

# Outcomes among 10,314 hospitalized COVID-19 patients at a tertiary care government hospital in Delhi, India

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## Abstract

A significant proportion of patients with coronavirus disease 2019 (COVID-19) require timely hospitalization to reduce the risk of complications and mortality. We describe the trends of the age and gender stratified outcomes among hospitalized COVID-19 patients with moderate to severe illness at the largest dedicated tertiary care COVID-19 government hospital in New Delhi, India. A retrospective cohort study through secondary data analysis from in-patient hospital data of patients admitted from April 1 to November 15, 2020 was conducted. The data of 10,314 laboratory-confirmed patients with COVID-19 was analyzed, of which 8899 (86.28%) were discharged after recovery, and 1415 (13.72%) died. The mean (SD) age of the hospitalized patients was 46.43 (18.74) years ( $n = 10,309$ ) including 6031 (58.50%) male and 4278 (41.50%) female patients ( $n = 10,309$ ). On bivariate analysis, increasing age was associated with significantly higher odds of mortality in both gender ( $p < .001$ ). The mortality rate in female patients was lower (11.92%) compared with male patients (15.75%) ( $p = .675$ ). However, elderly women had the highest odds of mortality ( $p < .001$ ), indicating the possible role of delayed health seeking behavior, secondary to familial, and social neglect. Mortality in the patients with COVID-19 also occurred early after admission suggesting rapid deterioration, delayed reporting by patients, or their late referral from other health facilities. However, the overall statewide recovery rate showed steady improvement since the onset of the pandemic. In contrast, the recovery rate among the moderate-severe cases that were hospitalized at this tertiary care center during the same period reflected a lower nonspecific zigzag pattern indicating limited effectiveness of the COVID-19 treatment regimens.

## KEYWORDS

coronavirus, COVID-19, epidemiology, pandemic, recovery rate

## 1 | INTRODUCTION

It is well-established that although most patients with coronavirus disease 2019 (COVID-19) have mild-moderate symptoms and show recovery, a significant proportion require timely hospitalization to reduce the risk of complications and mortality.<sup>1,2</sup> The state of Delhi comprising the Indian capital city with a population of 19.6 million had recorded 0.48 million COVID-19 cases and 7614 associated deaths as of November 16, 2020.<sup>3</sup> Previous studies show that the risk of severe COVID-19 illness and fatality is higher among men, elderly, and in individuals with comorbidities, especially diabetes.<sup>4</sup> Overall recovery rates from COVID-19 in developing countries including India is high but there is paucity of information on the outcomes among patients with moderate-severe illness requiring hospitalization.<sup>5,6</sup>

**Objective:** to ascertain the risk of age and gender of hospitalized moderate-severe patients with COVID-19 in Delhi, India on their treatment outcomes including duration of hospitalization, recovery, or death. We further described the age and gender stratified outcomes in the cohort.

## 2 | PATIENTS AND METHODS

### 2.1 | Study setting and duration

We conducted a retrospective cohort study through secondary data analysis from in-patient data of patients admitted from April 1 to November 15, 2020 at the Lok Nayak Hospital (LNH), the largest dedicated COVID-19 government tertiary care hospital in Delhi, India. According to the government guidelines, regular hospitals could be converted into dedicated COVID hospitals for referral and management of moderate-severe patients with COVID-19.<sup>7</sup> The LNH is a 2000 bed multispecialty hospital located in the Central District of Delhi which provides services free of cost to all patients. Nearly one in five deaths in the entire state of Delhi during the period of observation occurred among the patients hospitalized at the LNH.<sup>3</sup>

### 2.2 | Admission criteria

In the state of Delhi, patients with mild disease were not immediately hospitalized in any government hospital and instead their suitability for home isolation was ascertained by a district health team.<sup>8</sup> COVID-19 patients with severe disease or moderate disease along with the presence of comorbidities, or those with initially mild disease but experiencing worsening of symptoms or depletion of oxygen saturation were referred and managed at the LNH. Severe disease constitutes severe pneumonia (respiratory rate [RR]  $\geq 30$  per min and/or  $\text{SpO}_2 < 90\%$ ), or acute respiratory distress syndrome, or septic shock and those patients requiring intensive care. Moderate disease was defined as  $\text{RR} \geq 15 < 30$  and/or  $\text{SpO}_2$  90%–94%.<sup>7</sup>

### 2.3 | Laboratory testing

The severe acute respiratory syndrome coronavirus 2 detection in respiratory specimens (nasal and oropharyngeal swabs) was conducted using real-time polymerase chain reaction (RT-PCR) methods.

