



A Review On Covid-19 Vaccines and its Hesitancy

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Received: 23-10-2021; Revised: 15-12-2021; Accepted: 21-12-2021; Published on: 15-01-2022.

ABSTRACT

The COVID-19 pandemic was caused by the virus namely Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2), has caused a substantial loss not only to human lives but also to public, healthcare systems and global economy. The vaccine development is the crucial process which helps to end the covid-19 pandemic. The preliminary data from trials shows that the covid-19 vaccine is safe as well as effective. However, the acceptance of the COVID-19 vaccine among the public depends on various factors. The primary aim of the study is to examine the factors that promote vaccine acceptance or hesitancy and strategies to overcome hesitation thereby to improve vaccine acceptance among public.

Keywords: COVID-19, coronavirus, vaccines, vaccine acceptance, vaccine hesitancy.

QUICK RESPONSE CODE →

DOI:
10.47583/ijpsrr.2022.v72i01.008



DOI link: <http://dx.doi.org/10.47583/ijpsrr.2022.v72i01.008>

INTRODUCTION

Corona virus (COVID-19) is one of the novel deadly viruses, which can affect both animals and humans. Many types of corona viruses are identified in humans, which causes extreme respiratory infections ranging from the common cold to more severe diseases like Severe Acute Respiratory Syndrome (SARS), Corona virus disease 2019 (COVID-19), and Middle East Respiratory Syndrome (MERS). SARS-CoV-2 has spread among the borders of roughly 200 countries, infecting about 150 million peoples and killing more than 3 million peoples¹. During initial phase of this pandemic the major objective was to prevent and decrease the transmission of virus from one person to another. The researchers from all over the world put efforts to end the pandemic by searching for novel treatment methods. The attempts to achieve herd immunity by getting exposed are unethical which leads to unnecessary infections, increased transmission rate and deaths also. Thus, vaccination is the only method to achieve herd immunity against covid-19 rather than getting contacted to the virus².

A vaccine is the most anticipated intervention and many of global R&D companies are worked on an accelerated pace to reduce deaths and transmission³. Several studies have found that many factors which influences the vaccine acceptance when a new vaccine was introduced⁴⁻⁶. This article provides understanding that factors that contribute

to less acceptance rates and that can be useful to prepare resolutions and encourage public to vaccinations and strengthen confidence among public. This will help in preventing further waves of covid-19 and thereby to end the pandemic.

COVID-19 VACCINES

As mentioned earlier, many companies are worked effortlessly to discover the vaccines. Generally, vaccine development and in specific covid-19 vaccine development is assumed to be a multi-stage process which is based on WHO guidelines for vaccine development. Good clinical practice (GCP), Good manufacturing practice (GMP) guidelines for pharmaceuticals and biological products are rigidly followed by vaccine developers⁷.

The vaccine development phase consists of 4 stage testing process which aids in better understanding of safety as well as efficacy of vaccines against covid-19. WHO's Emergency Use Listing (EUL) is a necessity for COVAX facility vaccine supply. The EUL evaluates the quality, safety and efficacy of vaccines and also the cold chain requirements⁸.

Types of covid-19 vaccines:

The main aim of vaccines is to prevent infections by developing body's own immune system against covid-19 without causing us to sick. There are different types of vaccines each one has specific genetic mechanism on their own. The ultimate aim is to improve our body defenses against the covid-19 virus. The body should develop immunity mechanism that helps in production of antibodies (T & B-lymphocytes) that knows how to deal against virus effectively in future. As of now there are major types of vaccines which are as follows:

- **Messenger RNA (mRNA) vaccines:** It consists of virus material which stimulates covid-19, that assists our



body cells by producing specific virus protein which is harmless. Once the cells are understand how to reproduce these specific proteins the genetic material was destructed and helps in production of T & B-lymphocytes which aids in preventing future infections. E.g. Moderna vaccine.

- **Vector vaccines:** In this type of vaccine, an altered genetic material of virus which was a bit different from covid-19 virus is used. It is used to produce more powerful and stable vaccines. It also develops immunity by above mentioned mechanism, which knows how to fight against covid-19 infections in future. E.g. covishield vaccine.

