Journal of Multidisciplinary Healthcare

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ORIGINAL RESEARCH

Evaluation of Short-Term Side Effects Following the First Dose of COVID-19 Vaccines Among Physicians and Dentists: A Cross-Sectional Study from India

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Background: Efficacy and safety are fundamental for the development of successful COVID-19 vaccines. Vaccine-associated side effects influence vaccine hesitancy. This study investigated the prevalence, severity, and onset of side effects following the first dose of COVID-19 vaccines among physicians and dentists working in various healthcare settings across India.

Methods: A cross-sectional survey collected self-report data from April to June 2021 on side effects following the first dose of the vaccine. An online validated questionnaire using the Google Docs® platform was circulated via email and social media platforms.

Results: More than 40% of participants experienced at least one side effect after the first dose of vaccination; the most common were mild and resolved within three days after vaccination. More than 91% of respondents received the Covishield (AstraZeneca) vaccine; the most prevalent adverse effects were soreness of the injected arm (78.9%), tiredness (71.1%), and fever (54.9%). Logistic regression showed that women were almost 60% less likely to report side effects.

Conclusion: Findings supported the safety of the first dose of the COVID-19 vaccine based on relatively few self-limiting side effects, mainly soreness of the injected arm and tiredness. Further research is needed to determine the long-term safety of COVID-19 vaccines, especially after booster doses.

Keywords: prevalence, adverse effects, COVID-19 vaccine, physicians, dentists, India

Introduction

In late 2019, patients from Wuhan first experienced pneumonia due to a novel coronavirus subsequently identified as a human beta coronavirus (HβCoV) of zoonotic origin,[1] which is predominantly spread directly or indirectly via respiratory droplets and aerosols released when infected persons cough, sneeze, talk, or sing.[2–4] In early 2020, the World Health Organization (WHO) designated this fast-spreading virus, with an incubation period ranging from 1–14 days (average of five days), as the 2019 novel

Received: 19 September 2022
Accepted: 10 January 2023
Published: 19 January 2023

coronavirus (2019-nCoV).[5] The Coronavirus Study Group of the International Committee on Taxonomy of Viruses designated this virus as the "severe acute respiratory syndrome coronavirus-2" (SARS-CoV-2),[6] the seventh known coronavirus to infect humans.[7] WHO declared the associated disease, coronavirus disease-2019 (COVID-19), a pandemic in March 2020.[8] Until the advent of vaccines in 2021, COVID-19 prevention and control measures in the community relied on a complementary suite of non-pharmaceutical interventions, including hand hygiene, use of personal protective equipment, crowd avoidance, social distancing, community lockdowns, and travel restrictions.[9]

COVID-19 vaccines provided definitive therapy, reducing illness and hospitalizations from COVID-19 infection, thus potentially ameliorating the course and impact of the COVID-19 pandemic.[10] Reports have identified common vaccine-related side effects such as pain at the injection site, fever, myalgia, fatigue, and headache. Less frequently, serious adverse events (SAE) were reported in four vaccine trials: COVID-19 Vaccine AstraZeneca (AZD1222)—168 SAEs with three events shown to be related to the vaccine; Ad26.COV2. S vaccine– four SAEs with none related to the vaccine; Comirnaty (BNT162b1) vaccine – five SAEs reported and; Covaxin (BBV152) vaccine – one SAE was identified.[11] Arguably, the low attribution of SAEs speaks to the relative safety of the vaccines. Vaccine uptake depends on public acceptance. Given persistent challenges such as public mistrust and low acceptance even among healthcare workers,[12] there remains a need to investigate and document safety data of COVID-19 vaccines in varied settings.

Global efforts to combat COVID-19 primarily depend on preventive measures adopted by individuals to reduce the likelihood of infection transmission.[13] Many drugs and therapeutic compounds have been recommended in the fight against COVID-19, but these function only as supportive treatments.[14] Vaccination is likely to remain the most effective prophylactic measure for effective public health response.[15] Vaccines induce the body's adaptive immune response via generating protective antibodies against possible future infections. Effective vaccines can reduce disease transmissibility, morbidity, and mortality and, eventually, confer herd immunity.[2,4] Knowledge of potential side effects is important for vaccine recipients, clinicians, and caregivers.[16]

