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# A Hospital-Based Study of Factors Associated with COVID-19-Related Deaths in Western Uttar Pradesh

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## ABSTRACT

**Background:** The COVID-19 pandemic has rapidly affected mortality in India and public health efforts must focus on preventing the avoidable fatalities during this pandemic. Understanding various clinical characteristics of the deceased patients of COVID-19 along with the estimation of time interval between the onset of symptoms and admission in hospital and various factors associated with COVID-19 related deaths could inform public health interventions focusing on preventing deaths due to COVID-19.

**Materials and Methods:** The present study was a retrospective hospital-based cross-sectional study conducted in Subharti Medical College and Hospital, Swami Vivekanand Subharti University, Meerut, Uttar Pradesh, India. The duration of the study was 21 months. Data of COVID-19 deaths were collected from the Medical Record Department of Chhatrapati Shivaji Subharti Hospital, Meerut, which is a dedicated Level-3 COVID Hospital.

**Results:** Total Deaths due to COVID-19 were 298. Out of 298 deaths, 205 were males and 93 were females. The maximum number of deaths were in May 2021. When the duration of oxygen support was 1 to 5 days in 44.97% of the deceased, less than 1 day were 17.11% and more than 5 days were 17.11. The duration of ventilator support was less than 1 day in 39.26% of the deceased, 1 to 3 days in 39.3%, and more than 3 days in 21.14% of the deceased. The most common symptom associated with COVID-19 deceased was fever with breathlessness both in males and females. The most common co-morbid condition associated with COVID-19 deaths was hypertension with diabetes mellitus both in males and females.

**Conclusion:** From the present study, we conclude that the majority of deaths were males. The maximum number of deaths due to COVID-19 was in May 2021, both in males and females. The most common symptom associated was fever with breathlessness and most common comorbid condition associated with deaths of COVID patients were hypertension with diabetes mellitus. The duration of oxygen support was 1 to 5 days in the majority of the patients. The duration of ventilator support was less than 1 day in the majority of patients.

**Keywords:** COVID-19, Deaths, Hypertension, Diabetes mellitus, Fever, Breathlessness.

## INTRODUCTION

As of October 19, 2021, COVID-19 has infected 3,40,94,373 individuals with 4,52,454 (1.33%) deaths and 3,34,58,801 (98.14%) patients recovered in India.[1] As per details from Census 2011, Uttar Pradesh has a population of 19.98 crores and projected as 23.30 crores in 2021,[2] reported 1,710,036 cases and 18,989 deaths due to COVID-19.[3] Now new evidences are emerging to caution that young and adults' population are also prone to critical illness and adverse outcomes.[4,5]

Public health efforts must focus on preventing the spread of infection by COVID- appropriate behavior and follow strict covid protocols.[6] At present, the most important and effective method to deal with COVID-19 is supportive care and prevention efforts to control the transmission.[7] The challenge for hospitals is to control the deaths due to COVID-19 infection and this fatality can only be reduced by awareness among people of the country, early diagnosis and accurate diagnosis, identification of various signs and symptoms of the disease, prediction of progression of the disease, identification of various comorbid conditions directly related to the fatality, preparedness of timely oxygen support and ventilator support.[8] Early and timely medical care to patients with exposure and symptoms mainly with associated co-morbid conditions could reduce the spread of the infection, severity, and deaths due to COVID and can produce better clinical outcome.[9,10]

At present, COVID-19 has its presence across the globe and the knowledge regarding the virus is increasing day by day by various researches. However, there are many unknown facts about COVID-19 related to demographic and clinical characteristics of the deceased, the different time intervals between the time of infection and the outcome.[10–12] The present study aims to understand the demographic as well as clinical characteristics of the deceased due to COVID-19 infection along with the estimation of various symptoms and its onset related to COVID-19 infection, admission to hospital, comorbidities associated and duration of oxygen support and ventilator support and death, which could inform public health interventions focusing on preventing deaths and transmission of infection due to Covid-19.

