Clinical Spectrum of COVID-19 Patients after Vaccination

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ABSTRACT

Objective: To examine the clinical severity and magnitude of COVID-19 patients after the second dose of the COVID-19 vaccine.

Study Design: Cross-sectional study.

Place and Duration of Study: Tertiary Care Hospital, Islamabad Pakistan, from Feb to Jun 2021.

Methodology: The individuals who had two doses of the vaccine (dead inactivated- Vero Cell) and got COVID-19 at least two weeks after vaccination were included in the study. These patients were divided into Mild, Moderate and Severe categories based on their symptoms and Investigations.

Results: Out of 5000 individuals vaccinated, 225(4.5%) got infected with COVID-19 later. Among these 225, 172(76.4%) had mild symptoms and recovered, with only 1(0.4%) death was reported.

Conclusion: COVID-19 vaccination does not infer 100% immunity, but if someone gets infected with COVID after vaccination, there are remarkable chances of recovery.

Keywords: COVID-19 vaccine, Post-vaccine infection, Severe disease.

INTRODUCTION

The COVID-19 vaccination programme started in December 2020 in several Countries.[1,2] Different types of vaccines with different modes of action were used, and the government of Pakistan also planned to vaccinate 70% of the country's adult population to achieve herd immunity 6 to counter the COVID-19 pandemic.[3,4] The vaccination programme got off to a shaky start in Pakistan as it encountered several setbacks, such as supply, logistics, misinformation and myths.[5,6] However, this programme has gained momentum recently, with more than 12 million people being fully vaccinated. High-risk groups were the first to get the vaccination per the protocol to control this epidemic.[7] We conducted this study to see the clinical spectrum of disease in patients infected with COVID-19 after vaccination.

METHODOLOGY

This cross-sectional study was conducted at a Tertiary Care Hospital, Islamabad Pakistan, from February to June 2021. Patients from the Department of Medicine after permission from the Ethical Committee and Research Department. (The IERB approval certificate number is IH/75993/3/P-2) were enrolled. Sample size was calculated through an online calculator.[8]

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Inclusion Criteria: Individuals who were 30 years & above after getting two doses of vaccine (dead inactivated- Vero cell) and were infected with COVID-19 at least two weeks after the second dose of vaccine were included in the study.

Exclusion Criteria: Patients who were infected with COVID-19 after a single dose of vaccine and those developing symptoms of fever, fatigue, nasal obstruction, runny nose, pharyngeal pain, myalgias, diarrhoea, shortness of breath, dyspnea, loss of sense of smell, taste or any neurological thromboembolic symptoms within 14 days after the second dose of vaccination were also excluded from the study.

Written informed consent was obtained from all the participants of the study. The study sample was approached through a consecutive sampling technique.

SARS-CoV-2 RT-PCR was done for all suspected cases. Both nasopharyngeal and oral samples were taken and evaluated by a pathologist. Viral pneumonia has been found among the samples of COVID-19 patients. In some studies, pneumonia was present in 100% symptomatic patients and even in half of the asymptomatic patients. HRCT Chest was also conducted. All CT scans were done with 64 section scanners without using contrast and were reported by two consultant radiologists. Fatal outcomes of COVID-19 cases are accompanied by cytokine release syndrome, of which ferritin, D-Dimers, CRP, and LDH levels are

key mediators. We checked all these biomarkers of the patients included in this study. Data regarding symptoms like fever, myalgias, diarrhoea, cough, shortness of breath and loss of smell and taste were collected using a premade proforma. Table-I showed the classification of the disease into three categories; mild, moderate, and severe, based on clinical symptoms, oxygen saturation, and HRCT score.

Table-I: Classification of Adult Cases with COVID-19

Classification	Characteristics
Mild	Mild clinical symptoms like fever, cough, myalgias, diarrhea etc but no signs of pneumonia on imaging (HRCT chest)
Moderate	Clinical symptoms plus radiological findings of pneumonia but normal oxygen saturations at room air
Severe	Radiological findings of pneumonia and oxygen saturation ≤93% at% at rest, respiratory failure and requiring mechanical ventilation including any organ failure that requires any ICU care

The data were compiled and analyzed with statistical Package for the social sciences (SPSS) version 23.00. First, frequency and percentage were computed for qualitative variables like age groups, gender and symptoms like cough, myalgias, shortness of breath etc. Then, we divided the patients into mild, moderate and severe categories based on their symptoms and investigations.

RESULTS

The present study was conducted to determine the severity of COVID infection in the vaccinated population. The results found that among the 5000 individuals who were vaccinated, 225(4.5%) got infected with COVID-19 later on. Among these 225, 172(76.4%) had mild symptoms and recovered, with only one death reported.

Among 5000 people vaccinated, only 225 were infected with COVID-19 disease later on, as shown above. Many more men participants were made part of the study compared to women, as shown by their percentages in the table. The majority of the patients recovered, and only one patient expired (Table-II).