Efficacy and safety are fundamental for the development of a successful vaccine. COVID-19 vaccines have been developed and deployed at an unprecedented pace. These praiseworthy but compressed efforts raised questions about the quality of evidence supporting efficacy and safety.[17] At present, eleven COVID-19 vaccines have received Emergency Use Listing (EUL) from the World Health Organization (WHO): Tozinameran (Pfizer/BioNTech), Moderna (Spikevax), Covishield (Oxford/AstraZeneca formulation), Novavax (Covovax), Ad5-nCoV (CanSino), BBV152 (Covaxin –Bharat Biotech), Janssen COVID-19 vaccine, BIBP CorV/BIBP COVID-19 vaccine (Sinopharm), and Sinovac (CoronaVac).[18] The different types of COVID-19 vaccination platforms are: a) mRNA vaccines, b) viral vector (adenovirus) vaccines, c) inactivated virus vaccines, and d) protein subunit vaccines. The mechanism of action of these vaccines varies, although the common target is to trigger the immune response against SARS-CoV-2. Accordingly, it is expected that adverse effects associated with vaccines can vary widely.[19] Covishield is an adenoviral vector vaccine that does not generate an immune response to the adenovirus but only triggers an immune response to the viral protein encoded in the host DNA.[2]

The SARS-CoV-2 virus, which is spread via infected respiratory droplets or aerosols, has infected and killed millions globally. As of December 21, 2022, approximately 659.2 million people have been infected, and 6.6 million have died.[20] More than 13.7 billion vaccine doses have been administered worldwide, and 68.7% of the world population has received at least one dose of a COVID-19 vaccine.[21] India is one of the worst-hit countries by the COVID-19 pandemic. COVID-19 was first reported in India on 30 January 2020 in Kerala state. The total number of COVID-19-infected patients in India is approximately 44.6 million, with at least 530,680 related deaths by December 2022.[20] Drug regulators in India granted emergency approval for the first COVID-19 Vaccine, AstraZeneca, on January 1, 2021. As of 21 December 2022, 70% of the Indian population was fully vaccinated.[22] Physicians, dentists, nurses, and other healthcare workers (HCWs) have more direct and frequent contact with vulnerable individuals who are at high risk of COVID-19 infection and other health problems.[23,24] In India, more than 1700 physicians had died of COVID-19 by February 2022.[25]

Vaccine awareness programs for HCWs hope to influence behavior and attitudes towards preventive public health measures, thus reducing transmission of COVID-19.[26] These attitudes and behaviors are especially important for developing long-term anti-COVID-19 strategies. Studies in India demonstrated that 40% to 90% of physicians, nurses, and dental practitioners were willing to receive a vaccine if available.[23,27–29]

Notably, most studies on the side effects of the COVID-19 vaccine have been funded by pharmaceutical manufacturers. These studies typically follow guidelines established by drug regulatory authorities and are monitored by third

parties.[30] However, the (perceived) need for more clearly independent studies on side effects may impact vaccine hesitancy and uptake. Professional and public perceptions of side effects play a primary role in public confidence in vaccine development and uptake.[31] Further, unsubstantiated claims regarding side effects spread through mass and social media contribute to vaccine hesitancy among the public and HCWs.[24]

In an environment where mis- and disinformation threaten public health, accurate reporting of the prevalence and severity of side effects associated with COVID-19 vaccination is essential to inform policy and encourage vaccine uptake.[24] Physicians and dentists are a key population in which the study of self-reported side effects following vaccination is necessary for several reasons: they are a priority population for vaccination; their clinical training facilitates greater accuracy in reporting symptoms, and their experiences may shape clinical practice and policy actions.[16]

This study aims to determine the prevalence, severity, and onset of adverse effects following the first dose of COVID-19 vaccines among physicians and dentists working in public and private healthcare settings across India. During the study, two non-replicating viral vector vaccines, Covishield (AstraZeneca) and Gam-COVID-Vac (Sputnik V), and one inactivated virus vaccine, BBV152/Covaxin (Bharat Biotech), were available in India.

Materials and Methods

Study Design and Participants

A cross-sectional survey was conducted among HCWs in 128 teaching, non-teaching, government, and private hospitals across 16 states of India (Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Pondicherry, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh, and West Bengal). The inclusion criteria were physicians or dentists who had received at least one dose of a COVID-19 vaccine.