## MATERIALS AND METHODS

The present study was conducted in Subharti Medical College and Chhatrapati Shivaji Subharti Hospital, Swami Vivekanand Subharti University, Meerut, Uttar Pradesh, India. We obtained death summaries of patients died due to COVID-19 from Medical Record Department of Chhatrapati Shivaji Subharti Hospital, which was a dedicated Level-3 COVID Hospital. Each death summary consisted of age, sex, district, state, symptoms, duration of symptoms, comorbid conditions, duration of oxygen support, and duration of ventilator support, date of admission and time of admission, date and time of death. The information was collected from April 2020 to August 2021. More than 5,000 COVID-19 infected patients were admitted during this period, out of which 298 died during treatment. Control group of 298 patients recovered from COVID-19 were taken and various symptoms, associated comorbid conditions, duration of oxygen, and ventilator support were analyzed. From the death summaries of all deceased, the various symptoms and its duration, date of admission, duration of stay in hospital, associated comorbidities, duration of oxygen and ventilator support were analyzed. Inclusion criteria were COVID-related deaths in the hospital and deaths with a negative COVID-19 test report before death. Exclusion criteria were brought dead patients, patients dying of another causes such as trauma but with COVID-19-positive test report and COVID-negative deaths. All statistical analyses were performed through the statistical software SPSS version 25.0. The data were collected via Excel sheets (MS Excel software) from medical record department. All graphs and tables were compiled using MS Excel.

## OUTCOMES

The total number of COVID-19 infected patients admitted were 3,250 and deaths due to COVID were 298 (9.16%) during the period of analysis. In the control group of 298 patients, 160 were males and 138 were females. Also, 68.79% deaths were male and 31.21% were female deaths [Table 1].

In males, the age group most commonly infected and died were 61 to 80 years of age and in females the age group most commonly died were 41 to 60 years of age [Table 2].

The most common symptoms in the deceased were a combination of fever and breathlessness in both males and females [Table 3] (***p* = 0.78**). In the control group, the most common symptom associated with both females and males was loss of taste and smell (***p* = 0.73).**

The most common comorbid condition associated with the deceased due to COVID-19 were hypertension with diabetes

**Table 2**: Age group distribution in male and female deaths due to covid-19.

| Age (y) | Male | Female |
|---|---|---|
| **Less than 2O** | 4 | 0 |
| 21–40 | 25 | 13 |
| 41–60 | 70 | 45 |
| 61–80 | 96 | 32 |
| ABOVE 80 | 10 | 3 |

**Table 1**: Ratio of male and female deaths due to COVID-19.

| S. No. | No. of male deaths | No. of female deaths | Total deaths | Ratio (male and female) |
|---|---|---|---|---|
| 1 | 205 (68.79%) | 93 (31.21%) | 298 | 68.79% = male<br>31.21% = female |

**Table 3**: Symptoms associated with deceased due to COVID-19.

| Symptoms | Males | Females |
|---|---|---|
| Fever only | 12 | 5 |
| Fever and cough | 62 | 26 |
| Fever and sputum | 6 | 3 |
| Fever and breathlessness | 92 | 45 |
| Fever and sore throat | 5 | 0 |
| Cough and sputum | 5 | 4 |
| Cough and breathlessness | 50 | 26 |
| Fever, cough, and breathlessness | 37 | 19 |
| Fatigue and myalgia | 3 | 2 |

mellitus (***p*=0.76**), followed by diabetes alone (***p*=0.64**) followed by hypertension alone both in males and females (***p*=0.48**) [Table 4] as compared with the control group in which the most common comorbidities associated with COVID-19 were hypertension only (***p*=0.35**), followed by liver diseases only (***p*=0.32**) in both males and females.

Table 5 and Table 6 show the duration of oxygen support and ventilator support in males and females deceased due to COVID-19.

There were more deaths of patients requiring ventilator support as compared with those requiring non-invasive ventilator support and oxygen support (***p*=0.72**).

**Table 4**: Comorbid conditions associated with the deceased due to COVID-19.

| Comorbid conditions | Males | Females |
|---|---|---|
| Hypertension only | 20 | 8 |
| Hypertension and dm | 44 | 18 |
| Hypertension and renal disease | 2 | 1 |
| Hypertension and liver disease | 1 | 0 |
| Hypertension and other cardiovascular diseases | 1 | 0 |
| Hypertension and lung disease | 4 | 0 |
| Dm only | 33 | 17 |
| Dm and renal disease | 1 | 0 |
| Dm and liver disease | 0 | 0 |
| Dm and other cardiovascular disease | 3 | 1 |
| Dm and lung disease | 0 | 3 |
| Renal disease only | 3 | 1 |
| Renal disease and liver disease | 1 | 0 |
| Renal disease and other cardiovascular diseases | 0 | 0 |
| Renal disease and lung disease | 1 | 0 |
| Liver disease only | 2 | 2 |
| Liver disease and other cardiovascular disease | 0 | 0 |
| Liver disease and lung disease | 0 | 1 |
| Cardiovascular disease only | 7 | 2 |
| Cardiovascular disease and lung disease | 1 | 0 |
| Hypothyroidism only | 5 | 4 |

Dm, Diabetes mellitus.

