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The Adverse Effects of COVID-19 Vaccine on Students and Staff of Saint James School of Medicine

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Abstract

COVID-19 is a global pandemic declared by WHO, which has contracted more than 500 million people. Existing data on adverse effects of coronavirus disease 2019 (COVID-19) vaccines among university students are limited. This study aimed to investigate the characteristics of adverse effects that may arise from administering COVID-19 vaccines to university students in Saint James School of Medicine. An online survey study was conducted among students from Saint Vincent Campus of SJSM to assess types of adverse effects of COVID-19 vaccines received by the students. Of the 34 participants, 8 (23.5%) received the Johnson & Johnson vaccine, 9 (26.5%) received Moderna, 16 (47.1%) received Pfizer, and one (2.9%) received Sputnik. Pain was the most common adverse effect for both doses, reported by 62.5% of Johnson & Johnson, 50% of Moderna, and 56.3% of Pfizer recipients. Swelling and redness were more frequently reported among Moderna (44.4% and 33.3%) and Pfizer (37.5% and 31.3%) recipients for both doses. Generalized adverse effects like fatigue and muscle aches were also common across doses. Fatigue was reported by 55.6% of Moderna and 37.5% of Pfizer recipients, while muscle aches were noted in 55.6% of Moderna and 46.9% of Pfizer recipients. Most adverse effects occurred within 24-48 hours, were more frequent and severe after the first dose compared to the second and resolved without the need for hospital treatment. Students experienced different adverse effects depending on the type COVID-19 vaccine doses. The effects were generally mild and were less common after the second dose than the first. There is a significant difference for redness in second dose for local reactions when compared between genders.

Keywords: Covid -19, Generalized Adverse Reactions, Local Adverse Reactions, Two Doses, Vaccine.

INTRODUCTION

COVID-19 is a global pandemic declared by WHO, which has contracted more than 500 million people. The virus emerged in late 2019, and to combat the pandemic, local lockdowns and mass testing were done. In addition, a new vaccine was promised to decrease the mortality rate of contracted and uncontracted individuals. Various processes were modeled for the COVID-19 vaccines, Pfizer-BioNTech and Moderna COVID-19 vaccines, Sinopharma, and Covishield.

Based on clinical trials, vaccines for COVID-19 found to be overall safe. To date, no vaccine is completely free from adverse reactions. A few vaccines have side effects such as fever, myalgia, headaches, and local or injection site reactions. The importance of knowing the COVID-19 adverse reactions critical to public trust in the vaccination. The vaccine hesitancy rates and rejection were higher because of negative beliefs about it. Knowing adverse reactions is an essential factor in choosing individuals' vaccine. Our study aimed to collect the adverse reactions to COVID-19 vaccines that have affected students of Saint James school of medicine/and compare these affects based on age, gender, and type of vaccine.

METHOD

Data Collection

Students and faculty from SJSM were asked to answer a questionnaire in an observational study with a sample size of approximately 38. Subjects with local

reactions, generalized, and no reactions were categorized. Four subjects who did not get the vaccine were not included in the study. The questionnaire used to collect the data is from the Texas Science Center at Saint Antonio Institutional Review Board. The local side effects include pain at the site of injection, Swelling, Redness, and Itching. The Generalized Side effects include Fatigue, Headache, Muscle, Body aches, Chills/ Fever, joint pain, Gastrointestinal (Nausea, Vomiting, diarrhea), Cutaneous (Rash), Respiratory (shortness of breath), Neurologic (Syncope, Dizziness), Cardiovascular (Palpitations, Hypotension, Tachycardia). Data was collected using Google Forms along with consent. Data (Demographic and adverse events following immunization) collected by Google Forms from Saint James School of Medicine, Saint Vincent Campus students and staff were analyzed with statistical software to analyze the percentages and significant values.

The study questionnaire was introduced to students by the Student representative of each MD class on their social media, such as WhatsApp and Gmail.

Ethical Considerations

Respondent privacy was prioritized, with no personally identifiable data recorded. Only the study investigators had access to survey data. This study was conducted in accordance with STROBE cross-sectional reporting guidelines.

