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Research Article

Exploring the Side Effects of COVID-19 Vaccines (Pfizer, AstraZeneca, Moderna) in Saudi Arabia

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Abstract

The public controversy regarding the safety of the COVID-19 vaccines is still a concern to this day, so our study aimed to investigate the possible side effect of COVID-19 vaccination in Saudi Arabia and to potentially explore an association between different vaccine types and experienced side effects. The data was gathered using an online-based google form distributed via social media. 461 participants met the inclusion criteria and were included in the analysis. The focus was exploring the side effects experienced after receiving first, second, or booster doses of Pfizer, AstraZeneca, or Moderna vaccines. Pain at injection site was the most commonly experienced side effect after receiving Pfizer as a first, second, or booster dose, whereas myocarditis and thromboembolism and pericarditis were rarely associated with Pfizer. Pain at injection site was the most common side effect with AstraZeneca as a first and second dose and myocarditis and thromboembolism have been rarely reported with AstraZeneca. Regarding Moderna as a booster dose, respondents most frequently reported pain at the injection site, and myocarditis and pericarditis were rarely reported. Overall, most of the reported side effects of Pfizer, AstraZeneca, and Moderna COVID-19 vaccines were minor, and life-threatening side effects were extremely rare.

Keywords: AstraZeneca; COVID-19; Moderna; Pfizer; Side-Effects; Vaccine

Introduction

The 2019 coronavirus disease (COVID-19) is a highly contagious viral illness caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), that has had a catastrophic effect on the global population, resulting in more than 769.8 million confirmed cases and more than 6.9 million deaths as of 6th of August worldwide [1]. It has emerged as the most consequential global health crisis since the Spanish flu in 1918. After the first cases of this predominantly respiratory viral illness were first reported in Wuhan, China, in late December 2019, SARS-CoV-2 rapidly spread across the world in a short period of time, and the World Health Organization (WHO) declare it as a global pandemic on March 11, 2020 [2].

The first case reported in Saudi Arabia was on March 2nd at that time increasing numbers were seen all over the world [3]. After the first case was confirmed in Saudi Arabia, the government response was swift and immediate, started by launching a social media campaign encouraging people to stay at home and follow the ministry of health's instructions. On March 23, a lockdown was imposed in Mecca, Medina, and Riyadh with travel restrictions throughout the country. Within the following next ten days, the curfew was extended to a 24-hour period. The quick spread of cases of COVID-19 all over the world and the rapid changes in people's daily lives have left people alarmed and frightened [4-6]. A number of companies, including Pfizer-BioNTech, Oxford-AstraZeneca and Moderna developed vaccines to combat the COVID-19 pandemic. During clinical trials, mild to moderate side effects have been reported. This study aims to explore the potential side effects of COVID-19 vaccines and perhaps suggest an association between different vaccine types and related side effects.

Materials and Methods

Study design

An analytical cross-sectional questionnaire-based study was conducted in Saudi Arabia between June 2022 and December 2022 using an online questionnaire to explore the side effects of COVID-19 vaccines (Pfizer, AstraZeneca, Moderna) in Saudi Arabia.

Inclusion criteria

Any Saudi citizen who has received at least one dose of Pfizer or AstraZeneca or Moderna COVID-19 vaccinations was included in the study.

Sampling technique and sample size

The sampling was done using convenient sampling method. A single proportion formula was used with precision (d) of 0.05 and proportion (p) of 50% yielding a mandatory Sample size of 384 participants. 461 of the 473 responses met the inclusion criteria and were used for the analysis.

Data collection

The study tool was a Google form questionnaire that was distributed to the public via social media platforms. All questions were mandatory. In the first section, information regarding participants' demographic data including their age, gender, level of education was collected. They were also asked about their past medical history, history of previous COVID-19 infection prior to vaccination, and general information regarding COVID-19 vaccination. In the second section, participants were asked about any side effects that they might experience after receiving the first, second, and booster doses of COVID-19 vaccinations. This section was divided into musculoskeletal symptoms, gastrointestinal symptoms, cardiovascular symptoms, generalized symptoms, allergy symptoms, psychological problems, neurological symptoms, nose/throat symptoms, endocrine symptoms, and respiratory symptoms. The third section of the questionnaire asked female participants about the impact of vaccinations on menstruation and menstrual cycle. The fourth section of the questionnaire was about participants' opinions and knowledge regarding COVID-19 vaccinations, using the Likert scale of level of agreement [7]. In the last section, participants were asked about their sources of information related to COVID-19 vaccines.