## DISCUSSION

Association of increasing death with age could be due to associated comorbid conditions and less responsive immune system among elderly [11.12]. The present study reported higher number of deaths in males (68.79%) as compared with females (31.21%) and the results are same as that reported by Asirvatham *et al.*[13] The most common age group in females affected was from 41 years to 60 years but in males, the most common group affected was from 61 years to 80 years. The main reason of increased mortality among Indian males could be due to the behavioral risk factors such as the consumption of alcohol and smoking.[14] In many studies, the mortality among females has been reported less as compared with males and the reason could be due to protection of sex hormones and X-chromosome, which plays an important role in providing adaptive and innate immunity.[15]

The disease severity and increased risk of mortality in COVID-19 patients are strongly associated with various comorbid conditions such as hypertension, diabetes mellitus, obesity, respiratory disease, cardiovascular disease, and thyroid-related diseases and the results of the present study confirm the previous findings.[4,16,17] In the present study, the single comorbid condition strongly associated with mortality was diabetes mellitus both in males and females, followed by hypertension. In the present study, multiple comorbid conditions associated with mortality were hypertension with

**Table 5**: Duration of oxygen support in males and females deceased due to COVID-19.

| | | Average duration of oxygen support | | |
|---|---|---|---|---|
| S. No. | No. of days | Male (No. and %) | Female (No. and %) | Combined (No. and %) |
| 1 | Less than 1 day | 32 (62.75%) | 19 (37.25%) | 51 (17.11%) |
| 2 | More than 5 days | 40 (78.43%) | 11 (21.57%) | 51 (17.11%) |
| 3 | 1–5 days | 98 (73.13%) | 36 (26.87%) | 134 (44.97%) |
| 4 | No oxygen | 35 (56.45%) | 27 (43.55%) | 62 (20.81%) |
| | Total | 205 | 93 | 298 |

**Table 6**: Duration of ventilator support in males and females deceased due to COVID-19.

| | | Average duration of ventilator support | | |
|---|---|---|---|---|
| **S.NO.** | **No. of days** | **Male (no. and %)** | **Female (no. and %)** | **Combined (no. and %)** |
| 1 | Less than 1 day | 81 (69.23%) | 36 (30.77%) | 117 (39.26%) |
| 2 | More than 3 days | 39 (61.90%) | 24 (38.10%) | 63 (21.14%) |
| 3 | 1–3 days | 72 (71.29%) | 29 (28.71%) | 101 (33.89%) |
| 4 | No ventilator | 13 (76.47%) | 04 (23.53%) | 17 (5.71%) |
| | Total | 205 | 93 | 298 |

diabetes mellitus. Studies in China reported around 70% of deaths with only one comorbidity.[18] South Korea and Brazil reported 83% and 90.7% of hypertension, cardiovascular disease, and diabetes melllitus as the main comorbid conditions associated with COVID-19-related deaths.[19,20]

The most common symptom at the time of admission were fever with breathlessness, followed by fever with cough which was followed by cough with breathlessness, less than one-third of the patients presented with fever with cough and breathlessness and the findings are same as those of Asirvatham *et al.*[13,16,18] A meta-analysis of patients of COVID-19 showed fever as the most common symptom followed by dry cough and fatigue.[21]

The duration of symptom onset and hospital admission in our study was found to be 7 days, which is within the range as mentioned in the studies held in China, Italy, and Singapore[16,22,23]; some countries reported a wide range of 5 days to 16 days, which is slightly higher.[24,25]

## CONCLUSION

The present study provides evidence that the elderly males and females with various comorbidities are more prone to severity and mortality from COVID-19 infection. Awareness among population about various symptoms is very important to decrease the mortality because the duration between onset of symptoms and hospital admission is important to start early interventions to save the life and decrease mortality. Ventilator support and oxygen support are very crucial in treating the moderate and severe cases and timely shift in ICU can reduce the mortality. Timely admission, early diagnosis, and treatment along with timely support of oxygen and ventilator are of crucial importance to reduce the mortality among COVID-19 patients.

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### Conflict of interest

None declared.

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