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## Syed Kashif Mohiuddin

Joginpally B. R. Pharmacy  
College, Yenakapally, Moinabad  
Mandal, Hyderabad, Telangana,  
India

## Hajera Fatima

Joginpally B. R. Pharmacy  
College, Yenakapally, Moinabad  
Mandal, Hyderabad, Telangana,  
India

## Safety of Covid vaccination, possible risk and allergies

Syed Kashif Mohiuddin and Hajera Fatima

### Abstract

Coronavirus disease (COVID-19) is caused by (SARS-CoV-2) it was 1st reported in Wuhan China in Dec 2019. Vaccination is the only Possible way to fight (COVID-19) infection. To the best of our knowledge, more than eight COVID-19 vaccines have been approved for vaccination under an Emergency Use Authorization (EUA), Many people have experienced sore arms and fever for a couple of days after getting a COVID-19 vaccine. Some get chills and headaches. These side effects have become widely accepted as protection against the deadly coronavirus variants Alpha, Beta, Gamma, Delta and Omicron variants. But there are rare allergic reactions to an ingredient in the mRNA vaccines micro thrombi formation and blood clots associated with vaccine few mild cases of heart inflammation, called myocarditis, and pericarditis in adolescents and young adults. COVID-19 vaccines are not interchangeable, all currently authorized and recommended COVID-19 vaccines are safe and effective. Now 3rd shot is given as booster dose to protect from new variants.

**Keywords:** Covid-19, Vaccination, emergency use authorisation, alpha, beta, gamma, delta and omicron variants, micro thrombi, myocarditis

### Introduction

Coronavirus disease (COVID-19) is caused by (SARS-CoV-2) it was 1st reported in Wuhan China in Dec 2019. Globally, as of December, 18, 2021, there have been 271,963,258 confirmed cases of COVID-19, including 5,331,019, deaths and 8,337,664,456 vaccine doses administered. Reported to the World Health Organization (<https://covid19.who.int>).

Vaccination is the best way to fight (COVID-19) infection. To the best of our knowledge, more than eight COVID-19 vaccines have been approved for vaccination among priority groups under an Emergency Use Authorization (EUA), including the Pfizer-BioNtech (BNT162b2) vaccine, Moderna (mRNA-1273) vaccine, India's COVISHIELD and COVAXIN, Russia's Sputnik V(GAM-COVID-VAC), AstraZeneca's (ChAdOx1) and Janssen's (Ad26.COV2.S).

Many people have experienced sore arms and fever for a couple of days after getting a COVID-19 vaccine. Some get chills and headaches. These side effects have become widely accepted as protection against the deadly coronavirus.

But there are rare allergic reactions to an ingredient in the mRNA vaccines and rare blood clots in young women associated with vaccine a group that monitors vaccine safety for the U.S. Centers for Disease Control and Prevention is investigating whether there is a link between Pfizer's mRNA vaccine and a few mild cases of heart inflammation, called myocarditis, in adolescents and young adults. So far, cases of myocarditis have not risen above the number normally expected in young people, and no one actually knows whether the vaccine triggers the heart inflammation or not.

### According to (CDC) Centre for disease control and prevention

([www.cdc.gov](http://www.cdc.gov))

<https://www.cdc.gov/coronavirus>

### Pfizer-BioNtech COVID-19 Vaccine

Cases of myocarditis and pericarditis in adolescents and young adults have been reported more often after getting the second dose than after the first dose of one of the two mRNA COVID-19 vaccines.

### Pfizer-BioNtech

These reports are rare and the known and potential benefits of COVID-19 vaccination

### Corresponding Author:

Syed Kashif Mohiuddin

Joginpally B. R. Pharmacy  
College, Yenakapally, Moinabad  
Mandal, Hyderabad, Telangana,  
India

outweigh the known and potential risks, including the possible risk of myocarditis or pericarditis.

