



### RESEARCH ARTICLE

## COVID-19 CASE FATALITY AND VACCINATION STATUS: A HOSPITAL BASED CROSS SECTIONAL STUDY

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#### Abstract

**Introduction:** Effectiveness of COVID-19 vaccine in preventing COVID-19 and related mortality is to be studied in depth especially now since we are on the verge of 4th wave of pandemic. The present study aims to evaluate the effectiveness of vaccines in preventing case fatality in hospitalized COVID-19 patients in a tertiary care centre.

**Methods:** A hospital based cross-sectional study was done in all COVID-19 patients admitted in a tertiary care centre in Aurangabad from February 2021 to May 2022. 1275 patient's vaccination status was known and outcome of these patients were studied. Unadjusted Odds ratios for each variable were estimated and logistic regression was used for multivariate analysis.

**Results:** 360 study participants (28.24%) had taken at least 1 dose of vaccine, while 915 (71.76%) were not vaccinated. 441 (34.59%) participants had unfavourable outcome (death). The mortality in vaccinated was 24.17% (87/360) while it was 38.69% (354/915) in unvaccinated. In logistic regression model, partial as well as complete vaccination, age<65, female sex, not having a comorbidity were associated with favourable outcome. Vaccine effectiveness for single dose and double dose was 37% and 66% respectively.

**Conclusions:** It is observed that getting partially as well completely vaccinated was a protective factor for good recovery in COVID 19. Vaccine is found to be effective in preventing mortality in COVID patients.

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#### Introduction:-

The Corona virus disease 2019 (COVID-19) was declared as a pandemic on 11 March 2020 by WHO<sup>(1)</sup>. As of 27 July 2022, there are a total of 570,005,017 confirmed cases of COVID-19 and a total of 6,384,128 deaths globally, while India had 43,938,764 confirmed cases and 526,167 deaths<sup>(2)</sup>. India started COVID-19 vaccination on January 16 2021 with Covaxin (by Bharat biotech) and Covishield (by Serum Institute of India) only for Health care workers and Front-line workers and later made available to general public in a phased manner from 1<sup>st</sup> March 2021 (elderly and those aged more than 45 with comorbidities) and 1<sup>st</sup> may 2021 (for all adults)<sup>(3,4)</sup>. India crossed the 1 billion milestone for COVID-19 vaccinations on 21 October 2021<sup>(6)</sup>. India started COVID 19 vaccinations for 15-18 age group on January 3<sup>rd</sup> 2022 and Covaxin was preferred for them. Later on, March 16<sup>th</sup> 2022 CorBEVax vaccine was introduced for 12-14 age group. Precautionary dose was introduced for healthcare, frontline workers and individuals aged 60 years and above and later all individuals above 18 years on January 10<sup>th</sup> and April 10<sup>th</sup> respectively<sup>(7,8,9)</sup>.

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COVID -19 vaccine have proved to be effective against severe disease, hospitalization as well as deaths in adults, children and adolescents<sup>(5)</sup>. Study on COVAXIN shows, 78% vaccine efficacy was proved against COVID-19 infection of any severity 14 days or more after 2<sup>nd</sup> dose and 93% vaccine efficacy against severe COVID-19 disease. 79% efficacy seen in adults aged less than 60 years, while 68% efficacy in those aged 60 years and above in preventing COVID-19 infection<sup>(10,11)</sup>. COVISHIELD by Serum Institute of India protected 63% individuals after 2 doses of vaccine against COVID-19 infections<sup>(12)</sup>.

Now COVID-19's end is nearby and we are in the winning zone. There are many factors which are helping us for containment of this pandemic like, COVID appropriate behaviour, Vaccination etc. This study aims to study the risk factors for mortality in COVID-19 patients and evaluate the effectiveness of COVID vaccinations in preventing case fatality in hospitalised COVID-19 patients in a tertiary care centre.

### **Subjects and Methods:-**

A cross-sectional study was conducted based on records of all COVID-19 patients admitted in a tertiary care centre in Aurangabad. The centre is a Dedicated COVID hospital of 1200 beds with 130 ICU beds and 760 isolation beds for COVID-19 patients. As of 31<sup>st</sup> May 2022, the total COVID positive patients admitted in the centre came to be 11308. Data was collected from records of COVID patients admitted from 1<sup>st</sup> February 2021 to 31<sup>st</sup> May 2022 (16 months).

AIIMS/ ICMR -COVID-19 national task force / Joint Monitoring Group Ministry of Health and Family Welfare, Government of India formulated clinical guidance for management of COVID-19 patients. Patients with Upper respiratory tract symptoms and /or fever without shortness of breath or hypoxia was classified as Mild disease and home isolation and care is recommended for these patients. Moderate Patients will have either breathlessness/ Respiratory rate  $\geq 24$ /min or Spo<sub>2</sub> 90% to  $\leq 93\%$  on room air and they are admitted in isolation wards. They undergo monitoring of temperature and oxygen saturation, and will be discharged after 10 days of symptom onset, if fever resolved within 3 days and above 95% for 4 days. No RT-PCR test is required before discharge for moderate patients. Severe disease is characterised by Respiratory rate  $> 30$ /min, breathlessness or Spo<sub>2</sub>  $< 90\%$  on room air. These patients are admitted in Intensive care unit. These patients are discharged after clinical recovery and RT-PCR negative result<sup>(13,14)</sup>.

