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Determining the Rate of COVID-19 Infection in Post-Vaccinated Individuals and Its Severity

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Author`s Contribution

[1] Concept, Design, Analysis and interpretation of data
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ABSTRACT

Objective: To assess the incidence of Covid-19 infection in people who were vaccinated and to categorize disease severity.

Methodology: This cross sectional study was carried out at the Department of Medicine, KRL Hospital, Islamabad from September 2021 to February 2022. Individuals above 18 years of age, and fully vaccinated were included in the study. Using a pre-validated interview based close ended questionnaire data was collected, informed consent was obtained, and data was analyzed using SPSS Statistics 23. The severity of COVID-19 was determined by applying the WHO severity definitions.

Results: The study included 362 individuals. 55.00% were males and 45.00% were females. The minimum age was 20 years and maximum 76 years with a mean of 45.73 ± 14.919. 27.1% of the participants had co morbidities, of which diabetes was the most frequent (59.18%). Majority (37.84%) individuals received Sinopharm vaccine. This was followed by Pfizer (24.58%) and Moderna (13.82%). 158 patients (43.65%) reported infection with covid-19. Out of 158, 41 (25.94%) had severe infection and 9 (5.70%) had critical infection on WHO criteria.

Conclusion: A substantial proportion of fully vaccinated individuals suffered from Covid-19 infection (43.64%). Pfizer was the most effective vaccine in preventing infection (79.77%). While Sinopharm was the least effective (41.60%). However, vaccination was effective in preventing severe and critical infection in a significant number of patients (86.18%).

Keywords: COVID-19; Pandemic; Vaccination; Immunity, Vaccine, Comorbid, Sinopharm, Moderna, Pfizer, Sinovac

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Introduction

The first case of coronavirus illness (COVID-19) was detected on December 31st, 2019 in Wuhan, China.[1] Public health systems around the globe had come to a standstill as a result of a global pandemic. The first country to detect a case of Covid-19 outside of China was Thailand.[2] Covid-19 was certain to become an area of research and study at some point because of the rapid spread of virus. It was officially declared as a pandemic on 11 March, 2020. Symptoms of the disease were more or less of common cold caused by influenza, however acute respiratory distress syndrome, respiratory failure, disseminated intravascular coagulopathy leading to multiple organ failure, cardiac arrhythmias and superimposed secondary infections are some of the serious complications of Covid-19 that led to mortalities globally.[3]

Re-infection after an initial sickness is conceivable, however it is not known for how long an initial illness confers immunity to the virus.[4] COVID-19 reinfection cases have been documented, and it's not clear if the virus causes immunity or not. While some reinfections are milder than the initial infection, some are more severe.[5]

Vaccination was seen as a vital tool to curb Covid-19 infection. Prodigious research efforts and universal coordination led to rapid development of vaccine candidates and initiation of clinical trials across the world. According to research, a greater awareness of the

risk posed by COVID-19 could increase vaccination readiness regardless of individual preferences.[6]

Two months after being treated for a PCR positive result, a cardiac surgeon in Pakistan experienced reinfection. After getting infected for the second time, the patient's Covid-19 PCR was also positive.[7] Governments have incorporated vaccination for Covid-19 into their plans to fight the pandemic off. However, the role of vaccination in providing long term immunity seems controversial. Covid-19 vaccines on one hand protects against infection without causing any symptoms, on the other hand a majority of people report mild to moderate symptoms after receiving a vaccine.[8] In some cases, even those fully vaccinated may still become infected.[9] This led to hesitancy among general population about vaccination that could jeopardize global health and is a growing threat in fighting the pandemic.

Scientists are trying to achieve herd immunity in order to halt further spread of Covid 19 re-infections. Aiming to achieve herd immunity, 70–85% of the population must have been vaccinated against COVID-19. When it comes to COVID-19, people's opinions on the virus are constantly changing. Pfizer announced in November 2020 that the COVID-19 vaccine was 95% effective in preventing illness.[10]

The aim of this study was to assess the effectiveness of vaccines available to our population in preventing Covid-19 infection and its severity.

Methodology

This cross-sectional study was conducted in the department of medicine at KRL Hospital Islamabad, Pakistan, from September 2021 to February 2022. Non-probability convenience sampling technique was used. Data was collected after obtaining approval from the ethical committee of KRL hospital Islamabad. Informed consent of the individuals involved in the study was taken.The severity of COVID-19 was graded by applying the WHO severity definitions. [11]

Patients were grouped into:

1. Non-Severe**:**
2. Severe
3. Critical**.**

Data was entered and analyzed using SPSS version 23. Descriptive statistics were taken and the results were interpreted in frequencies and percentages. Participants included were 18 years of age and above. All were vaccinated. Individuals below 18 years of age and those who were unvaccinated were excluded from our study.

