

Covid-19 vaccines – a marvel in healthcare innovation

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Editorial

COVID-19 (coronavirus disease 2019) is an illness produced by a virus named SARS-CoV-2 and was found in December 2019 in Wuhan, China. It most frequently causes respiratory side effects that can feel similar as a flu, cold and/or pneumonia. It is extremely infectious and has in no time spread all over the planet. Coronavirus might go after more than your lungs and respiratory framework. Different organs of your body may likewise be impacted by the infection. Covid caused the downfall of economy and the world, as we know it, leading into a long, gut-wrenching pandemic in modern history that would still take years, if not decades, to fully recover from. But fortunately, some leading pharmaceutical companies succeeded in coming up with timely and innovative vaccines, which led the world towards the light from the darkest era of pandemic.

Based on research from United States Centers for Disease Control and prevention (CDC), SARS-CoV-2 variant is the primary strain responsible for the spread of COVID-19. Pfizer-BioNTech and Moderna, the companies as well the names of the vaccines for Covid-19 use genetically engineered messenger RNA (mRNA) which is the key component to counter the protein responsible for breakdown of immune. The virus contains a spike like structure on its outer surface which is known as S protein. Now when mRNA vaccines get administered inside the human body, it guides human cells to generate a new S protein which is harmless. As a result, human muscle cells begin production of S protein strains and those spikes from the S protein, is evident on the cell surface. The immune system recognizes the new S shaped protein and will start building an immune response and new antibodies. As soon as this is recognized and the instruction is delivered, the mRNA will immediately break down leaving no trace in the body. Throughout this process, it never enters the nucleus of our cells, where the DNA lies, thereby keeping intact the structure of the DNA.

The other brand of vaccine, the Janssen/Johnson & Johnson vaccine is a vector vaccine. This vaccine uses the genetic material from the virus which is placed in a different (not SARS-CoV-2), but a live, weakened virus strain, such as an adenovirus. Now, this genetically implemented adenovirus will be used just to deliver the genetic material of the COVID-19 virus that gives the cells the instructions to make copies of the S protein. Once the immune system notices the S protein on cell surface, it will start creating antibodies for survival.

The other vaccine, Novavax COVID-19 uses a different method to counter the virus and is a protein subunit vaccine. Such sort of conjugated vaccine includes only those protein containing pieces of a virus that are capable enough to stimulate our immune system to prepare the antibody against the virus. Thus, this vaccine contains harmless S proteins which stimulates the antibodies production.

We all know that COVID-19 vaccines are a big boon to the humanity, especially considering the drastic effect it has had on the

lives of millions around the world, but the question that requires further pondering is that, is it a really a blessing? Since there was an urgent need for vaccination and immunization, the United States FDA (Food & Drug Administration) approved an emergency use with very less data than it ideally requires. Those emergency use approvals were authorized to Pfizer-BioNTech, Moderna, Janssen/Johnson & Johnson and Novavax. All these vaccines have different rate of effectiveness for different age groups and genders. There were some critical side-effects to these vaccines (Janssen/Johnson & Johnson vaccine) like blood clotting which could be life-threatening, which is why the FDA later had to restrict the use of this specific vaccine. There are so many questions and concerns out there about the vaccine's safety, such as...

- I. What are the possible adverse reactions after taking the vaccination?
- II. Are there any known long-term side effects of vaccine?
- III. Does the vaccine affect other body organs?
- IV. Can the same vaccine provide protection against the different variants, which are so prevalent these days?

In response to those concerns, there are some possible side effects noticed after taking the 1st and 2nd dose of the vaccines which involves body ache, fever, fatigue, nausea vomiting, swollen lymph nodes and many more. Most of the symptoms go away in few days, whereas many people have no side effect at all. Besides these two doses, the booster shot also have the similar kind of symptoms. Since the clinical trials for the vaccines had just started 2 years ago in summer 2020, there is no evidence of long-term side effect reported yet. It has also been reported that the vaccine affects heart in some cases – the number of myocarditis and pericarditis cases after taking mRNA vaccine hiked in males especially for the age group of 12 to 29. There are few research that have inclined that there could be more of these conditions with Novavax vaccine. Whereas some of those who have taken Janssen/Johnson & Johnson vaccine have reported Guillain-Barre Syndrome (GBS – a very rare autoimmune disorder in which

our body's immune system attacks our nerves and causes damage). These cases were noticed in men in the age group of 50-64.

While talking about the vaccine's level of protection against other variants, the Omicron variant is known to spread more rapidly but it's not as deadly as Delta variant. According to the CDC, "Omicron has a few major offshoots, including BA.5 and BA.2.12.1. BA.5 made up about 88% of COVID-19 infections that had genetic sequencing in the United States during a recent week in August 2022". CDC have recently downgraded Delta from the category of concerned variant to being monitored variant. Those who are already fully vaccinated have less chances of being affected by these variants, but that still does not mean one cannot get affected as proved by the recent positive cases of prominent public figures who had taken both doses as well as the booster shots.^{1,2}

Conclusion

So, in conclusion, there are few risk factors associated with the available vaccines, quite so for some specific age groups and genders, keeping in mind we still don't know if there will be any long-term consequences, but we must all agree that if this incredible innovation at a very crucial time had not been made, we may have lost many more of our friends and family and we very well may still be living in the dark, full of fear and socially distanced from one another. Besides the personal agony, it might have led to an even greater fall of world economy which is a completely different but very important aspect of everyone's lives.

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Conflicts of interest

The author declares there is no conflict of interest.

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