RESULTS

Table 1: Demographic data

Sex	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	Total (Percentage)
Male	1 (4.3%)	7 (30.4%)	9 (39.1%)	0 (0.0%)	1 (4.3%)	2 (8.7%)	2 (8.7%)	1 (4.3%)	23 (67.6%)
Female	1 (9.1%)	2 (18.2%)	5 (45.5%)	1 (9.1%)	1 (9.1%)	0 (0.0%)	1 (9.1%)	0 (0.0%)	11 (32.4%)

A total of 38 individuals answered the questionnaire. Four male subjects have been excluded from the study because they were not vaccinated, so we were left with only 34 subjects. Of these, 23 (67.6%) were male, and 11 (32.4%) were female. Participants ranged across various age groups, with a higher concentration of males in the 20-24 (30.4%) and 25-29 (39.1%) age ranges.

Females were also primarily in the 25-29 age group, representing 45.5% of the female participants. The data shows a predominance of male participants, with both males and females primarily concentrated in early adulthood (20-29 years) (Table 1).

Table 2: Covid Vaccine Dose 1 Local Reaction

Local Reaction (Dose 1)	Johnson & Johnson	Moderna	Pfizer	Sputnik
No Symptoms	2 (25.0%)	3 (33.3%)	6 (37.5%)	0
Pain	5 (62.5%)	4 (44.4%)	10 (62.5%)	1 (100.0%)
Swelling	0	3 (33.3%)	5 (31.3%)	0
Redness	1 (12.5%)	2 (22.2%)	3 (18.8%)	0
Itching	2 (25.0%)	0	0	0
Headache / Body Aches	2 (25.0%)	1 (11.1%)	2 (12.5%)	0
Fever	0	1 (11.1%)	1 (6.3%)	0
Muscle Soreness	0	1 (11.1%)	0	0

Of the 34 subjects, 8 (23.5%) of them received the Johnson & Johnson vaccine, 9 (26.5%) subjects received the Moderna vaccine, 16 (47.1%) subjects received the Pfizer vaccine, and only 1 (2.9%) received the Sputnik vaccine. A total of 20 (58.8%) subjects reported having at least one adverse effect after receiving the vaccination. The students who received the Pfizer or Johnson & Johnson vaccines reported the highest rate of adverse effects (62.5%). The most common adverse effect of Johnson & Johnson, Moderna, and Pfizer vaccines was pain (62.5%, 44.4%, and 62.5%, respectively). Pfizer vaccine was reported to cause more swelling and redness compared to the other two types. Both Moderna and Pfizer vaccines were reported to cause more injection site pain than the Johnson & Johnson vaccine. Most of the adverse effects occurred within the first two days (Table 2).

Table 3: Covid Vaccine Dose 2 Local Reaction

Local Reaction (Dose 2)	Johnson & Johnson	Moderna	Pfizer	Sputnik
No Symptoms	7 (87.5%)	4 (44.4%)	6 (37.5%)	0
Pain	1 (12.5%)	5 (55.6%)	8 (50.0%)	1 (100.0%)
Swelling	0	4 (44.4%)	6 (37.5%)	0
Redness	0	3 (33.3%)	5 (31.3%)	0
Itching	0	1 (11.1%)	0	0

Local Reaction (Dose 2)	Johnson & Johnson	Moderna	Pfizer	Sputnik
Muscle Soreness	0	1 (11.1%)	0	0

Among the 34 participants, 8 (23.5%) received the Johnson & Johnson vaccine, 9 (26.5%) received Moderna, 16 (47.1%) received Pfizer, and 1 (2.9%) received Sputnik. After the second dose, 17 (50.0%) subjects reported no symptoms, with Johnson & Johnson recipients having the highest rate of no symptoms (87.5%), followed by Moderna (44.4%) and Pfizer (37.5%). Pain was the most frequently reported adverse effect, experienced by 15 (44.1%) participants. It was most common among Moderna recipients (55.6%), followed by Pfizer (50.0%), and least frequent with Johnson & Johnson (12.5%). The sole Sputnik recipient also reported pain (100.0%). Swelling and redness were prevalent among Pfizer and Moderna recipients. Swelling affected 6 (37.5%) Pfizer recipients and 4 (44.4%) Modema recipients, while redness was reported by 5 (31.3%) Pfizer recipients and 3 (33.3%) Moderna recipients. Rarely reported symptoms included itching and muscle soreness, each noted by 1 (11.1%) Moderna recipient. Overall, fewer localized reactions were reported after the second dose compared to the first (Table 3).