We used the Raosoft software package (Raosoft, Inc., Seattle, WA 98115, USA. http://www.raosoft.com/samplesize.html) to calculate a required sample size of 377 physicians and dentists at a 95% confidence interval with a 5% margin of error. Participation in the survey was voluntary. Inclusion criteria were physicians and dentists working in India's academic and healthcare institutes. All participants gave consent before participation. No identifiable personal information was collected.

Given the threat of COVID-19 infection, the study employed online convenience and snowball sampling to recruit participants. We distributed the survey link via email to medical and dental schools, professional associations, hospitals, and medical facilities with a request to share it with clinical personnel. We further shared the link using social media (eg, Facebook, Messenger, WhatsApp, and Viber). The survey included a request to share the link with colleagues. Non-respondents received two reminders to complete a questionnaire. Data collection continued from 4 April to 18 June 2021, with a pause for more than one month during the overwhelming second wave of COVID-19 in March 2021. Some members of the research team were infected, and many lost colleagues and family members during the study period.

Study Questionnaire and Data Collection Process

Participants completed a self-administered online questionnaire using the Google Docs® platform (Appendix 1). The questionnaire was validated and used in our previous study, and details are discussed elsewhere.[16] The adapted questionnaire was reviewed by a multinational panel of public health specialists from India and other countries (Bangladesh, Barbados, UK, and USA) and amended according to their feedback. Then, a pilot study was conducted with 48 respondents, and the questionnaire was refined based on their inputs. The questionnaire included the following sections: demographic details; vaccination-related information; adverse effects after the 1st dose of vaccine, including onset, severity, and duration of symptoms; and treatment received to alleviate symptoms.

Adverse effects were recorded as follows:

- Time of symptom onset: same day, 1–3 days, and 4–7 days following vaccination.
- Severity: Mild: I was still able to do most daily activities; Moderate: I had to stop my daily activities; and Severe: I had to seek medical attention.
- Duration: 1 day, 2–3 days, 4–7 days, and still present.

Ethical Approval

This study was conducted in accordance with the Declaration of Helsinki, and the ethical approval for the study was granted by the Institutional Review Board (IRB) of Sree Balaji Medical College, Chennai, Tamil Nadu, India (REF:002/SBMCH/IHEC/2021/1178).

Statistical Analysis

After cleaning data and eliminating respondents who did not confirm that they were practicing physicians or dentists, we estimated the prevalence of side effects after vaccination. We conducted univariate and multivariate analyses to explore predictors of side effects following COVID-19 vaccination. Bivariate analyses were performed to examine the relationship between existing comorbidities and demographic characteristics with reported side effects. Multivariate logistic regression was performed to investigate the individual effects of predictor variables on side effects. All statistical analysis was performed using IBM SPSS 22.

Results

Respondents' Characteristics

The demographic characteristics of participants are shown in Table 1. A total of 509 participants responded to the questionnaire. 64% were dentists, and 36% were physicians. Most were female (53.1%) and employed in the public healthcare sector (74.1%). More than 41% were between 31 and 40 years old, and 22.4% of the respondents had comorbidities. Approximately one-quarter of respondents (23.2%) had tested positive for COVID-19 by RT-PCR test, and more than three-quarters (78%) had received both the first and second doses of COVID-19 vaccination at the time of the survey. Among the COVID-19-positive cases, approximately half of respondents (47.4%) contracted the virus before the 1st dose of vaccination and 35.6% after the 2nd dose. The majority (91%) received Covishield (AstraZeneca) vaccine, followed by Covaxin (India) (8.4%), Moderna (0.4%), and Sputnik V (0.2%).

Table 1 Demographic and Background Characteristics of Respondents

Variables	Number	Percent
Gender (n=507)		
Male	238	46.9%
Female	269	53.1%
Age (in years) (n=509)		
≤30	158	31.0%
31–40	209	41.1%
41–50	80	15.7%
51–60	37	7.3%
61–70	22	4.3%
70+	3	0.6%
Workplace (n=495)		
Private	367	74.1%
Public/Government	124	25.1%
Both Private and Public	2	0.4%
None	2	0.4%
Occupation (n=509)		
Physician	183	36.0%
Dentist	326	64.0%

(*Continued*)

Table 1 (Continued).