**Name:** BNT162b2

**Manufacturer:** Pfizer, Inc., and BioNTech

**Type of Vaccine:** mRNA

**Number of Shots:** 2 shots, 21 days apart Some immunocompromised people should get 3 shots

The Pfizer-BioNTech vaccine is recommended for people 12 years and older. Who Should NOT Get Vaccinated

If you have had a severe allergic reaction (anaphylaxis) or an immediate allergic reaction, even if it was not severe, to any ingredient in an mRNA COVID-19 vaccine (such as polyethylene glycol), you should not get either of the mRNA COVID-19 vaccines.

If you had a severe or immediate allergic reaction after getting the first dose of an mRNA COVID-19 vaccine, you should not get a second dose of either of the mRNA COVID-19 vaccines.

A severe allergic reaction is one that needs to be treated with epinephrine or with medical care

An immediate allergic reaction means a reaction within 4 hours of exposure, including symptoms such as hives, swelling, or wheezing (respiratory distress).

If you aren't able to get an mRNA COVID-19 vaccine, you may still be able to get a different type of COVID-19 vaccine.

#### Possible Side Effects

1. In the arm
2. Pain
3. Redness
4. Swelling
5. Throughout the rest of your body: Tiredness
6. Headache
7. Muscle pain Chills
8. Fever
9. Nausea

These side effects happen within a day or two of getting the vaccine. They are normal signs that your body is building protection and should go away within a few days.

**COVID-19 vaccines are not interchangeable:** If you received a Pfizer-BioNTech or Moderna COVID-19 vaccine, you should get the same product for your second shot.

#### How Well the Vaccine Works

Based on evidence from clinical trials in people 16 years and older, the Pfizer-BioNTech vaccine was 95% effective at preventing laboratory-confirmed infection with the virus that causes COVID-19 in people who received two doses and had no evidence of being previously infected.

#### Moderna COVID-19 Vaccine

Cases of myocarditis and pericarditis in adolescents and young adults have been reported more often after getting the second dose than after the first dose of one of the two mRNA COVID-19 vaccines, Pfizer-BioNTech or Moderna.

These reports are rare and the known and potential benefits of COVID-19 vaccination outweigh the known and potential risks, including the possible risk of myocarditis or pericarditis.

#### General Information

**Name:** mRNA-1273

**Manufacturer:** Moderna sTX, Inc.

**Type of Vaccine:** mRNA

**Number of Shots:** 2 shots, 28 days apart Some Immuno compromised people should get 3 shots

**How Given:** Shot in the muscle of the upper arm

The Moderna vaccine is recommended for people aged 18 years and older.

#### Who Should NOT Get Vaccinated

If you have had a severe allergic reaction (anaphylaxis) or an immediate allergic reaction, even if it was not severe, to any ingredient in an mRNA COVID-19 vaccine (such as polyethylene glycol), you should not get an mRNA COVID-19 vaccine.

If you had a severe or immediate allergic reaction after getting the first dose of an mRNA COVID-19 vaccine, you should not get a second dose of either of the mRNA COVID-19 vaccines (Moderna).

A severe allergic reaction is one that needs to be treated with epinephrine, with medical care. An immediate allergic reaction means a reaction within 4 hours of getting the shot, including symptoms such as hives, swelling, or wheezing (respiratory distress). If you aren't able to get an mRNA COVID-19 vaccine, you may still be able to get a different type of COVID-19 vaccine

#### Possible Side Effects

1. In the arm where you got the shot: Pain
2. Redness
3. Swelling
4. Throughout the rest of your body:
5. Tiredness
6. Headache Muscle
7. Pain Chills
8. Fever
9. Nausea

These side effects happen within a day or two of getting the vaccine. They are normal signs that your body is building protection and should go away within a few days.

#### How Well the Vaccine Works

Based on evidence from clinical trials, in people aged 18 years and older, the Moderna vaccine was 94.1% effective at preventing laboratory-confirmed COVID-19 infection in people who received two doses and had no evidence of being previously infected.

The vaccine was also highly effective in clinical trials at preventing COVID-19 among people of diverse age, sex, race, and ethnicity categories and among people with underlying medical conditions.

**Johnson & Johnson's Janssen (J&J/Janssen) COVID-19 Vaccine:** Women younger than 50 years old should especially be aware of the rare risk of blood clots with low platelets after vaccination.

