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Original Article

Adverse Effects of COVID-19 Vaccination Among Recipients in Yazd Province, 2021

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Introduction: Following the rapid global spread of coronavirus disease 2019 (COVID-19), vaccines were developed and authorized for emergency use starting in early 2021. This study aimed to assess the potential adverse effects of COVID-19 vaccines in Yazd Province.

Materials and Methods: To address this objective, a descriptive-analytical cross-sectional study was conducted in 2021 among vaccinated individuals aged ≥18 years who reported post-vaccination symptoms. Adverse effects were recorded within 48 hours via phone or in-person follow-up and analyzed using SPSS v26.

Results: Of the 325 participants (51.7% female), the most common side effects were injection-site pain (58.5%), fever (36.3%), and allergic reactions (15.4%). Notably, the Sinopharm COVID-19 vaccine was the most commonly used (67.1%), followed by the AstraZeneca COVID-19 vaccine (18.5%). In addition, most participants (86.5%) received one dose. Importantly, no significant associations were found between adverse effects and age, gender, or vaccine type, except for rare cases of thrombocytopenia and seizures in younger individuals.

Conclusions: Taken together, these findings indicate that reported adverse effects were mostly mild and transient, supporting the overall safety of COVID-19 vaccines and encouraging public vaccination.

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Introduction

The global outbreak of Coronavirus disease 2019 (COVID-19) since late 2019 has posed a significant threat to public health and the global economy [1, 2]. As the disease spread rapidly, vaccination emerged as a critical tool for preventing infection and reducing disease severity [3]. COVID-19 vaccines—such as mRNA vaccines (Moderna and Pfizer-BioNTech), viral vector vaccines (AstraZeneca), and inactivated vaccines (Sinopharm)—have been widely administered worldwide to reduce severe cases and hospitalizations [4]. Although these vaccines are highly effective, numerous reports have documented adverse effects following vaccination. These range from mild and temporary symptoms such as injection site pain, swelling, fatigue, and fever to rare but serious complications, including myocardial infarction and axillary lymphadenopathy [1].

International studies have shown that common post-vaccination reactions are generally mild, self-limiting, and short-lived. For instance, Riad et al. found that over 80% of vaccine recipients experienced at least one physical symptom, such as pain or swelling, following vaccination, while severe adverse events remained rare [5]. Similarly, Boivin et al. investigated cardiac complications after the Moderna vaccine and found that myocardial infarction was uncommon and mainly occurred in individuals with pre-existing conditions [6]. Additionally, reports like Dominguez et al. described temporary axillary lymphadenopathy post-vaccination, which typically did not require medical intervention [7].

In Iran, studies have also shown that common adverse effects after COVID-19 vaccination include injection site pain, fever, fatigue, swelling, and muscle pain, usually mild to moderate in intensity and resolving within a few days [8]. Data collected from Yazd Province in 2021 provides a detailed overview of the types and severity of vaccine-related adverse effects in the local population. These insights are valuable for improving vaccination programs, enhancing public awareness, and addressing vaccine hesitancy [9].

Given the importance of public awareness and accurate assessment of adverse effects across various populations, this study aimed to identify the types, frequencies, and severities of COVID-19 vaccine-related adverse effects among recipients in Yazd Province in 2021. The findings of this research can help healthcare policymakers and providers optimize vaccination processes and strengthen public trust in COVID-19 vaccines.

Materials and Methods

Study design and objective

This descriptive cross-sectional study aimed to investigate adverse events reported by health centers in COVID-19 vaccine recipients in Yazd Province.

Study population and sampling

All individuals over the age of 18 who had experienced complications after receiving the vaccine and had referred to health centers affiliated with Yazd University of Medical Sciences participated in this study.

Participants who reported post-vaccination adverse events were included.

