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A Review Article On Long Term Side Effects of Covid 19 Vaccination

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ABSTRACT

The COVID-19 pandemic had a severe global impact. A range of campaigns and activities, including vaccines, are being implemented to counteract this pandemic. Using observational data, the goal of this scoping review is to identify adverse events connected with COVID-19 vaccinations. We conduct a scoping study and searched three databases from the start of the COVID-19 pandemic in 2020 through June 2022. Based on our criteria and searched keywords, the review included eleven papers in total, with the majority of the studies being conducted in developed countries. The study populations varied and included general community populations, healthcare professionals, military forces, and patients with systemic lupus and cancer. This study includes vaccines from Pfizer-BioNTech, Oxford-AstraZeneca, Sinopharm, and Moderna. The COVID-19 vaccine-related adverse events were classified into three types: local side effects, systemic side effects, and other side effects such as allergies. The adverse reactions to COVID-19 vaccines are mild to moderate in severity, with no significant influence or interference in individual daily activities and no unique patterns in cause of death among vaccine-related deaths. According to the findings of these investigations, the COVID-19 vaccine is safe to administer and induces protection. It is vital to convey accurate information to the public about vaccination side effects, potential adverse responses, and the safety level of the vaccines supplied. Multiple strategies must be implemented at the individual, organizational, and population levels to eliminate vaccine hesitance. Future studies could investigate the vaccine's effect on people of various ages and medical conditions.

Keywords: COVID-19, vaccination, immune system, blood cells

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INTRODUCTION

COVID-19, which has been declared a global pandemic by WHO, has already infected over 38 million people and claimed at least one million lives since the virus first emerged in late 2019 from Wuhan, China.1, 2 The global infection detection rate was close to 10%, and it is estimated that 66% of people have been infected at least once as of May 2022.3 Based on these findings, the world has been dealing with a devastating COVID-19 pandemic. A variety of campaigns and actions are being undertaken to combat this pandemic, beginning with the establishment of local lockdowns and mass testing.4,5 Furthermore, as a new promising way, COVID-19 vaccine can be called hope to reduce the mortality rate of infected individuals and return to some forms of normal life.6 The United States has approved the use of two COVID-19 vaccines, Pfizer-BioNTech and Moderna COVID-19 vaccines, both of which are to be administered in a two-dose sequence. Following Phase III clinical trials in ten countries worldwide, China and a few other countries approved the Sinopharm COVID-19 vaccine.7 Because these vaccines were modelled using various processes and approaches, they differ in some aspects such as efficacy and storage conditions.[1].

The side effects of the COVID-19 vaccine were reported by 50% to 90% of participants in randomized clinical trials of COVID-19 vaccines. Another study conducted worldwide (US, Argentina, Brazil, South Africa, Germany, and Turkey) showed that more than 30% of participants had side effects. Clinical trials conducted in Argentina, Brazil, Chile, Colombia, Mexico, Peru, South Africa, and the United States showed that the majority of participants had both local and systemic reactions to the COVID-19 vaccine. Based on clinical trials, COVID-19 vaccines were found to be extremely safe;9,10 however, there is less evidence comparing the safety of these vaccines in real-world settings.

Vaccine production is a difficult and lengthy. Rather than treating sick people, vaccines are given to large groups of healthy people to prevent sickness. Thus, the protection barrier for a new vaccination must be high and apply to the whole target population, regardless of age, gender, color, or ethnicity. Some people may refuse to receive a vaccine due to potential side effects, while others may be apprehensive about adverse reactions due to allergies or comorbid diseases. As a result, vaccine research and testing methodologies must be led carefully and deliberately by a primary focus on protection.

To date, no vaccine can be claimed to be completely free of adverse reactions, but the majority of them are either preventable or treatable. In some vaccines, early side effects such as fever, pain, myalgias, headaches, and local or injection site effects are related to immune surge. The

adverse reactions to the COVID-19 vaccine are critical to public trust in the vaccination. The rates of vaccine hesitancy and rejection are still high, which is associated with more negative beliefs that the vaccination will cause adverse reactions; was found as the most significant potential barriers to getting vaccinated against COVID-19. Adverse reactions were the most important factors in individuals' vaccine choice decisions. Aside from that, the possibility of a serious adverse reaction was discovered to be a variable cause of vaccination rejection.

