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ORIGINAL ARTICLE

Outcome and Severity of COVID-19 in Vaccinated and Unvaccinated patients

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ABSTRACT

Background: The coronavirus disease of 2019 (COVID-19) pandemic is the world's worst problem and the global health disaster of our time. In order to fully comprehend the advantages of COVID-19 immunization, illness attenuation must be considered. This should be done by investigating whether those who contract COVID-19 despite vaccination experience milder symptoms than those who are unvaccinated. The COVID-19 pandemic brought on by is still a serious public health issue on a global scale.
Aim: To evaluate the significant impact and efficacy of vaccination in positive SARS-CoV-2 patients during different timelines of a pandemic.
Methodology: This is a cross sectional study involving 212 PCR-positive SARS-CoV-2 patients with their clinical–epidemiological findings admitted at Ziauddin Hospital between the years 2021 to 2022. SARS-CoV-2. RNA positivity was determined using qualitative RT-PCR with in vitro diagnostic kits, following the manufacturer's recommendations. SARS-CoV-2 positive patients had at least one positive RT-PCR test result, while SARS-CoV-2 negative patients had solely negative RT-PCR test findings. The data was provided through electronic patient records. The patients were categorized into Asymptomatic, Mild, Moderate and Severe/Critical as per WHO and CDC guidelines.
Results: Among total of 212 patients there were 5(2.4%) vaccinated and 20(9.4%) unvaccinated asymptomatic, 6(2.8%) vaccinated and 12(5.7%) unvaccinated mild, 16(7.5%) vaccinated and 39(18.4%) unvaccinated moderate and 27(12.7%) vaccinated and 87(41%) unvaccinated severely/critically ill patients. The association between the severity of illness and vaccination status of patients showed significantly positive results with a p-value of 0.005.
Conclusion: It was concluded that vaccine plays a significant role in the course of illness and severity of disease, this study investigated the impact of vaccination status on patients with positive SARS-CoV-2 to compare the severity and course of illness between the vaccinated and unvaccinated groups based on a number of clinical indicators. but the efficacy of these vaccines remains a point of concern for future studies.
Key words: COVID-19, pneumonia, SARS-CoV-2, immunization

INTRODUCTION

The vaccination protected against reinfection and showed strong effectiveness against several novel types. Hope for reducing the burden of coronavirus illness was raised through immunization initiatives[1]. In order to fully comprehend the advantages of COVID-19 immunization, illness attenuation must be taken into account. This should be done by investigating whether those who contract COVID-19 despite vaccination experience milder symptoms than those who are unvaccinated[2]. Concerns have been raised about the vaccine's effectiveness due to the appearance of the novel, highly contagious lineages of the severe acute respiratory syndrome coronavirus 2 and the loss of neutralizing antibodies a few months after immunization[3]. Currently, immunization is thought to be the most effective method of preventing COVID-19 infections. COVID-19 vaccinations have been miraculously developed in a frantic rush to be distributed by Christmas 2020, achieving positive results and rising in popularity[4].

The COVID-19 pandemic brought on by is still a serious public health issue on a global scale. For avoiding SARS-CoV-2 infections and hospitalizations,) COVID-19 vaccines, such as mRNA1273 (Moderna) and BNT162b2 (Pfizer-BioNTech), are proven to be quite effective[5].

As shown by the genome sequences from the newly emerging COVID-19 variants, it is crucial to investigate how these mutations affect the COVID-19 vaccines' actual efficacy[6]. It is yet unclear what kind

of protection COVID-19 infection offers. Phylogenetically different SARS-CoV-2 variants have been the subject of several recent investigations, but they are still uncommon[7]. Tests performed on infected patients during the SARS pandemic in 2003 showed that the immune system's reaction to infection lasts for more than two years[8]. While reinfection within six months is uncommon, infection with a seasonal human coronavirus strain does not elicit a durable response against reinfection[9].

The novel variants that emerged in South Africa and Brazil raised concerns since these spike mutations lowered neutralizing antibodies, implying more re-infections and raising the possibility that vaccinations would become less effective Contrarily, another study found that COVID-19 convalescent patients and vaccine recipients can neutralize the variant of N501Y, increasing the effectiveness of the current immunizations against the 20B/501Y.V1 strain[10]. This indicates that vaccinations are effective at preventing re-infections. Others have evaluated prior infection's similar protection.

The emergence of COVID-19 despite prior complete immunization is now being documented globally and referred to as a vaccine breakthrough. Breakthrough cases usually are at the peak since vaccine efficiency is less than 100%[11].

METHODOLOGY

Patient recruitment and Categorization: This cross-sectional study was conducted at Ziauddin University Hospital Pakistan by recruiting PCR-positive COVID-19 patients consecutively who visited OPDs or were admitted to the ward and ICU between the years 2021 to 2022. After IRB permission, informed consent was obtained from all participants. SARS-CoV-2 RNA positivity was determined using qualitative RT-PCR with in vitro diagnostic kits, following the manufacturer's recommendations. SARS-CoV-2 positive patients had at least one positive RT-PCR test result, while SARS-CoV-2 negative patients had solely negative RT-PCR test findings.