Study setting and data collection

This cross-sectional survey was conducted in Yazd Province from 23 March 2021 to 22 March 2022. Individuals aged 18 years and older who had received COVID-19 vaccination via the affiliated health centers were enrolled. Data on reported adverse events were collected via structured questionnaires administered by trained researchers and health center staff. The questionnaire captured details on vaccine type, dose number, timing, and duration of symptoms, as well as specific adverse events such as local injection-site reactions, pain, swelling, paresthesia, headache, gastrointestinal symptoms, and other systemic complaints.

After obtaining informed consent, trained personnel collected the data using a standardized form. Data on demographic variables, medical history, vaccine product, dose number, and adverse events were recorded. All collected data were entered into a database for subsequent analysis.

Statistical analysis

Descriptive statistics were generated, and analytical tests were performed using SPSS software, version 26. Continuous variables were reported as mean ± standard deviation or median (IQR) as appropriate; categorical variables were summarized as frequencies and percentages. For inferential analyses, chi-square tests and independent t-tests were used where applicable. A p-value < 0.05 was considered statistically significant.

Results

A total of 325 participants were included in the study. The gender distribution was nearly equal, with 168 males (51.7%) and 157 females (48.3%). No significant differences were observed between males and females in the frequency of most adverse effects ($p > 0.05$), except for muscle pain and diarrhea, which were slightly more frequent in males. No statistically significant association was found between age and the overall occurrence of most adverse effects ($p > 0.05$), except for certain minor events, such as fainting and menstrual irregularities, which were more frequent in specific age groups. The majority of participants were 60 years old or older (53.2%) and aged 40–49 (13.2%) (Table 1). The most commonly reported adverse effects were muscle pain (myalgia), fever, headache, Diarrhea, and local pain at the injection site (Table 2). Most adverse effects were mild to moderate and resolved within a few days. Most adverse effects are local pain (58.8%) and Fever (36.3%).

Participants received different vaccines with the following frequencies: Sinopharm, 67.1%; AstraZeneca, 18.5%; Sputnik, 6.5%; Covaxin, 4.9%; and other, 3%. The highest proportion of adverse events was reported among recipients of Sinopharm (67.1%) (Table 3). Table illustrating vaccine proportions: Sinopharm: 67.1%, AstraZeneca: 18.5%, Sputnik: 6.5%, Baharat 4.9%, Others: 3.0%.

The study results showed that vaccination side effects were not related to gender; however, unlike gender, the observed side effects were significantly associated with age groups, with

thrombocytopenia and seizures being more common in individuals under 20 years of age (Tables 4 and 5). As shown in Table 4, the ANOVA test results indicate that there is no statistically significant. The difference between males and females in terms of the occurrence of side effects, meaning all observed differences between the two groups were not significant.

Analysis shows that side-effect frequencies differed across vaccine types. The Sinopharm vaccine was most frequently administered and therefore accounted for the majority of reported effects. Statistically significant differences were found for: Joint pain ($p = 0.001$), Fever ($p = 0.001$), Muscle pain ($p = 0.001$) (Table 6). ANOVA analysis shows that nausea and thrombocytopenia were the only side effects with statistically significant differences among age groups ($p < 0.05$). Both were more frequently observed in participants under 20 years old, although this age group had a small sample size. Other side effects did not differ significantly by age. Overall, side-effect patterns were broadly similar across vaccines, with significant variation only in muscle pain, joint pain, and fever.

Table 1. Occurrence of the most adverse effects of COVID-19 vaccination in Yazd by age

Age group (years)	Frequency	Percentage
<20	4	1.2
20–29	31	9.5
30–39	37	11.4
40–49	43	13.2
50–59	37	11.4
≥60	173	53.2
Total	325	100

Table 2. Frequency of major adverse effects of COVID-19 vaccination in Yazd

Type of adverse reaction	Number of cases	Percentage
Nervous tension	3	0.9
Seizure	2	0.6
High fever	3	0.9
Loss of consciousness	8	2.5
Allergic reaction	50	15.4
Fainting	3	0.9
Diarrhea	11	3.4
Joint pain	19	5.8
Nausea	22	6.8
Local pain	190	58.5
Anaphylactic reaction	1	0.3
Fever	118	36.3
Thrombocytopenia	2	0.6