**Clinical management protocol:** of the hospital was based on the recommendations of the Indian Council of Medical Research, which was updated as per the evidence generated in drug trials and international consensus guidelines regarding the best clinical practices.<sup>9</sup> The hospital also framed guidelines for use of the drugs and treatments which were repurposed for use in patients with COVID-19 through a multidisciplinary expert committee that was constituted for the purpose.

- (i) Anticoagulation therapy with heparin was instituted in the admitted patients having raised D-dimer levels, or in the patients in whom hypoxia was induced after a 6 min' walk test.
- (ii) Hydroxychloroquine was used extensively in patients except those with underlying cardiac illness after electrocardiogram monitoring until August 2020 with progressive phasing out of the drug.
- (iii) Remdesivir was prescribed to patients with moderate disease after no response to steroids for 3 days and nonresponse to oxygen therapy with increasing  $\text{FiO}_2$ , or in case of lymphopenia.
- (iv) Tocilizumab was recommended for moderate-severe cases with progressively increasing oxygen requirement despite being on steroids, extensive and bilateral lung disease on computed tomography or X-Ray, and a 10-fold increase in interleukin-6 levels indicative of cytokine storm.
- (v) Ivermectin use was permitted in admitted cases but contraindicated in pregnant women, patients with hepatic, or renal disease, and the elderly of age more than 65 years.
- (vi) Corticosteroids are usually reserved for patients having severe and critical COVID-19, or in those with moderate illness having multiple comorbidities.
- (vii) Plasma therapy was reserved for patients with  $\text{RR} > 30$ ,  $\text{SpO}_2 < 93$ ,  $\text{P/F} < 300$ , and lung infiltrates  $> 50\%$  presenting within 7 days of symptom onset.

Some of the therapies including Remdesivir, Ivermectin, and Plasma Therapy were not recommended by the ICMR due to paucity of evidence from high-quality trial data but was permitted in the LNH based on the clinic acumen and experiences of the treating physicians.

### 2.4 | Discharge criteria

According to the recommended country guidelines, patients were usually discharged after 10 days of symptom onset in the case of: (i) absence of fever, (ii) resolution of breathlessness, and (iii) no oxygen requirement.<sup>10</sup>

## 2.5 | Methodology

Patient data were extracted from the hospital electronic registration data and the laboratory records with respect to the following variables: age, sex, date of admission, date of outcome, type of outcome, and the initial patient RT-PCR laboratory reports.

## 2.6 | Statistical analysis

Data were entered in MS-EXCEL 2016, cleaned, and then analyzed with IBM SPSS Version 25 (Armonk, NY: IBM Corp). The results were expressed in frequency and proportions for categorical variables and mean and standard deviation for continuous variables with normal data and median and interquartile range for non-normal data. The difference between proportions was assessed with the  $\chi^2$  test and the difference between means by the independent samples *t*-test. A *p* value < .05 was considered statistically significant.

## 2.7 | Ethical considerations

The study was approved by the Institutional Ethics Committee (F.1/IEC/MAMC/(74/02/2020/No71) with exemption from full review. Patient consent was not applicable since we analyzed secondary data.

## 3 | RESULTS

We analyzed admission and outcome data of 10,314 laboratory-confirmed patients with COVID-19 from April 1 to November 15 2020. Among these patients, 8899 (86.28%) were discharged after recovery, and the case fatality rate was 13.72%. Furthermore, 438 (4.25%) COVID-19 positive patients were hospitalized at the hospital's COVID-19 intensive care unit directly at the time of admission, of which 290 (66.21%) patients died.

The mean (standard deviation) age of the patients was 46.43 (18.74) years (*n* = 10,309). The age-profile of the patients was less than 30 years in 2210 (21.44%), 30–39 in 1587 (15.39%), 40–49 in 1614 (15.66%), 50–59 in 1955 (18.96%), 60–69 in 1760 (17.07%), and more than or equal to 70 in 1183 (11.48%). The recovery rate in the less than 30, 30–39, 40–49, 50–59, 60–69, and more than or equal to 70 age-group of patients was 96.97%, 94.09%, 88.85%, 82.81%, 77.50%, and 69.74%, respectively.