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Demographic information, clinical details, vaccination status, and outcomes were provided through electronic patient records. Each patient's age, sex, medical history, initial symptoms (fever, cough, and dyspnea), and prognosis were all noted. The following definition of severity was used by the CDC: "Asymptomatic" refers to the absence of any signs or symptoms; "mild" refers to patients, whether inpatients or outpatients, who do not exhibit any signs of dyspnea but do not require oxygen; "moderate" refers to hospitalized patients who exhibit these signs but do not require high flow oxygen; and "critical" refers to all patients who require mechanical ventilation, all COVID-19-related deaths that take place during the hospital stay, or both.

Statistical Analysis: SPSS version 21 was used for all statistical analyses. All dependent variables in COVID-19 had their frequencies and percentages calculated. We used the Chi-Square test was used to analyze the relationship between all dependent variables and clinicopathological features. For a statistical difference in the mean of different inflammatory markers in the COVID-19 severity group Kursk al-Wallis test was applied. All estimations were considered significant if the P-value was less than 0.05.

RESULTS

This study was conducted on 212 patients divided into 2 categories vaccinated and unvaccinated. of the total of 212 participants 54 were vaccinated with a variety of vaccination whereas 158 were non-vaccinated. Among the vaccinated patients 29(13.7%) were female 25(11.8%) fully vaccinated males were statistically significant with a p-value of 0.005.

Three main signs and symptoms of Covid-19, fever, cough, and shortness of breath, have been linked to vaccination history. For fever, the results show that among the total of 54 vaccinated people, 22(10.4%) had a positive history of fever, while 32 (15.1%) had none. However, among the unvaccinated group, there were a total of 100 (or 47.2%) patients with a positive history of fever, while 58(or 27.4%) had none. Results with a p-value of 0.003 are statistically significant. For cough, among the total of 54 vaccinated people, 31(14.6%) had a positive history of cough, while 23(10.8%) had no cough. However, among the unvaccinated group, there were a total of 65(30.7%) patients with a positive history of cough, while 93(43.9%) had no cough. Results with a p-value of 0.001 are statistically significant. The correlation of shortness of breath showed no significant results with the status of vaccination.

The association of diabetes and hypertension with the status of vaccinations showed no significant results with a p-value of more than 0.05. Only TLC revealed a favorable correlation with the level of immunization from all lab investigations included in the table above. In comparison to 158 unvaccinated persons, 21 (9.9%) of the patients in the group of 54 vaccine recipients had normal TLC counts, compared to 32(15.1%) who had increased TLC and two (0.9%), who had lowered TLC counts. The results had a p-value of 0.003 and were statistically significant. Whereas the levels of D-dimer, Ferritin, LDH, CRP and Procalcitonin had no significant association with the status of vaccination with a p-value of more than 0.05.

There were 5(2.4%) vaccinated and 20(9.4%) unvaccinated asymptomatic, 6(2.8%) vaccinated and 12(5.7%) unvaccinated mild, 16(7.5%) vaccinated and 39(18.4%) unvaccinated moderate and 27(12.7%) vaccinated and 87(41%) unvaccinated severely/critically ill patients. The association between the severity of illness and vaccination status of patients showed significantly positive results with a p-value of 0.005.

Another analysis of the relationship between vaccination status and sickness outcome revealed that the ratio of mortality among unvaccinated patients was higher than that of vaccinated individuals, while the discharge ratio was higher among vaccinated individuals than the unvaccinated category. The p-value of 0.008 indicated a statistically significant difference between the two.

Table 1: Summary of statistical differences b/w median of inflammatory markers and vaccination status

Inflammatory markers	Vaccination status		P value
	Yes	No	
TLC	11.4	11.1	0.003
D-Dimer	1172.0	1214.0	0.429
Ferritin	1508.29	611.5	0
LDH	323.0	536.0	0.1
CRP	47.18	85.60	0.394
Procalcitonin	2.280	1.000	0.306

Table 2: Summary of disease outcome and severity in persons infected with SARS-CoV-2 stratified by vaccination status