Table 3. Frequency distribution of vaccine types

Vaccine type	Number	Percent
Sinopharm	218	67.1
AstraZeneca	60	18.5
Barekat	6	1.8
Spikogen	2	0.6
PastoCovac	2	0.6
Sputnik	21	6.5
Bharat	16	4.9
Total	325	100

Table 4. Frequency distribution of side effects based on gender

Side effect	Male	Female	Total	p-value
Cough	2 (1.2)	1 (0.6)	3 (0.9)	0.6
Nausea	2 (1.2)	0 (0)	2 (0.6)	0.17
Headache	2 (1.2)	1 (0.6)	3 (0.9)	0.6
Dizziness	4 (2.4)	4 (2.4)	8 (2.5)	0.92
Skin sensitivity	27 (16.1)	23 (14.6)	50 (15.4)	0.55
Fainting	1 (0.6)	2 (1.3)	3 (0.9)	0.52
Fatigue	6 (3.6)	5 (3.2)	11 (3.4)	0.57
Joint pain	9 (5.4)	10 (6.4)	19 (5.8)	0.92
Fever	11 (6.5)	11 (7)	22 (6.8)	0.86
Muscle pain	100 (59.5)	90 (57.3)	190 (58.5)	0.77
Anaphylaxis	0 (0)	1 (0.6)	1 (0.3)	0.34
Redness	63 (37.5)	55 (35)	11 8(36.3)	0.64
Thrombocytopenia	1 (0.6)	1 (0.6)	2 (0.6)	0.96

Data are presented as number (%)

Table 5. Frequency distribution of side effects based on age group

Side effect	<20	20-29	30-39	40-49	50-59	≥60	Total	p-value
Cough	0	0	2.7	0	0	1.2	0.9	0.78
Nausea	25	0	0	0	0	0.6	0.6	0.001
Headache	0	0	0	0	0	1.7	0.9	0.75
Dizziness	0	3.2	0	0	2.7	3.5	2.5	0.71
Skin sensitivity	0	9.7	18.9	11.6	13.5	17.3	15.4	0.38
Fainting	0	0	2.7	0	0	1.2	0.9	0.78
Fatigue	0	0	0	4.7	5.4	4	3.4	0.93
Joint pain	0	6.5	10.8	7	2.7	5.2	5.8	0.8
Fever	25	0	5.4	7	13.5	6.4	6.8	0.2
Muscle pain	50	71	56.8	58.1	51.4	58.4	58.5	0.75
Anaphylaxis	0	0	0	0	2.7	0	0.3	0.56
Redness	25	29	29.7	53.5	43.2	33.5	36.3	0.13
Thrombocytopenia	25	3.2	0	0	0	0	0.6	0.001

Data are presented as percentage.

Table 6. Frequency distribution of side effects based on vaccine types

Adverse effect	Sinopharm N (%)	AstraZeneca N (%)	Barkat N (%)	SpikoGen N (%)	PastoCovac N (%)	Sputnik V N (%)	Bharat N (%)	Total N (%)	p-value
Paralysis	2 (0.9)	1 (1.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (0.9)	0.99
Seizure	1 (0.5)	1 (1.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.6)	0.96
High fever	3 (1.4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (0.9)	0.96
Loss of consciousness	8 (3.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	8 (2.5)	0.67
Allergic reaction	37 (17)	9 (15)	3 (50)	1 (50)	0 (0)	0 (0)	0 (0)	50 (15.4)	0.08
Fainting (Syncope)	3 (1.4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (0.9)	0.96
Diarrhea	10 (4.6)	1 (1.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	11 (3.4)	0.81
Joint pain	10 (4.6)	7 (11.7)	1 (50)	1 (16.7)	0 (0)	0 (0)	0 (0)	19 (5.8)	0.001
Nausea	12 (5.5)	9 (15)	0 (0)	1 (50)	0 (0)	0 (0)	0 (0)	22 (6.8)	0.001
Local pain at the injection site	134 (61.5)	19 (31.7)	4 (66.7)	0 (0)	0 (0)	19 (90.5)	14 (87.5)	190 (58.5)	0.001
Anaphylactic reaction	1 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.3)	NA
Fever	71 (32.6)	29 (48.3)	2 (33.3)	1 (50)	1 (50)	8 (38.1)	6 (37.5)	118 (36.3)	0.48
Thrombocytopenia	2 (0.9)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.6)	0.98