There were a total of 6031 (58.50%) male and 4278 (41.50%) female patients (*n* = 10,309). On bivariate analysis, among COVID-19 cases, increasing age was associated with significantly higher odds of mortality in both gender (*p* < .001) (Table 1). On adjusted analysis, the risk of mortality was independently associated with male gender adjusted odds ratio (aOR) 1.14 (95% confidence interval [CI] 1.01–1.29, *p* = .032), and in those aged 60–69 years aOR 9.09 (95% CI 6.95–11.89, *p* < .001), or more than or equal to 70 years aOR 13.59 (95% CI 10.33–17.86, *p* < .001), compared with the patients below 30 years of age.

The median duration of hospital stays among the COVID-19 recovered and death outcome patients were 9 (interquartile range [IQR] 6–13) (*n* = 8369) and 5 (IQR 2–10) days (*n* = 1415), respectively (*p* value < .001). Furthermore, mortality in the patients with COVID-19 occurred early after admission indicating either the rapid deterioration, delayed reporting by patients, or their late referral from other health facilities. Among the geriatric, in comparison with the younger patients with COVID-19, the duration of hospital stay was significantly prolonged among the recovered (*p* < .01) and shorter in those who had a fatal outcome (*p* < .001) (Figure 1). Moreover, the odds of mortality was positively associated with age more than or equal to 40 years (*p* < .001).

## 4 | DISCUSSION

The present study observed that mortality rate in younger patients especially aged less than or equal to 40 years was very low, a finding consistent with the global evidence.<sup>11,12</sup> Furthermore, the mortality rate in female patients was lower (11.92%) compared with male patients (15.75%) but this difference was not statistically significant (*p* = .675) in contradiction with the overall country-picture which records higher case fatality among women than men.<sup>13</sup> However, in most parts of the developed world, COVID-19 positive male patients have significantly worse prognosis than female patients, attributable to both a biological and behavioral predisposition.<sup>14</sup>

In this study, almost 28.55% patients belonged to the geriatric age group although their share in the total population of India is only 8% suggesting increased morbidity and mortality in this subgroup, probably due to weakened immunity and the presence of multiple comorbidities.

The mortality rate among the hospitalized patients in this study (13.72%) was also significantly lower compared with reports in Brazil (39.6%)<sup>2</sup> and New York, USA (21%).<sup>12</sup> India has globally one of the highest recovery and the lowest COVID-19 mortality rates. Potential reasons for the phenomenon could be the younger age-profile of the patients and the overall lower percentage share of elderly population, which is evident from the lower mean age of hospitalized patients in this study compared with China<sup>11</sup> and the USA.<sup>12</sup> Nevertheless, in the present study, elderly women had the highest odds of mortality, indicating the possible role of delayed health seeking behavior, secondary to familial and social neglect, contributing to adverse outcomes in this most vulnerable subgroup.<sup>15</sup> Higher innate immunity due to pre-existing burden of infection from poor hygiene and the long-standing policy of universal BCG vaccination at birth inducing trained immunity could be other factors that improved prognosis in Indian patients.<sup>16,17</sup>

The overall statewide recovery rate demonstrated steady improvement since the onset and progression of the pandemic. In contrast, the recovery rate among the moderate-severe cases that were hospitalized at this tertiary care center during the same period reflected a lower nonspecific zigzag pattern indicating limited effectiveness of the COVID-19 treatment regimens (Figure 2).