Among 5000 vaccinated people, 225(4.5%) got COVID infection (Table-III). Among 225 COVID positive patients 172(76.4%) patients were mild, 43(19.1%) patients were moderate, and 10(4.4%) were severe. 224(99.5%) patients completely recovered and 1(0.5%) patient expired who developed massive stroke as a complication of COVID-19 (Table-IV).

Table-II: Demographics, Symptoms and Investigations related Information of COVID-19 patients (n = 225)

Characteristics	n (%)
Age Groups (years)	
30-50	160 (70.4%)
51-70	65 (29.6%)
Gender	
Male	180 (79.2%)
Females	45 (20.8%)
Chronic diseases	
Diabetes	35 (15.4%)
Hypertension	40 (17.6)
Chronic respiratory diseases	15 (6.6%)
Cardiovascular disease	07 (3.1%)
Symptoms	
Fever	115 (50.6%)
Upper respiratory (cough,sorethroat,flu)	175 (77.0%)
Shortness of breath	25 (11.0%)
Headache,myalgias	35 (15.4%)
HRCT Chest	
Normal	172 (75.6%)
<50% lung involvement	43 (18.92%)
>50%lung involvement	10 (4.4%)
CRS markers (D-dimers,CRP,LDH,Ferritin)	
Normal	152 (66.9%)
Raised	73 (33.1%)
Oxygen Saturation	
>93%	215 (94.6%)
<93%	10 (5.4%)

Table-III: Magnitude of COVID-19 after Vaccination (n=225)

No. of Individuals who got two Doses of Vaccine	COVID-19 Positive cases two weeks after vaccination
5000	225(4.5%)

Table-IV: Clinical Severity and Outcome of COVID-19 Patients after vaccination (n = 225)

Total (n) COVID-19 Patients	Clinical Severity			Outcome	
	Mild	Moderate	Severe	Recovered	Expired
225	172 (76.4%)	43 (19.1%)	10 (4.4%)	224 (99.5%)	01 (0.5%)

DISCUSSION

In the present novel study, COVID-19 vaccination directly protected most of the population vaccinated. Furthermore, for patients infected with COVID-19 after vaccination, the spectrum of disease was mainly mild to moderate, and most of them recovered. Furthermore, the researchers found that vaccines provide direct protection by forming neutralizing antibodies and therefore minimizing the likelihood of getting infected with the disease and indirect protection by minimizing the chances of disease spread, where those

in contact with high-risk individuals are vaccinated to reduce transmission.[9-11] The results are supported by many studies which found that inactivated SARS-COV-2 vaccine was highly effective and formed neutralizing IgG antibodies in many individuals vaccinated with it.[12-14]

Jara *et al.* conducted a randomized, double-blind phase 1/2 clinical trials to check the safety and immunogenicity of inactivated COVID-19 vaccine and found that seroconversion and neutralizing COVID antibodies, were formed in more than 90% individuals after two doses of vaccine.[15] Likewise, another study by Zhang *et al.* found similar findings that revealed antibodies formation in more than 90% of sample individuals who got two shots of inactivated vaccine. The side effects noted in some individuals after vaccination were mainly fever and pain at the injection site.[16]

Different studies have also been conducted to assess the safety and immunogenicity of COVID vaccines which act through different mechanisms and found similar results.[17-19] Some studies have compared the efficacy of different vaccines. Cheng *et al.* compared the efficacy between seven different vaccines and found that the mRNA vaccine is the most effective. However, they found all vaccines, including inactivated SARS-COV-2 vaccine, equally effective and beneficial.[20]

Our study showed no substantial difference in the recovery of patients with comorbidities and all those who had even been suffering from long-term illnesses recovered from COVID. However, one patient expired and had raised cytokine release syndrome markers leading to clot formation and causing a massive stroke; the likely possibility of death in this patient was the late presentation to the hospital as he was brought after developing complications of COVID; however, future research work is needed on this area.

LIMITATIONS OF STUDY

One of the major limitations of the present study was that among the total number of people vaccinated for COVID-19, only those individuals were tested for COVID-19 who showed any symptoms of the virus and who reported to the hospital (setting). However, it is suggested for future researchers that all patients should be taken into custody for follow-up results and better generalizability of the study. Furthermore, because of economic constraints, some of the investigations which show the criticality of the disease were not included in the study, like IL6.

RECOMMENDATION

The mass scale vaccination is the mainstay in preventing this menace of COVID, & everyone should get vaccinated as early as possible regardless of the type of vaccine. In addition, however, the policymakers should uphold the importance of physical measures like face masks, hand sanitization and social distancing to prevent the disease. The results of our study show that the public should be encouraged to vaccinate during this global pandemic.

CONCLUSION

To conclude, vaccines do not give 100% immunity to COVID. However, if someone gets infected with COVID-19 after vaccination, there are remarkable chances of successful recovery without complications, and only a few patients develop moderate to severe disease.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

AN & MTY: Conception, study design, drafting the manuscript, approval of the final version to be published.

SN & SY: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

ZR & AA: Critical review, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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