Variables	Number	Percent
Vaccination Status (n=509)		
First dose only	112	22.0%
Both first and second doses	397	78.0%
Vaccine type (n=509)		
Covishield (AstraZeneca)	463	91.0%
BBV152 (Covaxin -India)	43	8.4%
Moderna (Spikevax)*	2	0.4%
Gam-COVID-19-Vac (Sputnik V)	1	0.2%
COVID-19 test status (n=509)		
Yes, tested positive (RT-PCR)	118	23.2%
Yes, tested positive (CT)	6	1.2%
Yes, never tested (symptomatic)	23	4.5%
No	362	71.1%
Time of SARS-CoV-2 infection (n=135)		
Before the 1st dose	64	47.4%
Between 1st dose and 2nd dose	23	17.0%
After the 2nd dose	48	35.6%
Comorbidities, if any (n=495)		
No illness	384	77.6%
Hypertension	31	6.3%
Diabetes	20	4.0%
Diabetes, hypertension, and others	9	1.8%
Obesity and others	14	2.8%
Autoimmune diseases	6	1.2%
Asthma and others	14	2.8%
Hypothyroidism	9	1.8%
Others	8	1.6%
Incidence of side effects (n=509)		
Yes	204	40.1%
No	305	59.9%

Notes: *Moderna vaccine was not available in India during the study period. The participants may have received it in other countries where the vaccine was available.
Abbreviations: RT-PCR, reverse transcription PCR test; CT, cycle threshold PCR test.

Adverse Effects Following the 1st Dose of COVID-19 Vaccination

The prevalence of vaccine-related adverse effects among respondents is shown in Figure 1. More than 40% (n=204) of the respondents reported one or more side effects. The six most reported side effects were: soreness of the injected arm (78.9%), tiredness (71.1%), fever (54.9%), headache (49.8%), generalized soreness of muscles (46.6%), and longer-than-usual sleeping period (43.1%). Most respondents (55.5%) characterized the severity of symptoms as mild. However, some respondents (6.6%) did rate their experience of symptoms as severe. The two most common severe symptoms were tiredness (5.9%) and longer-than-usual sleep (4.9%). The actions taken to alleviate vaccine-related sickness included: paracetamol (86.7%), sleep (75.2%), and drinking copious amounts of water (67.5%). Only 10.8% of the respondents had suffered similar side effects from previous vaccinations for other diseases (eg, BCG, HPV). The respondents were aware of the risk of thromboembolic events (70.1%) and thrombocytopenia (47.5%), which may occur as rare but serious complications.

