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Effect of COVID-19 vaccination status on outcome of adult patients admitted at a tertiary care centre in India

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Abstract

COVID-19 vaccination was initially started in India on 16th January 2021 after approval from national authorities. This study was carried out to assess the effect of vaccination status on the severity and clinical outcome among patients infected with COVID-19. The study included all adult COVID-19 patients admitted to our hospital from 1st April to 30th June 2021. A total of 819 patients were enrolled in the study out of which only 183 (22.3%) were vaccinated. The study documented a statistically significant reduction in the severity of illness among the vaccinated (single/double dose) (33% severe COVID-19) against the unvaccinated (43% severe COVID-19) groups; along with a reduction in mortality. On univariate and multivariate analysis, age, severity of illness and lack of COVID-19 vaccination status were associated with a statistically significant increased mortality. To conclude, this study demonstrates the role of vaccination in decreasing the severity and mortality of COVID-19 infection.

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Introduction

COVID-19 vaccination was initially started in India on 16th January 2021 for health care workers, followed by Frontline workers and elderly population (60 year plus), middle-aged population with comorbidities (45 to 60 years) and eventually to all middle-aged population and young adults (18 to 45 years). The national protocol was providing two doses one month apart. Two vaccines COVAXIN (inactivated vaccine made indigenously by Bharat Biotech) and COVISHIELD (carrier vaccine made by AstraZeneca) were approved and the world's largest vaccination drive was launched [1]. COVID-19 vaccination can help in decreasing risk of infection and transmission thereby helping in attaining herd immunity [2]. Even though both the vaccines had a proven efficacy of over 50% in phase II/III trials, as desired by the World Health Organization (WHO), real world data from India only can help understand the benefits of vaccination in a holistic perspective. This retrospective study was carried out to assess the effect of vaccination status on the severity and clinical outcome among patients infected with COVID-19.

Methods

The study included all adult COVID-19 patients admitted in our hospital from 1st April to 30th June 2021. Demographic and clinical outcome records were retrospectively tabulated and analysed. Data was analysed using Stata 11 (Stata Corp, College Station, TX, USA).

Table 1. Baseline characteristics of the study population.

Variable	n (%)
Gender	
Male	513 (63)
Female	306 (37)
Age in years, mean (SD)	52 (16)
Age in years	
<40	207 (25.3)
40-60	362 (44.2)
>60	250 (30.5)
Co-morbidities	
Present	349 (42.6)
Absent	470 (57.4)
Vaccinated	183 (22.3)
One dose	147 (17.9)
Two doses	36 (4.4)
Not vaccinated	636 (77.7)
Type of vaccine	
COVAXIN	114 (62.3)
COVISHIELD	69 (37.7)
Disease severity	
Mild	142 (17.3)
Moderate	341 (41.6)
Severe	336 (41)
Outcome	
Discharge	615 (75.1)
Death	189 (23.1)
Still admitted	15 (1.8)
ICU requirement	334 (40.8)

Results

There were 819 patients in the study period out of which only 183 (22.3%) were vaccinated with a single (147 patients) /double dose (36 patients) of either vaccine approved in India. Notably, the majority of the hospital admission population [636 (77.7%)] was not vaccinated. It was a predominantly male (63%) middle-aged (mean age of 52 years) population with 42.6% having comorbid illnesses (most common being Diabetes and hypertension). The demographic and clinical profile of the patients is summarised in Table 1.

As per Indian national guidelines [3], patients with COVID-19 are classified as mild, moderate and severe. Moderate COVID-19 has been defined as a respiratory rate (RR) of 24-30/minute with saturation of oxygen (sO2) in the range of 90-94% requiring oxygen support. Severe disease is classified if patients have tachypnoea (RR>30/min) or sO2 <90% or shock or acute respiratory distress syndrome (ARDS). Of 819 patients, 677 were moderate (41.6%) and severe (41%); 334 (40.8%) required intensive unit care (ICU). At the end of the study period, 615 (75%) patients were discharged, 189 (23%) deceased and 15 were still admitted. The median duration of hospital stay was 8 days. The study documented statistically significant differences in severity of illness among the vaccinated (single/double dose) (33% severe COVID-19) and unvaccinated (43% severe COVID-19) groups (Table 2). Moreover, mortality was reduced in the vaccinated group (13.5%) as compared to those not vaccinated (26%). On univariate analysis (Table 3); age, presence of comorbidities, severity of illness and unvaccinated status were associated with an increased risk of mortality. However, on multivariate

Table 2. Severity of disease and outcomes in vaccinated and unvaccinated.