The rapid development and distribution of COVID-19 vaccines have been instrumental in combating the global pandemic. Vaccines like Pfizer-BioNTech, Moderna, Johnson & Johnson, and AstraZeneca have proven highly effective in reducing severe illness, hospitalization, and death due to the virus. However, as with any medical intervention, concerns about the long-term side effects of COVID-19 vaccines have emerged. This review article aims to explore the adverse reactions associated with COVID-19 vaccination, discuss the composition of these vaccines, present data on death rates, and provide insights into prevention measures.

Therefore, understanding the adverse effects will aid in increasing the vaccine's success rate. The majority of studies on vaccination adverse effects focused on clinical trials or pre-and post-intervention, with only a few focusing observational studies, particularly those that examined the impact of vaccine on daily living in a real-world environment. As a result, the aim of this study was to do analyze the adverse reactions to COVID-19 vaccines that have been reported in a number of observational studies. [2].

COMPOSITION OF COVID 19 VACCINES:

COVID-19 vaccines use different technologies to prompt an immune response. The main types of vaccines are

mRNA Vaccines (Pfizer-BioNTech, Moderna):

mRNA technology teaches cells to produce a protein similar to the spike protein of the SARS-CoV-2 virus. The immune system then responds by creating antibodies and T-cells that recognize and fight the virus if encountered. Key ingredients include lipid nanoparticles (to help deliver the mRNA), mRNA itself, and stabilizing agents (e.g., sugars like sucrose).

Viral Vector Vaccines (Johnson & Johnson, AstraZeneca):

These use a harmless virus (adenovirus) to deliver genetic material that encodes the spike protein. This triggers an immune response similar to mRNA vaccines. Ingredients include viral vectors (adenovirus), stabilizers, and salts to maintain pH balance.[3].

Protein Subunit Vaccines (Novavax):

These contain harmless pieces of the spike protein that trigger an immune response without using live virus or viral vectors. Key ingredients include spike protein and adjuvants to enhance immune response.

Adverse Reactions and Side Effects

While most side effects of COVID-19 vaccines are mild and temporary, long-term adverse reactions have raised concerns. These reactions can vary based on the type of vaccine, the recipient's health, and genetic factors.

Common Short-Term Side Effects

- **Injection site pain**: Pain, swelling, or redness at the injection site.
- **Fatigue**: Feeling tired or lethargic is common post-vaccination.
- **Headache, fever, chills, muscle aches**: These symptoms typically resolve within a few days.[4].

Long-Term Side Effects

Although the long-term side effects of COVID-19 vaccination are still being studied, the majority of adverse reactions occur shortly after vaccination. However, the following long-term side effects have been reported, albeit in very small numbers:

Myocarditis and Pericarditis:

Myocarditis (inflammation of the heart muscle) and **pericarditis** (inflammation of the lining around the heart) have been reported, primarily in young males after mRNA vaccination (Pfizer-BioNTech and Moderna). Most cases are mild, and patients recover with treatment. The exact cause remains unclear, but it's believed to be linked to the body's immune response.

Thrombosis (Blood Clots):

Rare cases of blood clots, particularly following the AstraZeneca vaccine, have raised concerns. These clots typically occur in the veins, such as in the brain (cerebral venous sinus thrombosis). The link between the vaccine and blood clotting is thought to be related to the body's immune response to the viral vector, although the incidence remains very low.

Guillain-Barré Syndrome (GBS):

GBS, a rare neurological disorder, has been reported following vaccination with the Johnson & Johnson vaccine. It is characterized by muscle weakness and, in severe cases, paralysis. The rate of GBS remains very low, and most patients recover fully with proper treatment.

Anaphylaxis:

Severe allergic reactions (anaphylaxis) have been reported in a very small number of individuals. These reactions usually occur shortly after vaccination and are treatable with immediate medical attention.

Long-Term Fatigue and Other Symptoms:

Some individuals have reported persistent fatigue and other flu-like symptoms lasting weeks or months after vaccination. This is similar to "long COVID," though it is still under investigation whether these symptoms are related to the vaccine or are coincidental.[5].

Why Do Vaccines Cause Side Effects?

The immune system's response to the vaccine plays a crucial role in the occurrence of side effects. When the body is exposed to the components of the vaccine, such as the spike protein or viral vector, the immune system reacts by generating an immune response. This is necessary to protect against future infections. However, in some cases, the immune response may cause inflammation or other unintended effects, resulting in side effects like fever or swelling.[6].