Statistical analysis

The data analysis was done using IBM SPSS Statistics 29.0.0.0. Socio-demographic characteristics and medical and vaccination status and, opinions, knowledge and sources of information related to COVID-19 vaccines were all descriptive variables, so frequency and percentage were used to describe them. As for the different side effects of COVID-19 vaccines the variables were also descriptive, but odds ratio and chi-square test were used to measure the association with a 95% confidence interval.

Ethical considerations

The institutional review board of college of medicine research center in King Saud University, Riyadh, Saudi Arabia approved this study project (approval no. E-22-7057_F6_CMED). The participation was voluntary and anonymous. Completing the questionnaire was considered the respondents agreement to participate in the study. Participants' information was kept confidential.

Results

Socio-Demographic Characteristics

461 out of the 473 respondents met the inclusion criteria, and 446 of them (96.7%) reported side effects. The most common age group among the respondents was 21 to 35 (204, 44.3%), and least common was the age group 51 or more (62, 13.4%). 357 of the respondents (77.4%) were females. The majority of the respondents were Saudi (439, 95.2%), most of them (305, 66.2%) resided in the central area. Regarding education, the majority (246, 53.4%) held a diploma or college degree. Employment data revealed that most of them were students (201, 43.6%). Approximately half of the participants were single (241, 52.3%). The majority (183, 39.7%) were of normal weight with a BMI between 18.5-24.9, followed by those who were overweight (BMI between 25.0-29.9) (135, 29.3%). Approximately one fifth of the participants (98, 21.3%) reported an existing chronic condition, including chronic respiratory disease (10, 2.2%), Diabetes mellitus (27, 5.9%), Hypertension (21, 4.6%), and cardiovascular disorders (8, 1.7%). Moreover, (91, 19.7%) reported having allergies, while (20, 4.3%) reported immunodeficiency, and (3, 0.7%) reported having received organ transplant. (44, 9.5%) of the participants were currently smoking. Furthermore, (122, 26.5%) reported being infected with COVID-19 before receiving vaccination (Table 1).

Variable		N (%)
Age groups	20 or less	98 (21.3)
	21-35	204 (44.3)
	36-50	97 (21.0)
	51-65	56 (12.1)
	66 or more	6 (1.3)
Gender	Female	357 (77.4)
Nationality	Saudi	439 (95.2)
Area in Saudi Arabia living in	Central Area	305 (66.2)
	Northern Area	14 (3.0)
	Southern Area	24 (5.2)
	Eastern Area	56 (12.1)
	Western Area	62 (13.4)
Level of education	illiterate	1 (0.2)
	Middle-school or less degree	17 (3.7)
	high-school Degree	163 (35.4)
	College or diploma degree	246 (53.4)
	postgraduate degree	34 (7.4)
Employment status	Employed	155 (33.6)
	Self-employed	10 (2.2)
	Student	201 (43.6)
	Housewife	57 (12.4)
	Unemployed	38 (8.2)
Marital status	Single	241 (52.3)
	Divorced	11 (2.4)
	Widowed	6 (1.3)
	Married	203 (44.0)
BMI groups	Underweight (Below 18.5)	47 (10.2)
	Healthy Weight (18.5-24.9)	183 (39.7)
	Overweight (25.0-29.9)	135 (29.3)
	Obesity (30.0 and above)	96 (20.8)
Chronic diseases	Chronic respiratory disease	10 (2.2)
	Diabetes mellitus	27 (5.9)
	Hypertension	21 (4.6)
	Cardiovascular disease	8 (1.7)
	Hypercholesterolemia	3 (0.7)
	Obesity	16 (3.5)
	thyroid disorders	18 (3.9)
	Joint inflammation	14 (3.0)
	Other diseases	13 (2.8)
Allergies	Yes	91 (19.7)
Immunodeficiency	Yes	20 (4.3)
Organ transplant	Yes	3 (0.7)
infected with COVID-19 before receiving Vaccination	Yes	122 (26.5)
Smoking status	Yes	44 (9.5)
Vaccination status	Vaccinated with only one dose	4 (0.9)
	Vaccinated with only two doses	91 (19.7)
	Vaccinated with two doses plus booster	366 (79.4)