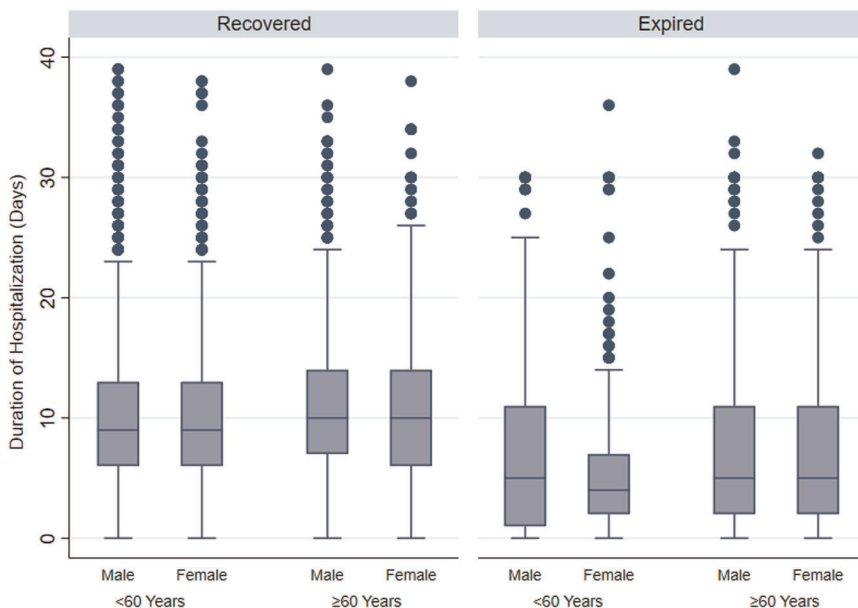
The strengths of the study are the large sample size and sample representativeness. The study also reports on the COVID-19 sex-disaggregated data of moderate-severe hospitalized patients. However,

TABLE 1 Association of age and gender with outcome in patients with COVID-19 (N = 10,314)

Age	Total Cases (10,314)	Male				Female							
		Deaths (1415)	Recovered (8899)	OR (95% CI)	Cases (6031)	Deaths (905)	Recovered (5126)	OR (95% CI)	Cases (4278)	Deaths (510)	Recovered (3768)	OR (95% CI)	
<30	2210	67 (3.03)	2143 (96.97)	1	975	37 (3.79)	938 (96.21)	1	1232	30 (2.44)	1202 (97.56)	1	
30 to <40	1587	78 (4.91)	1509 (95.09)	1.65 (1.18–2.31)	904	49 (5.42)	855 (94.58)	1.45 (0.94–2.25)	682	29 (4.25)	653 (95.75)	1.78 (1.06–2.99)	
40 to <50	1614	180 (11.15)	1434 (88.85)	4.01 (3.01–5.36)	1094	106 (9.69)	988 (90.31)	2.71 (1.85–4.00)	520	74 (14.23)	446 (85.77)	6.65 (4.29–10.30)	
50 to <60	1955	336 (17.19)	1619 (82.81)	6.64 (5.07–8.70)	1288	240 (18.63)	1048 (81.37)	5.81 (4.06–8.30)	666	96 (14.51)	570 (85.49)	6.75 (4.43–10.29)	
60 to <70	1760	396 (22.50)	1364 (77.50)	9.29 (7.11–12.14)	1054	254 (24.10)	800 (75.90)	8.05 (5.63–11.51)	706	142 (20.11)	564 (79.89)	10.09 (6.72–15.14)	
≥70	1183	358 (30.73)	825 (69.27)	13.88 (10.56–18.24)	712	216 (30.76)	493 (69.24)	11.26 (7.82–16.22)	471	139 (29.51)	332 (70.49)	16.77 (11.10–25.35)	
p value	<.001	<.001				<.001				<.001			