All COVID-19 patients admitted in tertiary care centre from 1<sup>st</sup> February 2021 to 31<sup>st</sup> May 2022 were studied in this study. A total of 7140 patients were admitted as COVID-19 positive in the study period. Muthukrishnan J et al<sup>3</sup> got 12.5% mortality among COVID-19 patients in their study. In the finite sample of 11300 COVID-19 patients admitted till May 2022 in the hospital, using 12.5% as p value, 95% Confidence limit, 80% power and taking relative error of 15%, the minimum sample size came to be 1081. Complete information regarding 1275 study participants were able to collect from records and they were included in the study. Details regarding them was collected from Health Management & Information System and various departments like General Medicine, General surgery, Paediatrics, Neonatology and Obstetrics & Gynaecology.

From records of all study participants, data regarding age, gender, address, provisional diagnosis, comorbidities, duration of stay in hospital, presenting symptoms, duration of symptoms, outcome and Vaccination status were collected. The outcome was recorded as "Discharged" and "Died". The patients whose outcome is absconded, pending and unknown were excluded from the study. Vaccination status were graded as Partially vaccinated, completely vaccinated and not vaccinated. A person who has completed at least 14 days after 1<sup>st</sup> dose of COVID vaccine was labelled as "partially vaccinated", those who completed at least 14 days after 2<sup>nd</sup> dose was labelled as "completely vaccinated". Patients who have not taken any COVID vaccine or have not completed 14 days after 1<sup>st</sup> dose are taken as "Not vaccinated".

A line list was made with all the data collected in Microsoft Excel 2019. Quantitative data were expressed as frequency (percentages) and quantitative data expressed in mean and standard deviation. Association between Outcome of patients and Age, Sex, Comorbidities, Duration of stay, Duration of Symptoms and Vaccination status were analysed and unadjusted odd's ratio was calculated. Adjusted odd's ratio was calculated using multivariable logistic regression. SPSS version 26 was used for analysis.

**Results:-**

Among the total 1275 participants, age ranged from 1 to 98 with a mean age of  $53.28 \pm 17.5$ . 723 (56.7%) were males and rest 552 (43.3%) were females in the study. The study participants was mainly from Aurangabad district (78.4%), followed by Ahmednagar (9.6%) and rest 12% belonged to other nearby districts of Aurangabad like Beed, Buldhana, Hingoli, Nanded, Parbhani etc.

817 (64.08%) participants had no comorbidities. 297 (23.29%) had only 1 comorbidity, 135 (10.59%) had 2 comorbidities and rest 26 (2.04%) had 3 or more. The most common comorbidity was Hypertension (12.96%), followed by Type 2 Diabetes Mellites (14.75%).

Total 834 (65.41%) patients were discharged after treatment, while rest 441 were died (34.59%). Hospital stay in discharged patients ranged from 1 to 76 days, mean duration was 9 days. In patients with death as an outcome, death interval was calculated and it ranges from 0 to 71, mean death interval came to be 10 days. Duration of symptoms ranged from 1 to 30 days, mean duration being 7 days.

160 study participants were partially vaccinated, 200 were completely vaccinated and rest 915 participants were not vaccinated with any COVID vaccine. Among the total 441 participants who died, 354 (80.27%) had not taken any COVID vaccine, while 48 were partially vaccinated and 39 were completely vaccinated. However, among the 834 participants who were discharged, only 561 (67.27%) were not vaccinated while 112 and 161 were partially and completely vaccinated respectively. (TABLE 1)

**Univariate Analysis of Risk Factors (Table 2)**

Unadjusted Odds ratio was calculated to find the association between good outcome in COVID-19 patients and factors. Socio-demographic variables like Age  $\geq 65$ , male gender was found to be associated with having a bad outcome in COVID-19 patients. Having even 1 comorbidity was associated with bad outcome. Not having vaccinated was associated with bad outcome.

A logistic regression of 95% confidence interval was carried out to adjust for the confounders and Age  $\geq 65$  years, male gender, comorbidities, not vaccinated were found to be truly associated with bad outcome in patients.

**Vaccine Effectiveness (Table 3)**

Unadjusted and Adjusted Vaccine effectiveness were calculated using formulae,

$$VE = (1 - OR) * 100\%$$

Odds ratio for partial vaccination and mortality in COVID-19 patients was found to be 0.68 (0.47-0.98).

$$\text{Unadjusted VE for partial vaccination} = (1 - 0.68) * 100 = 32\%$$

Unadjusted VE for complete vaccination in preventing mortality was 62%.