Table 4: Covid Vaccine Dose 1 Generalised Reaction

Generalized Reaction (Dose 1)	Johnson & Johnson	Moderna	Pfizer	Sputnik
No Symptoms	4 (50.0%)	3 (33.3%)	7 (43.8%)	0
Fatigue	3 (37.5%)	5 (55.6%)	5 (31.3%)	0
Headache	2 (25.0%)	3 (33.3%)	3 (18.8%)	0
Muscle/Body Ache	1 (12.5%)	5 (55.6%)	7 (43.8%)	1 (100.0%)
Chills/Fever	2 (25.0%)	4 (44.4%)	4 (25.0%)	1 (100.0%)
Joint Pain	1 (12.5%)	1 (11.1%)	2 (12.5%)	1 (100.0%)

Among the 34 subjects, 8 (23.5%) received the Johnson & Johnson vaccine, 9(26.5%) received Moderna, 16 (47.1%) received Pfizer, and only 1 (2.9%) received Sputnik. In terms of reactions following the first dose, 14 (41.2%) subjects experienced no symptoms, with Johnson & Johnson recipients reporting the highest rate of no symptoms (50.0%), followed by Pfizer (43.8%) and Moderna (33.3%). Fatigue was a frequently reported side effect, especially among Moderna recipients, with 5 (55.6%) experiencing it, compared to 5 (31.3%) of Pfizer recipients and 3 (37.5%) of Johnson & Johnson recipients.

Headaches were noted by 8 (23.5%) subjects, with 3 (33.3%) among those receiving Moderna and 3 (18.8%) among Pfizer recipients. Muscle or body aches were another common reaction, reported by 7 (43.8%) of Pfizer recipients, 5 (55.6%) of Moderna recipients, and 1 (12.5%) of Johnson & Johnson recipients, with the single Sputnik recipient also reporting it (100.0%). Additionally, chills or fever were noted by 2 (25.0%) Johnson & Johnson recipients, 4 (44.4%) Moderna recipients, and 4 (25.0%) Pfizer recipients, along with the Sputnik recipient (100.0%). Joint pain was less common, reported by 1 (12.5%) Johnson & Johnson recipient, 1 (11.1%) Moderna recipient, 2 (12.5%) Pfizer recipients, and again by the Sputnik recipient (100.0%). Like localized reactions, these adverse effects were self-limiting and were gone in a few days (Table 4).

Table 5: Covid Vaccine Dose 2 Generalised Reaction

Generalized Reaction (Dose 2)	Johnson & Johnson	Moderna	Pfizer	Sputnik
No Symptoms	6 (75.0%)	4 (44.4%)	8 (50.0%)	0
Fatigue	1 (12.5%)	5 (55.6%)	7 (43.8%)	0
Headache	1 (12.5%)	4 (44.4%)	4 (25.0%)	0
Muscle/Body Ache	0	2 (22.2%)	8 (50.0%)	1 (100.0%)
Chills/Fever	0	1 (11.1%)	4 (25.0%)	0
Joint Pain	0	0	1 (6.3%)	1 (100.0%)

For the second vaccine dose, 6 (75.0%) of Johnson & Johnson recipients, 4 (44.4%) of Moderna recipients, and 8 (50.0%) of Pfizer recipients reported experiencing no symptoms, while the single Sputnik recipient reported symptoms. Fatigue was noted by 13 (38.2%) participants, with the highest frequency among Moderna recipients (55.6%) and Pfizer recipients (43.8%), while only 1 (12.5%) Johnson & Johnson recipient reported fatigue. Headache was also a common response, affecting 4 (25.0%) of Pfizer recipients, 4 (44.4%) of Moderna recipients, and 1 (12.5%) Johnson & Johnson recipient. Muscle or body aches were reported most frequently among Pfizer recipients, with 8 (50.0%) noting this symptom. Two (22.2%) Moderna recipients and the single Sputnik recipient (100.0%) also experienced muscle or body aches. Chills or fever were reported by 4 (25.0%) of Pfizer recipients and 1 (11.1%) of Moderna recipients, with no reports among Johnson & Johnson and Sputnik recipients.

