.0 (24.7)	151 (32.8)	0.009
	Oxford/AstraZeneca	67.0 (8.3)	39.0 (11.3)	28.0 (6.1)	
	Johnson and Johnson	5.0 (0.6)	3.0 (0.9)	2.0 (0.4)	
	Moderna	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	

(*Continued*)

Table 2 (Continued).

Variables		Total (n=805)	Male (n=344)	Female (n=461)	*P*-value
		No. (%)	No. (%)	No. (%)	
Have you ever been infected with COVID-19?	Yes	204 (25.3)	95.0 (27.6)	109 (23.6)	0.219
	No	601 (74.7)	249 (72.4)	352 (76.4)	
If you were infected with COVID-19, when was that?	Before the first dose	191.0 (23.7)	89.0 (25.9)	102 (22.1)	0.403
	After the first dose	13.0 (1.6)	5.0 (1.5)	8.0 (1.7)	
	Did not infected	601 (74.7)	250 (72.7)	351 (76.1)	

Notes: Data are expressed as percentages for categorical variables. The chi-square test was used to examine differences in the prevalence of different categorical variables.
Abbreviations: AIDS, acquired immunodeficiency syndrome; COVID-19, coronavirus disease 2019.

Table 3 shows the most visible symptoms among the study population after the COVID-19 vaccine by gender. The results revealed that 24.1% of the study participants experienced swelling, redness, or pain at the injection site after the COVID-19 vaccine, followed by headache (14.5%) and exhaustion (14.2%). In addition, 10.6% experienced an increase in body temperature above 36.5 °C, 9.8% experienced muscle or joint pain, 6.2% of the study participants had dizziness, and 7.7% had insomnia. Only 0.9% of the study participants experienced gastritis, 2.0% experienced nausea, 0.4% experienced loss of consciousness, 1.6% experienced shortness of breath or difficulty breathing, 1.0% experienced ringing in the ear, 1.7 experienced harshnesses, 0.5% experienced blood clots, and 2.4% experienced other symptoms.

Symptoms such as diarrhea, epileptic seizures, swollen lymph nodes, irritability, and admission to intensive care were not reported. Significant statistical associations were found between males and females in the symptoms of muscle or joint pain, headache, dizziness, and nausea (P-value < 0.05) (Table 3).

Table 3 The Most Visible Symptoms Among the Study Population After the COVID-19 Vaccine by Gender

Symptoms		Total (n=805)	Male (n=344)	Female (n=461)	*P*-value
		No. (%)	No. (%)	No. (%)	
1. Redness, puffiness, or discomfort at the injection site	Yes	194 (24.1)	75.0 (21.8)	119 (25.8)	0.109
	No	611 (75.9)	269 (78.2)	342 (74.2)	
2. Increase body temperature above 36.5 °C	Yes	85.0 (10.6)	34.0 (9.9)	51.0 (11.1)	0.338
	No	720 (89.4)	310 (90.1)	410 (88.9)	
3. Shivering	Yes	39.0 (4.8)	13.0 (3.8)	26.0 (5.6)	0.147
	No	766 (95.2)	331 (96.2)	435 (94.4)	
4. Exhaustion	Yes	114 (14.2)	45.0 (13.1)	69.0 (15.0)	0.256
	No	691 (85.8)	299 (86.9)	392 (85.0)	
5. Muscle or joint pain	Yes	79.0 (9.8)	18.0 (5.2)	61.0 (13.2)	0.001
	No	726 (90.2)	326 (94.8)	400 (86.8)	
6. Headache	Yes	117 (14.5)	40.0 (11.6)	77.0 (16.7)	0.027
	No	688 (85.5)	304 (88.4)	384 (83.3)	

(*Continued*)

Table 3 (Continued).