- **Covid-19 protein subunit vaccines:** Rather than whole virus, these vaccines contains harmless protein fragments of virus. It finds out the presence of protein in the similar way as mRNA does, that creates antibodies and defensive WBC's. If you infected against virus in future, the antibodies will fight against them. E.g. novavax vaccine^{9,10}

COVID-19 VACCINES IN INDIA

Indian government commenced the covid-19 vaccination campaign all over the country from January 16, 2021. As of 26 August 2021, Indian government successfully administered 60, 38, 46, 475 vaccine doses entirely, including first and second doses. The vaccines which got approval for emergency use in India are as follows:

Table 1. Vaccines available in India.

Brand Name	Vaccine type	Manufacturer of vaccine	Doses	Dose interval
Covishield (approved on 01 January 2021)	Vector (adenovirus) vaccine	Serum institute of India (in association with Oxford university, UK and Astrazeneca)	Two	12-16 weeks
Covaxin (approved on 03 January 2021)	Inactivated virus vaccine	Bharath Biotech (in association with ICMR, India)	Two	4-6 weeks
Sputnik V (approved on 12 April 2021)	Combined vector (adenovirus) vaccine	Dr. Reddy's Laboratories, India (vaccine developed by Gamaleya National Research Institute of Epidemiology and Microbiology, Russia)	Two	3 weeks
Moderna (approved on 29 June 2021)	mRNA vaccine	Moderna, in Cambridge, Massachusetts, and funded by the National Institute of Allergy and Infectious Diseases (NIAID), USA	Two*	4 weeks
Janssen COVID-19 (approved on 7 August 2021)	Viral vector vaccine	Janssen Pharmaceuticals Companies of Johnson & Johnson	One	-
ZyCoV-D (approved on 20 August 2021)	Plasmid DNA vaccine	Cadila Healthcare(Zydu Cadila), India (supported by the Department of Biotechnology, Government of India)	Three	2 nd dose-4weeks 3 rd dose-8 weeks ¹¹⁻¹⁶

*Third dose of vaccine required for some immunocompromised peoples.

There is totally six vaccines got approval for emergency use by Drug Controller General of India (DCGI) as of 26 August 2021. Covishield, covaxin and sputnik are currently used for vaccination and remaining vaccines are in progress.

Safety:

Potential vaccines undergo a rigorous testing process. Preclinical trials have been conducted. Human clinical trials are conducted in 3 phases to verify safety, adverse reactions, required doses and immunogenicity. All stages of trials must follow strict safety guidelines established by national regulatory agencies, giving priority to the safety of participants. After the vaccine is released, there is also post-market surveillance. This ensures that the vaccine meets similar safety, performance and quality parameters.

Contraindications to this vaccine include a history of drug / food allergies, fever, bleeding disorders, people taking blood thinners or anti-platelet drugs, people with weakened immune systems, pregnant women, and breast feeding mothers¹⁷.

Side effects:

Common side effects are pain or tenderness at the injection site, fatigue, headache, fever, body aches and nausea, which can be treated with adequate rest, hydration, good nutrition, acetaminophen (paracetamol) and a positive attitude. Some fatal side effects reported on covishield and janssen vaccines are blood clots called splanchnic vein thrombosis (SVT) and cerebral venous sinus thrombosis (CVST). In most patients currently identified, these clots



occur simultaneously with thrombocytopenia. Adverse Event Following Immunization (AEFI) data in India reported only 0.61 cases of coagulation and bleeding events per million covishield doses, so 28 days after vaccination is important to observe any abnormal side effects¹⁸.

SALIENT FEATURES

Here, we will discuss the three vaccines used in India, namely Covishield, Covaxin and Sputnik V. As of now, they have been used in people over 18 years of age.