There are other COVID-19 vaccines available for which this risk has not been seen. If you received a J&J/Janssen COVID-19 Vaccine.

**Name:** JNJ-78436735

**Manufacturer:** Janssen Pharmaceuticals Companies of Johnson & Johnson

**Type of Vaccine:** Viral Vector

**Number of Shots:** 1 shot

**How Given:** Shot in the muscle of the upper arm

### Who should not get vaccinated?

**If you have had a severe allergic reaction (anaphylaxis) or an immediate allergic reaction:** Even if it was not severe, to an ingredient in the J&J/Janssen COVID-19 Vaccine (such as polysorbate), you should not get the J&J/Janssen COVID-19 Vaccine.

A severe allergic reaction is one that needs to be treated with epinephrine or with medical care. An immediate allergic reaction means a reaction within 4 hours of exposure, including symptoms such as hives, swelling, or wheezing (respiratory distress). If you aren't able to get the J&J/Janssen COVID-19 Vaccine, you may still be able to get a different type of COVID-19 vaccine

### Possible Side Effects

1. In the arm where you got the shot: Pain
2. Redness
3. Swelling
4. Throughout the rest of your body: Tiredness
5. Headache Muscle
6. Pain Chills
7. Fever
8. Nausea

These side effects happen within a day or two of getting the vaccine. They are normal signs that your body is building protection and should go away within a few days.

### Fainting after Vaccination

Fainting (syncope) and other events that may be related to anxiety like rapid breathing, low blood pressure, numbness, or tingling can happen after getting any vaccine. Although uncommon, these events are not unexpected, and they are generally not serious.

According to information from the Vaccine Adverse Event Reporting System (VAERS), there were 653 reports of fainting events (fainting and near-fainting) among nearly 8 million doses of J&J/Janssen COVID-19 Vaccine administered in the United States in March and April 2021. This translates to a rate of about 8 fainting events for every 100,000 doses of the J&J/Janssen COVID-19 Vaccine given. These events occurred during the recommended 15-minute wait after vaccination. It's not clear at this time whether these events were associated with the vaccine or with anxiety, possibly related to preexisting concerns some people who chose to get the one-dose J&J/Janssen COVID-19 Vaccine may have about needles or shots. By comparison, the rate of fainting after vaccination in 2019–2020 was 0.05 per 100,000 doses.

### How Well the Vaccine Works

The J&J/Janssen COVID-19 Vaccine was 66.3% effective in clinical trials (efficacy) at preventing laboratory-confirmed COVID-19 infection in people who received the vaccine and had no evidence of being previously infected. People had the most protection 2 weeks after getting vaccinated.

In the clinical trials, the vaccine had high efficacy at preventing hospitalization and death in people who did get sick. No one who got COVID-19 at least 4 weeks after receiving the J&J/Janssen COVID-19 Vaccine had to be hospitalized.

\*Astra Zeneca / COVISHIELD is developed by the SERUM Institute of India. What ingredients are there in COVISHIELD?

COVISHIELD Ingredients are as follows: L-Histidine, Magnesium chloride hexahydrate, Polysorbate 80, L-Histidine hydrochloride monohydrate, Water for Injection, Ethanol, Sodium chloride, Sucrose, Disodium edetate dihydrate (EDTA).

### Possible Side Effects

1. In the arm where you got the shot: Pain
2. Redness
3. Swelling
4. Throughout the rest of your body: Tiredness
5. Headache Muscle
6. Pain Chills
7. Fever
8. Nausea

These side effects happen within a day or two of getting the vaccine. They are normal signs that your body is building protection and should go away within a few days.

### How Well the Vaccine Works

If two doses are taken within 12 weeks apart from the efficacy of COVISHIELD is 81.3 percent. This data is been collected from the official website of the SERUM Institute of India.

### Covaxin

#### Ingredients

It is made up of in combination of several viruses' dead bodies. Further, it has 6µg of whole-virion inactivated SARS-CoV-2 antigen which is a strain of NIV-2020-77. Moreover, there is one more ingredient that is inactive is aluminum hydroxide gel.