Symptoms		Total (n=805)	Male (n=344)	Female (n=461)	*P*-value
		No. (%)	No. (%)	No. (%)	
7. Dizziness	Yes	50.0 (6.2)	11.0 (3.2)	39.0 (8.5)	0.002
	No	755 (93.8)	333 (96.8)	422 (91.5)	
8. Insomnia	Yes	62.0 (7.7)	24.0 (7.0)	38.0 (8.2)	0.593
	No	743 (92.3)	320 (93.0)	423 (91.8)	
9. Gastritis	Yes	7.0 (0.9)	3.0 (0.9)	4.0 (0.9)	0.639
	No	798 (99.1)	341 (99.1)	457 (99.1)	
10. Nausea	Yes	16.0 (2.0)	2.0 (0.6)	14.0 (3.0)	0.019
	No	789 (98.0)	342 (99.4)	447 (97.0)	
11. Diarrhea	Yes	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	-
	No	805 (100)	344 (42.7)	461 (57.3)	
12. Loss of consciousness	Yes	3.0 (0.4)	1.0 (0.3)	2.0 (0.4)	0.608
	No	802 (99.6)	343 (99.7)	459 (99.6)	
13. Shortness of breath or difficulty breathing	Yes	13.0 (1.6)	4.0 (1.2)	9.0 (2.0)	0.279
	No	792 (98.4)	340 (98.8)	452 (98.0)	
14. Ringing in the ear	Yes	8.0 (1.0)	3.0 (0.9)	5.0 (1.1)	0.530
	No	797 (99.0)	341 (99.1)	456 (98.9)	
15. Epileptic seizures	Yes	0 (0.0)	0 (0.0)	0 (0.0)	-
	No	805 (100)	344 (42.7)	461 (57.3)	
16. Hoarseness	Yes	14.0 (1.7)	5.0 (1.5)	9.0 (2.0)	0.402
	No	791 (98.3)	339 (98.5)	452 (98.0)	
17. Blood clots	Yes	4.0 (0.5)	1.0 (0.3)	3.0 (0.7)	0.640
	No	801 (99.5)	343 (99.7)	458 (99.3)	
18. Swollen lymph nodes	Yes	0 (0.0)	0 (0.0)	0 (0.0)	-
	No	805 (100)	344 (42.7)	461 (57.3)	
19. Irritability	Yes	0 (0.0)	0 (0.0)	0 (0.0)	-
	No	805 (100)	344 (42.7)	461 (57.3)	
20. Other symptoms	Yes	19.0 (2.4)	7.0 (2.0)	12.0 (2.6)	0.390
	No	786 (97.6)	337 (98.0)	449 (97.4)	
21. Admission to intensive care	Yes	0 (0.0)	0 (0.0)	0 (0.0)	-
	No	805 (100)	344 (42.7)	461 (57.3)	

Notes: Data are expressed as percentages for categorical variables. The chi-square test was used to examine differences in the prevalence of different categorical variables.
Abbreviation: C, Celsius.

Finally, the binary logistic regression was employed to calculate the crude and adjusted OR and 95% CI for the most visible symptoms among the study population after the COVID-19 vaccine by gender (Table 4). The findings showed that, after adjusting for confounding factors, the male participants had lower odds of having swelling, redness, or pain at

Table 4 Crude and Adjusted Odds Ratio and 95% Confidence Interval for the Most Visible Symptoms Among the Study Population After COVID-19 Vaccine by Gender