- ✓ One vaccine is not superior to the other vaccine and should be administered according to availability.
- ✓ The vaccine can be given to patients with heart diseases, cancer, organ transplantation and immunocompromised individuals. There are no contraindications unless the patient has previously experienced severe anaphylaxis to any of the vaccine components or is currently undergoing treatment for an acute disease that necessitates hospitalization. In that situation, a 4-to-8-week interval should be observed post discharge.
- ✓ According to the National Technical Advisory Group on Vaccination's most recent recommendation, pregnant women should be thoroughly informed about the risks and hazards of covid-19 throughout pregnancy, and they can be safely provided the vaccine after consent.
- ✓ The active natural immunity in the body lasts for 3 to 6 months after a covid-19 infection. The most recent recommendation is to get vaccinated after 3 months of RTPCR positivity. It's also crucial to get vaccinated after infection since mutant variants of the virus pose a significant risk of re-infection. This is why a booster dose is needed later.
- ✓ Vaccination provides comprehensive protection for 9 to 12 months, with the second dose providing complete protection after 2 to 3 weeks. However, vaccines do not provide sterile immunity but offers protection against major illnesses, complications, and death.
- ✓ Blood donation need to be done 3 months after vaccination.

VACCINE HESITANCY

Vaccination hesitancy refers to the delay or refusal of vaccination despite the availability of vaccination services; it is complex and environment-specific, and varies with time, location, and type of vaccine, including factors such as compliance, convenience, and trust¹⁹. Vaccine hesitancy among public plays a major role in deficit in covid-19 vaccination rates²⁰. The significant percent of population are more hesitant to the vaccines, the pandemic persists all over the world²¹. This global rise in hesitancy rates are linked with political misinformation that directly related with raised social media usage among public²². Vaccine acceptance varies based on the trust levels in government

information sources²³. Any factor that probably decreases the trust in government data concerning vaccines that probably maximizes the covid-19 related influences in affected communities. Many studies have found that various factors influences the rate of vaccine acceptance when vaccine is newly introduced²⁴⁻²⁶. Vaccine hesitancy is an oldest phenomenon which causes threats to public health, specifically during outbreaks of infectious diseases (e.g. H1N1, measles, pertussis etc). The accelerated production of covid-19 vaccines which are safe as well as effective is truly prominent. At the same time, covid-19 vaccine hesitancy is usually the main restrictive measure to curb the negative health and socio-economic impact of the current pandemic. To contain and flatten the global covid-19 case curve, we must understand that high vaccine coverage is necessary at the community level. Vaccine hesitancy will affect people who refuse to be vaccinated and the entire population, posing a great challenge to reach the threshold of immunity to covid-19. The results of the 2009 H1N1 influenza pandemic were not satisfactory. The acceptance rate of the vaccine in different countries was very low, between 17% and 67%²⁷. It was one of the first examples of public assistance concerning vaccines against the evolving pandemic.

Reasons for vaccine hesitancy:

- Past experiences with vaccines and relationship with healthcare providers.
- Concerns regarding safety of vaccines, side effects, or toxic effects, and low quality of vaccine constituents.
- Lack of vaccine information sources and the influences of anti-vaccine supporters.
- Suspecting healthcare providers, authorities, government resources, pharmaceutical industries and research, and uncertainty about vaccine manufacturing processes.
- Religious beliefs regarding vaccination.
- Perceptions of low efficacy and high risk regarding vaccines.
- Inconvenience.
- Impact of social media on spreading false information.
- Cost of vaccines in private hospitals.
- Willingness to lead a natural and traditional lifestyle.
- Fear of taking any injections²⁸⁻³³.

The additional concerns regarding covid-19 vaccines are as follows,

- Speedy development of vaccines.
- Doubts about unforeseen negative impacts in future.
- Liking for natural immunity.
- Thinking of pharmaceutical company's business to take vaccine.



- Novel development of vaccines like mRNA and adenovirus based vaccines.