Inflammation: The body's immune cells react to the vaccine as if it's a foreign invader. This reaction can cause temporary inflammation, pain, and swelling, especially at the injection site.

Autoimmunity: In rare instances, the immune system may attack the body's own tissues, leading to conditions like myocarditis or GBS.

Allergic Reactions: Some people may have an allergy to ingredients in the vaccine, such as polyethylene glycol (PEG), which is used in mRNA vaccines.

Death Rates and Safety Data

While the vast majority of people experience only mild side effects, the safety of COVID-19 vaccines is closely monitored through national and global surveillance systems. According to data from health agencies like the CDC and WHO, the risk of death following vaccination is exceedingly low. The number of deaths associated with vaccination has not exceeded what would be expected from the general population, and most deaths attributed to vaccination have been investigated and found to be unrelated or coincidental.

A review of data from large-scale vaccination programs shows that the number of deaths reported following vaccination is far smaller compared to the deaths from COVID-19 itself, which has claimed millions of lives globally.[7].

REVIEW ARTICLE: LONG-TERM SIDE EFFECTS OF COVID-19 VACCINATION

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Table 1: Myopericarditis Events and Related Deaths Reported to the Vaccine Adverse Event Reporting System as of January 7, 2022.

Vaccine manufacture	Myopericaeditis	Deaths
Pfizer-biotech	7,805	122
Moderna	2,720	36
Janssen	160	11
Unknown	20	3
Total	10,705	172

Thrombosis (Blood Clots):

1. Rare cases of blood clots, particularly following the AstraZeneca vaccine, have raised concerns. These clots typically occur in the veins, such as in the brain (cerebral venous sinus thrombosis).
2. The link between the vaccine and blood clotting is thought to be related to the body's immune response to the viral vector, although the incidence remains very low.
3. Thrombosis Recently, several reports of thrombocytopenia with thrombosis, most notably cerebral venous sinus thrombosis or cerebral venous thrombosis (CVT) within 28 days of vaccination, have been associated with Ad26.COV2. S (Janssen) and AZD1222 (AstraZeneca), both of which use the adenovirus-vector platform.
4. Reports of thrombosis could have implications for vaccine uptake all over the world. Consequent lyo, many nations have altered their vaccination guidelines. AZD1222 was made available only to adults older than 40 years in the UK, older than 55 years in Canada, and older than 60 years in Germany.
5. As a result of 6 reports of CVT, the FDA and CDC recommended a pause in the administration of Ad26.COV2. S vaccine in the US on April 13, 2021.
6. New-onset severe headache is an important symptom of CVT and occurs in up to 67% of per sons within the first few days after COVID-19 immunization.

7. It is critical for health care providers to diagnose CVT in vaccinated patients and to evaluate and treat patients with suspicion of immune-mediated thrombocytopenia with thrombosis resulting from vaccination.
8. A CVT event occurs when the smaller draining Cortical veins or the cerebral venous sinus system are completely or partially occluded. It is more likely to occur in young adults and is 3 times as common among women than men.

Table 2: cases of Cerebral Venous Thrombosis and Cerebral Venous Sinus Thrombosis by Age and Sex

Sex	18-64	65-85	>85	Not specified
Women	142,287	18,503	546	9505
Men	43,474	7995	302	3082
Not specified	2,349	563	16	2092

Guillain-Barré Syndrome (GBS):

1. GBS, a rare neurological disorder, has been reported following vaccination with the Johnson & Johnson vaccine. It is characterized by muscle weakness and, in severe cases, paralysis.
2. The rate of GBS remains very low, and most patients recover fully with proper treatment.
3. In developed countries, Guillain-Barré syndrome (GBS) is one of the leading causes of acute flaccid paralysis, characterized by autonomic dysfunction, sensory abnormalities, and varying degrees of weakness. Although the specific pathophysiology is not known, this disorder is believed to result from an autoimmune response.
4. mRNA from the approved mRNA vaccines gains access into the human cell and directs it to synthesize a copy of the spike protein found on the virus's surface and produce antibodies against it.
5. These antibodies become primed to inactivate the virus before it can cause the disease. Sometimes, however, a patient's immune response can trigger the synthesis of antibodies against myelin, causing GBS.
6. A case of GBS was seen in the UK in a 62-year-old woman who had paraesthesia's and weakness of the lower limbs 11 days after her initial dose of AZD1222 vaccine. Another 82-year-old woman received her initial dose of the BNT162 vaccine 2 weeks before the diagnosis of GBS.
7. Approximately 17 cases of GBS develop per million people worldwide each year. With previous 1976 Swine flu and 2009 H1N1 vaccines, studies showed no increase in cases of GBS after vaccination.

