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A Comparative Study of Clinical Profile of Hospitalized COVID-19 Patients in Relation to Their Vaccination Status

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ORIGINAL STUDY

A comparative study of clinical profile of hospitalized COVID-19 patients in relation to their vaccination status

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Abstract

Background: **The clinical picture, outcome of Covid-19 infection and vaccine effectiveness vary in different individuals. These may depend on multiple variables like age, sex, comorbidities, and immune status against the virus and in general.**

Objective: **To describe demography, clinical profile, vaccination status and its impact on clinical outcome of hospitalized Covid-19 patients.**

Methods: **This retrospective study was conducted on hospitalized Covid-19 patients of N.S.C.G.M.C. Khandwa, a tertiary care centre from central India. The author studied 188 Covid-19 positive admitted patients' demographic profile, clinical profile, co-morbidity, vaccination status, clinical outcome and association of these variables to their vaccination status during second Covid-19 wave in India from first April 2021 to 30th June 2021.**

Results: **The mean age of study participants was 54.1 years and majority (76.5%) were male. Most patients (71.8%) were unvaccinated and 47.9% patients had co-morbid conditions, most common was diabetes (28.9%) followed by hypertension (25.6%). Unvaccinated patients had severe lung infection (72%). There was statistically significant difference between vaccinated and unvaccinated patients in terms of severity of infection, comorbidity, mean baseline SpO_2 at admission and need of supplemental oxygen.**

Conclusion: **Vaccination decreases severity of infection and need for supplemental oxygen significantly.**

Keywords: Clinical profile, Covid-19, Hospitalization, Severity, Vaccine

1. Introduction

Covid-19 pandemic has created a worldwide menace not only in terms of public health; it has also affected every aspect of human life and health, including physical, social and psychological well-being. With the initial intimidation by rising cases, the multi-pronged response focused on understanding transmission, disease and Non-Pharmacological Interventions (NPIs) in the population which was followed by search for effective treatments [1]. The next and more effective way was vaccine development and mass vaccination.

Like many countries of the world, India also started vaccines development to subdue the Covid-19 pandemic. In India, Covid-19 vaccination program started from 16th January 2021, and it primarily employed two vaccines, namely Covishield and Covaxin [2,3]. Frontline workers were vaccinated as quickly as possible, followed by high-risk population and general population subsequently.

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However, India started to witness the second wave of Covid-19 since February 2021, with increasing number of cases reported in all states, including Madhya Pradesh.

As stated, vaccine efficacy is not always equivalent to vaccine effectiveness. Effectiveness is defined as reduced risk of infection or disease among individuals which is attributed to vaccination, in real world conditions. The findings of effectiveness studies in a particular age group or geographical setting might not predict generalizability. The clinical picture, outcome of Covid-19 infection and vaccine effectiveness in individuals are heterogeneous and dependent on multiple variables including age, sex, ethnicity, and comorbidities. Vaccine hesitancy also plays a significant role [4]. From a healthcare perspective it is imperative to know if the vaccine is effective against severe infection, hospitalization and mortality and also various factors associated with them.

Regarding the effectiveness of these vaccines among the Indian population very few studies are available. Our study intends to present data of hospitalized Covid-19 patients at our institute from central India during the second wave of pandemic. Such data would be useful for further research on Covid-19 infection and vaccine effectiveness.

2. Methodology

This retrospective, observational study was conducted around the second Covid-19 wave in India. The recorded data of patients admitted in Covid ward from 1st April 2021 to 30th June 2021, were retrieved from the patient's record section and vaccination center of Nand Kumar Singh Chouhan Government Medical College, Khandwa (NSCGMCK), a main tertiary care Centre of East Nimar region of Madhya Pradesh, India. Institutional ethics committee approval was obtained (No. 39/IEC/NSCGMCK/2022, dated 01/04/2022).

Covid-19 cases included in the study were hospitalized patients with positive molecular or antigen test result for Covid-19 within 10 days after symptom onset or patients with a clinical syndrome consistent with Covid-19.

We included patients only 45 years or more in our study for more uniform distribution of vaccination status among study participants. Patients details such as name, age, gender, vaccination status and doses, co-morbidity, investigations such as chest radiography, High resolution computed tomography (HRCT) chest, baseline SpO_2, course in ward and clinical outcome (discharge, death or referral to higher center) were recorded.