Joint pain was infrequent, noted by only 1 (6.3%) Pfizer recipient and the Sputnik recipient (100.0%). Like when comparing the dose 1 and dose 2 localized reactions, there was a decrease in generalized reactions in the second dose (Table 5).

Table 6: Covid-19 Vaccine Adverse effects between Female and Male

Reaction Type	Female	Male	P-Value
Local Reactions (Dose 1)			
No Symptoms	4 (36.4%)	7 (36.8%)	0.7296
Pain	5 (45.5%)	11 (57.9%)	0.8969
Swelling	3 (27.3%)	3 (15.8%)	0.3086
Redness	4 (36.4%)	4 (21.1%)	0.2224
Itching	1 (9.1%)	2 (10.5%)	0.9697
Aches	1 (9.1%)	1 (5.3%)	0.5824
Local Reactions (Dose 2)			
No Symptoms	5 (45.5%)	7 (36.8%)	0.3912
Pain	6 (54.5%)	11 (57.9%)	0.7139
Swelling	4 (36.4%)	3 (15.8%)	0.1157
Redness	4 (36.4%)	2 (10.5%)	0.0477*
Itching	1 (9.1%)	1 (5.3%)	0.5824
Generalized Reactions (Dose 1)			
No Symptoms	2 (18.2%)	7 (36.8%)	0.4487
Fatigue	6 (54.5%)	8 (42.1%)	0.2733
Headache	5 (45.5%)	6 (31.6%)	0.2588
Muscle/Body Ache	4 (36.4%)	6 (31.6%)	0.5384
Chills/Fever	3 (27.3%)	5 (26.3%)	0.7219
Joint Pain	2 (18.2%)	2 (10.5%)	0.4219
Generalized Reactions (Dose 2)			
No Symptoms	4 (36.4%)	6 (31.6%)	0.5384
Fatigue	6 (54.5%)	7 (36.8%)	0.1759
Headache	5 (45.5%)	5 (26.3%)	0.1557
Muscle/Body Ache	5 (45.5%)	5 (26.3%)	0.1557
Chills/Fever	3 (27.3%)	3 (15.8%)	0.3086
Joint Pain	1 (9.1%)	x	0.9697

(Table 6, *= p <0,05

This above table compares localized and generalized reactions between females and males after doses 1 and 2, including p-values for statistical significance. For local reactions after Dose 1, pain was the most common reaction in both genders, with 45.5% of females and 57.9% of males reporting it (p=0.8969). Swelling and redness were more frequent in females (27.3% and 36.4%, respectively) compared to males (15.8% and 21.1%), but these differences were not significant (p=0.3086 and p=0.2224). After Dose 2, pain remained the most common reaction in both genders (54.5% in females, 57.9% in males, p=0.7139), but redness was reported more frequently by females (36.4% vs. 10.5%, p=0.0477). For generalized reactions, fatigue and headache were more common in females after both doses. After Dose 1, 54.5% of females and 42.1% of males reported fatigue (p=0.2733), and 45.5% of females and 31.6% of males had headaches (p=0.2588). These trends continued after Dose 2, with fatigue in 54.5% of females and 36.8% of males (p=0.1759), and headache in 45.5% of females and 26.3% of males (p=0.1557). Overall, while some differences were observed between the genders, few reached statistical significance. The only significant difference between genders was reported redness. (Table 6).