Pfizer vaccine receivers	First dose	349 (75.7)
	Second dose	374 (81.1)
	Booster dose	292 (63.3)
AstraZeneca vaccine receivers	First dose	97 (21.0)
	Second dose	59 (12.8)
	Booster dose	17 (3.7)
Moderna vaccine receivers	First dose	10 (2.2)
	Second dose	20 (4.3)
	Booster dose	67 (14.5)
Unknown vaccine receivers	First dose	5 (1.1)
	Second dose	5 (1.1)
	Booster dose	4 (0.9)

Table 1: Socio demographic characteristics and medical and vaccination status of the COVID-19 vaccine receivers (sample size = 461).

Vaccination Status

Regarding vaccination status, the majority (366, 79.4%) finished two doses and the booster dose. Side effects were reported by (423, 91.8%) of those who received the first dose, (404, 87.6%) of those who received the second dose, and (312, 67.7%) of those who received the booster dose. Most of the participants took the Pfizer vaccine (349, 75.7%) as first dose, (374, 81.1%) as second dose receivers, and (292, 63.3%) as a booster dose (Table 1).

First Dose

Pfizer

(318, 91.1%) of those who received the Pfizer vaccine as a first dose reported side effects including, pain at the injection site (252, 72.2%), muscle pain (202, 57.9%), headache (187, 53.6%), joint pain (168, 48.1%), hair loss (135, 38.7%), myocarditis (6, 1.7%), pericarditis (1, 0.3%), and thromboembolism (1, 0.3%).

Table 2 shows a highly statistically significant decrease ($p \leq 0.001$) of fever in Pfizer receivers (OR 0.35 (95% CI: 0.22-0.56)). Similarly, chills exhibited a highly statistically significant decrease in Pfizer receivers ($p \leq 0.001$) (OR 0.48 (95% CI: 0.31-0.75)). Additionally, Nausea, tiredness, headache, and feeling unwell (malaise) also showed a statistically significant decrease.

AstraZeneca

(92, 94.8%) of the AstraZeneca, receivers reported side effects. The pain at injection site (73, 75.3%) was the most prevalent, in addition to fever (72, 74.2%), headache (66, 68.0%), muscle pain (61, 62.9%), chills (59, 60.8%), joint pain (54, 55.7%), hair loss (36, 37.1%), myocarditis (1, 1.0%); thromboembolism (1, 1.0%).

As shown in Table 2 there was a highly statistically significant increase in fever ($p \leq 0.001$) among those who received AstraZeneca as a first dose (OR 2.94 (95% CI: 1.79-4.85)). Moreover, chills were highly statistically significant increased ($p \leq 0.001$) in those receiving AstraZeneca as a first dose (OR 2.32 (95% CI: 1.47-3.67)) compared to other vaccines. However, nausea, tiredness, headache, and feeling unwell (malaise) also showed a statistically significant increase.