The recorded data was tabulated and statistical analysis was done. Quantitative data variables were expressed using mean and standard deviation. χ^2test was used to find the association between vaccination status and other clinical variables. Significance levels for all analyses were set at the P less than 0.05.

3. Result

Of total 188 patients, majority (76.5%) were male. The mean age of study patients was 54.1 years with SD of 8.3 years and 54 (28.7%) patients were above 60 years of age. A larger proportion of all patients were unvaccinated ($n = 135$). In this study, unvaccinated patients are those who had not received even a single dose of any kind of Covid-19 vaccine, which were being given in India during the study period. We found 53 patients to be vaccinated, of which only 2 patients had received both doses of vaccine. However, since patients who received both doses were admitted within 14 days of second dose, we had considered all vaccinated patients as partially vaccinated. For the purpose of analysis, we divided participants into two groups single dose vaccinated and unvaccinated.

Co-morbid medical conditions were present in 47.9% of patients and type II diabetes was the most common (28.9%) comorbidity followed by hypertension (25.6%) and both diabetes and hypertension was present in 35.6% patients. Admitted vaccinated patients had proportionately lower prevalence of comorbidity as compared to admitted unvaccinated patients and the difference was statistically significant.

On comparison of chest radiography finding of vaccinated and unvaccinated patients, 72% of severe lung involved patients were unvaccinated, while the vaccinated patients had milder chest infection (54%). The chest HRCT facility was not available at our institution during the study period; hence HRCT scores of only 45 patients were available. Of these, 14 patients were vaccinated, among them 10 patients had score equal or less than 13 (total score 25) and four had more than 13 score. Amongst 31 unvaccinated patients, 10 had score less than 13 and 21 had score more than 13. This difference of chest HRCT score between vaccinated and unvaccinated was statistically significant.

The mean baseline oxygen saturation of vaccinated patients was 83.1 ± 9.9 as compared with nonvaccinated patients who had 78.2 ± 12.7, the difference is statistically significant. In our study, majority of patients ($n = 181$) needed supplemental

oxygen. Delivery of oxygen via NRB mask was given to 97 patients of whom 72% were unvaccinated, while those who required HFNO/BiPAP, only 27% were vaccinated. There was no significant difference between the mean of total 'stay in the hospital' among vaccinated (11.42 ± 7.94) and unvaccinated patients (12.39 ± 7.49).

The clinical outcome varied between vaccinated and unvaccinated patients, as among vaccinated patients, 71.7% were discharged from hospital and 26.4% succumbed to death. Whereas from unvaccinated group, 65.9% were discharged, 25.9% died and 8.1% were referred to higher center or took discharge against medical advice. The difference was not statistically significant.

4. Discussion

In our study 28.7% patients were aged more than 60 years, one probable reason is initial phased implementation of vaccination in India [2,3,5] because of which we could include only people 45 years or more in our study, leading to predominance of elderly participants. Nonetheless, other similar studies from India Umakanthan and colleagues and Bhatnagar and colleagues [6–8] and other countries across the globe Wang and colleagues and Chilimuri and colleagues [9–16] also show similar findings. Most plausible argument proposed can be elderly being high risk population Rashedi and colleagues [17].

In our study larger proportion of participants were male (76.6%) similar to other studies from India Aggarwal and colleagues [7], Ghosh and colleagues [18], and Suri and colleagues [19]. Men are more sensitive to SARS-CoV-2 so the male sex is one of the risk factors for Covid-19 Chen and colleagues [20].