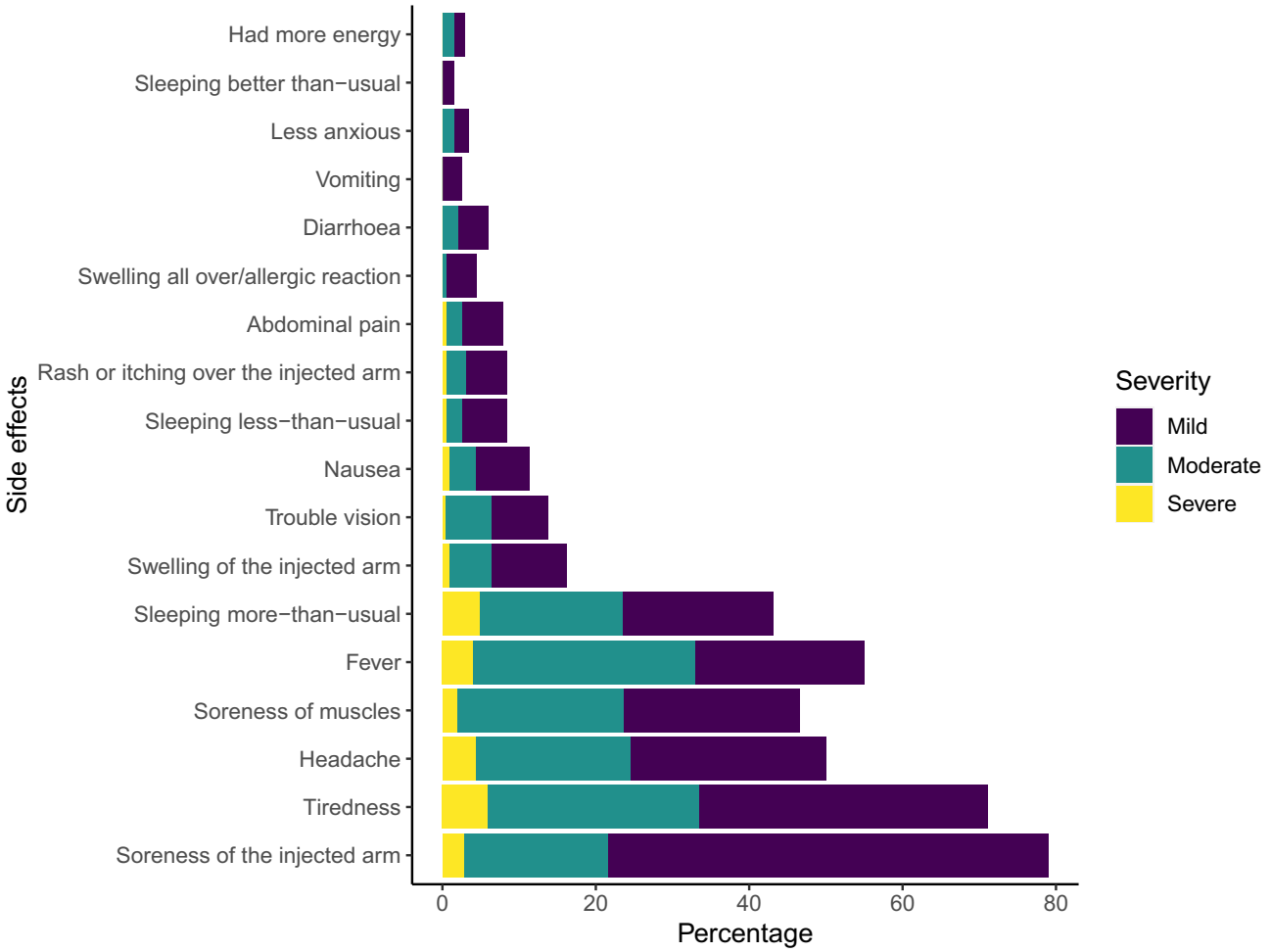

Figure 1 Reported adverse effects of COVID-19 vaccination following the first dose of COVID-19 vaccines (n = 204).

The details of the five most reported side effects, including onset and duration, are summarized in Table 2. For most respondents, these side effects appeared on the day of vaccination. Approximately half of the participants reported soreness in the arm (48.4%), and nearly one-third reported fever (31.9%) and headache (31.9%) on the day they were vaccinated. However, most respondents reported that these frequently observed side effects lasted 1 to 3 days. For 47.1% of participants, soreness in the arm lasted for 1 to 3 days, followed by fever (37.7%) and tiredness (31.4%). Soreness in the arm persisted for 7 days or more for 19.1% of participants, and tiredness persisted for more than 7 days for 4.4%. There was no significant association between vaccine type and observed side effects.

The prevalence of side effects among physicians stratified by gender, age, and occupation is shown in Table 3. Only soreness of muscles showed a significant relationship with the gender of participants. We examined differences in the level of reported events by two age groups (≤ 45 years and >45 years). Soreness of muscles, tiredness, and sleeping more than usual differed significantly by age group. No adverse effects were significantly associated with the participants' occupation except for diarrhea, nausea, and vomiting.

Determinants of Side Effects

Findings from the binary logistic regression model are summarized in Table 4. We considered six explanatory variables for the regression analysis. However, except for the gender of the physicians and dentists, no variables were associated with the presence of side effects. Female physicians and dentists were almost 60% less likely to report side effects than their male counterparts.

Table 2 Summary of the Five Most Reported Side Effects Following the First Dose of COVID-19 Vaccines (n = 204)