Table 2. Factors influencing vaccine hesitancy

Ecological factor/ External factors	<ul style="list-style-type: none"> • Social norms • Politics • Mass media and social media • Public-healthcare provider relationship • Cultural perspectives regarding health
Vaccine related factors	<ul style="list-style-type: none"> • Safety about vaccine • Efficacy about vaccine • Perceptions about disease vulnerability • Vaccine cost • Availability of vaccines
Individuals related factors	<ul style="list-style-type: none"> • Knowledge about vaccines • Attitudes about vaccines • Education • Income • Past vaccine experiences³⁴⁻³⁶

Vaccine hesitancy and healthcare professionals:

The suggestions and advice from the healthcare professionals is the most common way to change the minds of vaccine-hesitant to vaccinate, and is one of the strongest predictors of vaccination acceptance^{37,38}. On the contrary, people cited the lack of recommendations from general practitioners as a reason for hesitation³⁹.

To properly address the problem of vaccine hesitancy, the healthcare professionals need to understand the factors that cause vaccine hesitancy and how to support patients in the decision-making process to guide them to receive the vaccine and build confidence among them. Since vaccination hesitancy is highly variable and varies from case to case, the patient's concerns must be determined to provide relevant and reliable information. Although the lack of information doesn't correspond with vaccine hesitancy, many patients will seek information and assurance from the healthcare professionals⁴⁰.

They must report, educate, and correct vaccine-related doubts asked by patients; however, care must be taken not to burden the patients with technical information that may be forgotten. Strong risk denial also increases the perceived risk of vaccination⁴¹. They must be careful not to repeat the myth of the vaccine to patients. They can also promote the fact that they have been vaccinated (for example, put a label "I have been vaccinated against COVID-19" on their clothing), which can start a conversation and show their confidence in the vaccine.

STRATEGIES TO IMPROVE VACCINE ACCEPTANCE:

The public's willingness to accept the COVID19 vaccine depends on their knowledge and perception of the vaccine. The accelerated development of vaccines may exacerbate public concerns and negative attitudes. The knowledge of vaccines and their acceptance depends on several factors. The following are the ways to improve vaccine acceptance,

- Governments and local authorities should be actively involved in social media to provide correct information while alleviating concerns about vaccine-related issues (such as safety and efficacy). They must also try to solve community problems such as false beliefs, lack of knowledge and mistrust.
- To develop communication channels and provide reliable information about vaccines and aware the people about benefits of vaccine.
- Build trust and support medical staff to make vaccination decisions and recommend them to patients.
- Local and community leaders, celebrities and public figures sharing the right information can encourage the public to receive the vaccine as soon as possible.
- Intervention education programs for those who are hesitant to vaccines and most vulnerable to false information are important.
- If more research confirms the safety and efficacy of the COVID-19 vaccine, especially for the novel corona virus and its mutants, and if such information is provided through a centralized information source, many of the public's concerns about the vaccine may be resolved.
- Provide emotional support to hesitant by saying "I know there is uncertainty, but this disease is terrible. I have been vaccinated (or plan to vaccinate), and I want this for my family, and I hope you do too"⁴².
- More research is needed to understand the factors that leads to vaccine hesitancy which helps government to develop more effective strategies on implementing public vaccination campaigns⁴³.

CONCLUSION

Several vaccine controversies have come all over the world in past 30 years. In 1980's from the accusations that pertussis vaccine causes seizures, mental defects, and brain damage. In late 1990's there is relation between autism and MMR vaccine. In 2010's there is relation between adverse events and HPV vaccine⁴⁴. Resistance to vaccination has always existed, but these controversies and the outbreak of vaccine-preventable disease in unvaccinated or under vaccinated groups have sensitized public health authorities that the vaccine cannot be widely accepted. Many studies



about safety and efficacy of vaccines should be needed to clear the fear among public. As mentioned in the review, several factors influencing vaccine hesitancy is the major problem. Increasing rate of vaccine hesitancy is an important concern which resulted in developing new strategies to improve vaccine acceptance. At last, the health care professional's role is vital in successful vaccination programs and further research is required to understand why some peoples in health care sector have still doubts considering safety and efficacy of vaccines. As earlier all people take vaccination, earlier the pandemic will end all over the world.

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Source of Support: The author(s) received no financial support for the research, authorship, and/or publication of this article.

Conflict of Interest: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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