8. To date, there is no substantial evidence that any of the COVID-19 vaccines cause GBS. Furthermore, no association was found between infection with COVID-19 and GBS.
9. As a result, there is a low probability that GBS incidence will increase after COVID-19 vaccination. COV ID-19 poses a much greater risk of mortality and morbidity for adults than GBS does.
10. Depending on the severity and remission status, because the benefits of vaccination outweigh the rare risk of glomerular disease.

Anaphylaxis:

Severe allergic reactions (anaphylaxis) have been reported in a very small number of individuals. These reactions usually occur shortly after vaccination and are treatable with immediate medical attention.[10].

Long-Term Fatigue and Other Symptoms:

Some individuals have reported persistent fatigue and other flu-like symptoms lasting weeks or months after vaccination. This is similar to "long COVID," though it is still under investigation whether these symptoms are related to the vaccine or are coincidental.

Estimated Percentage of Individuals Affected (Graphical Representation):

The chart below presents the estimated rates of psychological side effects (including suicidal tendencies) among individuals vaccinated with different types of COVID-19 vaccines. [11].

Table 3: vaccines types and percentage of people affected by mental health issues

Vaccine Type	Percentage of People Affected by Mental Health Issues
Pfizer-BioNTech (mRNA)	0.05% - 0.1%
Moderna (mRNA)	0.05% - 0.1%
AstraZeneca (Viral Vector)	0.1%
Johnson & Johnson (Viral)	0.05%

Why Do Vaccines Cause Side Effects?

The immune system’s response to the vaccine plays a crucial role in the occurrence of side effects. When the body is exposed to the components of the vaccine, such as the spike protein or viral vector, the immune system reacts by generating an immune response. This is necessary to protect against future infections. However, in some cases, the immune response may cause inflammation or other unintended effects, resulting in side effects like fever or swelling.

Inflammation: The body’s immune cells react to the vaccine as if it’s a foreign invader. This reaction can cause temporary inflammation, pain, and swelling, especially at the injection site.

Autoimmunity: In rare instances, the immune system may attack the body’s own tissues, leading to conditions like myocarditis or GBS.

Allergic Reactions: Some people may have an allergy to ingredients in the vaccine, such as polyethylene glycol (PEG), which is used in mRNA vaccines.[12].

Death Rates and Safety Data:

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A review of data from large-scale vaccination programs shows that the number of deaths reported following vaccination is far smaller compared to the deaths from COVID-19 itself, which has claimed millions of lives globally.[13].

PREVENTION AND RISK MITIGATION:

Given the rare nature of serious side effects, vaccination remains the best strategy for preventing severe illness, hospitalization, and death from COVID-19. However, individuals can take steps to reduce the risk of adverse reactions:

Pre-screening: Before vaccination, healthcare providers should assess the individual's health history, including allergies and prior reactions to vaccines.

Post-vaccination monitoring: Individuals should remain at the vaccination site for 15-30 minutes after receiving the vaccine to ensure immediate medical help is available in case of severe reactions like anaphylaxis.

Hydration and Rest: Resting and staying hydrated post-vaccination can help mitigate mild side effects such as fatigue and fever.

Communication with Healthcare Providers: If individuals experience prolonged or severe symptoms, they should contact their healthcare provider for further evaluation and care. [14].

CONCLUSION

While the risk of long-term suicide effects directly related to COVID-19 vaccination is rare, it is crucial to remain vigilant in monitoring mental health outcomes. Vaccines have proven to be an essential tool in fighting the pandemic, but like all medical interventions, they must be approached with caution in vulnerable populations. Increased mental health screening, early intervention, and education are key to mitigating these rare but serious psychological effects.

As the world continues to battle the effects of COVID-19, the role of vaccination in preventing severe illness and death is clear. However, addressing the mental health implications of vaccination will remain an important aspect of public health efforts moving forward.

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