Gender	Total (n=805)		Statistical Tests			
	Male n (%) 344 (100)	Female n (%) 461 (100)	Crude OR (95% CI)	*P*-value[a]	Adjusted OR (95% CI)[b]	*P*-value[a]
1. Redness, puffiness, or discomfort at the injection site						
No	269 (78.2)	342 (74.2)	Ref	-	-	0.018
Yes	75.0 (21.8)	119 (25.8)	0.801 (0.576–1.115)	0.188	0.596 (0.388–0.916)	
2. Increase body temperature above 36.5 °C						
No	310 (90.1)	410 (88.9)	Ref	-	-	0.103
Yes	34.0 (9.9)	51.0 (11.1)	0.882 (0.558–1.394)	0.590	0.635 (368–1.096)	
3. Shivering						
No	331 (96.2)	435 (94.4)	Ref	-	-	0.061
Yes	13.0 (3.8)	26.0 (5.6)	0.657 (0.333–1.298)	0.227	0.488 (0.230–1.034)	
4. Exhaustion						
No	299 (86.9)	392 (85.0)	Ref	-	-	0.054
Yes	45.0 (13.1)	69.0 (15.0)	0.855 (0.571–1.281)	0.448	0.619 (0.380–1.008)	
5. Muscle or joint pain						
No	326 (94.8)	400 (86.8)	Ref	-	-	0.001
Yes	18.0 (5.2)	61.0 (13.2)	0.362 (0.210–0.625)	0.001	0.272 (0.149–0.495)	
6. Headache						
No	304 (88.4)	384 (83.3)	Ref	-	-	0.005
Yes	40.0 (11.6)	77.0 (16.7)	0.656 (0.435–0.989)	0.044	0.529 (0.338–0.828)	
7. Dizziness						
No	333 (96.8)	422 (91.5)	Ref	-	-	0.001
Yes	11.0 (3.2)	39.0 (8.5)	0.357 (0.180–0.709)	0.003	0.263 (0.125–0.554)	
8. Insomnia						
No	320 (93.0)	423 (91.8)	Ref	-	-	0.260
Yes	24.0 (7.0)	38.0 (8.2)	0.835 (0.491–1.420)	0.506	0.727 (0.418–1.266)	
9. Gastritis						
No	341 (99.1)	457 (99.1)	Ref	-	-	0.866
Yes	3.0 (0.9)	4.0 (0.9)	1.005 (0.223–4.520)	0.995	0.875 (0.184–4.161)	

(*Continued*)

Table 4 (Continued).

Gender	Total (n=805)		Statistical Tests			
	Male n (%) 344 (100)	Female n (%) 461 (100)	Crude OR (95% CI)	*P*-value[a]	Adjusted OR (95% CI)[b]	*P*-value[a]
10. Nausea						
No	342 (99.4)	447 (97.0)	Ref	-	-	0.014
Yes	2.0 (0.6)	14.0 (3.0)	0.187 (0.042–0.827)	0.027	0.145 (0.31–0.679)	
11. Loss of consciousness						
No	343 (99.7)	459 (99.6)	Ref	-	-	0.629
Yes	1.0 (0.3)	2.0 (0.4)	0.669 (0.060–7.409)	0.743	0.543 (0.046–6.442)	
12. Shortness of breath or difficulty breathing						
No	340 (98.8)	452 (98.0)	Ref	-	-	0.209
Yes	4.0 (1.2)	9.0 (2.0)	0.591 (0.180–1.935)	0.385	0.450 (0.130–1.565)	
13. Ringing in the ear						
No	341 (99.1)	456 (98.9)	Ref	-	-	0.377
Yes	3.0 (0.9)	5.0 (1.1)	0.802 (0.190–3.380)	0.764	0.511 (0.116–2.262)	
14. Hoarseness						
No	339 (98.5)	452 (98.0)	Ref	-	-	0.417
Yes	5.0 (1.5)	9.0 (2.0)	0.741 (0.246–2.230)	0.594	0.625 (0.201–1.944)	
15. Blood clots						
No	343 (99.7)	458 (99.3)	Ref	-	-	0.637
Yes	1.0 (0.3)	3.0 (0.7)	0.445 (0.046–4.297)	0.484	0.574 (0.057–5.750)	
16. Other symptoms						
No	337 (98.0)	449 (97.4)	Ref	-	-	0.425
Yes	7.0 (2.0)	12.0 (2.6)	0.777 (0.303–1.995)	0.600	0.669 (0.248–1.798)	

Notes: [a]The probability (P) value gauges the likelihood that any observed variation between groups is the result of chance. [b]Adjusted for the smoking status, age (years), body mass index (kg/m^2), history of diabetes mellitus, type of COVID-19 vaccine for the first dose, and type of COVID-19 vaccine for the second dose.
Abbreviations: Ref, reference; °C, Celsius; OR, odds ratio; CI, confidence interval.

the injection site, muscle or joint pain, headache, dizziness, and nausea compared to female participants [OR = 0.596, 95% CI = (0.388–0.916)], [OR = 0.272, 95% CI = (0.149–0.495)], [OR = 0.529, 95% CI = (0.338–0.828)], [OR = 0.263, 95% CI = (0.125–0.554)], and [OR = 0.145, 95% CI = (0.31–0.679), P < 0.05 for all], respectively.