Pfizer			
Side Effect	**N (%)**	**OR (95%CI)**	**P - value**
Pain at injection site	252 (72.2)	0.91 (0.56-1.47)	0.695
Joint pain	168 (48.1)	0.78 (0.51-1.19)	0.244
Muscle pain	202 (57.9)	0.73 (0.47-1.14)	0.171
Nausea	44 (12.6)	0.43 (0.25-0.74)	0.002**
Diarrhea	22 (6.3)	0.69 (0.32-1.50)	0.342
Vomiting	7 (2.0)	0.31 (0.11-0.90)	-
Tiredness	89 (25.5)	0.59 (0.38-0.93)	0.023*
Headache	187 (53.6)	0.62 (0.40-0.96)	0.031*
Fever	170 (48.7)	0.35 (0.22-0.56)	<0.001***
Chills	140 (40.1)	0.48 (0.31-0.75)	0.001***
Feeling unwell(malaise)	145 (41.5)	0.64 (0.42-0.98)	0.039*
Hair loss	135 (38.7)	1.14 (0.73-1.77)	0.573
Rash	13 (3.7)	0.83 (0.29-2.38)	0.725
Decreased sleep quality	88 (25.2)	0.77 (0.48-1.24)	0.283
AstraZeneca			
Side Effect	**N (%)**	**OR (95%CI)**	**P-value**
Pain at injection site	73 (75.3)	1.18 (0.71-1.98)	0.520
Joint pain	54 (55.7)	1.36 (0.87-2.13)	0.184
Muscle pain	61 (62.9)	1.19 (0.75-1.89)	0.465
Nausea	25 (25.8)	2.34 (1.35-4.05)	0.002**
Diarrhea	9 (9.3)	1.52 (0.68-3.39)	0.308
Vomiting	7 (7.2)	3.97 (1.36-11.60)	-
Tiredness	37 (38.1)	1.80 (1.12-2.88)	0.014*
Headache	66 (68.0)	1.87 (1.16-3.00)	0.009**
Fever	72 (74.2)	2.94 (1.79-4.85)	<0.001***
Chills	59 (60.8)	2.32 (1.47-3.67)	<0.001***
Feeling unwell(malaise)	53 (54.6)	1.70 (1.08-2.67)	0.02*
Hair loss	36 (37.1)	0.96 (0.60-1.52)	0.847
Rash	4 (4.1)	1.08 (0.35-3.34)	0.900
Decreased sleep quality	27 (27.8)	1.09 (0.66-1.80)	0.731

N=frequency, %=percentage, OR=odds ratio, 95%CI=95% confidence interval, *Statistically significant at p≤0.05, **statistically significant at p≤0.01, ***statistically significant at p≤0.001.

Table 2: Association between the type of COVID-19 vaccine and experienced side effects for the first dose (sample size=461).

Moderna

(9, 90.0%) of the Moderna vaccine recipients reported side effects; muscle pain (8, 80.0%) was the most common one, followed by fever (7, 70.0%), pain at injection site (6, 60.0%), decreased sleep quality (5, 50.0%), and anxiety (4, 40.0%). No statistical significance was found.

Second Dose

Pfizer

(337, 90.1%) of those who received Pfizer as their second dose experienced side effects including pain at injection site (260 69.5%); muscle pain (194, 51.9%); headache (184, 49.2%); fever (178, 47.6%); joint pain (173, 46.3%); hair loss (154, 41.2%); feeling unwell (malaise) (143, 38.2%); chills (137, 36.6%); myocarditis (6, 1.6%); pericarditis (4, 1.1%); thromboembolism (1, 0.3%). None of the above side effects reaches any statistically significant value.

AstraZeneca

AstraZeneca receivers (46, 78.1%) reported side effects such as pain at injection site (34, 57.6%), fever (27, 45.8%), muscle pain (25, 42.4%), headache (24, 40.7%), hair loss (21, 35.6%), chills (20, 33.9%), joint pain (18, 30.5%), feeling unwell (malaise) (16, 27.1%), heat/cold intolerance (16, 27.1%), and myocarditis (1, 1.7%).

Table 3 shows a statistically significant decrease of joint pain ($p \leq 0.05$) in those who received AstraZeneca (OR 0.5 (95% CI: 0.28-0.90)).

Pfizer			
Side Effect	**N (%)**	**OR (95%CI)**	**P-value**
Pain at injection site	260 (69.5)	1.54 (0.95-2.49)	0.08
Joint pain	173 (46.3)	1.41 (0.87-2.27)	0.159
Muscle pain	194 (51.9)	1.21 (0.76-1.93)	0.425
Nausea	39 (10.4)	0.66 (0.34-1.30)	0.231
Diarrhea	24 (6.4)	1.92 (0.57-6.53)	0.288
Vomiting	11 (2.9)	0.63 (0.2-2.02)	0.433
Tiredness	92 (24.6)	0.77 (0.46-1.28)	0.309
Headache	184 (49.2)	1.14 (0.71-1.82)	0.588
Fever	178 (47.6)	1.23 (0.77-1.97)	0.394
Chills	137 (36.6)	1.04 (0.64-1.7)	0.862
Feeling unwell(malaise)	143 (38.2)	1.45 (0.88-2.41)	0.145
Hair loss	154 (41.2)	1.20 (0.74-1.95)	0.452
Rash	14 (3.7)	0.81 (0.26-2.51)	0.711
Decreased sleep quality	102 (27.3)	1.34 (0.77-2.34)	0.299
AstraZeneca			
Side Effect	**N (%)**	**OR (95%CI)**	**P-value**
Pain at injection site	34 (57.6)	0.61 (0.35-1.06)	0.077
Joint pain	18 (30.5)	0.50 (0.28-0.90)	0.019*

