Case Report

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www.imedpub.com

Journal of Biomedical Science
ISSN 2254-609X

2021
Vol.10 No.3:55

SARS-CoV-2 Post Vaccination Disease Infection Tracking: Breakthrough Cases in Pakistan

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Received date: July 06, 2021; **Accepted date:** July 20, 2021**; Published date:** July 27, 2021

Citation: Tariq A, Farooq A, Mehmood T, Rehman R, Abbas B, et al. (2021) SARS-CoV-2 Post Vaccination Disease Infection Tracking: Breakthrough Cases in Pakistan. IPJBS Vol.10 No.3:55.

Abstract

Background: The available COVID-19 vaccine claims to present good protection against infection. However, none of them offers 100% safety to counter the disease. Since the start of the vaccination program, there are reports from different parts of the world mentioning the individuals have developed COVID-19 infection after administration of two doses of vaccine.

Case: The brief report presents incidents of SARS-CoV-2 re-infection in two vaccinated individuals despite evidence that two doses of vaccine (Sino pharm) led to antibody production against spike proteins. Both the individuals gave history of travel and close contact with an infected patient. One of the individual presented with respiratory distress symptoms but none of them develop signs of Disseminated Intravascular Coagulation (DIC). No significant findings in chest X-ray and High Resolution Computed Tomography (HRCT) were unremarkable even with the drop of oxygen saturation to 91%. There is a rarity of reported occurrence of SARS-CoV-2 infection after two jabs, particularly from Pakistan.

Conclusion: The study reveals that post vaccination COVID-19 infection reduces the morbidity and mortality rate by controlling the derangements initiating the disseminating intravascular coagulation. The vaccine breakthrough incident puts light on the significance of constant public health monitoring and contingency protective measurements. Our findings may help to pave down further guidelines regarding changing scenario of the pandemic in a country with limited resources and huge population burden.

Keywords: SARS-CoV-2; Vaccine; COVID-19; Infection; Re-infection

Introduction

The global pandemic of SARS-COV-2 has infected more than 181 million people including 3.9 million deaths by the 30th of June, 2021 [1]. This pandemic has placed heavy impacts on all countries since its emergence back in 2019. Thus there was a great need and demand for vaccines globally. The scientific community has laid huge efforts into discovery and development of effective immunization by adopting universal vaccination strategy [2,3]. The current approach in designing vaccines is targeting the viral spike protein coded by S gene. Although the global vaccination program is in full swing in most of the countries currently but still there are two important concerns worldwide. Firstly, being a Ribonucleic Acid (RNA) virus, there are many published reports regarding mutation in S gene region of the virus raising apprehension over the persistent efficacy of vaccine as the new variant may acquire ability to escape the vaccine-induced immunity [4]. Secondly, same may also lead to development of symptomatic illness [5]. These undesirable outcomes are already under observation by scientific community and need proactive measurements to manage if emerged. Furthermore, the assurance of protection conferred by vaccination is not yet well established. So the possibility of COVID-19 re-infection after complete vaccination cannot be ruled out [6]. Among the candidate vaccines, Pakistan, being a low income country, initially received Sinopharm vaccine in donation to start with the immunization program. It went through an earlier approval process by the concerned authorities for emergency use. Sinopharm was also approved for the said purpose in 30 other countries. The first European country that approved use of this vaccine was Hungry. The vaccine is based upon the inactivated SARS-CoV-2. The vaccine is administered in two jabs, with an interval of four weeks between the first and second dose. The manufacturer of the vaccine claimed 79% effectiveness, in December 2020, on the basis of phase III interim data, to prevent the development of symptomatic COVID-19 infection. The trials in patients have yielded good immunogenic results and vaccine was generally found safe and well-tolerated with few reports of adverse effects [7].

Case Study

The first patient, a 38 years-old male, is a resident of the Capital Territory of Islamabad, Pakistan. He had already been

vaccinated with two jabs (Sinopharm). Patient 01 received the first dose on 4th March and the second dose on 2nd April 2021. Similarly, patient 02 received two doses on 1st March and 29th March 2021 respectively. Neutralizing antibodies titre was performed after three weeks of completion of vaccination in both cases. Detecte Antibodyd titer in patient 01 was >60 IU/ml after 20 days of administration of second dose whereas it was >52 IU/ml in patient 02 after 22 days of the completion of vaccination showing development of good antibodyimmune response against the disease In the current study, we describe two fully vaccinated persons who were infected subsequently with SARS-CoV-2; despite evidence that two doses of vaccine led to antibody production against spike protein. Written consent for publication was obtained from all subjects involved in the study. Study design conforms to the standards currently applied in Pakistan. After 30 da y s of the sec ond dose (Ma y2nd) the patient 01, reported in a private clinic with consistent symptoms of viral infection (sore throat, cough, body aches, and fever) with a history of two days. The second patient, 37 years-old male, also a resident of the Capital Territory of Islamabad, Pakistan presented to a local private clinic with symptoms of cough, fever, muscular aches, and diarrhea since three days following 34 days of the second dose of Sinopharm (May 2 nd). Both patients have contact history with an already diagnosed COVID-19 infected individual 4-5 days prior to the appearance of symptoms.