### Possible Side Effects

1. In the arm where you got the shot: Pain
2. Redness
3. Swelling
4. Throughout the rest of your body:
5. Tiredness
6. Headache Muscle
7. Pain Chills
8. Fever
9. Nausea

These side effects happen within a day or two of getting the vaccine. They are normal signs that your body is building protection and should go away within a few days.

### How Well the Vaccine Works COVAXIN Efficacy report?

According to Bharat Biotech official journal released on their site states that COVAXIN demonstrates 81% efficacy.

### Sputnik V Vaccine

The Sputnik V Covid Vaccine is a Russian-based vaccine. This is the third-largest used Covid-19 Vaccine. It is

developed by the Gamaleya Research Institute of Epidemiology and Microbiology. Why it is famous because the other two vaccination will be completed when you have their two doses. While Sputnik V is the only vaccination of Covid-19 which can be used as a single dose. The other name of Sputnik V is (GAM-COVID-VAC).

**How Covid-19 Sputnik V Vaccination works**

It works pretty differently than the above two vaccinations. Now, as soon as you get the short of Sputnik V it starts spiking the protein in the body. To which when in real Covid - 19 attacks the body, it works as multiplying anti-bodies against it and shield it from the virus.

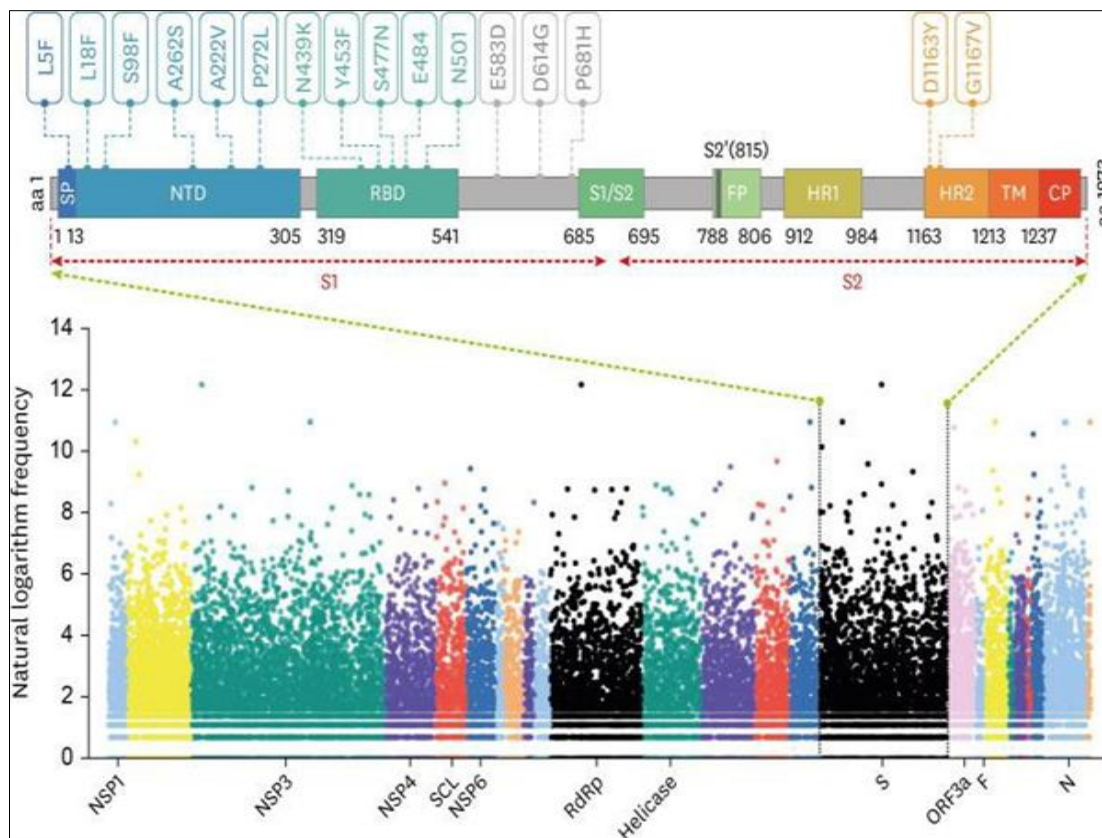
**Side effects of Sputnik V**

There can be few side effects after taking the Sputnik V vaccination. Although no strong allergies are reported after taking Sputnik V. Few side effects are mild fever, nausea, headache, and pain in the upper arm near the injection.