In the study, out of 53 participants, only two had received both doses and the rest 51 had received only one dose of either vaccine. Suri and colleagues, conducted similar hospital based study involving a cohort of 2080 hospitalized patients in India, from April to June 2021 and found that 86.2% were partially vaccinated among Covaxin recipients and 90.1% were partially vaccinated among Covishield recipients Suri and colleagues [19]. Another muticentric, hospital based, case control study from India conducted by Tarun et al., from May–July 2021, on participants aged more than 45, found 8% cases as fully vaccinated, 18% cases partially vaccinated and 71.3% cases as unvaccinated Bhatnagar and colleagues [8]. A larger proportion of unvaccinated participants in our study were probably due to phased implementation of vaccination in India before and during the study period and also due to vaccine hesitancy and vaccine resistance among people in the beginning, leading to lesser number of vaccinated people. Umakanthan and colleagues conducted a longitudinal online survey in India covering 3000 people and found 41.5% having vaccine hesitancy and vaccine resistance Jaiswal and colleagues [4]. A large number of participants had received only single dose, initially due to vaccine shortage and subsequently, despite vaccine availability, due to changes in guidelines on the interval between doses Victor and colleagues [21].

Nearly half patients had associated co-morbidities. This was expected as the prevalence of multiple chronic conditions among individuals increases with age. Approximately one in four adults have two or more chronic conditions and half of older adults have three or more chronic condition Boyd and colleagues [22]. Diabetes was the most common comorbid medical condition (28.9%) followed by hypertension (25.6%). Amit et al., and Suri and colleagues also found diabetes and hypertension as most common co-morbid conditions Aggarwal and colleagues [7] and Suri and colleagues [19]. Admitted vaccinated patients had proportionately lower prevalence of comorbidity as compared with admitted unvaccinated patients and the difference was statistically significant. The probable reason could be vaccine hesitancy leading to lesser vaccination among very aged people with multiple comorbidities during the initial phase of vaccination in India. Other possible reasons could be that initially frontline workers and their relatives/acquaintances had taken vaccinations, they are presumed to be more health conscious people with easy access to medical treatment and hence lesser comorbidities.

On comparing the Covid-19 related morbidity, chest imaging (HRCT chest) in vaccinated and unvaccinated patients there was significant difference. Vaccinated patients were found to have comparatively milder lung infection. This finding is comparable to findings of Suri and colleagues, Peter et al. (2021) and Ghosh and colleagues. Chest imaging plays an important role in both assessment of disease extent and follow-up Hosseiny and colleagues [23]. Similarly, there was statistically significant difference between the mean baseline oxygen saturation (SpO_2) at the time of admission, of vaccinated patients (83.1 ± 9.9) and unvaccinated patients (78.2 ± 12.7). On comparing the mode of supplemental oxygen delivery, indirectly reflecting the amount of oxygen needed and severity of illness, 53.6% of total patients needed supplemental oxygen via NRB (nonrebreather mask), of

which slightly more than half (51.9%) were unvaccinated, whereas those who required high flow nasal oxygen (HFNO) or BiPAP (46.4%),73% patients were unvaccinated. Daher and colleagues [24], in their study concluded that patients with Covid-19 who require oxygen therapy, need long-term inpatient and supplemental oxygen care, hence it can be argued that vaccination was helpful in reducing the severity of infection and the need of supplemental oxygen. Akashneel et al. 2021, studied 'Covid-19 vaccine efficacy in preventing the disease and reducing the disease severity from India', and found significant protective effects of not just complete vaccination but partial vaccination also, similar to our findings Bhattacharya and colleagues [25].

The clinical outcome varied between vaccinated and unvaccinated patients, as from former group, 71.7% were discharged from hospital and 26.4% succumbed to death. Whereas from unvaccinated group, 65.9% were discharged, 25.9% died and 8.1% were referred to higher center or took discharge against medical advice. However the difference was not statistically significant probably due to higher referral rate and taking discharge against medical advice among unvaccinated group. This finding is in contrast with other studies from India, probably due to limited age group (45 and above), smaller sample size, incomplete vaccinations and hospital-based sample in our study, these also being limitations of our study. In our study, being retrospective in nature, we could not follow-up study participants and hence long-term complications of Covid-19 among vaccinated and unvaccinated discharged patients could not be studied. The study results also may lack generalizability.

4.1. Conclusions

In conclusion, The effect of single dose of vaccine in reducing the severity of the Covid-19 disease was also significantly observed. The single dose of Covid-19 vaccine also helped in creating significant difference in severity of infection, comorbidity, mean baseline SpO_2 at admission and need of supplemental oxygen.

Conflicts of interest

None declared.

Institutional Review Board (IRB) Approval Number

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