DISCUSSION

Across all three COVID-19 vaccine types, common localized adverse effects included pain, swelling, and redness, consistent with findings from other studies. Injection site pain was largely due to localized immune responses and the high vaccine concentration at the injection site. In contrast, muscle pain and fatigue reflect systemic responses, often linked to increased pro-inflammatory cytokines like interleukin-6 (IL-6), which can cause fever. Histamine release causes itchiness, redness and swelling in the localized area of vaccination. There are two types of vaccines that we are studying in this paper: Viral vector and mRNA vaccines. Viral vector vaccines work by using a harmless virus that does not cause any diseases, called a vector, to deliver genetic instructions into the body. These instructions help the body's cells produce a specific protein from the target virus, such as the spike protein of SARS-CoV-2. Once this protein is made, the immune system recognizes it as foreign and responds by

producing antibodies and activating protective immune cells. This process trains the body to fight the actual virus if exposed in the future. Examples of viral vector vaccines include those developed by Johnson & Johnson (Ad26.COV2.S) and Sputnik V. By preparing the immune system in advance, these vaccines help reduce the risk of severe illness if someone gets infected. On the other hand, mRNA vaccines deliver a small piece of genetic material called messenger RNA (mRNA) into the body, instead of introducing a weakened or inactive virus. The mRNA provides instructions for cells to produce a harmless piece of the virus, such as the spike protein found on the surface of SARS-CoV-2. The immune system recognizes this protein as foreign and responds by creating antibodies and activating immune cells. This prepares the body to defend itself if exposed to the real virus in the future. Pfizer-BioNTech Moderna Spikevax are two examples of mRNA vaccines, and they are highly effective and can be produced quickly, making them invaluable during a global pandemic. However, they are a lot more difficult to store than viral vector vaccines, requiring them to be in low temperatures.

Other studies reported minor symptoms, including loss of appetite, vomiting, and diarrhea, with even rare adverse events like thrombosis and myocarditis having been documented with viral vector (VV) and mRNA COVID-19 vaccines. Other adverse effects found in previous studies were gastrointestinal symptoms and other minor effects were less frequent here compared to previous studies. In other studies, some participants reported. Coughing after receiving the VV vaccine, likely caused by an immune response leading to respiratory inflammation and activation of the cough reflex. Minor adverse effects, including loss of appetite, vomiting, diarrhea, and rashes, were also observed in other studies after the second dose of mRNA vaccines, possibly due to heightened immunogenicity and reactogenicity associated with the second dose.

Most adverse effects from the first vaccine dose appeared within 48 hours, consistent with mRNA and viral vector vaccine reports indicating that systemic reactions usually occur within the first or second day. However, other studies claimed to find adverse effects from the second dose that were delayed, appearing up to 96 hours after vaccination. Although several studies have examined adverse effect severity between doses, few have addressed management. Nonetheless, adverse effects were generally mild, and only a few cases required hospitalization, consistent with previous research findings.

This study had some notable limitations. First, due to the fact that the study was only done on the students of Saint James school of Medicine, the findings may not be generalizable to students in other settings. Second, the survey was anonymous, and each student has done it his/her own, so this might have led to misunderstandings of certain questions. Third, the survey was conducted over a brief period, which may have introduced time-related limitations and external influences from recent social media or news. Additionally, due to the fact that our survey requires the subjects to inform us of past events, recall bias can occur.

There is also a potential of confounding factors, such as age or weight, that could have affected the overall results. Future studies are needed to better understand the causal relationship between vaccine types, dosage, and adverse effects, especially among university students. Finally, the sample size was small, and to get more accurate results, more subjects are needed.

CONCLUSION

In conclusion, this study highlights the adverse effects that students of Saint James School of Medicine experienced based on the Vaccine they received and based on their sex. While there were many asymptomatic subjects, pain and fatigue were the most common symptoms the students experienced. Swelling, redness, muscle aches were also commonly reported symptoms, while itching and chill were less commonly reported. Overall, we found redness at site of location in dose 2 to be statistically significant between males and females. The majority of adverse effects occurred 24-48 hours after vaccination, and both the first dose and second dose had mild or moderate symptoms that resolved spontaneously without any treatment at a hospital. The study findings can be informative for how the vaccines have affected students in Saint James, and hopefully our findings will help to promote vaccine acceptance for the general people.

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