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Original Article

Internal Medicine Section

Vaccination Status and Outcome of Patients at a Dedicated COVID-19 Centre, Delhi, India: A Retrospective Study

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ABSTRACT

Introduction: Coronavirus Disease-2019 (COVID-19) vaccine provides strong protection against transmission, serious illness, hospitalisation, and death. As India carried out robust vaccination drive covering more than two third of its population, the study was aimed to highlight the effects of vaccination status of patient on the outcome of COVID-19 infection.

Aim: To describe the relation of vaccination with disease severity and its outcome during the third wave of COVID-19.

Materials and Methods: It was a single-centre retrospective, cross-sectional study conducted in a dedicated COVID-19 Hospital (Guru Tegh Bahadur Hospital) in Delhi, India. A total of 257 patients were admitted between 10th January 2022 to 9th February 2022, and 246 were included in the study. For each individual, demographic, and clinical data was collected. Vaccination data was extracted via the CoWin platform which included vaccine type, as well as date of administration. The profile of patients was established based on clinical examination, laboratory data, nursing record and radiological record during the course of hospitalisation. The clinical outcome was described as discharge, length of hospital stays, and in-hospital death in relation to the vaccination status. Statistical analysis was done using Statistical Package for the Social Sciences (SPSS), version 22.0.

Results: Total of 246 patients were divided into three groups- 97 were fully vaccinated, 46 were partially vaccinated and 103 were unvaccinated. Both vaccinated and unvaccinated groups had similar percentage of co-morbidities i.e. 61.3% vs 63.5%. Those who were fully vaccinated were more likely to maintain saturation at room air 30.9% vs 26.1% vs 3.9%, had lesser requirements of mechanical ventilation (6.2% vs 15.2% vs 21.4%), shorter duration of hospital stay (4.2 vs 5.3 vs 7.2 days), and lesser mortality (9.3% vs 21.7% vs 33%) as compared to the partially vaccinated and unvaccinated patients respectively.

Conclusion: The beneficial effect of the vaccination was observed in severity, mortality, morbidity, and lesser number of hospitalisations. Hence, vaccination coverage was critical in reducing the severity in reducing the and the hospitalisation in third wave of COVID-19.

Keywords: Coronavirus disease-2019, Hospital stay, Mechanical ventilation, Mortality, Severe acute respiratory syndrome coronavirus-2

INTRODUCTION

Even as the COVID-19 treatment protocols evolved leading to better management and outcomes, prevention still seems to be the best and most effective way of combating COVID-19. Social distancing, hand hygiene, and wearing masks, these time tested methods for prevention of a respiratory illness proved to be effective in breaking the chain, even in this current pandemic. Vaccines, as public health tool, have an undisputable track record in helping eradicate many diseases. Since the beginning of the pandemic, it was believed that despite all the measures taken to curb the contagion, a vaccine will be the most effective tool in preventing the spread and complications of COVID-19 pandemic and achieve a state of normalcy [1-3].

In India, the vaccination drive was kicked off on 16th January 2022, and since, then more than two billion doses of vaccine had been administered up till September 2022 [4]. The COVID-19 vaccines provide strong protection against serious illness, hospitalisation, and death. There is also evidence that vaccinated individuals were less likely to transmit the virus on to others [5]. Data also suggests that although COVID-19 was usually milder, if contracted after vaccination than in unvaccinated individuals, mortality remained high in hospitalised individuals [6,7]. A few studies have mentioned that the mortality rate in the hospitalised individuals with COVID-19, even after vaccination were similar to mortality rate in 2020 during the first wave of COVID-19 [8,9].

As COVID-19 variants, with the potential to reduce vaccine efficacy, continue to emerge worldwide, more data is required regarding the real world effectiveness of current mass vaccination efforts [10]. In Delhi, more than half of the population was either partially or fully vaccinated, but it was still unclear, why the number of cases had risen so dramatically during the third wave in January 2022 [11]. As India was carrying out robust vaccination drive, which has covered more than two third of the population, the present study aimed to describe the relation of vaccination with disease severity and its outcome during the third wave of COVID-19.

MATERIALS AND METHODS

The single-centre retrospective, cross-sectional study was conducted from 10th January 2022 to 9th February 2022, in a dedicated COVID-19 Hospital (Guru Tegh Bahadur Hospital) in Delhi, India. The study was approved by Institutional Ethical Committee (CTRI no. ECR/510/INST/DL/2014/RR-20).

Inclusion criteria: All the patient data who were admitted in dedicated COVID-19 facility of Guru Tegh Bahadur Hospital, Delhi, India, with Real Time-Polymerase Chain Reaction (RT-PCR) positive for Severe Acute Respiratory Syndrome Coronavirus-2 (SARS CoV-2) and who were more than 18 years of age, were included in the study.

Exclusion criteria: Patients with the history of COVID-19 infection and unknown vaccination status were excluded from the study. A total of 257 patients were admitted and after excluding 11 patients, 246 patients were included in the study.