Discussion

The COVID-19 pandemic began in 2020; nations prioritize preventative measures for safe and effective vaccinations 10. Vaccine candidates were created concurrently; only a few were granted Emergency Use Authorization (EUA).[23]

Saudi Arabia initiates early COVID-19 vaccination campaign as part of efforts.[23,24] Saudi Arabia's population's willingness to receive the COVID-19 vaccine varies due to rapid development and mRNA vaccines, which may factor in the difference.[17,18,25,26]

Recent publications highlight potential severe post-vaccination side effects due to key variables.[24,26]

This study assessed short-term adverse effects and symptoms of COVID-19 vaccines in Saudi Arabia, focusing on individuals receiving Pfizer-BioNTech, Oxford/AstraZeneca, and Johnson and Johnson vaccinations. Results showed 60% to 80% of side effects influenced by age, vaccine type, and dose.[27,28]

The study found frequent side effects and symptoms after COVID-19 vaccines, including fatigue (14.2%), headache (14.5%), and swelling (24.1%). These symptoms occurred on the first, seventh, or twenty-eighth days, mainly for those receiving double dosage.[27–30]

Menni et al report soreness and local pain as common adverse effects after injections.[31] 70–80% of Saudi Arabian trial participants experienced injection site pain.[32] The study finds younger participants experiencing fatigue and headaches, contrasting previous research, mainly due to their younger ages.[31,32] Research shows younger people experience more side effects.[27,33]

Alhazmi et al study show that 60% of respondents experienced adverse effects from COVID-19 vaccines, including weariness and soreness.[29]

The study finds that female participants in Makkah, Saudi Arabia, have a higher risk of visible COVID-19 symptoms than males, consistent with previous research.[29,31] Adam et al found males more likely to experience adverse effects after COVID-19 vaccination.[30] The study suggests lower male percentages may cause increased side effects in females, including injection site reactions, fatigue, headache, muscle pain, chills, and nausea.

The study found that 87.1% and 12.9% of participants received Pfizer-BioNTech and Oxford/AstraZeneca COVID-19 vaccines, respectively. The second dose had a higher risk of systemic side effects.[34] Future studies are needed to confirm Saudi Arabian findings.

Mild-to-moderate COVID-19 vaccination side effects were reported.[27–29,31,32] The study found non-life-threatening COVID-19 vaccine side effects, with 25.3% infected, 23% infected before, and 1.6% after. Age, sex, serostatus, and comorbidities may influence vaccine half-life.[35–37]

Concerns about mRNA vaccines spreading COVID-19 are unfounded as they were not created using live COVID-19. Insufficient time for T- and B-lymphocyte production after immunization allows for "breakthrough cases" and potential infection.[38,39]

Research on COVID-19 vaccine adverse effects may increase public trust in vaccine safety, potentially hastening immunization. Addressing vaccine hesitancy through friendly organizations and government-induced policy measures could shift public disbelief to confidence.[40] The study reveals women's gender decreases vaccine hesitancy, while older age, education, and adherence to prevention increase it.[41] The study found no serious health issues and raised awareness of COVID-19 vaccine benefits and safety. It dispelled misconceptions about post-vaccination effects and recommended future studies on booster shots. Long-term health care and strategic financial planning are top priorities in many nations.[42]

This study evaluates visible symptoms of COVID-19 vaccines in Makkah, Saudi Arabia, following participants for the first, seventh, and 28th days. Although it is the first in Saudi Arabia to discuss side effects and symptoms, its cross-sectional design limits generalizability. Additionally, many participants did not receive the second dose, and the predominant circulating variant of COVID-19 did not report during the study period, potentially affecting vaccine efficacy and severity.

Conclusion

The study assessed COVID-19 vaccine-related symptoms in Makkah, Saudi Arabia, revealing common side effects like pain, edema, redness, fatigue, and headache. Female participants were more likely to experience these symptoms. A larger population study is needed to evaluate vaccine effectiveness and long-term side effects.

Disclosure

The authors report no conflicts of interest in this work.

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