Muscle pain	25 (42.4)	0.67 (0.39-1.17)	0.157
Nausea	9 (15.3)	1.50 (0.69-3.27)	0.301
Diarrhea	1 (1.7)	0.25 (0.03-1.87)	0.145
Vomiting	2 (3.4)	1.05 (0.23-4.77)	0.950
Tiredness	16 (27.1)	1.09 (0.59-2.03)	0.774
Headache	24 (40.7)	0.69 (0.4-1.21)	0.193
Fever	27 (45.8)	0.96 (0.56-1.66)	0.885
Chills	20 (33.9)	0.88 (0.5-1.57)	0.664
Feeling unwell(malaise)	16 (27.1)	0.61 (0.33-1.11)	0.103
Hair loss	21 (35.6)	0.79 (0.45-1.40)	0.425
Rash	2 (3.4)	0.85 (0.19-3.78)	0.827
Decreased sleep quality	11 (18.6)	0.61 (0.31-1.21)	0.155
N=Frequency, %=Percentage, OR=Odds Ratio, 95%CI=95% Confidence Interval, *Statistically significant at p≤0.05, **statistically significant at p≤0.01, ***statistically significant at p≤0.001.			

Table 3: Association between the type of COVID-19 vaccine and experienced side effects for the second dose (sample size=461).

Moderna

(18, 90.0%) of the Moderna recipients experienced side effects, like pain at injection site (13, 65.0%), headache (12, 60.0%), joint pain (11, 55.0%), muscle pain (11, 55.0%), hair loss (10, 50.0%), anxiety (9, 45.0%), runny nose (9, 45.0%), tiredness (9, 45.0%), chills (8, 40.0%), and myocarditis (1, 5.0%). No significant decrease or increase was observed.

Booster Dose

Pfizer

Regarding the booster dose, (232, 79.5%) who received Pfizer reported side effects including pain at injection site (165, 56.5%), muscle pain (124, 42.5%), hair loss (117, 40.1%), joint pain (108, 37.0%), headache (103, 35.3%), fever (101, 34.6%), feeling unwell (malaise) (93, 31.8%), chills (88, 30.1%), myocarditis (3, 1.0%), and thromboembolism (3, 1.0%).

Table 4 shows a highly statistically significant increase (p≤0.001) in pain at injection site (OR 3.01 (95% CI: 2.01-4.49)), muscle pain (OR 2.1 (95% CI: 1.39-3.17)), hair loss (OR 2.39 (95% CI: 1.55-3.68)) in Pfizer receivers. However, joint pain, headache, fever, chills, feeling unwell (malaise), and rash also showed a statistically significant increase.

AstraZeneca

(16, 94.1%) of AstraZeneca recipients had side effects as hair loss (8, 47.1%), chills (6, 35.3%), fever (6, 35.3%), pain at injection site (6, 35.5%), anxiety (5, 29.4%), joint pain (5, 29.4%), decreased appetite (4, 23.5%), and myocarditis (1, 5.9%). None of the above side effects reaches any statistically significant value.

Moderna

(61, 91.0%) of the 67 Moderna vaccinated participants reported pain at injection site (45, 67.2%), muscle pain (40, 59.7%), headache (39, 58.2%), fever (36, 53.7%), joint pain (36, 53.7%), myocarditis (1, 1.5%), and pericarditis (1, 1.5%).

As presented in Table 4 those who received Moderna as a booster dose showed a highly statistically significant increased side effects (p≤0.001) Of pain at injection site (OR 2.67 (1.54-4.61)), joint pain (OR 2.89 (95% CI: 1.70-4.89)), muscle pain (OR 3.08 (95% CI: 1.81-5.24), headache (OR 3.74 (95% CI: 2.19-6.37)), fever (OR 3.08 (95% CI: 1.81-5.22), feeling unwell(malaise) (OR 3.16 (95% CI: 1.86-5.37)), and decreased sleep quality (OR 3.05 (95% CI: 1.73-5.38). Nausea, tiredness, and chills also showed a statistically significant increase.

