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The impact of vaccination on COVID-19

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Abstract

The coronavirus disease 2019 (COVID-19) pandemic caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) became a challenge globally by affecting millions of people worldwide. COVID-19 vaccination is an effective option to stop disease outbreak. COVID-19 vaccines are fully approved or currently authorized for use through Emergency Use Authorization (EUA) from the Food and Drug Administration (FAD) are essential for controlling the COVID-19 pandemic. Despite COVID-19 vaccines are effective, some fully vaccinated persons can be infected with SARS-CoV-2 called breakthrough infection. Observing COVID-19 results in populations by vaccination status is simplified through dependable correlation of COVID-19 case surveillance and vaccination data. The incidence of SARS-CoV-2 infection, hospitalization, and death is elevated in unvaccinated than vaccinated persons, and the incidence rate ratios are related to vaccine effectiveness. We conducted a retrospective analysis of medical reports of 169 patients with confirmed COVID-19. We assessed vaccine effectiveness against COVID-19 and against hospitalization with COVID-19 in the Infectious Disease, AIDS and Clinical Immunology Research Centre, Georgia from from April 1 through October 31, 2021. Our study indicates the vaccine effectiveness against COVID-19. Hospitalization rate were

higher in unvaccinated patients compared with vaccinated patients. Vaccination is considered to be one of the most important advances in public health. There are many people who are not vaccinated. It is important to create the awareness about COVID-19 vaccines and educate people about the importance of vaccine and its effectiveness.

KEYWORDS: COVID-19; MRNA vaccine; vaccine breakthrough infection; vaccine effectiveness; hospitalization

Introduction

Coronaviruses are RNA viruses, which can cause mild and severe diseases. Mild diseases like common cold and severe disease like SARS, MERS and COVID-19. Coronavirus is a zoonotic disease. It is transmitted from animal to human. It is possible to be transmitted from human to human. COVID-19 is transmitted by respiratory droplets and direct contact. The Most people are infected by direct contact with symptomatic patients. In closed environment person might get infected through the airborne. SARS-CoV-2 can survive some days in an environment, 30 minutes on 56ºC and 5 minutes on 70ºC.Virus is sensitive on UV and high temperature. It is inactivated by disinfection liquids (natrium hypochlorite, 75% ethanol and so on). SARS-CoV-2 is using transmembrane ACE-2 receptor to enter in to the cell. The Incubation period is 1-14 days, mostly 4-7 days. Course of COVID-19 might be Mild, Moderate or Severe. Asymptomatic and subclinical forms of disease also exist. Sever infection includes sever atypical pneumonia, acute respiratory distress syndrome, sepsis and septic shock.

To prevent outbreak it is important to get vaccination. Vaccines direct our immune system to identify the targeted virus and produce antibodies to fight off the disease without getting the disease. After vaccination, the body is prepared to fight the virus when exposed to it and prevents illness. There are several COVID-19 vaccines authenticated for use by WHO. The first mass vaccination programme was started in early December 2020. As of 26 November 2021, the following vaccines have obtained WHO Emergecy Use Listing (EUL):

- The Pfizer/BioNTech Comirnaty, 31 December 2020.
- The SII/COVISHIELD and AstraZeneca/AZD1222 vaccines, 16 February 2021.
- The Janssen/Ad26.COV 2.S developed by Johnson & Johnson, 12 March 2021.
- The Moderna COVID-19 vaccine (mRNA 1273), 30 April 2021.
- The Sinopharm COVID-19 vaccine, 7 May 2021.

- The Sinovac-CoronaVac, 1 June 2021.
- The Bharat Biotech BBV152 COVAXIN vaccine, 3 November 2021.

A modern take is that, inactivated or weakened virus vaccines, are vaccines in which inactivated or weakened virus has been used so that it generates immune response and doesn't cause disease

Protein-based vaccines, are harmless fragments of proteins or protein shells that imitate the COVID-19 virus to efficiently generate an immune response.