Specimen collection and processing

The nasopharyngeal swabs were collected in Viral Transport Medium (VTM) from the patients at Molecular Diagnostic Laboratory of local public sector tertiary care hospital. The Nucleic acid extraction of the virus was performed using automated extraction platforms of Lab Aid Zeesan (Xiamen Zeesan Biotech. Co Ltd.) as per the manufacturer's instructions. The qualitative confirmation of SARS-CoV2 was done using reverse transcription real-time Polymerase Chain Reaction (PCR) kit (NCoV-19 Nucleic Acid Diagnostic Kit Polymerase Chain Reaction (PCR-Fluorescence Probing, 129 IVD marked) by Senstech (Senstech Diagnostic UK Limited, Peterborough, Cambridgeshire, United Kingdom) targeting 130 novel coronavirus (2019-nCoV) ORF-1 and conserved coding nucleocapsid protein gene as per manufacturer's protocol. On the same day samples of the patients were also given to molecular diagnostic lab of National Institute of Health, Islamabad for COVID-19 Polymerase Chain Reaction (PCR). Furthermore, their samples were also processed for SARS-CoV-2 Rapid Ag Test Device using Panbio™ as per manufacturer's instructions. The C-reactive protein (CRP), complete blood counts and D-Dimers were conducted using ARCHITECT Modular 4000 from Abbot™ Diagnostics, U.S.A.

Results

Real time polymerase chain reaction of the nasopharyngeal swabs of both subjects was found positive at Molecular Diagnostic Laboratory of local public sector tertiary care hospital on 2 nd May 2021. The very next day same positive results were also reported from the National Institute of Health, Islamabad, Pakistan. Moreover, rapid antigen detection test was positive in both cases too. It has been 30 days since the patient 01 received the second dose of vaccine whereas patient 02 was found tested positive after 34 days of the vaccination from the same laboratories.

In both either cases, no co-morbid have been identified. Both the patients were isolated and treated with the standard regime as per established COVID-19 protocol. During isolation, on the fourth day of appearance of flue like symptoms, the patient 01 reported with shortness of breath on mild exertion. The oxygen saturation was checked and found fluctuating between 91% to 95%. This situation persists for the next two days. No significant abnormalities were detected on X-rays followed by High Resolution Computed Tomography (HRCT) in both patients. Both of them had D-dimers within normal range. No significant finding was observed in blood counts. The symptoms of infection were relieved in patients 01 and 02 on 09th and 11th days respectively after diagnosis whereas their Polymerase Chain Reaction (PCR) tests became negative after 14 days of diagnosis on 17 May 2021 in **Tables 1 and 2** represent patients' data and clinical findings.

	Patient 1	Patient 2
Age	38	38
Gender	Male	Male
Gap between vaccination and symptomatic presentation	30	34
Clinical symptoms	Sore throat, Cough, Body aches and Fever	Cough, Fever, Muscular aches, and Diarrhea
Laboratory results		
SARS-CoV-2 PCR	Positive	Positive
HRCT chest	Negative	Negative
SARS-CoV-2 rapid detection test	Positive	Positive
SARS-CoV-2 Ig G	Positive	Positive
SARS-CoV-2 Ig M	Negative	Positive
D-Dimer	6.20 ng/ml	7.58 ng/ml
CRP	46 mg/L	72 mg/L

Table 1: Characteristics of patients and laboratory findings.

	Patient 1	Patient 2
First dose of vaccine	Mar-04	Mar-01
Second dose of vaccine	Apr-02	Mar-29
Neutralizing antibodies detection	Apr-22	Apr-20
Onset of symptoms	Apr-30	Apr-29
SARS-CoV-2 real time PCR detection	May, 02	
SARS-CoV-2 rapid detection		

Drop in oxygen saturation	May 04-05	Normal
Asymptomatic	May-11	May-13
Presentation of patients		
Negative PCR results	May-17	

Table 2: Time line of presented cases.

Discussion

There is a rarity of reported cases of SARS-CoV-2 infection after 14 days of the second dose of vaccine. In the current study, both patients completely vaccinated with Sinopharm with good neutralizing antibody titers; presented with mild to moderate symptoms. One individual developed symptoms of respiratory distress but and recovered without developing any serious complications. HoweverTherefore, it is crucial to monitor clinical symptoms in fully vaccinated patients too to avoid COVID 19 related complexities. Hacisuleyman, et al., reported a vaccine outbreak in 02 individuals after 14 days of jab among 417 staff members, Rockefeller University, New York U.S.A, who had received a second dose of either the BNT162b2 (Pfizer–BioNTech) or mRNA-1273 (Moderna) vaccine at least 2 weeks prior [8]. A study from Italy reported an 83 years old male infected with SARS-CoV-2 infection after almost one month of the second dose. The patient received both doses of Pfizer BNT162b2 mRNA COVID-19 [9]. A cohort study conducted by Keehner et al., screened 28,184 vaccinated health care workers (received two jabs) at the University of California San Diego (UCSD) and the University of California, Los Angeles (UCLA) U.S.A. Only 37 health care workers tested positive after the second dose of vaccination (01 to more than 15 days of vaccination) [10].

These results are quite encouraging in the way that vaccines are exhibiting the required efficacy in general outside of trial phases. The incident also puts light on the significance of consistent public health monitoring and contingency protective measurements unless overall control is not attained [11]. It will also be significant to keep contingency measures under observation and testing of any suspected symptomatic as well as asymptomatic case even after a successful national vaccination program as the exact span and respective extent of protection after immunization is yet to be established [11]. Additionally it will be also beneficial to continue basic SOP's adopted during the pandemic for little further including wearing masks and controlled social gatherings less the disease is eradicated from society [12].

5.

Conclusion

Moreover, analysis including sequencing of viral RNA and phylogenetics may also be conducted to rule out the emergence of any new mutant strain. It is expected that our findings may also help to pave down further guidelines regarding changing scenario of the pandemic.

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