Parameters	Frequency		P value
Gender			
Male	25(11.8%)	85(40.1%)	0.005
Female	29(13.7%)	73(34.4%)	
Sign/symptoms			
Fever yes	22(10.4%)	100(47.2%)	0.003
Fever no	32(15.1%)	58(27.4%)	
Cough yes	31(14.6%)	65(30.7%)	0.001
Cough no	23(10.8%)	93(43.9%)	
SOB yes	39(18.3%)	99(46.6%)	0
SOB no	15(7.1%)	59(27.8%)	
Comorbs			
Diabetes yes	22(10.4%)	77(36.3%)	0.196
Diabetes no	32(15.1%)	81(38.2%)	
Hypertension yes	27(12.7%)	93(43.9%)	0.165
Hypertension no	27(12.7%)	65(30.7%)	
Lab Investigations			
TLC Normal	21(9.9%)	128(60.4%)	0.003
TLC Raised	32(15.1%)	28(13.2%)	
TLC Decreased	1(0.5%)	2(0.9%)	
D-Dimer Normal	16(7.5%)	43(20.3%)	0.429
D-Dimer Raised	38(17.9%)	115(54.2%)	
Ferritin Normal	0	43(20.3%)	0
Ferritin Raised	54(25.5%)	115(54.2%)	
LDH Normal	11(5.2%)	19(9.0%)	0.1
LDH Raised	43(20.3%)	139(65.6%)	
CRP Normal	10(4.7%)	25(11.8%)	0.394
CRP Raised	44(20.8%)	133(62.7%)	
Procalcitonin Normal	0	4(1.9%)	0.306
Procalcitonin Raised	54(25.5%)	154(72.6%)	
Severity			
Asymptomatic	5(2.4%)	20(9.4%)	0.005
Mild	6(2.8%)	12(5.7%)	
Moderate	16(7.5%)	39(18.4%)	
Severe/Critical	27(12.7%)	87(41%)	
Outcome			
Discharged	46(21.7%)	120(56.6%)	0.008
death	8(3.8%)	38(18%)	

DISCUSSION

According to the WHO's standards, COVID-19 severity is divided into three categories: mild, moderate, and severe/critical based on the previously described clinical symptoms. In contrast to other studies[16,26], the most common finding analysis was severe/critical, followed by mild and moderate. This view is supported by the fact that disease outbreaks provide a significant challenge to Pakistan's healthcare system, which is still developing. Underreporting of such cases is also caused by a lack of basic health facilities, poor health policies, ineffective management, and reluctance to hospitalize patients with milder stages of the disease12[12].

In another study conducted in Pakistan, more males than females were reported to have been hospitalised as a result of COVID-19. This finding is in line with research conducted in 2020 by K. Yuki et al., who explained the association as being caused by comorbidities more common in men, such as hypertension, cardiovascular, and lung diseases, which are linked to social and behavioural factors more prevalent in men, such as smoking and alcohol consumption. Additionally, the male-biased COVID-19 infectivity and severity are greatly influenced by sex-based immunological differences between males and females[12].

Vaccination status plays a critical role in the progression and severity of illness[13]. The same goes for this deadly virus, where

vaccination was introduced in late 2020 after undergoing multiple trials. But to date, the efficacy of the vaccine is still less than 100% which gives an alarm of this nonending illness[14] using an mRNA vaccine Patients with COVID-19 were considerably less likely to receive the COVID-19 vaccine compared to those with other illnesses and patients whose COVID-19 disease progressed to the point of death or mechanical ventilation.

This study compared the positive covid 19 patients in both vaccinated and unvaccinated categories on the basis of several parameters that showed that vaccination with COVID-19 vaccination was significantly less likely in patients who had COVID-19 hospitalization, disease progression to death, or invasive mechanical ventilation[15]. These findings are consistent with a lower risk of developing severe COVID-19 among vaccine breakthrough infections when compared to not being vaccinated.

Even after accounting for vaccination status, older age and comorbidities were linked to any negative outcome, mild-moderate disease, and severe-critical disease, despite the reported effectiveness of currently available vaccines being somewhat lower against the Delta variant[16]. These well-known risk factors contribute to patients with SARS-CoV-2 having poor outcomes. When compared to individuals infected with the Beta variant, these factors were associated with a higher risk of unfavorable outcomes.

According to a Qatari study, being completely unvaccinated was associated with a noticeably lower risk of negative outcomes. This was true for all outcomes, including both severe-to-critical disease and mild-to-moderate disease[17].

In this study, a comparison of any outcome between patients who received vaccinations and those who did not show a 2-fold higher risk among the latter group. This emphasizes the importance of vaccination in lowering serious SARS-CoV-2 infection outcomes independently of VOC.

Despite the rapid development of multiple vaccine candidates and the consistent emergence of approvals in multiple countries around the world, our findings stated that COVID-19 vaccines showed a decline in rates of infections, severity, hospitalization, and mortality among the various populations since the vaccines' rollout began. Among the COVID-19 vaccines, the Pfizer/BioN Tech vaccine had the most extensive research, with >90% effectiveness against infection[18], severe infection, infection requiring hospitalization, and mortality after the second dose.

Limitations: There were methodological issues with some of the studies, such as a lack of ethnic diversity in the population sampled to assess vaccine efficacy[19] and the same goes with this study. Additionally, studies evaluated the vaccines' efficacy values at various follow-up intervals, which affected the efficacy value observed and made data comparison to studies with significantly shorter or longer follow-up intervals more challenging[20] as in this present study. This study also did not separate the population who had received the first and second doses of the vaccine and even after a no. of studies it is still questionable that who will face more severity.

CONCLUSION

Despite the high efficacy of the recently developed COVID-19 vaccines in lowering infection, hospitalization/severity, and mortality rates that have been seen, more work is required to test these vaccines' efficacy/effectiveness against other recently emerging variants.

Conflict of interest: Nil

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