Variables	Vaccinated (n=183)	Not vaccinated (n=636)	p-value
Mild disease	40 (22%)	102 (16%)	
Moderate disease	82 (45%)	259 (41%)	0.034
Severe disease	61 (33%)	275 (43%)	
Outcome			
Discharge	157 (86%)	458 (72%)	
Death	25 (13.5%)	164 (26%)	0.001
Still admitted	1 (0.5%)	14 (2%)	

Table 3. Factors affecting mortality in the study population.

Variable	Death (n=189)	Discharged (n=615)	p-value	
Univariate analysis of factors affecting outcome in study population				
Male gender	110 (58%)	393 (64%)	0.15	
Age category (years)				
<40	16 (8%)	186 (30%)		
40-60	83 (44%)	272 (44%)	<0.0001	
>60	90 (48%)	157 (26%)		
Severity of disease (severe)	132 (70%)	189 (31%)	<0.0001	
Presence of comorbidities	94 (50%)	248 (40%)	0.022	
Vaccinated	25 (13%)	157 (26%)	<0.0001	
Variable	**Death (n=189)**	**Discharged (n=615)**	**p-value**	**Adjusted odds ratio**
Multivariate analysis of factors affecting outcome in study population				
Male gender	110 (58%)	393 (64%)	0.35	1.2 (0.82, 1.75)
Age category (years)				
<40	16 (8%)	186 (30%)		
40-60	83 (44%)	272 (44%)	<0.0001	2.27 (1.7, 3.01)
>60	90 (48%)	157 (26%)		
Severity of disease (severe)	132 (70%)	189 (31%)	<0.0001	4.2 (3.01, 5.8)
Comorbidities	94 (50%)	248 (40%)	0.56	1.11 (0.76, 1.63)
Vaccinated	25 (13%)	157 (26%)	<0.0001	0.34 (0.20, 0.57)

analysis (Table 3); only age, severity of illness and lack of COVID-19 vaccination status were associated with a statistically significant increased mortality.

Discussion

These results are of immense public health importance. Severity classification of COVID-19 and effective triage [4] of patients can help in judicious utilisation of healthcare resources and reducing mortality. However, in the absence of definite treatment and limited tertiary care hospitals, the strongest weapon against COVID-19 is mass vaccination as it can help decrease the severity along with mortality of the illness [5].

Phase II/III trials demonstrate efficacy by showing risk reduction in COVID-19 infection. However, the benefits of mortality and severity reduction cannot be undermined. This study is one of the initial data from India demonstrating this key role of vaccination.

Recent evidence from the United States using an agent-based model of SARS-CoV-2 transmission has found reduced infection, severity, ICU admission and deaths, especially among the elderly age-groups after vaccination [6]. Similarly, a susceptible-exposed-infectious-recovered (SEIR) model-based study has found reduced transmission, hospitalisation and deaths. It was concluded that early vaccination is the key to increased efficacy and benefit [7]. Thus, it is imperative to carry out large scale vaccination in India along with following COVID-19 appropriate behaviour to prevent, mitigate and effectively manage subsequent COVID-19 waves [8].

Limitations

This was a single-centre retrospective study conducted over a small period of time amongst hospitalised patients infected with COVID-19. While the study demonstrated mortality and severe reduction amongst infected patients, further large-scale multicentre studies are required to assess the impact of vaccination on infectivity, severity and mortality. Significant mutations in the SARS-CoV-2 genome have led to multiple surges in case load globally, over the past 12 months [2]. This poses another challenge to the development of effective vaccines. Our study did not include genomic sequencing of the SARS-CoV-2 virus isolated from our patient population. Thus, it limits our knowledge on these vaccines' efficacy against various known mutants.

Conclusions

This study demonstrates the efficiency of COVID-19 vaccination in prevention against the development of severe disease and mortality. With significant differences in prognosis of the disease between vaccinated and unvaccinated populations in our study, it is need of the hour to accelerate vaccination drive to combat this pandemic.

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