Adverse Event	Severity of Side Effects				Time of Appearance				Duration of Side Effects				
	Severe	Moderate	Mild	Total	Same Day	2–3 Days	4–7 Days	Total	Same Day	1–3 Days	4–7 Days	>7 Days	Total
Soreness of the injected arm	6 (2.9%)	38 (18.7%)	117 (57.4%)	161 (78.9%)	98 (48.4%)	60 (29.4%)	2 (1.0%)	160 (78.4%)	11 (5.4)	96 (47.1%)	39 (19.1%)	0 (0%)	146 (71.6%)
Soreness of muscles	4 (2.0%)	44 (21.6%)	47 (23.0%)	95 (46.6%)	47 (23.7%)	40 (19.6%)	0 (0%)	87 (42.6%)	8 (4.0%)	57 (27.9%)	12 (5.9%)	4 (2.0%)	81 (39.7%)
Fever	8 (4.0%)	59 (28.9%)	45 (22.1%)	112 (54.9%)	65 (31.9%)	46 (22.5%)	0 (0%)	111 (54.4%)	24 (11.8%)	77 (37.7%)	3 (1.5%)	5 (2.5%)	109 (53.4%)
Headache	9 (4.4%)	41 (20.1%)	52 (25.5%)	102 (50%)	65 (31.9%)	37 (18.1%)	2 (1.0%)	104 (51.0%)	26 (12.7%)	54 (26.5%)	10 (4.9%)	4 (2.0%)	94 (46.1%)
Tiredness	12 (5.9%)	56 (27.5%)	77 (37.7%)	145 (71.1%)	58 (28.4%)	52 (25.5%)	2 (1.0%)	112 (54.9%)	14 (6.9%)	64 (31.4%)	13 (6.4%)	9 (4.4%)	100 (49.0%)

https://doi.org/10.2147/JMDH.S390364 DovePress

https://doi.org/10.2147/JMDH.S390364 DovePress

Table 3 Prevalence of Side Effects Among Physicians and Dentists Following First Dose of COVID-19 Vaccines Stratified by Gender and Age

Adverse Events	Gender				Age				Occupation			
	Male (n=238)	Female (n= 269)	Total	p-value	21–44 Years (n=392)	45+ Years (n= 110)	Total	p-value	Physicians (n=183)	Dentists (n= 326)	Total	p-value
Soreness of injected arm	52 (21.8%)	109 (40.5%)	161	0.353	136 (34.7%)	23 (20.9%)	159	0.145	53 (29%)	108 (33.1%)	161	0.234
Soreness of muscles	23 (9.7%)	72 (26.8%)	95	**0.003**	84 (21.4%)	10 (9.1%)	94	**0.027**	30 (16.4%)	65 (19.9%)	95	0.524
Fever	37 (15.5%)	75 (27.9%)	112	0.701	96 (24.5%)	15 (13.6%)	111	0.532	37 (20.2%)	75 (23%)	112	0.600
Headache	31 (13%)	71 (26.4%)	102	0.085	83 (21.1%)	17 (15.5%)	100	0.065	37 (20.2%)	65 (19.9%)	102	0.402
Vision trouble	7 (3%)	5 (1.9%)	12	0.080	12 (3.1%)	0 (0%)	12	0.321	5 (2.7%)	8 (2.5%)	13	0.705
Tiredness	52 (21.8%)	93 (34.6%)	145	0.127	126 (32.1%)	17 (15.5%)	143	**0.001**	50 (27.3%)	95 (29.1%)	145	0.450
Sleeping more than usual	21 (8.8%)	67 (24.9%)	88	0.118	78 (20%)	8 (7.3%)	86	**0.027**	31 (16.9%)	57 (17.5%)	88	0.553
Sleeping less than usual	10 (4.2%)	7 (2.6%)	17	0.153	16 (4.1%)	1 (0.9%)	17	0.821	7 (3.8%)	10 (3%)	17	0.230
Sleeping more than usual	4 (1.7%)	2 (0.7%)	6	0.299	6 (1.5%)	0 (0%)	6	0.472	3 (1.6%)	3 (0.9%)	6	0.464
Had more energy	2 (0.9%)	1 (0.3%)	3	0.519	3 (0.8%)	0 (0%)	3	0.428	2 (1.1%)	1 (0.3%)	3	0.370
Less anxious	2 (0.9%)	5 (1.9%)	7	0.401	7 (1.8%)	0 (0%)	7	0.691	4 (1.2%)	3 (0.9%)	7	0.360
Swelling of injected arm	6 (2.5%)	27 (10%)	33	0.092	30 (7.7%)	2 (1.8%)	32	0.166	16 (8.7%)	17 (5.2%)	33	0.427
Swelling all over/allergic reaction	2 (0.9%)	7 (2.6%)	9	0.682	8 (2%)	1 (0.9%)	9	0.664	7 (3.8%)	2 (0.6%)	9	0.026