Adjusted VE for partial and complete vaccination was 37% and 66% respectively.

**Discussion:-**

The present study found out that age  $\geq 65$  years is a risk factor for mortality in COVID-19 patients. Adjusted odds ratio was 2.08. This result was like results seen in Muthukrishnan J et al, age  $> 80$  was associated with higher mortality (Adjusted odds ratio 1.07) and Estiri H et al<sup>15</sup> in which age 65-80 was associated with higher mortality Odds ratio 4.30 (3.73-4.96). Mahraeen E et al<sup>16</sup> also showed increasing age was associated with mortality odds ratio 1.18 (1.08-1.29).

Male gender had higher odds of getting bad outcome in present study which was like Muthukrishnan J et al in univariate analysis, Mehraeen E et al, and Estiri H et al. Multivariate analysis in Muthukrishnan et al showed no significant association between gender and mortality in COVID-19 patients. Comorbidities are associated with higher mortality in present study (Adjusted OR- 1.96). Univariate analysis in Muthukrishnan J et al found similar significant association (OR-2.55), but the association was not significant in multivariate analysis. Mehraeen E et al Diabetes and Hypertension was associated with higher mortality. Other comorbidities like COPD, Cardiovascular disease, chronic kidney disease, malignancy, liver disease etc were not significantly associated. Estiri H et al had similar results showing higher mortality in patients with comorbidities.

In present study Vaccine efficacy was studied and adjusted VE was 37% and 66% respectively for single dose and 2 doses of vaccine respectively in preventing COVID-19 mortality. COVID-19 tracker<sup>17</sup> study revealed vaccine

effectiveness in preventing mortality. For 1<sup>st</sup> dose 96% and 2<sup>nd</sup> dose 97.5% was seen. Vaccine effectiveness for not getting infection was studied by Oxford Astrazeneca<sup>18</sup> and revealed an effectiveness of 76% and 81.3% after 1<sup>st</sup> and 2<sup>nd</sup> dose respectively. In P.Behra et al<sup>5</sup> vaccination status was not found to be effective in preventing break-through infections.

So, to conclude in present study it is observed that getting partially as well completely vaccinated was a protective factor for good recovery in COVID 19 patients. The odds of having bad outcome in non-vaccinated as compared to partially vaccinated was 1.59, while compared to fully vaccinated it was 2.92. Age<65, female sex, not having a comorbidity were associated with favourable outcome.

### Acknowledgement:-

Nil.

### Tables:

**Table 1:-** Demographic Characteristics Of Participants.

| CHARACTERISTICS        | FREQUENCY/<br>MEAN | DIED         | DISCHARGED    |
|------------------------|--------------------|--------------|---------------|
| AGE (MEAN ± SD)        | 53.28±17.5         | 60.2 ± 14.29 | 49.63 ± 17.96 |
| GENDER [FREQUENCY (%)] |                    |              |               |
| MALE                   | 723 (56.7%)        | 273 (61.9%)  | 450 (53.95%)  |
| FEMALE                 | 552 (43.3%)        | 168 (38.1%)  | 384 (46.05%)  |
| COMORBIDITY            |                    |              |               |
| YES                    | 458 (35.92%)       | 204 (46.25%) | 254 (30.45%)  |
| NO                     | 817 (64.08%)       | 237 (53.75%) | 580 (69.55%)  |
| DURATION OF STAY       | 9 DAYS             | 10 DAYS      | 9 DAYS        |
| VACCINATION STATUS     |                    |              |               |
| NOT VACCINATED         | 915 (71.77%)       | 354 (80.27%) | 561 (67.27%)  |
| PARTIAL                | 160 (12.55%)       | 48 (10.88%)  | 112 (13.43%)  |
| COMPLETE               | 200 (15.68%)       | 39 (8.85%)   | 161 (19.30%)  |

**Table 2:-** Risk Factors Of Mortality In Covid-19 Patients.

| FACTORS     | UNADJUSTED<br>OR (CI) | P VALUE | ADJUSTED OR (CI) | P VALUE |
|-------------|-----------------------|---------|------------------|---------|
| AGE ≥65     | 2.22(1.75-2.86)       | <0.0001 | 2.08 (1.61-2.70) | <0.0001 |
| MALE SEX    | 1.39 (1.09-1.75)      | 0.003   | 1.49 (1.16-1.92) | 0.001   |
| COMORBIDITY | 2 (1.56-2.5)          | <0.0001 | 1.96 (1.51-2.56) | <0.0001 |

**Table 3:-** Vaccination Effectiveness In Preventing Mortality.

| VACCINATION STATUS | ADJUSTED OR | VACCINE EFFECTIVENESS |
|--------------------|-------------|-----------------------|
| SINGLE DOSE        | 0.68        | 37%                   |
| DOUBLE DOSE        | 0.38        | 66%                   |

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