Results

A total of 362 patients were included in our study. Of which, 199 (55%) were males whereas 163 (45%) were females. Mean age was as 45.73 ± 14.919, with a minimum age of 20 and maximum of 76 years. 98 patients (27.1%) had co morbidities. (Table I). Types of vaccines administered are shown in table II. Out of 362 vaccinated individuals, 158 (43.64%) got infected with Covid-19. Post vaccination infection rate in respect of different vaccine is shown in table II. Table III shows grades of severity of infection.

Table I: Comorbidities

Comorbidities	N	(%)
Diabetes	58	59.18
Hypertension	44	44.90
Asthma/COPD	16	16.33
IHD	8	08.16

Table II: Type of Vaccines/ Post vaccination infection rate

	Vaccines		infection rate	
	N	(%)	N	(%)
Sinopharm	137	37.84%	80	58.39
Pfizer	89	24.58%	24	48.00
Moderna	50	13.82%	20	50.00
Sino Vac	40	11.04%	18	20.22
AstraZeneca	30	8.28%	11	36.66
Can Sino	16	4.41%	5	31.25

Table III: Severity of infections

Severity of infection	N	(%)
Non severe	108	68.35
Severe	41	25.94
Critical	9	5.70

Discussion

A global vaccination effort is the most effective way to prevent the further spread of the COVID-19 pandemic. Vaccine hesitancy has also become a serious issue in combating the pandemic, especially in Pakistan.[12] As per statistics, two out of five Pakistanis are hesitant to get the COVID-19 vaccine.[13] This situation prevails despite the efficacy (and safety) of the vaccines themselves having been clearly demonstrated from the time of Phase 3 clinical trials.[14] Concentrated efforts on the part of the vaccination teams and doctors to educate the population, persistence of myths and misinformation remains the major prevalent cause in prevention of an ideal vaccination effort and drive.[15]

Immunocompromised patients and health care personnel have always been prioritized in the COVID-19 immunization program, as were the elderly and those with pre-existing diseases.[16] Our study shows that fully vaccinated individuals experienced a modest illness, thus preventing some of the most lingering health consequences such as severe or critical disease requiring intensive care hospitalization. Overall in our study 43.64 percent individuals acquired infection despite being fully vaccinated. Similar results were reported elsewhere.

Those who acquire COVID-19 despite immunization have lower virus load, shorter illness time, and milder symptoms than those who were unvaccinated.[17] A weekly mortality and morbidity report revealed association between vaccination and Covid-19 infection. Unvaccinated individuals were 2.34 times more likely to have the infection as compared to fully vaccinated individuals.[18] A prospective cohort study reported that administering a booster vaccination a few months after a positive COVID infection resulted in a significant rise in COVID-19-directed IgG and IgA antibody levels.[19] In contrast to this natural immunity provides IgG antibodies only.[20-21]

Amongst the reported comorbidities, diabetes was the most frequent. In our study, 16% of all participants were diabetic. A meta-analysis published in 2020 showed that patients who had pre-existing diabetes have a 2.3-fold increased risk of COVID-19 severity and a 2.5-fold increased risk of mortality.[22] Another study observed similar results, with severity of Covid-19 risk of 2.75 times in patients with diabetes and 1.90 times risk for death.[23]

A prospective cohort study reports that COVID-19-vaccinated HCWs showed 100% recovery with no mortality, and only 5.6% of the individuals reported moderate disease vs 94.4% who remained asymptomatic or had mild symptoms. [24]

A case-control study across 21 hospitals in the United States reports that COVID-19-vaccinated patients showed considerably lower illness severity of the virus, including omicron and delta variants.[25]

The Centers for Disease Control and Prevention report that as long as SARS-CoV-2 continues to be transmitted in the community, the danger of infection in fully vaccinated people cannot be eradicated completely.[26]

Conclusion

A substantial proportion of fully vaccinated individuals suffered from Covid-19 infection (43.64%). Pfizer was the most effective vaccine in preventing infection (79.77%). While Sinopharm was the least effective (41.60%). However, vaccination was effective in preventing severe and critical infection in a significant number of patients (86.18%).

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