Data are presented as number (%)

Discussion

This study, conducted in Yazd Province, examined the adverse effects of COVID-19 vaccines and found that most adverse reactions were mild and temporary. These results align with global findings for vaccines such as Pfizer-BioNTech, Moderna, Sinopharm, and AstraZeneca. The most commonly reported adverse effects-namely, injection site reactions (58.5%), fever (36.3%), and allergic responses (15.4%)-closely mirror patterns observed in international research, supporting the overall safety of these vaccines across various populations. No significant link was observed between adverse effects and either gender or vaccine type, underscoring the broad tolerability of these vaccines. However, age-related differences did emerge: individuals under 19 experienced a higher rate of conditions like thrombocytopenia and seizures. These findings highlight the need for further investigation into vaccine responses among children and adolescents.

Studies from other regions, such as those by Abu-Halaweh et al. [10], and Almufty et al. [11], similarly report mild adverse effects, such as pain, fatigue, and headache -signs of a normal immune response to vaccination. The absence of unusual patterns in adverse reactions across the broader dataset supports this interpretation. International reports from the World Health Organization and Center for Disease Control and Prevention consistently show that severe vaccine-related adverse effects are infrequent, occurring in fewer than 0.01% of cases [12].

Overall, the adverse effects recorded in this study were predominantly mild and manageable, posing no significant risk to public health [13]. These results reinforce the safety and effectiveness of COVID-19 vaccines; however, closer monitoring of younger populations may be necessary to better understand rare events, such as seizures and thrombocytopenia[14].

Most participants received Sinopharm (67.1%) or AstraZeneca (18.5%), indicating a local preference for inactivated-virus and viral-vector vaccines. Injection site reactions occurred more frequently with Sinopharm, likely due to its adjuvant ingredients. For other vaccines (Barekat, Sputnik V, Covaxin, Pastocovac, SpikoGen), small sample sizes limit reliability; observed variations were not statistically meaningful. While rare clotting events were not observed in our small AstraZeneca cohort, larger studies are required to assess this. The higher incidence of seizures and thrombocytopenia in younger participants suggests that targeted monitoring is necessary. Large-scale multinational studies have emphasized the importance of ongoing surveillance for rare adverse events, such as myocarditis and hematologic conditions, in adolescents and young adults following vaccination [15-17].

The findings support ongoing vaccination efforts, as most side effects are mild. Real-world data demonstrate that high vaccination coverage drastically reduces COVID-19-related hospitalizations and mortality, particularly among older adults [18]. Providing transparent, real-time adverse event reports can further build public trust by making safety information accessible[19, 20].

Conclusion

These adverse effects are not considered serious or dangerous, and the healthcare system is capable of managing and treating them. Providing the public with appropriate information about common and temporary adverse effects can help reduce concerns and increase public trust in vaccination.

Ethical Considerations

Ethics and study registrationThe relevant ethics committee approved the study protocol and the informed consent procedures with the number of IR.SSU.MEDICINE.REC.1400.249.

Funding Statement

The responsible author covered the experiment and other associated costs.

Conflict of Interest

The authors declared no conflict of interest.

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Data Availability Statement

The data presented in this study are available on request from the corresponding author.

Authors' Contributions

A.A, S.A.M, S.B.M, and A.Y were responsible for designing the review protocol, conducting the literature review, providing feedback on the manuscripts, writing the manuscript and improving the interpretation of the results. A.A, F.S and Z.A.M were responsible for writing the manuscript, assembling data, analyzing data, and interpreting analyses.

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