Viral vector vaccines, in this type of vaccine we use a safe virus that doesn't cause disease but produces coronavirus proteins to activate an immune response.

RNA and DNA vaccines, is a cutting-edge approach that uses genetically engineered RNA or DNA to generate a protein that itself safely prompts an immune response.

WHO-authorized COVID-19 vaccines are safe to get for most people of 18 years and older, including those with hypertension, diabetes, asthma, pulmonary, liver and kidney disease, as well as chronic infections that are stable and controlled. Both Moderna and Pfizer vaccines are approved for use in children from 12 years of age. For a single dose vaccine, immunity will occur two weeks after vaccination. For two-dose vaccines, both doses are needed to attain the highest level of immunity. Getting vaccination could save lives. COVID-19 vaccines provide strong protection against serious illness, hospitalization and death. There are some evidence says being vaccinated will make it less likely to pass the virus on to others. Even after getting vaccinated, we have to take precautions to protect ourselves, family, friends and anyone else we may come into contact with. While COVID-19 vaccines are highly effective against serious illness, hospitalization and death, no vaccine is 100% effective. As a outcome, a few vaccinated people may get infected and fall ill with COVID-19 despite being fully vaccinated is called as a 'breakthrough infection' or 'breakthrough case'. With more contagious variants such as Delta, we are seeing more breakthrough infections and cases. Breakthrough infections can occur with every vaccine, and it doesn't mean that the vaccines do not work. According to data from the US CDC, unvaccinated individuals have 11 times increased risk of death from COVID-19 than vaccinated people. People who get COVID-19 after being vaccinated are likely to experience mild symptoms, effectiveness against serious illness and death remains high.

Breakthrough cases are the number of breakthrough infections that takes place in fully vaccinated people (at least after 14 days of their final COVID-19 vaccine dose). Unvaccinated cases are the number of cases that takes place in not fully vaccinated people including the cases of people who have got only one dose of the vaccine, or for whom 14 days have not passed between the last dose of their vaccine series and their positive test.

Materials and Methods

We used data of 169 patients in Georgia to assess the effectiveness of the vaccines among vaccinated and unvaccinated patients. We compared cohorts defined according to vaccine received; age, with age-specific unvaccinated cohorts by linking testing, hospital, and vaccine registry databases. This retrospective study analyzed medical records including clinical manifestation, comorbidities, laboratory data, treatment, and disease outcome. We assessed vaccine effectiveness against COVID-19 and against hospitalization with COVID-19 from April 1 through October 31, 2021.

Results

Our results you can see in table 1 and table 2.

Table 1. *Number of COVID-19 cases among vaccinated and unvaccinated individuals, by selected characteristics and vaccination status, Georgia, April 1 – October 31, 2021*

CHARACTERISTICS	Vaccination Status		
	Total	Fully Vaccinated	Unvaccinated
Total no. of cases	169	71	98
SEX			
Female	66	18	48
Male	103	53	50
Age groups, years			
3-12 years	6	-	-
18-91 years	163	71	98
Required oxygen	19	-	19

Table 2. *Investigated laboratory parameters in a group of vaccinated and unvaccinated individuals*

Laboratory values	Vaccinated	Unvaccinated	Normal values
AST	40.6	186.5	<41 M <30 F
ALT	31.8	102.3	<41 M <30 F
GTT	48	442	<49 U/L M <32 U/L F
D-dimer	0.511	0.857	<0.5 µg/ml
CRP	11	14.4	<6 mg/L
IL-6	96.41	111.99	<7pg/ml
LLD	221	699	207-414 U/L
Lactate	1.9	2.6	0.7-2.5

Conclusion

Our study indicates the vaccine effectiveness against COVID-19. Hospitalization rate were higher in unvaccinated patients compared with vaccinated patients. Vaccination is considered to be one of the most important advances in public health. There are many people who are not vaccinated. It is important to create the awareness about COVID-19 vaccines and educate people about the importance of vaccine and it's effectiveness.

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