Rash/itching over injected arm	6 (2.5%)	11 (4.1%)	17	0.843	15 (4%)	2 (1.8%)	17	0.948	7 (3.8%)	10 (3%)	17	0.612
Abdominal pain	6 (2.5%)	8 (3%)	14	0.835	13 (3.3%)	1 (0.9%)	14	0.095	8 (4.3%)	6 (1.8%)	14	0.130
Diarrhea	3 (1.3%)	9 (3.3%)	12	0.919	11 (2.8%)	1 (0.9%)	12	0.599	5 (2.7%)	7 (2.1%)	12	**0.042**
Nausea	7 (3%)	15 (5.6%)	22	0.667	20 (5.1%)	2 (1.8%)	22	0.340	10 (5.4%)	12 (3.6%)	22	**0.038**
Vomiting	2 (0.9%)	3 (1.1%)	5	0.850	5 (1.3%)	0 (0%)	5	0.520	4 (2.1%)	1 (0.3%)	5	**0.026**

Note: Bold - Significance: $p < 0.05$.

https://doi.org/10.2147/JMDH.S390364

Table 4 Logistic Regression Coefficients and Odds Ratios (95% CI) for Determinants of Side Effects Following the First Dose of COVID-19 Vaccines

Variables	β	SE (β)	Exp(β) with 95% CI
Gender of respondent			
Male (Ref)			
Female	−0.912***	0.200	0.402 (0.271, 0.595)
Workplace of respondent			
Private (Ref)			
Public/Government	0.365	0.229	1.441 (0.919, 2.259)
Respondents' occupation			
Physician (Ref)			
Dentist	0.049	0.209	1.050 (0.697, 1.583)
Vaccination Status			
First dose only (Ref)			
Both first and second doses	0.157	0.245	1.170 (0.723, 1.892)
COVID-19 test status			
Yes, tested positive (RT-PCR) (Ref)			
No	0.052	0.228	1.054 (0.674, 1.647)
Prior presence of any chronic illness			
No illness (Ref)			
Presence of illness	−0.010	0.231	0.990 (0.630, 1.557)

Notes: Reference category is denoted by (ref). Significance: ***p < 0.01.

Discussion

The unprecedented and devastating challenges and consequences of the COVID-19 pandemic precipitated record-pace efforts to develop and deploy vaccines and global interest in the effective, rapid development of safe vaccines.[24] Vaccines are designed to trigger the body's immune response (reactogenicity). These processes typically are associated with transient post-vaccination effects such as pain at the injection site, fever, and malaise occurring within a few days after vaccination.[32] However, occasional severe side effects may also occur.[30] Several factors, including host and vaccine characteristics and a mode of vaccine administration, modulate the perception and extent of reactogenicity.[33]

Ensuring that all sections of society sufficiently accept COVID-19 vaccines is a major challenge for public health agencies. Negative perceptions of short- and long-term side effects and uncertainty regarding safety and efficacy are common barriers to the acceptance of vaccines.[26,27] In the case of COVID-19, these barriers have been exacerbated by the unprecedented pace of development and deployment of novel vaccines under emergency authorization. Historically, vaccines have required 8 to 10 years of research and development before approval for use in humans. In contrast, the first COVID-19 vaccines were authorized within 8 to 10 months. Enormous investment of resources by pharmaceutical companies and governments drove this record-breaking effort.[19] Availability of data on the structural and genomic characteristics of previously identified coronaviruses and global scientific collaborations with relevant safety, efficacy, and effectiveness trials were also important factors in the accelerated release of COVID-19 vaccines.[34] However, these investments and scientific achievements have been frustrated by persistent barriers to vaccine acceptance. In addition to doubts raised by the rapid development of vaccines, misinformation, false beliefs, lack of confidence among stakeholders, and conspiracy theories have posed major obstacles to COVID-19 vaccination programs.[26,27]

In the global fight against the COVID-19 pandemic, vaccines seem to have played a critical role in reducing hospitalization, controlling disease spread, and preventing deaths.[32] However, evidence related to the safety and efficacy of the COVID-19 vaccines in real-world settings is still emerging, especially as reformulated vaccines are deployed to combat newer viral strains.