**Sputnik V Efficacy**

After the three complete clinical trials of Sputnik V, the efficacy report is 91.6 percent. Which is the highest form of all the Covid-19 vaccines in India till now used.

**Genome- wide mutations on SARS-CoV-2**



**Fig 1:** The distribution of genome-wide mutations on SARS-CoV-2 and the key mutations in S protein. The data of mutations in hCoV-19 genomes was obtained from GISAID database from January 1, 2020, to December 26, 2020. The Y-axis represents the natural logarithm frequency of each mutation in the whole genome of SARS-CoV-2. The X-axis represents the name of the marker gene or protein, and the relative positions of other unlabeled genes or proteins can be found in the GISAID database. Each mutation was shown as a solid dot colored by Open Reading Frame of hCoV-19 genome. The S protein structure was presented following a previous study (Wrapp *et al. Science* 2020;367:1260-3). The Arabic numerals below the S protein structure represent the amino acid site in the full-length amino acid sequence

**Table 1:** Represent the amino acid site in the full-length amino acid sequence

WHO label	Pangolineage <sup>a</sup>	GISAID clade	Nextstrain clade	Additional amino acid changes monitored <sup>b</sup>	Earliest documented samples	Date of designation
Alpha	B.1.1.7	GRY	20I (V1)	+S:484K +S:452R	United Kingdom, Sep 2020	18-Dec-2020
Beta	B.1.351	GH/50 1Y.V2	20H (V2)	+S:L18F	South Africa, May 2020	18-Dec-2020
Gamma	P.1	GR/50 1Y.V3	20J (V3)	+S:681H	Brazil, Nov 2020	11-Jan-2021
Delta	B.1.617. 2	G/478K.V1	21A, 21I, 21J	+S:417N +S:484K	India, Oct 2020	VOI: 4-Apr-2021 VOC: 11-May-2021
Omicron	B.1.1.529	GRA	21K, 21L	+R346K	Multiple countries Nov-2021	Vum: 24-Nov-2021 VOC: 26-Nov-2021



## Measures taken to deal pandemic and mutations of (SARS-CoV-2)

In the future, the following measures should be taken to meet the challenges associated with SARS-CoV-2 variants:

1. The monoclonal antibodies employed in the clinic should be tested again against the new variants. As a COVID-19 therapeutic agent, S protein-specific neutralizing antibodies can interact with the SARS-CoV-2 S protein to inhibit the virus from invading the human body. Monoclonal antibodies have been authorized for emergency use are Bamlanivimab plus estevimab and casirivimab plus imdevimab.
2. Vaccines under EUA may need to be updated periodically with respect to clinical efficacy against SARS-CoV-2 variants.
3. Implement more public health control strategies, such as wearing masks and social distancing. The effective implementation of public health control strategies by governments are decisive factors for decreasing viral transmission,
4. Efforts should be made to stop the spread of variant SARS-CoV-2 strains through international cooperation and by strengthening immigration quarantine. Experience and studies indicate that the rapid spread of COVID-19. Countries should strengthen their quarantine policies to reduce the risk of the cross-border transmission of SARS-CoV-2 variants.

## Conclusion

In summary, mutations of SARS-CoV-2 have presented new challenges to the prevention and treatment of COVID-19. Most COVID-19 vaccines that have been approved for emergency use are designed based on the S protein. Unfortunately, the mutation frequency of the S protein is very high. You should get a COVID-19 vaccination as soon as possible. Do not wait for a specific brand. All currently authorized and recommended COVID-19 vaccines are safe and effective. Continue to follow public health control strategies, such as wearing masks and social distancing even after getting vaccinated.

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