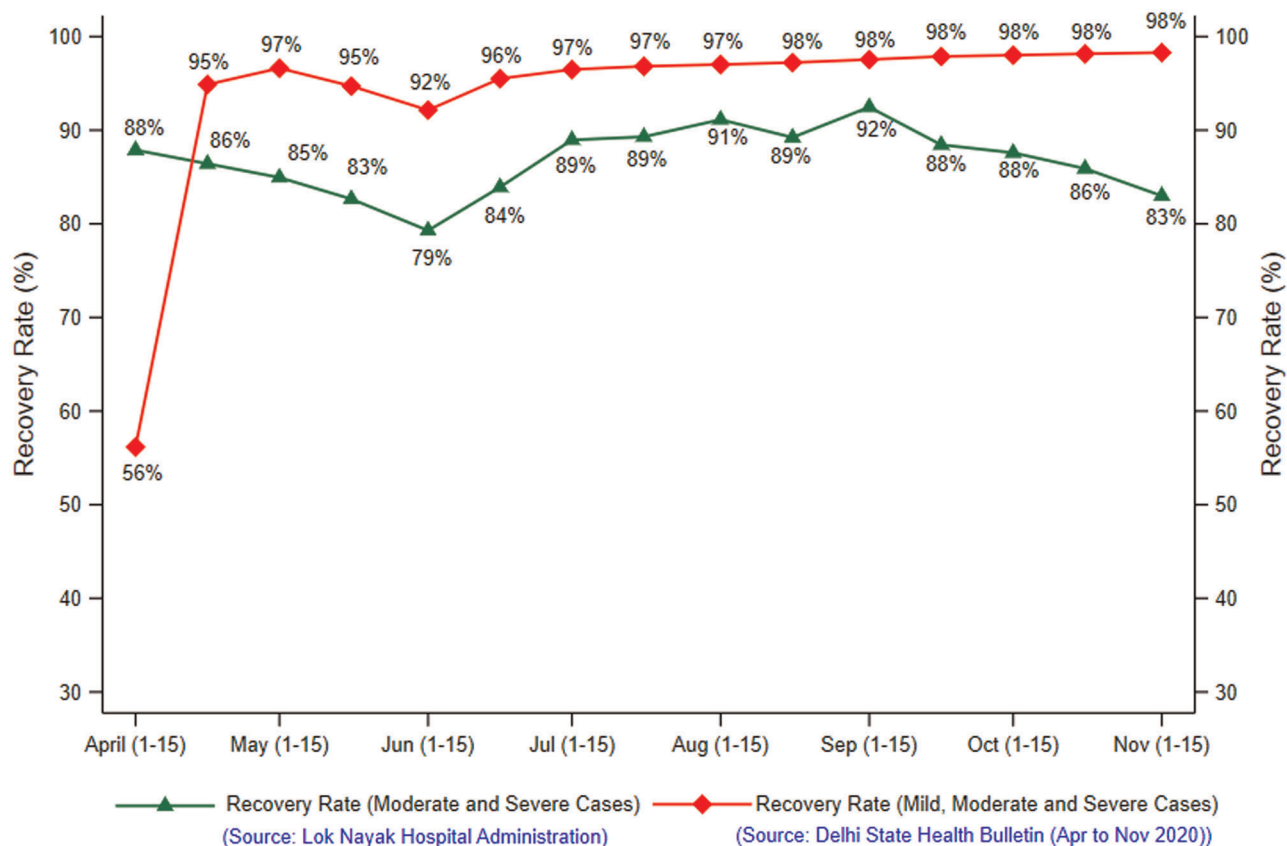
Note: Age was missing in five cases and gender in five cases.  
Abbreviations: CI, confidence interval; COVID-19, coronavirus disease 2019; OR, odds ratio.

**FIGURE 1** Duration of Hospitalization in patients with coronavirus disease 2019 stratified across age and gender ( $N = 10,309$ )



there are certain study limitations. First, the data on the presence of comorbidities like diabetes, hypertension, and lung disease that are known to increase the risk of mortality and adverse outcomes<sup>4</sup> among patients with COVID-19 was unavailable since we could not assess

individual patient records manually as the hospital does not maintain electronic health records. For similar reasons, the patients clinical and laboratory parameters that were likely predictors of their prognosis could not be ascertained through this analysis which also precluded the



**FIGURE 2** Comparison of the trends of the COVID-19 recovery rate among hospitalized moderate-severe and the overall statewide rate in Delhi, India (April 1–November 15)

estimation of the adjusted mortality rates.<sup>18</sup> Data on socioeconomic status of participants are not collected in a hospital setting but nevertheless being a government hospital, the LNH catered more to the socioeconomically vulnerable populations. Finally, the recovered patients were not followed-up beyond the day of discharge to assess the incidence of potential post-COVID complications.

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## CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

## AUTHOR CONTRIBUTIONS

**Conceptualization:** Vikas Malhotra, Saurav Basu, Nandini Sharma, Suresh Kumar, and Amod Borle. **Methodology:** Vikas Malhotra, Saurav Basu, Nandini Sharma, Suresh Kumar, and Amod Borle. **Formal Analysis:** Saurav Basu, and Kumar Dushyant. **Investigation (Data acquisition):** Vikas Malhotra. **Resources:** Vikas Malhotra, Nandini Sharma, Suresh Kumar, and Sandeep Garg. **Supervision:** Vikas Malhotra, Sandeep Garg, and Amod Borle. **Writing (original draft):** Saurav Basu. **Writing (Review & Editing):** All authors.

## PEER REVIEW

The peer review history for this article is available at <https://publons.com/publon/10.1002/jmv.26956>.

## DATA AVAILABILITY STATEMENT

The anonymized data set associated with this study will be provided on reasonable request to the corresponding author.

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## SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article.

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