Pfizer			
Side Effect	**N (%)**	**OR (95%CI)**	**P-value**
Pain at injection site	165 (56.5)	3.01 (2.01-4.49)	<0.001***
Joint pain	108 (37.0)	1.83 (1.2-2.80)	0.005**
Muscle pain	124 (42.5)	2.1 (1.39-3.17)	<0.001***
Nausea	25 (8.9)	1.23 (0.60-2.51)	0.578
Diarrhea	13 (4.5)	2.58 (0.72-9.18)	0.130
Vomiting	7 (2.4)	1.01 (0.29-3.51)	0.984
Tiredness	62 (21.2)	1.63 (0.97-2.73)	0.062
Headache	103 (35.3)	1.6 (1.05-2.43)	0.029*
Fever	101 (34.6)	1.55 (1.02-2.36)	0.041*
Chills	88 (30.1)	1.85 (1.17-2.92)	0.008**
Feeling unwell(malaise)	93 (31.8)	1.61 (1.04-2.49)	0.032*
Hair loss	117 (40.1)	2.39 (1.55-3.68)	<0.001***
Rash	17 (5.8)	5.16 (1.18-22.62)	0.016*
Decreased sleep quality	59 (20.2)	1.39 (0.84-2.31)	0.198
Moderna			
Side Effect	**N (%)**	**OR (95%CI)**	**P-value**
Pain at injection site	45 (67.2)	2.67 (1.54-4.61)	<0.001***
Joint pain	36 (53.7)	2.89 (1.70-4.89)	<0.001***
Muscle pain	40 (59.7)	3.08 (1.81-5.24)	<0.001***
Nausea	10 (14.9)	2.39 (1.1-5.19)	0.025*
Diarrhea	3 (4.5)	1.37 (0.38-4.96)	0.626
Vomiting	3 (4.5)	2.26 (0.59-8.75)	0.225
Tiredness	20 (29.9)	2.12 (1.18-3.80)	0.011*
Headache	39 (58.2)	3.74 (2.19-6.37)	<0.001***
Fever	36 (53.7)	3.08 (1.81-5.22)	<0.001***
Chills	26 (38.8)	2.02 (1.18-3.48)	0.01**
Feeling unwell(malaise)	34 (50.7)	3.16 (1.86-5.37)	<0.001***
Hair loss	29 (43.3)	1.64 (0.97-2.78)	0.064
Rash	2 (3.0)	0.68 (0.15-3.02)	0.613
Decreased sleep quality	24 (35.8)	3.05 (1.73-5.38)	<0.001***

N=Frequency, %=Percentage, OR=Odds Ratio, 95%CI=95% Confidence Interval, *Statistically significant at p≤0.05, **statistically significant at p≤0.01, ***statistically significant at p≤0.001.

Table 4: Association between the type of COVID-19 vaccine and experienced side effects for the booster dose (sample size=461).

Vaccines' Effect on Menstruation and Menstrual Cycle

First Dose

Out of the 357 females participating in the study, (348, 97.5%) answered questions regarding changes associated with their menstrual cycle and menstruation after receiving the COVID-19 vaccines. Results showed that (121, 35.8%) reported delay in menstruation after receiving the first dose; (92, 33.7%) Pfizer receivers, (24, 36.9%) AstraZeneca receivers, and (1, 16.7%) Moderna receivers. (52, 14.9%) participants experienced increased menstruation bleeding following the first dose, (39, 14.3%) of them were Pfizer takers, (10, 15.4%) AstraZeneca takers. Additionally, (114, 32.8%) reported increased Menstruation symptoms (pain, cramps, headache, etc.), (84, 30.8%) of them received Pfizer, (25, 38.5%) AstraZeneca, and (1, 16.7%) Moderna.

Second Dose

After receiving the second dose, (115, 33.0%) reported delay in menstruation; (94, 32.6%) of the received Pfizer, (14, 40.0%) AstraZeneca, and (4, 23.5%) Moderna. Of the (50, 14.4%) participants who reported increased menstruation bleeding, (41, 14.2%) were Pfizer takers, (5, 14.3%) AstraZeneca takers, (3, 17.6%) in Moderna takers. (119, 34.2%) experienced increased Menstruation symptoms (99, 34.4%) with Pfizer, (11, 31.4%) with AstraZeneca, (4, 23.5%) with Moderna.