We found that 40% of the participants experienced at least one side effect after the first dose of the COVID-19 vaccination. More than 91% of the respondents received the Covishield (AstraZeneca) vaccine, and the most common adverse effects reported were pain at the site of vaccination, followed by soreness of the injected arm (78.9%), tiredness (71.1%), fever (54.9%), and headache (49.8%). Symptoms were mainly mild and resolved within the first three days of immunization. The prevalence of side effects among HCWs reported in recent Indian studies ranged from 40% to 70%.[35–39] Further studies in India[37,40] and other Asian countries[16,41,42] have demonstrated that common adverse effects of the COVID-19 vaccine are fever, fatigue, muscle pain, joint pain, and headache. A Phase 2/3 study of the Covishield vaccine reported local and systemic side effects as primarily mild to moderate in severity.[43] Another Phase 1/2 study reported similar local and systemic reactions, which were reduced by the use of prophylactic paracetamol.[44]

A study conducted in India investigated side effects following the first immunization dose with Covishield and Covaxin among oral health care personnel. Consistent with the current findings, pain at the injection site was the most frequently reported adverse event. The majority reported that side effects were mild and self-limiting (ie, resolved within two days of vaccination).[45] The available clinical trial data for various COVID-19 vaccines support our findings that reported side effects were mild/moderate, self-limiting, and did not require any further treatment.[44,46–52] As in other studies of HCWs in India,[37–40,53] Nepal,[41,42] and Bangladesh,[16] most of our respondents experienced mild to moderate symptoms (93.4%), which were self-limiting and resolved within a few days.

We found that females were more likely to report generalized soreness of muscles (p=0.003), and younger participants reported more intense symptoms related to the soreness of muscles (p=0.027), tiredness (p=0.001), and sleeping more than usual (p=0.027). These findings are consistent with other studies reporting a significantly higher prevalence of side effects among females[16,54,55] and greater severity among younger people.[16] However, our findings showed that female respondents were almost 60% less likely to develop side effects in aggregate compared to males, controlling for other variables in multivariate analysis.

Many unsubstantiated claims regarding purported side effects have circulated on social media.[17] Public and social media have announced numerous cases of death after vaccination, even though evidence for a causal connection is lacking.[56] Based on reports of rare but life-threatening side effects (eg, thromboembolic events), some vaccines were temporarily paused or withdrawn from the market.[57] Evidence for currently available COVID-19 vaccines indicates no immediate serious side effect concerns, although some vaccines have been linked to deaths in rare cases. In our earlier study, we found a few serious (eg, acute myocardial infarction) and rare (eg, meningismus, severe eye pain, menstrual irregularities, excessive menstrual bleeding, hematuria) side effects among physicians in Bangladesh who received the 1st dose of Covishield (AstraZeneca) vaccine.[16] Clinical trials of Covishield vaccines conducted in Brazil, South Africa, and the UK reported serious adverse events (SAEs) among 168 participants (n = 11,636). Only 3 of 172 events were shown to be related to vaccination.[48] Similarly, a UK-based phase 2/3 trial identified 13 SEAs, none related to vaccination.[43] These and similar claims should be carefully reported and documented, requiring further longitudinal studies.

Limitations of This Study

Convenience sampling and associated response biases do not permit the generalizability of findings. For example, lack of internet access or fluency in English is potential source of under-coverage bias. Further, the presence of side effects may have influenced potential participants' motivation or ability to respond to the survey. Future studies using probability sampling would be useful. Finally, we caution that the absence of major side effects immediately post-vaccination does not imply long-term vaccine safety. A strength of this study is the accuracy and reliability of trained medical professionals to self-reported side effects.[16]

Conclusion

Our study elucidates the clinical presentation of short-term side effects associated with the Covishield vaccine among clinicians in India. First-dose administration was mainly associated with mild and self-resolving side effects. The most common side effects following the first dose were soreness of muscles and tiredness, and 40% of the respondents experienced at least one side effect. No life-threatening vaccine-related events were reported in this survey. More robust

studies are needed to determine the true prevalence of side effects and examine the potential long-term side effects of COVID-19 vaccines, especially after booster doses.

Informed Consent Statement

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

Acknowledgments

The authors thank the physicians who consented to participate in this study and completed the questionnaire. MAA Majumder, AMF Rabbi, A Rajasundaram, and WMS Johnson have full access to all the data and take responsibility for the integrity of the data.

Funding

This research received no external funding.

Disclosure

Dr. Md Anwarul Azim Majumder is the Editor-in-Chief of Advances in Medical Education and Practice (Dove Press). The other authors report no conflicts of interest in this work.

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