Study Procedure

Demographic, therapeutic, clinical data including various co-morbidities and outcomes data were recorded. Vaccination data was extracted via the CoWin platform 9, which included vaccine type as well as date of administration. The patients who had received only one dose of vaccination were considered to partially vaccinated and those who had taken both the doses were considered fully vaccinated. The type of vaccine taken was not disclosed in the study. Medical records of patients were retrospectively reviewed to retrieve demographic and clinical data which included age, gender, race, and zip code of residence, details of vaccine type and date of administration, existing medical records of patients were retrospectively reviewed to retrieve demographic, clinical data, details of vaccine type and course during hospital stay. The profile of patients was based on clinical examination, laboratory data, nursing record and radiological findings during the course of hospitalisation. All the data of admitted patients was filled in clinical case proforma and subsequently transcribed to Microsoft Excel.

The clinical outcome was described as discharge, length of hospital stay, and in hospital death. The data related to initial hospital admission unit {regular medical or surgical floor, progressive floor, Intensive Care Unit (ICU)}, change in unit type during admission, oxygen therapy (none, nasal cannula, supplemental high flow oxygen, ventilator), requirement of high flow oxygen, ventilator, specific inpatient medical therapies, hospital length of stay, and disposition from hospital (home, rehabilitation unit, death) was also assessed. However, as the primary aim of the study was to describe the relation between vaccination status and outcome of the COVID-19 patients, hence, the study was focused on mainly on the outcome after vaccination.

STATISTICAL ANALYSIS

Data was tabulated using Microsoft Excel 2019 and pivot tables were made. Statistical analysis was done using SPSS version 22.0 software. Chi-square test was applied to analyse the nominal variables and p-value of <0.05 was considered statistically significant.

RESULTS

Demography: The data of 246 patients were recorded and analysed. Mean age of the patients was 53.9±18.12 years; 55.69% (n=137) of the patients were males and 44.3% (n=109) were females.

Vaccination and its observed effects: Overall, majority (41.9%, 103) were unvaccinated. The subjects were further divided according to disease severity as per Ministry of Health and Family Welfare (MOHFW) guidelines [11] as shown in [Table/Fig-1].

Disease severity	
Mild	53 (21.5%)
Moderate	136 (55.3%)
Severe	57 (23.2%)
Vaccination status	
Fully	97 (39.4%)
Partially	46 (18.7%)
Unvaccinated	103 (41.9%)

[Table/Fig-1]: Disease severity of patients (during admission) and vaccination status (N=246).

It was found that n=30 (30.9%) of the fully vaccinated patients were able to maintain their saturation at room air, whereas, n=12 (26.1%) of the partially vaccinated, and only n=4 (3.9%) of unvaccinated patients were able to do so.

The percentage of patients requiring oxygen supplementation and mechanical ventilation was found to be more in unvaccinated patients as compared to the partially vaccinated [Table/Fig-2]. Also, the average duration of stay in hospital for the patients, who were successfully discharged was shortest for fully vaccinated patients and longest for unvaccinated patients [Table/Fig-3].

Vaccination status	Room air saturation	Nasal prongs	Oxygen mask	NIV/ Bilevel positive airway pressure (BIPAP)	Ventilator	Total oxygen requirement %
Fully (n=97)	30 (30.9%)	1 (1.0%)	54 (55.7%)	6 (6.2%)	6 (6.2%)	69.07%
Partially (n=46)	12 (26.1%)		19 (41.3%)	8 (17.4%)	7 (15.2%)	73.9%
Unvaccinated (n=103)	4 (3.9 %)		67 (65.0%)	10 (9.7%)	22 (21.4%)	96.1%

[Table/Fig-2]: Requirement of oxygen for the patients and other modes of ventilation as analysed according to their vaccination status.
NIV: Non invasive ventilation; BIPAP: Bilevel positive airway pressure

Vaccination status	Death	Discharge	Mean hospital stay (days)
Fully (n=97)	9 (9.3%)	88 (90.7%)	4.2
Partially (n=46)	10 (21.7%)	36 (78.3%)	5.3
Unvaccinated (n=103)	34 (33%)	69 (67%)	7.4
Total	53	193	

[Table/Fig-3]: Clinical outcome according to the vaccination status of individuals.

Out of the 246 patients, 53 succumbed to the illness, while 193 patients were successfully discharged. Vaccination status and the outcome was analysed in these patients and it was found that those who had taken complete course of vaccination had a better chance of survival. It was observed that among the admitted patients i.e. moderate to severe category or mild category with co-morbidities, the percentage of death among fully vaccinated group was 9 (9.3%), whereas 88 (90.7%) of fully vaccinated patients were discharged from the hospital. As compared to that, in the partially vaccinated group of patients 10 (21.7%) expired and 36 (78.3%) were discharged from hospital while in unvaccinated patients 34 (33%) succumbed to death and 69 (67%) of the patients were discharged from the hospital [Table/Fig-3]. Among the 53 deaths in hospital, death percentage was maximum in unvaccinated patients, followed by partially vaccinated patients and fully vaccinated patients.