Booster Dose

Moreover, for the booster (91, 26.1%) experienced delay in menstruation (66, 29.7%) with Pfizer, (3, 30%) with AstraZeneca, (21, 42%) with Moderna. (42, 12.1%) expressed an increase menstruation bleeding, (31, 14.0%) in Pfizer takers, (3, 30%) in AstraZeneca takers, (7, 14%) in Moderna takers. And (97, 27.9%) suffered increased Menstruation symptoms (pain, cramps, headache, etc.), (75, 33.8%) with Pfizer, (1, 10%) with AstraZeneca, and (18, 36%) with Moderna.

Opinions and knowledge regarding COVID-19 vaccines

When asked about their knowledge and opinion regarding COVID-19 and its vaccines using the Likert scale [7] for measuring attitudes, participants replied to "I took the vaccine willingly" with, strongly agree (108, 23.4%), Agree (131, 28.4%), Neither agree or disagree (91, 19.7%), Disagree (41, 8.9%), Strongly disagree (90, 19.5%). Responses to other inquiries like "I had a prior knowledge of the COVID-19 vaccine side effects like fever, injection site pain, fatigue" or "I had a prior knowledge that on rare occasions COVID-19 vaccines had major side effects like pericarditis and thromboembolism" or "The vaccine is needed even if it sometimes could cause major side effects like pericarditis and thromboembolism" or "I will still recommend the vaccine to people around me even after knowing it's side effects" are demonstrated in Figure 1.

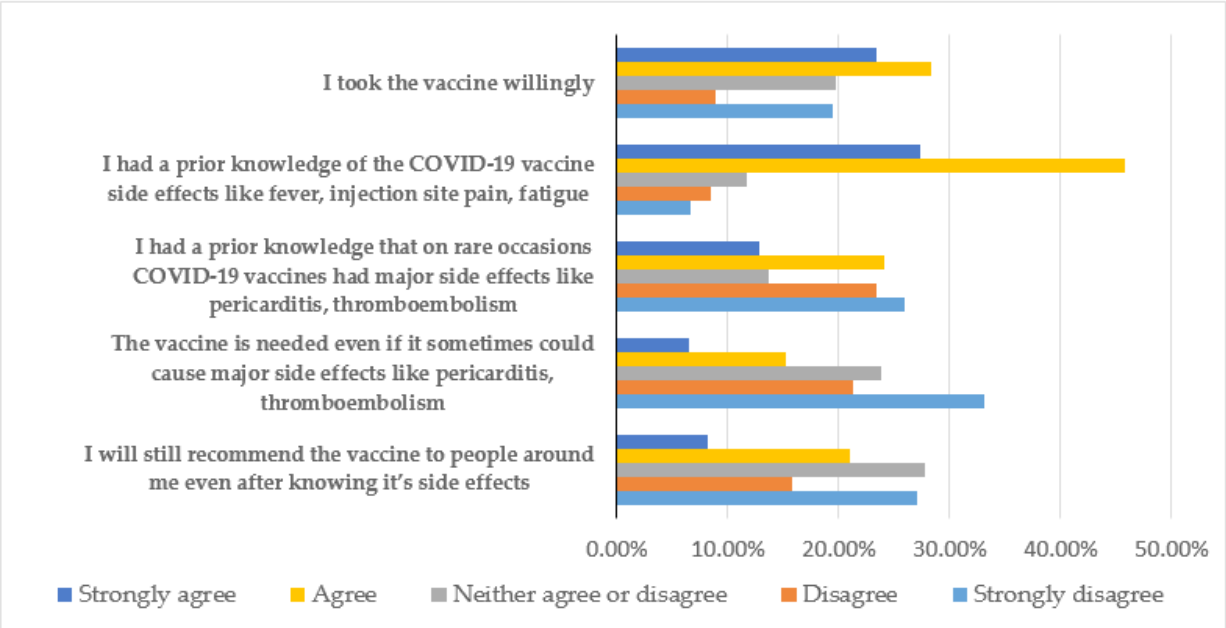

Figure 1: Opinions and knowledge regarding COVID-19 vaccines.