In terms of co-morbidities, the vaccinated and unvaccinated groups did not show any major difference in i.e., 61.3% of the patients who were fully vaccinated had one or more co-morbidities, whereas 63.5% patients in the unvaccinated group had one or more co-morbidity. Notably, it was observed that all the patients who were fully vaccinated patients but did not survive had either one or more than one co-morbidity, whereas it was not in the case of partially and unvaccinated groups table, Chi-square test was applied which showed a p-value of 0.074 [Table/Fig-4].

Vaccination status	Presence of co-morbidity
Fully (n=9)	9 (100%)
Partial (n=10)	6 (60%)
Unvaccinated (n=34)	21 (61.7%)

[Table/Fig-4]: Vaccination status of patients who died and the presence of co-morbidities.

DISCUSSION

Since, the time when COVID-19 was declared a pandemic, all of the world's hopes were pinned on the effectiveness of the vaccine for the disease so that the normalcy can be achieved again. The vaccination drive in India began in January 2021, with the healthcare workers getting vaccinated and by February,

vulnerable populations like the elderly and those who had one or the other co-morbidity were also included in the beneficiaries. During the second wave of COVID-19 in India there was a surge in COVID-19 cases so the governments took extra measures to cater to the sick patients who required admission in hospital while accelerating the process of vaccination so that future waves of the pandemic can be prevented. By the time of third wave of COVID-19 in India, 1.57 billion COVID-19 vaccine doses were administered [4]. To describe the effects of vaccination (fully or partially) with respect to COVID-19 associated hospitalisation was the purpose of the present study. In the tertiary care hospital, the relationship between vaccination status and disease severity was analysed and a positive trend was observed. However, it was not statistically significant which could be due to Berksonian bias as the patients with milder disease were less likely to require hospital admission and were managed at home. Hence, lower percentage of those under milder category was being reflected. It was observed that most of the admitted patients had one or other risk factor like hypertension, diabetes, pregnancy, obesity, tuberculosis, malignancy etc. and amongst the patients who had severe illness, 62% were more than 55 years of age. The breakthrough COVID-19 infection was reported to be more common in patients with co-morbidity, immunocompromised state and elderly age group owing to immunosuppression and low immunogenecity despite vaccination [2,11,12].

Vaccination may have had a role in four major aspects- decrease in the number of admissions, decreased severity of illness, decreased morbidity and cost of healthcare in terms of reduced days of admission and decreased mortality in vaccinated individuals. To begin with, the change in the number of individuals admitted and hospitalised before and after vaccination in this tertiary centre was substantial. As per data, peak hospitalisation in April 2021 was 16418 while in January 2022 it was 2424 i.e., a decrease of 85% in the number of admissions during subsequent COVID-19 “waves” in the city [4]. It could be due to the robust vaccination drive which “covered” almost 90% of adults under partial vaccination state and 70% under fully vaccination state. Although, genetic mutation of the virus leading to low virulence and milder disease and complicationscausing decreased Institutional care was a factor confounding this trend. But still it can be inferred that vaccinations were an important factor in the substantial decrease in the number of cases [11,13-15].

It was observed that need of mechanical ventilation, the duration of stay in hospital and mortality rates was lower in patients who were fully or partially vaccinated as compared to unvaccinated patients as was reported by other studies [15-18] and it can be attributed to the protective effect of vaccination in high-risk population. An early increase in acute phase reactants like C-Reactive Protein (CRP), procalcitonin and D-dimer was found to be associated with the severity of hypoxia, multiorgan failure and need for ICU admission [16]. Whether vaccination leads to decrease in acute phase reactants by the virtue of decreased virulence and subsequent immune response is a relevant question which arose from this trend.

The decrease in duration of stay, not only eased the morbidity of patients but in a pandemic it mitigated the burden on the limited resources, leading to better care for critically-ill patients, further decreasing the mortality rates. In this study it was found that most of the patients who did not survive had one or other co-morbidity, but as the focus was mainly on outcome of the patients, the risk of mortality by type of co-morbidity was not explained as it was shown by a study by Wahil MSA et al., who described the association of mortality with risk factors and co-morbidities. Similar studies also found that the patients who succumbed to COVID-19, had a relatively rapid progression to sepsis, coagulopathy, acute respiratory distress syndrome, metabolic acidosis etc., [19,20]. The extensive data would have added more information on effects of vaccine on patients with co-morbid conditions and their outcome.

Limitation(s)

Genotyping of viral samples could not be assessed, retrospectively and the antibody titre levels of the patients could not be assessed to correlate with the severity of illness. Further, the data of outcome with the type of vaccine, was not studied. Also, the correlation with individual co-morbidity or deranged laboratory parameters were not drawn. But, despite these limitations the study observed a positive effect of vaccination on COVID-19 related severity and complications, indicating the stance of the healthcare system of India.

CONCLUSION(S)

The study observed the beneficial effect of vaccination on reduction in the number of admissions, severity of disease, oxygen requirements, morbidity (duration of stay) and mortality (disease outcome) in patients of COVID-19 during the third wave in India. Hence, vaccination coverage was critical to reduce severity of disease and reduce hospitalisation in third wave of COVID-19.

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