Sources of Information Related to COVID-19 Vaccines

Participants were also asked about their sources of information related to COVID-19 vaccines revealing the most used source to be social media (339, 73.5%) followed by Friends/family/acquaintances (209, 45.3%); TV (107, 23.2%); internet (91, 19.7%); radio (34, 7.4%).

Discussion

Our study showed that all participants reported similar side effects after first, second and booster doses of all COVID-19 Vaccines.

For the Pfizer vaccine fever, chills, feeling unwell (malaise), and headache were significantly decreased in the first dose but increased with the booster dose. While Nausea and tiredness were only significantly decreased with the first dose. Pain at injection site, muscle pain, Hair loss, Joint pain, and rash were significantly increased with the booster dose.

For the AstraZeneca vaccine, fever, chills, Nausea, tiredness, headache, and feeling unwell (malaise) with the first dose were significantly increased which is the opposite of the Pfizer vaccine receivers. Joint pain with the second dose was significantly decreased.

As for Moderna, significant increase in pain at injection site, joint pain, muscle pain, headache, fever, feeling unwell (malaise) and chills was found with the booster dose which is similar to Pfizer, as well as decreased sleep quality, Nausea, tiredness.

The most frequent side effect associated with the Pfizer vaccine was pain at injection site, which is consistent with the findings of a retrospective cross-sectional study conducted by El-Shitany, et al. [8]. They mentioned that the reported side effects were consistent with the Pfizer fact sheet for recipients and caregivers [9]. In the present study, side effects were more frequently associated with the second dose; consistent with a previous study demonstrated that the second dose appears to be more frequently associated with side effects than the first dose [10]. Furthermore, our findings identified myocarditis as a potential significant side effect of the Pfizer vaccination, in agreement with a recent study carried out by Dionne et al [11]. According to Adam et al [12], the frequency of reported side effects was higher in people who received the AstraZeneca vaccine than those who received the Pfizer vaccine as reflected in our data.

Few studies reported the impact of vaccination on menstrual cycles and menstruation in Saudi Arabia regarding. A cohort study conducted by Al-Furaydi A, et al. [13] revealed findings of a delay or prolonged periods between cycles as well as an increase in menstrual symptoms, suggesting a potential link. Similarly, menorrhagia was reported as a potential side effect of COVID-19 vaccinations in the international meta-analysis study conducted by Al Kadri HM, et al. [14]. Moreover, the results of the Multinational Cross-Sectional Study [15] suggested a potential link between receiving the AstraZeneca vaccine as a first dose and experiencing alterations in menstrual cycle. Findings from the previous studies were also observed in the current study.

Surprisingly, our study found a less likelihood of participants recommending the COVID-19 vaccines to others compared to the cross-sectional studies conducted by Zahid, et al. [16] and El Hassan, et al. [17]. This could be attributed to the severe adverse effects that were mentioned in the questionnaire, possibly pointing to less common or unknown side effects as a potential barrier for COVID-19 vaccination that had previously been reported [16], and arguably indicating a lack of knowledge regarding the less common or more serious side effects. Additionally, the overall level of knowledge appears to be average to poor, as shown by the observational cross-sectional study by Ashour HA, et al. [18].

Our results demonstrated that social media and awareness campaigns as well as internet, and friends and acquaintances were the most common source of information about COVID-19 and its vaccines, in agreement with previous studies [16,18,19].

Conclusions

In general, the Pfizer, AstraZeneca, and Moderna COVID 19 vaccines seem to be safe with the most commonly reported side effect by participants who received a first, or second, or booster dose being pain at injection site. Overall, the frequency of side effects of AstraZeneca vaccine was more than that of Pfizer and Moderna. And the level of knowledge regarding common side effects e.g. pain at injection site, was high but, the knowledge regarding less common side effects e.g. thromboembolism, is low.

Author Contributions

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Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board (or Ethics Committee) of King Saud University – College of Medicine (Ref. No. 22/0616/IRB and date of approval 16 August 2022).

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data presented in this study are openly available in [Mendeley Data] at [10.17632/tkdmbbsjzs.1].

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Conflicts of Interest

The authors declare no conflict of interest.

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